





PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF
WASHINGTON

VOLUME 63

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PUBLISHED BY THE SOCIETY
WASHINGTON, D. C.

1961

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U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED QUARTERLY

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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 63

MARCH, 1961

No. 1

THE ODONATA OF WASHINGTON, D. C., AND VICINITY

THOMAS W. DONNELLY, *Dept. of Geology, Rice University, Houston, Texas.*

For more than a century the Washington, D. C., area has been intensively studied by naturalists. Significantly, a large part of our knowledge of the natural history of this area has come from government biologists who have found the woods and streams of nearby Maryland and Virginia rewarding places for weekend study, and the flora and fauna of this area is as a result, quite well documented. However, in spite of the existence of a fine collection of local dragonflies and damselflies in the U. S. National Museum, no study of the Odonata has been published. It seems desirable to record this Odonate fauna, not only to document the thorough collecting of the past fifty years and to present to entomologists a description of an eastern Odonate fauna, but also to provide an example of the effect of the growth of a large city on an aquatic insect fauna, which has been significantly impoverished during the last forty years.

Early collectors of dragonflies around Washington include H. S. Barber, Nathan Banks, J. S. Hine, W. L. McAtee, and Rolla Currie and his sister Bertha. These early workers, especially the Curries, collected extensively just prior to the first World War and succeeded in collecting nearly all of the presently known species. So thorough was their work, in fact, that recent collectors have been able to add only eleven species to their total of one hundred and three. Carl Cook collected here during World War II, and the author has collected extensively since 1949. Very few dragonflies were collected during the period between the World Wars.

The area covered by this report includes, in addition to the District of Columbia itself, adjacent Maryland (Montgomery, Prince Georges, Charles, and the southeastern corner of Frederick Counties) and Virginia (Fairfax, Arlington, and Prince William Counties). The entire area falls within Merriam's Carolinian Life Zone. The topography is mature, and there are very few natural lakes or ponds. The Potomac River and its tributaries drain all of the area except the northeast corner, which is drained by the Patuxent River. The two

natural subdivisions of the area are the Piedmont and the Coastal Plain. The Piedmont is underlain by ancient crystalline rocks and by Triassic sediments and diabase. Piedmont streams are characterized by boulder or cobble bottoms, with intervening reaches with mud and leaf trash bottoms. Emergent vegetation is usually sparse, except in the smallest streams. Streams in the regions underlain by Triassic sediments are commonly choked with finely comminuted red shale fragments and have in these places a somewhat limited insect fauna. The Coastal Plain is underlain largely by unconsolidated quartzose sands and gravels, and streams in this area have well sorted sand and gravel bottoms, with mud in the slower reaches. Unwise farming practices have probably been responsible for a layer of silt covering many of the former sandy stream bottoms.

Except for the fact that Piedmont streams commonly have a much greater variety of habitats than do Coastal Plain streams, there are no important factors which have promoted the development of distinct Odonate faunas in these two physiographic provinces. Generalizations regarding the restriction to one or the other of these two areas may be made from the known distribution of certain species in the Washington area, but these generalizations may fail rather badly in the consideration of the overall range of the species in North America. Thus, *Didymops transversa* may be seen flying in late May along nearly every slowly flowing Coastal Plain stream, but it is absent from Piedmont streams in our area. This same species, however, is also characteristic of cold, spring-fed streams in the mountains of Pennsylvania and New York. The ability of Odonata to disperse themselves widely and the limited dependence of Odonate nymphs and imagoes upon their environment makes the ranges of species of this order among the least satisfactory to reconcile to simple explanations based upon climatic, physiographic, or biological considerations.

The distributions of a few species within our area are, however, rather clearly defined by physiographic and climatic factors. Swift Piedmont streams with alternating boulder and cobble-choked reaches and slower, muddy reaches have several Odonate species which will probably not be collected on the Coastal Plain except as chance strays. *Erpctogomphus designatus*, *Dromogomphus spinosus*, *Macromia illinoensis*, *Hetaerina americana*, *H. titia*, *Argia apicalis*, *A. sedula*, and *Enallagma exsulans* certainly belong to this group, and *Epicordulia princeps*, *Stylurus laurae*, *S. spiniceps*, *Argia moesta*, *A. tibialis*, and *A. translata* probably belong here. Five rare species (*Ophiogomphus rupinsulensis*, *Stylurus annicola*, *Macromia alleghaniensis*, *Neurocordulia obsoleta*, and *Archilestes grandis*) are considered to be of probable Piedmont distribution. Only two species (*Somatochlora filosa* and *Calopteryx apicalis*) are probably limited to Coastal Plain streams. Both of these species are southern in distribution and reach their northern limits south of New York City, their limitation to Coastal Plain streams in the Washington area, then, may be the result of climatic restrictions of the nymphal range. The common spring damselfly *Enallagma divigans* is far more abundant in our area on

Coastal Plain than on Piedmont streams, but its distribution in the eastern United States as a whole is not at all limited to habitats resembling the Coastal Plain streams in the vicinity of Washington. Four stream species which are found in abundance on both Coastal Plain and Piedmont streams are *Gomphus exilis*, *Bayeria vinosa*, *Calopteryx maculata* and *Argia violacea*.

Two species whose ranges may be limited by chemical conditions are *Libellula needhami* and *Erythrodiplax bernice*, the latter of which has not been taken recently in the Washington area. The overall ranges of these species and their distribution in the Washington area suggest that these are halophilous insects rarely found any great distance from brackish water. One characteristic bog species now apparently limited to the Suitland Bog of Prince Georges County (which the author has not visited) is the miniscule dragonfly *Nannothemis bella*, which was taken in large numbers fifty years ago at Beltsville and Hyattsville.

Lentic habitats of the Piedmont and the Coastal Plain have similar Odonate faunas, although *Celithemis elisa*, *C. monomelaena*, *Tramea carolina* and *Pantala flavescens* are found in greater abundance on Coastal Plain ponds. The pond Odonates which may be found on nearly every pond or lake in the Washington area are *Anax junius*, *Perithemis tenera*, *Libellula cyanea*, *L. incesta*, *L. luctuosa*, *L. pulchella*, *Plathemis lydia*, *Sympetrum rubicundulum*, *S. vicinum*, *Erythemis simplicicollis*, *Pachydiplax longipennis*, *Lestes rectangularis*, *Enallagma civile*, *Ischnura posita*, and *I. verticalis*.

A unique lentic micro-habitat in the Piedmont is found in potholes high above the present water level in the Potomac River gorge, as at Great Falls. These potholes are filled by rainfall only and all of them are probably dry at times. In the summer the water becomes uncomfortably hot, and the general aspect of these small ponds is not what the collector would consider generally favorable to Odonates. However, one species of damselfly (*Lestes foreipatus*) is abundant here and has not been taken elsewhere in the area in recent years. This damselfly oviposits endophytically in emergent vegetation, thus surviving the occasional periods of drought. Nymphs of *Pantala hymenaea* and *Aeshna umbrosa* have been found in these ponds, and imagoes of *Anax junius*, *Libellula incesta*, *L. pulchella*, and *Sympetrum rubicundulum* are abundant around these ponds, but do not necessarily breed here.

The Chesapeake and Ohio Canal, paralleling the Potomac River from Cumberland, Maryland, to Washington, belongs in a special ecological category. The restored canal, from Washington to Seneca, Maryland, is about fifty feet wide and five feet deep, with steep sides, a mud and leaf trash bottom, and only a fringe of emergent vegetation. The water current is in most places so slow as to be imperceptible. The unrestored canal, from just below Seneca to Cumberland, is in some places a marshy depression and in other places a series of unconnected woodland pools. The unrestored canal has not been seriously studied by the writer, though cursory collecting has shown that, with a few exceptions, its Odonate fauna is rather limited. The restored canal is best characterized as lotic-lentic, and its Odonate fauna is strikingly

varied. Sixty species have been taken in the immediate vicinity of the canal, and fifty of these have been found in recent years. *Epicordulia princeps* is much more abundant here than elsewhere, and *Macromia alleghaniensis* and *Gomphus vastus* are apparently now limited to the canal. Six species of *Argia*, *Perithemis tenera*, *Libellula incesta*, *Erythemis simplicicollis*, *Pachydiplax longipennis*, *Enallagma exulans*, and *E. signatum* may be found in abundance on any summer day, and at least two dozen other species can be taken daily at almost any season. If the proposed Chesapeake and Ohio Canal Parkway is constructed one of the most interesting fresh water environments in the vicinity of Washington may be extensively damaged.

An area the recent destruction of which perhaps presages the doom of the Chesapeake and Ohio Canal is the upper Anacostia River system. In these bottomlands were once a variety of streams and ponds, including the famous magnolia bogs (McAtee, 1918). Rolla and Bertha Currie and their colleagues collected in this area extensively and collected seventy-five species of Odonates, including twenty-one species now unknown from the Washington area (*Gomphus parvidens* [type locality], *Anax longipes*, *Aeshna tuberculifera*, *Ac. verticalis*, *Macromia gorgina*, *Tetragoncuria spinosa*, *Libellula flavida*, *Erythrodiplax connata minuscula*, *Sympetrum semicinctum*, *S. obtusum*, *Lestes congener*, *L. disjunctus australis*, *L. inequalis*, *L. unguiculatus*, *Nehalennia gracilis*, *N. irene*, *N. integricollis*, *Enallagma carunculatum*, *E. double-dayi*, *E. durum*, and *Telecallagma dacckii*). Although a few of these species were recorded by the Curries in other parts of the Washington area, all were apparently typical of the Hyattsville area, and many were abundant there. Within the last forty years sewage disposal has fouled the streams and housing developments have spread over the once rich bottomlands, so that little of the original flora and fauna remain. However, Greenbelt Lake, a new artificial lake in this area, has yielded several interesting records recently, including *Tachopteryx thorcyi*, *Tetragoncuria williamsoni*, *T. semiaquac.* and *Enallagma basidens*. At another locality within this general area (Northwest Branch in College Park) the first specimens of *Archilestes grandis* found east of the Appalachians were collected in 1949, but this locality became a housing development shortly after the damselflies were collected, and the species was driven from this area shortly after becoming established.

Of the eleven species added to the local list in recent years, two may be chance strays (*Gomphus fraternus*, *Stylurus amicola*), but seven may be well established and may have been overlooked by the Curries (*Nasiaeschna pentacantha*, *Macromia alleghaniensis*, *Tetragoncuria williamsoni*, *T. semiaquac.*, *Helocordulia uhleri*, *Somatochlora tincaris*, and *S. tenebrosa*). However, two species have probably migrated into our area from the southwestern United States in the last few decades (*Archilestes grandis* and *Enallagma basidens*). Records of the first captures reported for the large, spectacular damselfly *Archilestes grandis* shows that this species spread northeastward into the mid-western States during the nineteen-thirties, but did not cross the Appa-

lachians until the forties. *Enallagma basidens* probably also spread into the area from the southwestern United States after World War I, although documentation of the movement of this species is less complete than that for *Archilestes*. *Archilestes grandis* is unlikely to have been overlooked by the Curries because of its large size and spectacular appearance; on the other hand, *Enallagma basidens* is unlikely to have been missed because of its almost invariable local abundance and the ease with which it can always be captured. In all probability neither *Archilestes grandis* nor *Enallagma basidens* were present during the time of the Curries' collecting.

Thirty-two species of the total one hundred and fourteen have not been taken in recent years, and eleven species were not recorded by the Curries and their contemporaries. Two of the thirty-two species (*Cordulegaster maculatus*, *Aeshna umbrosa*) almost certainly occur in limited numbers today but have not been taken because the imagoes fly either very early or very late in the season, when little recent collecting has been done. In spite of the recent creation of lentic habitats (such as Greenbelt Lake) there can be no doubt that the Odonate fauna of the Washington area has been significantly impoverished since the First World War and may be even further reduced by the construction of the proposed Chesapeake and Ohio Canal Parkway, which would entail partial filling in of the Canal.

List of Localities (*denotes those localities not visited by the author and represented only by specimens in the United States National Museum).

Maryland, Frederick Co.: Fr1, Lilypons; Fr2, Bennett's Creek at Park Mills. All localities are within the Piedmont.

Maryland, Montgomery Co.: M1, quarry lake at Dickerson; M2, Little Monocacy River at Dickerson; *M3, Barnesville; *M4, Poolesville; *M5, Travilah; M6, Tridelphia Reservoir; M7, Seneca Creek at Seneca; M8, C & O Canal at Rushville; M9, Muddy Branch at River Road; M10, C & O Canal at Pennyfield; M11, Watt's Branch at River Road; M12, Great Falls (including C & O Canal here); M13, C & O Canal at Carderock; *M14, Plummer's Island; M15, Cabin John; M16, C & O Canal at Glen Echo; M17, C & O Canal at Brookmont; M18, Little Falls Branch at River Road; *M19, Chevy Chase Lake; *M20, Garrett Park; *M21, Forest Glen; *M22, Woodside; *M23, Kensington; *M24, High Island; *M25, Potomac River Gorge; *M26, Little Falls; *M27, "C & O Canal" (no specific locality). Localities 2, 4, 7 and 8 are in areas of Triassic sediments. All other localities are in areas of Piedmont crystalline rocks.

Maryland, Prince Georges Co.: PG1, Northwest Branch at College Park; *PG2, Laurel; PG3, Beltsville; PG4, Greenbelt Lake; *PG5, Berwyn; *PG6, Lakeland; *PG7, Hyattsville; *PG8, Bladensburg; *PG9, Suitland; PG10, Silesia; *PG11, Woodyard; PG12, Pisecataway Creek at Pisecataway; *PG13, West Hyattsville; *PG14, East Branch of Anacostia River; *PG15, Branchville; *PG16, College Park. All localities are within the Coastal Plain.

Maryland, Charles Co.: C1, Mattawoman Creek at Mason Springs; *C2, Marshall Hall; C3, Cedarville State Forest; C4, Port Tobacco River 2 miles west of La

Plata; C5, Zekiah Swamp Run near Dentsville; C6, Allens Fresh Marsh (mouth of Zekiah Swamp Run); *C7, "Charles Co." (no specific locality). All localities are within the Coastal Plain.

Virginia, Fairfax Co.: *Fa1, Great Falls; *Fa2, Diffientl Run; *Fa3, Dead Run; *Fa4, Enola; *Fa5, Falls Church; *Fa6, Glen Carlyn; *FA7, Hunting Creek; *Fa8, Dyke; *Fa9, Mt. Vernon; Fa10, Pohick Creek at Gunston Cove; Fa11, Bull Run at Centreville; Fa12, "Pohick Creek" (no specific locality). Localities 7, 8, 9 and 10 are within the Coastal Plain; the others (except possibly No. 12) are within the Piedmont.

Virginia, Prince William Co.: PW1, Youngs Branch at U.S. Highway 29-211; PW2, Broad Run at Lake Jackson; *PW3, Colchester. Locality 3 is within the Coastal Plain; the other two are within the Piedmont.

Virginia, Arlington Co.: *A1, Arlington; A2, Potomac River at Gravelly Point; *A3, Chain Bridge; *A4, Rosslyn; A5, Roosevelt Island. Locality 2 is within the Coastal Plain; localities 3, 4 and 5 are within the Piedmont.

District of Columbia: DC1, "Washington" (no specific locality); *DC2, Soldier's Home; *DC3, High Island; *DC4, Chain Bridge; DC5, Georgetown; DC6, Kenilworth Aquatic Gardens; *DC7, Piney Branch; *DC8, Rock Creek Park; *DC9, East Branch of Anacostia River; *DC10, Hamilton Hill; DC11, Potomac Park; *DC12, Brightwood; *DC13, Potomac Flats. Localities 2, 6, 9, 10, 11, 12 and 13 are within the Coastal Plain; the remainder (except No. 1) are within the Piedmont.

List of Species

Of the one hundred and fourteen species listed, complete records are given for forty five, and only a list of localities and inclusive dates for the remainder. The symbol (†) denotes those species not collected since the First World War. The symbol (*) denotes those species collected only since about 1940. It should be noted that only a handful of records were available from the period between the World Wars.

The following abbreviations are used:

BPC—Bertha P. Currie

RPC—Rolla P. Currie

TWD—Thomas W. Donnelly

USNM—United States National Museum

n.d.—no date

Petaluridae

Tachopteryx thoreyi (Hagen): Fr2, M12, *M14 (nymph and imago), PG3, PG4, *Fa1, *PW3; May 22-July 6.

Cordulegasteridae

Cordulegaster diastatops (Selys): *PG13 (1 ♀, "1914, V. Busck," "USNM"), FA10 (1 ♀ May 1, 1949, TWD).

Cordulegaster erroneus Hagen: M12, *M14, *M23, *Fa3, *DC1; June 8- August 22.

†*Cordulegaster maculatus* Selys: *M14, *PG8, *Fa1, *Fa4, *A1, *DC1; April 12-May 5.

†*Cordulegaster obliquus* (Say): *Fa4 (1 ♂ "May 27, 1915, E. W. Reynolds, USNM"), *DC1 (n.d. [Howe, 1921, p. 122]).

Gomphidae

†*Progomphus obscurus* (Rambur): *M14 (1 ♂ "June 17, 1913, J. D. Hood," USNM), *M5 (1 ♂ n.d., "F. C. Pratt," USNM), *PG6 (1 ♂ "July 2, 1915, RPC," USNM). Found today on the Middle Patuxent River, near Savage, Md., just outside our area.

Hagenius brevistylus (Selys): M12, *M14, M15, *PG14, C1, PW2, *DC8; June 17-September 11.

Ophiogomphus rupinsulensis Walsh: M10 (1 ♀ May 31, 1949, TWD), M15 (n.d. [Howe, 1921, p. 122]).

Erpetogomphus designatus Hagen: Frl, M7 (nymph), M10, M11, M12, M15, M17, M20, *Fa1, DC5; July 2-September 20. This species is probably the most abundant gomphine dragonfly along the Potomac River at and above Great Falls, and also along the larger tributary streams to this river. The nymph lives among cobbles in swift streams.

Dromogomphus spinosus (Selys): Frl, M6, M8, M10, M11, M12, *M14, *PG15, *Fa1, *Fa2, Fa11, PW2; June 15-September 11. This is a very common species and inhabits slower streams than does the preceding species.

Lanthus albistylus (Hagen): M11 (1 ♂ reared, June, 1951, TWD), C4 (1 ♀, species emerging in large numbers, May 25, 1957, TWD), *Fa1 (1 ♀ June 2, 1914, RPC, USNM). Found on small, swift streams.

Gomphus exilis Selys: M8, M10, M13, *PG2, PG4, *PG6, *PG7, *Fa1, PW1; May 26-June 25. Locally abundant near slow streams.

**Gomphus fraternus* (Say): M12 (1 ♀, n.d., from a packet of dragonflies collected by T. Goldsmith along the C & O Canal.)

Gomphus lividus Selys: *Fa1, *Fa2, Fa10; April 30-May 9. An early and uncommon species in our area.

†*Gomphus parvidens* Currie: *PG6 (1 ♂, May 22, 1915, BPC, Holotype; present whereabouts of the type specimen are not known.)

Gomphus vastus Walsh: M8, M9, M10, M13, *M14, *Fa1, *DC8; May 14-July 31. Common near slow Piedmont streams.

†*Gomphus ventricosus* Walsh: *Fa1 (May 21, 24, 26, June 2, 1914; May 14, 1915, RPC, USNM).

**Stylurus amnicola* (Walsh): M8 (1 ♂, June 17, 1951, TWD).

Stylurus laurae Williamson: M2, M7, M11, *PG6 (1 ♀, July 2, 1915, labeled "*Gomphus notatus*"), RPC, USNM), *Fa1. This species has been taken locally in the imago stage only by Currie. However, the author has reared many specimens from Watt's Branch and Pohiek Creek. The nymph is quite common in Piedmont streams generally, but no imagoes have been seen since Currie's specimen was taken.

†*Stylurus plagiatus* (Selys): *M14, M15, *M24, *PG8, *C2, *DC1; June 1-September 14.

Stylurus spiniceps (Walsh): M7 (nymphs), M15, M16, *PG7; September 19-September 28. An uncommon species.

Aeshnidae

†*Gomphaeschna antilope* (Hagen): *DC1 (U.S. National Museum Building, May 20, 23, June 2, 22, 1920, USNM).

Basiaeschna janata (Say): M7, M11, M12, *Fa1, *Fa12; April 30-May 15. Nymphs of this species are very common in small Piedmont streams.

Boyeria vinosa (Say): M6, M7, M11, M12, M17, *PG7, C1, *Fa1, *DC1, *DC8; June 15-September 9. A very common semi-crepuscular species on all small woodland streams.

**Nasiaeschna pentacantha* (Rambur): C5 (1 ♂ May 25, 1957, TWD). At least two other specimens were identified nearby on the above date. This species should be looked for on small Coastal Plain woodland streams.

Anax junius (Drury): Fr1, M8, M10, M12, PG4, *PG6, *PG7, *PG16, C6, *DC9; April-October. A very common species easily identified on the wing but collected only occasionally. Prefers lentic habitats.

†*Anax longipes* Hagen: *PG7 (1 ♀ eating a *Libellula cyanea*, June 3, 1916, RPC, BPC, USNM), *DC1 (1 ♀, Post Office Building, June 13, year ?, W. Brown, USNM).

Epiaeschna heros (Fabricius): M8, M12, *M19, PG4, *PG7, *DC1, *DC4; May 22-August. There are several records from buildings in downtown Washington (U.S. National Museum, U. S. Dept. of Agriculture, etc.).

†*Aeshna tuberculifera* Walker: *PG7 (1 ♂, 1 ♀, September 18, 1916, V. Busek, USNM; 1 ♀, September 20, 1916, RPC, USNM).

†*Aeshna umbrosa* Walker: M15, *M19, *M21, *M25, *PG7, *A3, *DC8; September 20-October 3. Imagoes have been seen but not taken in recent years. Nymphs have been collected in potholes in the gorge of the Potomac River.

†*Aeshna verticalis* Hagen: *PG7 (4 ♂, 3 ♀, September 9, October 1, 4, 6, 1914, USNM).

Corduliidae

Didymops transversa (Say): PG4, *PG6, *Fa1; April 30-June 12. A common, early season species on small woodland streams of the coastal plain.

**Macromia alleghaniensis* Williamson: M12 (1 ♂, 1 ♀, August 10, 1952, TWD; 3 ♂, July 30-31, 1953, TWD; 1 ♂, n.d., T. Goldsmith). At Great Falls this species flies with the more abundant *M. illinoensis*, from which it may sometimes be distinguished by its slower, more deliberate flight.

†*Macromia georgina* (Selys): PG7 (1 ♂, July 4, 1899, USNM). This specimen was called *M. australensis* by Williamson (1909). It is, however, clearly *georgina*, although it is slightly smaller than typical specimens of this species from New Jersey and Texas. Recent sight records of *Macromia* from Coastal Plain streams of Charles County may be this species. *Illinoensis* seems to be confined to the Piedmont in our area, and *georgina* has been taken on the Eastern Shore of Maryland and is abundant in the Coastal Plain of New Jersey.

Macromia illinoensis Walsh: M7, M11, M12, *M14, *PG8, *Fa1, *Fa3, Fall; June 4-September 3. This species is common on nearly all Piedmont streams.

†*Macromia taeniolata* Rambur: *Fa8 (1 ♂, August 17, 1916, USNM), *A4 (1 ♀, July 30, 1899, G. N. Collins, USNM), *DC1 (1 ♀, July 10, 1907, W. C. Weedon, USNM).

Neurocordulia obsoleta (Say): *M14, M15, M16, *Fa1, DC8; May 28-July 6. Though only half a dozen specimens have been taken in our area, this rarely seen crepuscular species is probably not uncommon along fairly swift Piedmont streams.

Epicordulia princeps (Hagen): M7, M12, M16, *Fa1, *Fa8, PW1, *DC1 (U.S. National Museum Building); May 31-July 31. A common early summer species along slowly flowing streams (C & O Canal, for example). Half a dozen older specimens and a dozen recent ones from the Potomac River above Washington show markedly reduced wing maculation. The basal spot in the front wing is nearly absent, the nodal spot of both wings is only 2 mm. in diameter, and the apical spots are somewhat smaller than normal. This reduced maculation is easily observed in the field, and of many dozen specimens observed at close range in recent years, as well as all the collected specimens, none has shown "normal" maculation. Specimens from the lower Potomac River and from Prince William County, however, are normal. Specimens with reduced maculation have been observed in many places in the eastern United States, usually flying with normal specimens. The upper Potomac River population is perhaps unique in its apparent total absence of normal forms. This reduced maculation may be the result of a limnologic condition, or it may be a local, but temporally persistent, genetic condition.

Tetragoneuria cynosura (Say): M13 (nymph), *Fa1; May 2-June 17. No imagoes have been taken in recent years.

***Tetragoneuria semiaquea** (Burmeister): PG4 (1 ♀, reared, emerged April 17, 1954, TWD). This specimen is referred to *semiaquea* because of its short (24 mm.) broad abdomen, and because of its hind wing spot, which reaches the fourth antenodal.

†**Tetragoneuria spinosa** (Hagen): *PG7 (1 ♂, May 1, 1915, USNM).

***Tetragoneuria williamsoni** Muttkowski: PG4 (n.d., C. Cook, personal communication).

***Helocordulia uhleri** (Selys): Fa12 (n.d., C. Cook, personal communication).

Somatochlora filosa (Hagen): PG10 (2 ♂, 1 ♀, September 11, 1949, TWD), *C7 (1 ♂, 1 ♀, August 8, year ?, Hagen Coll., MCZ, [Walker, 1925]), *DC1 (1 ♂, n.d., Smithsonian Stable, N. R. Wood, USNM; 1 ♀, found dead, September 13, 1921, Mrs. McConnell, USNM).

***Somatochlora linearis** (Hagen): C1 (1 ♀, August 22, 1953, TWD), C5 (1 ♂, 1 ♀, August 22, 1953, TWD), Fa11 (1 ♀, August 15, 1953, TWD). Found on small woodland streams. The female at Mason Springs was observed ovipositing in damp sand at the water's edge.

***Somatochlora tenebrosa** (Say): M12 (1 ♂, August 20, 1950, G. B. Vogt, USNM; 1 ♂, July 31, 1953, TWD).

Libellulidae

Nannothemis bella (Uhler): *PG3, *PG7; PG9; May 28-July 4. Today found only at the Suitland Bog.

Perithemis tenera (Say): M6, M8, M10, M12, *M19, PG4, C6, Fa8, PW2, A2, A5, *DC2, *DC10, *DC11; June 4-September 15. Very common on ponds and slow streams with emergent vegetation.

Celithemis elisa (Hagen): M12, PG4, *PG7, C6; June 3-June 27. Found today only on coastal plain ponds with sand bottoms.

Celithemis eponina (Drury): PG3, *Fa1, *Fa9, PW1, *DC1; June 27-July 28. Rare in our area today.

†**Celithemis martha** Williamson: *PG7 (1 ♂, August 14, 1916, V. Busek, USNM).

Celithemis monomelaena Williamson: M12, PG4, *Fa1; July 4-July 27. Found today only at Greenbelt lake, where it is fairly common.

Libellula semifasciata Burmeister: M8, *M19, PG1, *PG6, *PG7, *DC1; April 27-September 24. Common in marshy places early in the season.

Libellula deplanata Rambur: C6 (1 ♂, April 27, 1950, TWD), *Fa1 (1 ♂, 1 ♀, April 30, 1915, RPC; 1 ♀, May 19, 1917, RPC, USNM).

Libellula cyanea Fabricius: Fr1, M8, M12, *M19, PG1, PG4, *PG6, *PG7, *Fa1, *A1, *DC8, DC10; May 15-July 27. A very common early season species around large ponds.

†*Libellula flavida* Rambur: *PG7 (1 ♀, August 25, 1916, BPC, USNM; 1 ♀, June 6, 1916, BPC, USNM), *DC12 (1 ♂, 1 ♀, July 16, 1899, N. R. Wood, USNM).

Libellula incesta Hagen: M8, M10, M12, M15, M17, PG1, PG4, *PG7, *Fa1; June 11-September 6. One of the most common pond dragonflies.

Libellula luctuosa Burmeister: *M4, M6, M8, M10, M12, M13, M15, *M19, PG1, *PG2, PG4, *Fa1, PW1, PW2, *DC13; June 11 ?-September. Another very common pond species.

Libellula needhami Westfall: C6, *A1, *DC1; June 16-August 22. An uncommon species, limited apparently to the Coastal Plain.

Libellula pulchella Drury: M6, M8, M10, M12, *M19, PG1, PG3, PG4, *PG7, C1, *Fa1, Fa10, DC5, DC6, *DC9, *DC11; May 15-September 8. An abundant, easily recognized pond species.

Plathemis lydia (Drury): M6, M8, M10, M12, M13, *M19, *M22, PG1, PG4, *PG6, *PG7, C1, Fa10, DC5, *DC8, *DC10; May 1-September 8. Abundant on ponds and slow streams. In our area this species shows more tolerance to organic pollution than does any other dragonfly.

†*Erythrodiplax bernice* (Drury): *DC1 (Borror, Ohio State Univ., n.d.); *DC10 (1 ♂, July 8, 1899, USNM). A Coastal Plain species not taken recently here.

†*Erythrodiplax connata miniscula* (Rambur): *PG6 (1 ♂, August 14, 1916, BPC, USNM), *PG7 (1 ♂, September 24, 1915, BPC, USNM).

Sympetrum ambiguum (Rambur): M8, M12, M17, *PG7; July 4-September 24. An uncommon late season species.

†*Sympetrum obtrusum* (Hagen): *M19 (1 ♂, 1 ♀, September 13, 1917, BPC, USNM), *PG7 (1 ♀, August 14, 1916, BPC, USNM).

Sympetrum rubicundulum (Say): *M4, M8, M12, *M19, *PG7, A2, *DC11; June 6-October 12. A common pond species, especially in the late summer.

†*Sympetrum semicinctum* (Say): *PG7, *DC12; June 21-September 24.

Sympetrum vicinum (Hagen): *M5, M8, M12, *M14, M17, PG1, *PG7, *Fa1, A3, *DC1, *DC10; June 25-November 7. Probably our most common autumn dragonfly.

Erythemis simplicicollis (Say): M8, M10, M12, M13, PG1, PG2, PG4, *Fa1, *DC1, DC6, *DC13; May 28-September. An abundant pond species.

Pachydiplax longipennis (Burmeister): Fr1, M8, M12, M15, *M19, *M24, PG4, *PG6, *PG7, C2, *Fa1, *DC2, DC5, *DC8, *DC10; May 30-September. Abundant, usually occurring with the preceding species.

Tamea carolina (Linnaeus): *M19, PG4, *PG7, C6, *Fa1; May 6-August 5.

Tamea lacerata Hagen: M17, *M19, PG4, *Fa1; June 24-August 23.

Pantala flavescens (Fabricius): *M19, C6, *DC13; July-August. This species may be seen frequently in the late summer flying over small park areas in Washington. Females have been seen on several occasions ovipositing on shiny, black automobile roofs.

Pantala hymenea (Say): Fr1, M7, M12; August 24—September. This specimen is common around Great Falls, where its nymphs have been collected in semi-temporary pothole ponds high above the present river level.

Calopterygidae

Calopteryx apicalis Burmeister: *PG6 (July 4, 1917, BPC, USNM); 2 ♂, 3 ♀, July 2, 1915, BPC, USNM; 1 ♂, June 25, 1906, D. H. Clemons, USNM), Fa10 (1 ♂, June 15, 1952, TWD).

Calopteryx maculata (Beauvois): Fr2, *M3, *M5, M7, M8, M10, M12, M13, M15, M16, *M19, *M20, *M22, *M23, PG3, PG4, *PG6, C1, C3, C4, C5, *Fa1, Fa11, DC5, *DC12; May 28-September 18. Abundant on all Piedmont streams; less common on Coastal Plain streams.

Hetaerina americana (Fabricius): Fr2, *M3, M8, M10, M12, M17, *M24, *PG7, *Fa1, *Fa2, Fa11, PW2, *DC4, DC5, *DC8; May 31-September 11. This species is almost ubiquitous along the shores of large Piedmont streams, especially in late summer. It is not found on the Coastal Plain in our area.

Hetaerina titia (Drury): M12, M13, *M14, M17, *M24, *M27, *PG6, *DC1; August 6-October 9. This species is much less common than the preceding and prefers swifter water. It is most common along the banks of the Potomac in late September.

Lestidae

***Archilestes grandis** (Rambur): M18 (1 ♂, August 24, 1951, TWD), PG1 (2 ♂, October 10, 1949, TWD). The College Park specimens are the first taken east of the Appalachian mountains.

†**Lestes congener** (Hagen): *PG7 (1 ♂, October 4, 1916, BPC, USNM).

†**Lestes disjunctus australis** Walker: *M19, *PG6, *PG7; April 30-September 24. This species was apparently most abundant in the spring and early summer.

Lestes forcipatus Rambur: M12 (August 10, 1952, TWD), *PG6 (1 ♂, July 14, 1917, RPC, USNM), PG7 (1 ♂, June 6, 1916, RPC, USNM), *DC1 (n.d., RPC, USNM). The only recent record for this species is from Great Falls, where it was found flying in abundance around small, semitemporary pothole ponds.

†**Lestes inequalis** Walsh: M12, *M26, *PG7, *Fa1; June 2-July 27.

Lestes rectangularis Say: Fr1, M8, *M19, PG1, *A3, *DC1; May 30-July 24. Characteristic of very small, weedy ponds.

†**Lestes unguiculatus** Hagen: *PG6 (1 ♂, August 16, 1914, USNM), *DC2 (1 ♂, July 31, 1899, USNM).

†**Lestes vigilax** Hagen: *PG6 (1 ♂, 1 ♀, July 29, 1915, RPC, USNM), *PG7 (1 ♀, September 3, 1914, BPC, USNM; 1 ♀, June 6, 1916, RPC, USNM).

Coenagrionidae

Argia apicalis (Say): *M3, M8, M11, M12, M13, *M14, M15, M17, *Fa1, Fa11, PW2, *DC2, *DC4; May 30-September 11. One of our most abundant species of *Argia*. The imagoes prefer bare places on the banks of slow streams.

†**Argia bipunctulata** Hagen: *PG7 (1 ♂, June 6, 1916, RPC, USNM); 1 ♂, September 1, 1914, BPC, USNM), *PG9 (1 ♀, May 20, 1918, W. L. McAtee,

USNM), *DC2 (1 ♀, July 7, 1899, W. R. Maxon, USNM), *DC12 (5 ♂, July 16, 1899, N. R. Wood, USNM).

Argia moesta Hagen: *M3, *M4, M7, M12, *M14, M15, *M24, PG4, *Fa1, Fa11, PW2, DC5; June 2-September 9. A very common *Argia* on large, boulder-choked streams. This species shuns vegetation, ovipositing under water both on logs and in algae on rocks.

Argia sedula Hagen: M8, M10, M11, M12, M13, M15, M17, *M24, *Fa1, Fa11, PW1, PW2; June 16-October 10. The most common *Argia* along slow streams, such as the C & O Canal. This species prefers slow streams with abundant emergent vegetation along the banks.

Argia tibialis (Rambur): M7, M10, M12, *M14, *M20, *PG6, *PG8, C1, *Fa1; May 30-September. A rather local species in our area. This species is usually found in shady places along slow streams.

Argia translata Hagen: Fr2, M12, M15, M17, *M24, *Fa1, Fa11, PW2, A2, DC4, DC5; July 10-September 15. A common late season *Argia*. This species is found in a variety of lotic habitats, but prefers streams with vegetated banks. It oviposits on floating pieces of bark, branches, and other debris.

Argia violacea (Hagen): M1, M8, M12, M13, M15, M17, *M19, *M20, M23, C5, *Fa1, Fa11, PW2, *DC1, *DC12; May 28-September 17. Though found in many habitats, this *Argia* is most abundant along small upland streams with a moderate current and abundant emergent vegetation.

†*Amphiagrion saucium* (Burmeister): M12, PG3, *PG7, *PG9, *PG11, *Fa1, *Fa6, *DC7; May 18-July 4.

†*Nehalennia gracilis* Morse: *PG7 (1 ♂, 1 ♀, May 28, 1915, BPC, USNM; 2 ♂, 1 ♀, June 6, 1916, RUC, USNM).

†*Nehalennia integricollis* Calvert: *PG7 (3 ♂, 3 ♀, July 6, 1914, BPC, USNM; 1 ♂, July 21, 1914, BPC, USNM; 1 ♀, June 10, 1915, BPC, USNM; 1 ♂, "June to Sept.", BPC, USNM).

†*Nehalennia irene* (Hagen): *PG7 (1 ♂, May 28, 1915, BPC, USNM; 1 ♂, July 21, 1915, BPC, 1 ♀, May 18, 1916, BPC, USNM).

Chromagrion conditum (Hagen): M8, PG4, *PG7, *Fa1; May 15-June 21. Local along small streams.

†*Teleallagma daeckii* (Calvert): *PG7 (1 ♀, May 28, 1915, BPC, USNM; 1 ♂, June 6, 1915, G. Chestnut, USNM; 1 ♂, June 6, 1915, RPC, USNM).

Enallagma aspersum (Hagen): M1 (1 ♀, September 17, 1954, TWD), PG4 (1 ♂ seen, August 1, 1954, TWD), *PG7 (1 ♂, 1 ♀, June 6, 1916, RPC, USNM).

**Enallagma basidens* Calvert: M1 (5 ♂, September 18, 1953, TWD), PG4 (2 ♂, August 10, 1954, TWD), PW1 (1 ♂, August 19, 1951, TWD). This species is now probably well established in our area.

†*Enallagma carunculatum* Morse: *PG7 (1 ♂, October 3, 1914, V. Busek, USNM).

Enallagma civile (Hagen): Fr1, M4, M6, M12, *M19, A2, *A4, *DC2; May-September 15. This species prefers bare banks around open ponds.

Enallagma divigans Selys: M12, C3, C5, C6, PW1; May 21-June 24. Very common on small Coastal Plain streams in the early summer.

†*Enallagma doubledayi* Selys: *M19 (1 ♂, June 1, 1900, C. N. Collins, USNM), *PG7 (2 ♂, August 25, 1916, BPC, USNM).

†*Enallagma durum* Hagen: *M19, *M24, *M27, *PG6, *C2, *DC4, *DC11; July 14-September 5.

Enallagma exsulans (Hagen): Fr1, M3, M7, M8, M11, M12, M13, *M14, M15, M17, *M24, *Fa1, Fa11, PW1, *DC8; May 28-August 6. Very common along Piedmont streams.

Enallagma geminatum Kellicott: M13, *PG7, *Fa1; May 21-June 24. A rare species today around Washington.

Enallagma signatum (Hagen): M6, M12, M13, *M19, *M24, C5, *DC1; May 28-August 30. Flies late in the afternoon along very slow streams, such as the C & O Canal.

Enallagma traviatum Selys: M10, M12, M13, M15, *M19, *Fa1, DC6; June 2-July 9. A local pond species.

Ischnura posita (Hagen): M8, M10, M12, M13, M17, *M19, PG1, PG4, C6, PW1, A2, *DC1, *DC7, *DC10, *DC12; April 22-September 15. Very common in the spring around the tiniest of ponds and marshy depressions.

Ischnura ramburii Selys: *M19, PG4, *PG6, *PG7, *DC1; May 18- August 31. An uncommon Coastal Plain species around Washington.

Ischnura verticalis (Say): M8, M10, M12, M13, M17, *M19, PG1, *PG6, *C2, *Fa4, Fa10, *A4, *DC7, *DC8; April 30-September. Occurs abundantly around small ponds or in marshy areas, usually with *I. posita*.

Anomalagrion hastatum (Say): *PG7, C6, *DC1; April 22- September 1. Locally common in marshy places.

ACKNOWLEDGEMENTS

I would like to acknowledge the assistance of Ashley B. Gurney of the U. S. Department of Agriculture in making the Odonata collection of the United States National Museum available for examination, and for his helpful criticism of this report. Robert H. Gibbs has also criticized the report.

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SPURIOUS RECORDS OF THE GENUS PYRGOMORPHA AUDINET-SEVILLE, 1839, IN THE AMERICAS

(ORTHOPTERA: ACRIDOIDEA: PYRGOMORPHIDAE)*

D. KEITH McE. KEVAN, *Department of Entomology, McGill University, Macdonald College, Quebec, Canada*

In former times, a number of species of Acridoidea, allegedly belonging to the Old World genus *Pyrgomorpha*, have been recorded from the Americas, but most of these have long since been assigned

to other genera outside the Pyrgomorphidae. There remain, however, two species of the genus, namely *P. tricarinata* I. Bolívar, 1884 and *P. dispar* I. Bolívar, 1884, whose occurrence in the western hemisphere ("Brazil" and "Mexico" respectively) has never been completely refuted.

Whilst examining material of the genus, kindly lent to me by Dr. Max Beier of the Naturhistorisches Museum in Vienna, I was fortunate enough to discover authentic material of both these species.

1. *Pyrgomorpha tricarinata* Bol.

A single female specimen, undoubtedly from the type series, is in the Vienna Museum and is labelled "Brésil," on a small blue label, and "Coll. Camille Van Volxem" on a white one. There are also further labels: *P. tricarinata* Bol., Brasil, Coll. Br.v.W." and Brun-

19

ner's reference number, 12. 189. This specimen is presumably not a true type since it does not bear Bolívar's own determination label and no type is stated to be in Vienna. It does however, have the same measurements as those given by Bolívar in his original description, with which it agrees very closely.

In the Brussels Museum there are three female specimens each bearing, in addition to blue and white labels similar to those mentioned above, a red-printed "type" label together with a hand-written label "Bolívar det.: *Pyrgomorpha tricarinata* Bol.". One also has two printed labels "M.R.Belg." and "N.7" (this specimen lacks the tip of the abdomen); the other two carry old labels "(Pyrgomorphidae)" and "Sphenarium sp.". One of the latter (the most complete specimen) also bears Bolívar's own determination label "*Pyrgomorpha carinata* Boliv. Type". I have examined all three specimens through the courtesy of M. A. Collart of the Institut Royal des Sciences Naturelle de Belgique, Brussels, and designate the last mentioned specimen as lectotype.

P. tricarinata is an undoubted *Pyrgomorpha*, but comparison with North African material (including types—♂ lectotype and ♀ syntype, Marruecos. Mazagán, VI.1907, *Escaltera*—Instituto español de Entomología, Madrid) indicates that it is synonymous with *P. procera* I. Bolívar, 1908, and that its data label had undoubtedly been misplaced.¹

¹ M. A. Collart has kindly drawn my attention to some valuable information concerning the scientific expeditions of Camille Van Volxem published in 1875 (*Ann. Soc. ent. Belg.* 18: Comptes-Rendus des Séances, pp. (III-CVI), an extract of which is as follows:—"En avril 1871, il entreprit son premier voyage scientifique, . . . IC parcourut successivement la partie méridionale du Portugal, les côtes du Maroc [my italics] et le midi de l'Espagne et revint en Belgique le 29 juillet . . . En 1872, après une rapide excursion dans l'Eifel, il accompagna notre savant collègue, M. E. Van Beneden, chargé par la Gouvernement d'une mission scientifique au Brésil et à la Plata . . . qui dura du 1er juillet 1872 à fin janvier 1873. . . ." This undoubtedly explains how *C. tricarinata*, a Moroccan species, came to be described as Brazilian.

Being the earlier described species its name takes precedence, thus:—

Pyrgomorpha tricarinata I. Bolívar, 1884, An. Soc. esp. Hist. nat. 13: 422, 424, 495; 1905, Bol. Soc. esp. Hist. nat. 4: 452; 1909, Gen. Ins. 90: 32 - Kirby, 1910, Syn. Cat. Orth. 3: 326

= *Pyrgomorpha procera* I. Bolívar, 1908, Bol. Soc. esp. Hist. nat. 8: 328 - **syn. nov.**

The genus *Pyrgomorpha*, including N. African species, requires revision, so that the full extent of the synonymy is not yet known.

2. *Pyrgomorpha dispar* Bol.

A male and a female in the Vienna Museum are labelled "*P. dispar* Bol." and "Coll. Br. v. W." and bear also small blue labels "Mexico." These specimens also indicate that a mistake in original labelling has occurred. They are undoubted members of the genus *Pyrgomorpha* and agree closely with Bolívar's description of *P. dispar*, the measurements of the female (herein designated the *lectotype*) fitting exactly with those given. The male is smaller than the measurements given by Bolívar for that sex and it possesses one hind leg; it is therefore not available for selection as the type, but it obviously belongs to the same series.²

The specimens undoubtedly belong to the West African species currently known as *P. kraussi* Uvarov, 1926, Thus:—

Pyrgomorpha dispar I. Bolívar, 1884, An. Soc. esp. Hist. nat. 13: 423, 425, 495; 1904, Bol. Soc. esp. Hist. nat., 4: 451; 1909, Ins. 90: 32 - Scudder, 1901, Occ. Pap. Boston Soc. nat. Hist. 6: 281 - Bruner, 1906, Biol. Centr. Amer., Orth. 2: 202 - Kirby, 1910, Syn. Cat. Orth. 3: 325 - Hebard, 1932, Trans. Amer. ent. Soc. 58: 266

= *Pyrgomorpha kraussi* Uvarov, 1926, Trans. ent. Soc. Lond. 1925: 440, pl. 48, fig. 20, 21 - **syn. nov.**

This completely disposes of *Pyrgomorpha* as an American genus as anticipated by Hebard (*l.c.*) and by Kevan (1959, *Publ. cult. Comp. Diam. Angola*, 43: 207). Since neither *P. tricarinata* nor *P. dispar* have been figured previously as such, photographs of the material reported accompany these notes.

With regard to the name *Pyrgomorpha dispar*, a rather interesting nomenclatorial situation has arisen. *Tanita dispar* Miller, 1929, is also a *Pyrgomorpha* and, to avoid homonymy, its name was recently changed to *P. milleri* Uvarov, 1953, although the apparent homonym has been published subsequently (see synonymy below). However,

²Since going to press, Dr. Beier has kindly forwarded me the second male of the series. This is obviously the one for which Bolívar gives measurements. It lacks hind legs and has its wings spread. It differs from the other specimens in that it bears no determination label and the word "Mexico" is below "Coll. Br. v. W." and not on a separate blue label. Two other labels bearing Bruner's numbers "1923" and "20.1923", however, confirm that it is a syntype. I still prefer to regard the female as lectotype, however, since it is the more complete specimen.

at the specific level I cannot distinguish between Bolívar's and Miller's *dispar* (even although they were described quite independently), so that it is interesting to speculate as to what degree of homonymy exists. At the subspecific level I believe the two to be distinct, *P. milleri* being more southerly and occurring in less arid regions. It differs from typical *P. dispar dispar* Bol. in having a slightly less oblique frontal profile and a somewhat greater tendency towards macropterism.

Until a thorough revision of the genus is undertaken it is impossible to be certain of the exact status of these two forms, but for the present they may be regarded as separate subsepecies. *P. dispar* (Miller) and *P. milleri*, however, are synonyms of *Tanita semlikiana* Rehn, as an examination of types and extensive series from many parts of Africa shows. The name of this form should thus be with the following synonymy:—

- Tanita semlikiana* Rehn, 1914, *Wiss. Ergebn. dtsh. Zent. Afr. Exp.* 1907-1908, 5(1): 102 - Carpenter, 1921, *Trans. ent. Soc. Lond.* 1921: 53 [as "*Tanita*"], *Ibid.*: 23, 33, 36, 53-55]—Sjöstedt, 1929, *Ark. Zool.* 20A (15): 20, 21
 = *Tanita dispar* Miller, 1929, *Trans. ent. Soc. Lond.* 77: 79, pl. 8, fig. 28, 29
 Burt, 1951, *Proc. R. ent. Soc. Lond.* (A)26: 65, pl. I, fig. 16-21 - Thomas, 1954, *Ibid.* 29: 23, 29, 30 - **syn. nov.**
 = *Pyrgomorpha milleri* Uvarov, 1953, *Publ. cult. Comp. Diam. Angola*, 21: 212, footnote - **syn. nov.**
 = *Pyrgomorpha dispar* (Miller [*nec* Bolívar], Chapman & Robertson, 1958, *J. ent. Soc. Sthn. Afr.* 21: 99 [as "*Pyrgomorpha*"], *Ibid.*: 93, fig. 8, 96.] **syn. nov.**

A NEW GELASTOCORID RECORD FOR CUBA

HEMIPTERA

Recently, through the courtesy of Ing. Fernando de Zayas, I have had the opportunity to examine a single male specimen of *Gelastocoris oculatus oculatus* (F.) from the collection of the Estación Experimental Agronómica, Santiago de las Vegas, Habana, Cuba. The specimen was collected by J. P. Carabiá on January 11, 1937, at Puerta de Golpe, Pinar del Río. This is the first record of the typical subspecies from Cuba. A specimen of *G. oculatus variegatus* (Guérin-Méneville) has been previously recorded from Isla de Pinos.

E. L. TODD, *Falls Church, Va.*

BOOK NOTICE

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A NEW SPECIES OF OGERIA FROM THE SOUTH PACIFIC

(HEMIPTERA: CRYPTOSTEMMATIDAE)

W. R. KELLEN, 1836 N. Arthur Ave., Fresno, Calif.

The genus *Ogeria* in the subfamily Schizopterinae was erected by Distant (1913) to accommodate a unique female specimen collected at Mahé in the Seychelles. This single representative of the genotype, *O. insularis* Distant, was found together with *Ceratocombus insularis* Reuter and *Seychellesanus typicus* Distant among damp dead palm leaves at an elevation of about 1000 feet. The male of *O. insularis* is unknown. The present species, the second member of the genus to be described, was collected on Tutuila in Samoa; this is the first indication we have of the distribution of the genus, and suggests that many more species will be found in the Indo-Australia Region and Oceania.

The author expresses his thanks to Drs. W. E. China, R. J. Izzard, and P. Wygodzinsky for their assistance in the preparation of this paper.

Ogeria tafunensis, n. sp.

Male.—Small, robust oblong, uniformly covered with short, subappressed, fine setae (Fig. 2). Head strongly declivous, four times as broad as long as viewed dorsally, 31:8, convex above, finely punctate, produced in front of eyes for a distance almost equal to length of eye, 5:6. Eyes relatively small, about one-fourth as wide as interocular width, 5:21, overlapping anterior angles of pronotum. Ocelli almost contiguous with middle inner margin of compound eyes, separated from compound eyes by about diameter of ocellus. Tylus with abundant fine setae; three erect setae equal in length to tylus, 6:6. Length of beak about three times greater than tylus, 18:6, extending to middle coxae. Antennae inserted below eyes, almost contiguous with propleura at inner margin, extending laterally, first two segments enlarged, subequal, 5:6, third and fourth segments slender, equal, 22:22, moderately covered with long erect setae, the longest equal to half the length of the segment.

Pronotum about twice as broad as long, 42:20, finely punctate, the anterior margin with a deep transverse, arcuate impression; posterior margin broadly convex. Distance to anterior impression one-seventh the interocular width, 3:21. Anterior margin and transverse line with row of several small calli; humeral angles rounded, swollen. Scutellum about one-third as wide as pronotum at base, 15:42, about twice as broad as long, 15:7, apex rounded, sides straight. Propleura swollen anteriorly, exceeding anterior margin of eyes (Fig. 1). Metapleura with inner posterior angle produced as a rounded point.

Hemelytra complete, membranous, almost three times longer than wide, 56:21, extending to apex of abdomen; costal margin without a fracture. Costa conspicuously thickened at middle; three cells along costal margin in apex of wing after thickening. Radius and medius confluent in base of wing forming a single large basal cell with cubitus; vein along hind margin a clavus crosses clavus before apex. Three subequal cells in middle of wing mediad to costal thickening. Claval cell slightly smaller than basal cell (Fig. 6). All veins with sparse, apically directed setae, length equal to width of veins; abundant conspicuous, long, erect

setae on crossvein bordering apical margin of basal cell, length about equal to width of cell.

Fore and middle femora subequal, the hind slightly longer, 24:25:27, slender, sparsely covered with short, apically directed setae. Fore and middle tibiae equal, the hind somewhat longer, 22:22:33, slender, the outer margins with sparse, short setae; inner margins of fore and middle tibiae with abundant, moderately strong, apically directed setae from middle to apex, equal in length to width of tibiae; hind tibiae with row of 12 erect short spines on inner margin running length of tibiae, length of spines equal to width of tibiae. Length of fore and middle tarsi equal, the hind slightly longer, 10:10:12; tarsal formula, 3:3:3. Claws simple. Coxae normal. A prominent digital process, posteriorly directed, between and equal in length to middle coxae (Fig. 4). Ventral surface finely tuberculate.

Terminalia as in Figure 5; left and right claspers as in Figures 8 and 9, respectively.

Color dull ferruginous to fusco-ferruginous on head, thorax and scutellum; vestiture stramineous. First two antennal segments stramineous, the last two testaceous. Legs testaceous, infuscated. Eyes dark red. Pleural areas and abdomen dull ferrugino-testaceous. Wing membrane fuliginous; veins fuscous, the thickened area of the costa black; a conspicuous, broad, dull, white spot in the basal third of the posterior border. The conspicuous long setae on the apical crossvein of the basal cell stramineous.

Total length, 1.1 mm; width, 0.5 mm.

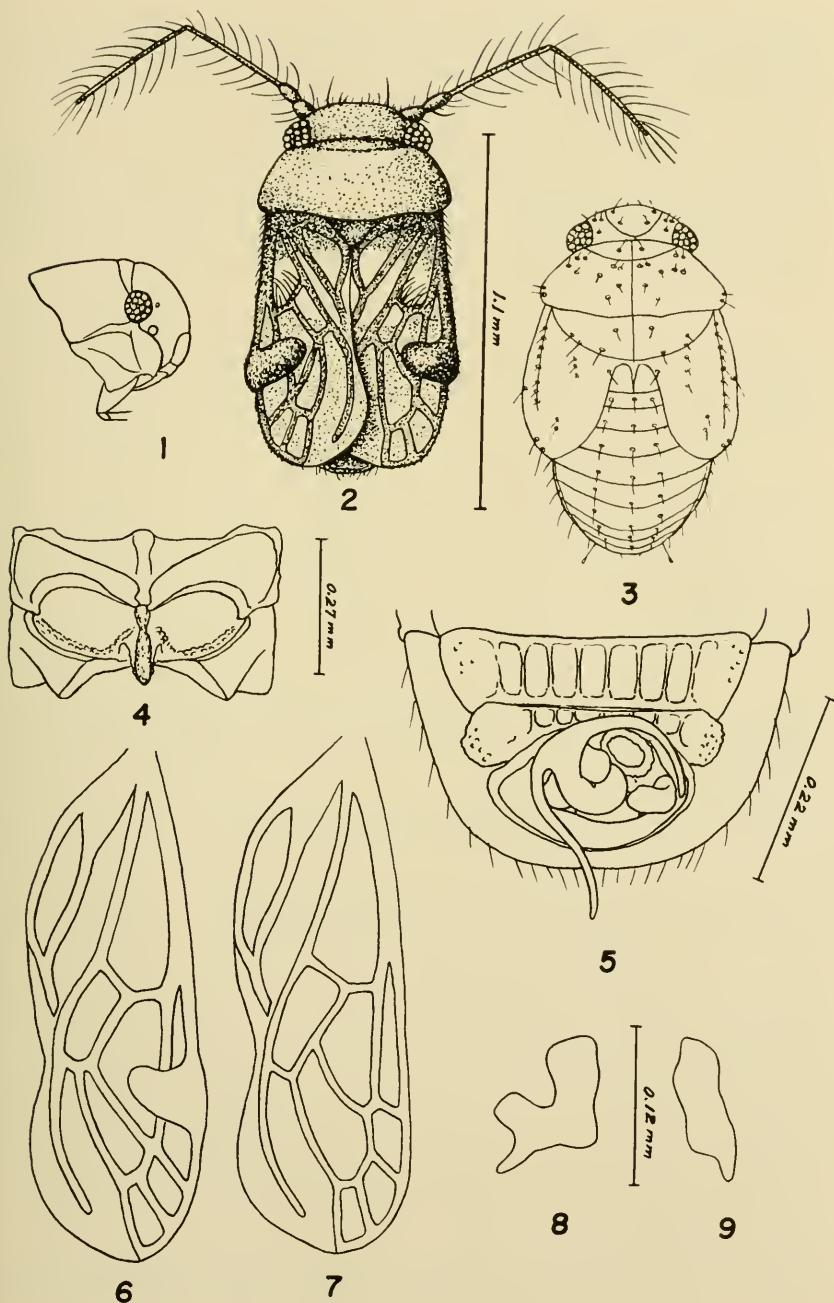
Female.—Similar to male, except hemelytra without thickening of costal vein (Fig. 7). Four cells along costal margin, the first basally obsolete. Long erect setae on apical margin of basal cell absent.

Types.—**Holotype**, male, Tafuna, Tutuila Island, Samoa, IX-9-58, W. R. Kellen. **Allotype**, female, Tafuna, Tutuila Island, Samoa, IX-9-58, W. R. Kellen. **Paratypes**: 7 males, IX-9-58; 1 male, IX-15-58; 1 female, VII-15-58; 3 females, IX-9-58; 2 females, IX-10-58; 1 female, IX-15-58. Tafuna, Tutuila Island, Samoa, W. R. Kellen. Holotype, allotype, and nine paratypes deposited at the U. S. National Museum, Washington, D. C.; four paratypes deposited at the British Museum (Natural History), London; two paratypes in the collection of Dr. Petr Wygodzinsky.

A total of nine males and eight females were collected at sea level together with *Ceratocombus* sp. under bark of rotten logs covered with overgrowths of vines. A single fifth instar nymph (Fig. 3) was reared to an adult female. An intensive search of many old logs in the same area failed to yield more specimens.

Discussion.—A list of comparative values of certain selected measurements of *O. insularis* and *O. tafunensis* is presented in Table I. Most of these values are very similar; however, the present species can be distinguished by its larger size, the relative lengths of the last two antennal segments, and the longer tibiae of the fore legs. More-

Fig. 1, head of male in profile; fig. 2, adult male; fig. 3, fifth instar nymph; fig. 4, mesosternum, male; fig. 5, male terminalia, dorsal view; fig. 6, forewing, male; fig. 7, forewing, female; fig. 8, left clasper, male; fig. 9, right clasper, male.



over, *O. insularis* has a distinct spinelike process on the mesosternum which is absent in the present species. Unfortunately, the diagnostic characters of the males cannot be compared, for as mentioned above, the male of *O. insularis* is unknown.

Table I

Comparative values of certain selected measurements of females of *Ogeria insularis* Distant and *Ogeria tafuncensis* n. sp. (measurements of the holotype of *O. insularis* kindly supplied by R. J. Izzard, British Museum (Natural History)). Values given in millimeters.

Measurement	<i>O. insularis</i> Distant	<i>O. tafuncensis</i> , n. sp.
Total length	0.90	1.10
Beak	0.20	0.24
Antennal segment 1	0.07	0.07
" " 2	0.06	0.08
" " 3	0.27	0.28
" " 4	0.38	0.28
Femur, leg 1	0.33	0.31
" " 2	0.33	0.32
" " 3	0.35	0.35
Tibia, leg 1	0.20	0.30
" " 2	0.29	0.30
" " 3	0.47	0.44

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**A NEW SPECIES OF ACANTHISCHIUM AMYOT & SERVILLE,
WITH A KEY TO THE SPECIES**

(HEMIPTERA: REDUVIIDAE; HARPACTORINAE)

J. C. ELKINS, 7010 Alderney Dr., Houston, Texas

The new species described here brings the total of described *Acanthischium* species to four.

Superficially, *Acanthischium maculatum* A. & S. and *Acanthischium invium*, n. sp., resemble some species of *Xystonyttus* Kirkaldy and *Graptocleptes* Stål, which are reduviid ichneumonimic genera that Haviland (1931) cites as remarkable instances of Müllerian mimicry. It is possible that in the instances of these two species this supposed mimicry is fortuitous since *Acanthischium superbum* Haviland somewhat resembles *Montina* A. & S.

Several male and female individuals of *A. maculatum* were available, and in this species the female is both more robust and has a more elevated disc on the posterior pronotal lobe than has the male.

Several features immediately set *Acanthischium* apart from other American harpactorine genera of the tribe *Zelini*. Most obvious are the elevated disc of the posterior pronotal lobe, which is laterally bordered by spine-bearing carinae that converge and meet at the posterior pronotal border; the collum is very long and slender, tapering from a tumid condition behind the ocelli to a much smaller diameter at the pronotal insertion; the trumpet shaped head and collum, coupled with a long scimitar-like rostrum, is strikingly close to a similar condition found in the old world *Sycanus* A. & S.

Acanthischium haglundi Stål was not seen.

***Acanthischium invium*, n. sp.**

Male.—Length 15 mm; width at pronotum, 4 mm.

Rather robust; sparsely covered with short pubescence; eyes, ocelli, venter of head, collum dorsally and ventrally, large basal femoral annulus, anterior pronotal lobe and margins of posterior pronotal lobe lateral to disc, light orange; remainder of body, including legs and hemelytra, black with violet reflections.

Measured dorsally, head plus collum slightly shorter than pronotum; 1st rostral segment slightly surpassing posterior margin of ocelli; pronotum slightly wider than long; measured along median line, posterior pronotal lobe 1.4 times longer than anterior lobe; carinae which laterally border posterior pronotal disc, converge and meet along posterior pronotal border, each carina bearing eight spines, second anterior spine long and very robust, last three posterior spines long.

Hemelytra extending 3 mm beyond end of abdomen; basal quadrangular cell of hemelytron 2.4 times longer than wide.

Male genital capsule missing.

Holotype.—Male; Colombia, Rio Ortegazon, IX-47, Richter. Collection of J. C. Elkins.

This species seems to be close to *Acanthischium superbum* Haviland, but is smaller, differently colored, and can be immediately distinguished as in the key.

KEY TO THE SPECIES OF ACANTHISCHIUM

1. Fore trochanter lacking ventral spine..... *haglundi* Stål
- Fore trochanter with ventral spine..... 2
2. Posterior prothoracic lobe with six or more spines on each carina..... 3
- Posterior prothoracic lobe with five or less spines on each carina.....
- *maculatum* A. & S.
3. Basal quadrangular cell of hemelytron 2.4 times longer than wide; head plus collum slightly shorter than pronotum measured dorsally; each posterior pronotal carina bearing eight spines, second cephalad spine long and robust..... *invium*, n. sp.
- Basal quadrangular cell of hemelytron 1.75 times longer than wide; head plus collum considerably shorter than pronotum measured dorsally; each posterior pronotal carina bearing six spines, first cephalad spine long and robust..... *superbum* Haviland

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Haviland, M. D. (Mrs. H. H. Brindley). 1931. The Reduviidae of Kartabo, Bartica District, British Guiana. *Zoologica*, New York, 7:133-135.

**THREE NEW SPECIES OF PHLEBOTOMUS FROM
MEXICO AND NICARAGUA¹**

(DIPTERA: PSYCHODIDAE)

G. B. FAIRCHILD and MARSHALL HERTIG, *Gorgas Memorial Laboratory,
Panama, R. de P.*

The three following species have been recognized as new for a number of years, but description was postponed in hopes of securing additional material. Further delay seems unwarranted, and descriptions are furnished herewith.

***Phlebotomus inusitatus*, n. sp.**

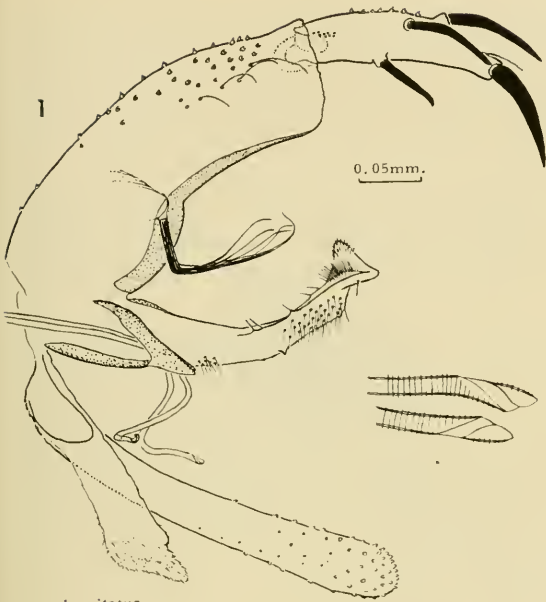
(Figs. 1-6)

Male.—Wing length 2.0 mm., venation as figured. Mesonotum and dorsum of abdomen faintly infuscated, hardly darker than pleura. Abdominal setae erect, sparse, evenly distributed but more thickly set on posterior margins of tergites. Upper anepisternal setae 12, lower mesanepisternals 3 to 5. Head and appendages as in female, except third antennal segment reaching to middle of third palpal segment and well beyond tip of proboscis. Ascoids simple, slender, about one-third shorter than in female, apparently paired on all but last two segments, though in the weakly stained specimens they are difficult to see. Palpal formula 1-(4-2)-3-5, the fifth segment longer than any two preceding. Pharynx slender, finely wrinkled at apex. Cibarium with weak denticles, of the same general shape as that of female, but more slender, without well-defined pigment patch, the arch weaker and diffuse in middle. Genitalia and pump as figured, the filaments a little over twice pump, their tips expanded, as figured. Second sternite narrowed in middle and with a central unsclerotized strip, as in female. Legs moderately long, the femora, tibiae and basitarsis of slide 3063 measuring, in millimeters, as follows: fore legs, 0.8, 0.9 and 0.5; mid legs, 0.8, 1.1 and 0.6; hind legs, 0.9, 1.3 and 0.7.

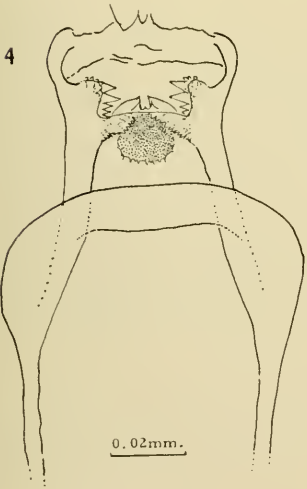
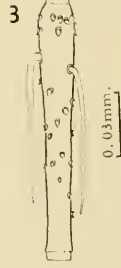
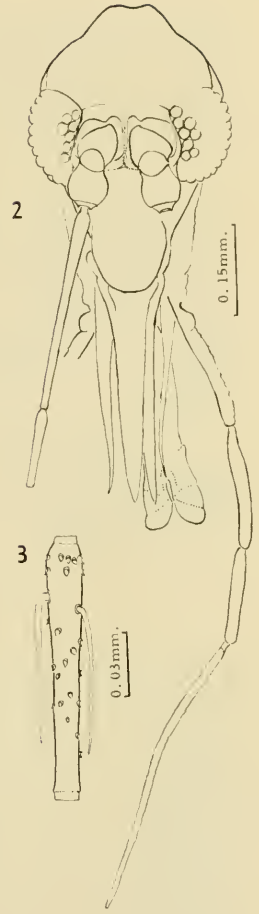
Female.—Wing length, 2.3 mm., venation as in male, but alpha and delta both longer and wing broader. Mesonotum and abdomen darker than in male, but still a relatively pale fly. Abdominal setae as in male. Upper anepisternals 21, lower mesanepisternals 7. Sides of eighth segment not visible in the single slide available. Head and appendages as figured. Ascoids of fourth antennal segment as figured. Palpal formula 1-(4-2)-3-5, fifth longer than any two preceding. Eyes small, proboscis unusually long and heavy. Pharynx broad and well sclerotized with numerous finely denticulate ridges at apex. Cibarium as figured, the chitinous arch exceedingly thick and heavy. Spermathecae shrunken in the only available specimen, apparently subglobose and rather thick walled, with short separate ducts. Genital fork not remarkable, the stem slender. Cerci ob-

¹The work here reported was supported in part by a research grant from the National Institute of Allergy and Infectious Diseases, N. I. H., U. S. P. H. S.

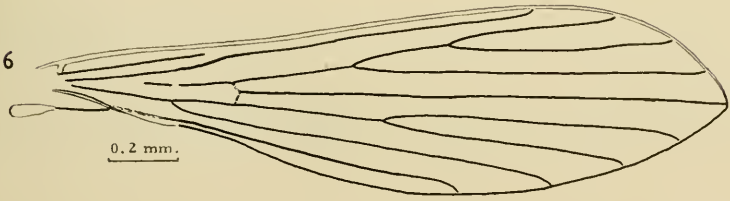
Phlebotomus inusitatus, n. sp.: Fig. 1, male genitalia and tips of genital filaments of holotype, the latter much enlarged; fig. 2, head and appendages of female allotype; fig. 3, antennal segment V of allotype; fig. 4, cibarium of allotype; fig. 5, genital pump of holotype; fig. 6, wing of holotype.



inusitatus



inusitatus



scured by a crack in the coverslip and mounted dorsoventrally, apparently broadly subtriangular. Second sternite narrowed in middle and with a broad oval unsclerotized median fenestra. Third sternite as wide as long, widest posteriorly, without fenestra. Legs moderately long, the femora, tibiae and basitarsi of slide 3077 measuring, in millimeters, as follows: fore legs, 0.85, 0.9 and 0.55; mid legs, 0.9, 1.1 and 0.65; hind legs, 1.0, 1.4 and 0.75.

Types.—**Holotype** male, slide 3062, Ocosocoautla, 60 K.W. of Tuxtla Gutierrez, Chiapas, Mexico, 8 April 1951, in holes and buttresses of oak trees, Fairchild and Hartmann colls. **Allotype** female, slide 3077, same data as holotype. **Paratype** male, slide 3063, same data as holotype.

This species seems to be closely related to *P. delpozoi* Vargas and Diaz Najera (1953), but differs strikingly in the structure of the parameres of the male. We are unable to visualize any distortion of this structure in our species which would give an appearance similar to that illustrated for *delpozoi*, and both of our specimens are identical in this respect. Our single female, unfortunately partially obscured by a crack in the coverslip, does not seem to differ appreciably from the description and figures of *delpozoi*. The name signifies unusual or strange.

***Phlebotomus vargasi*, n. sp.**

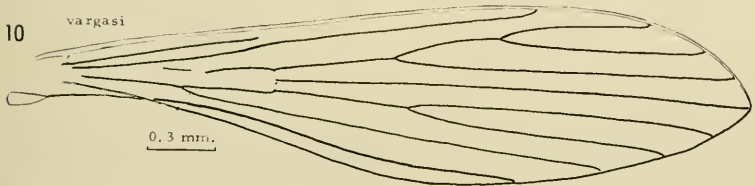
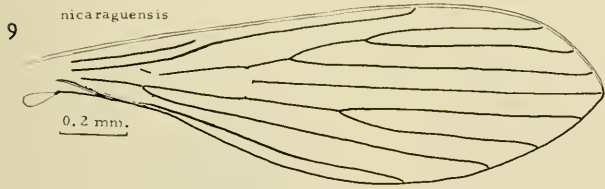
(Figs. 7, 8, 10, 11-13)

Male.—Wing length 3.3 mm., venation as figured. Whole insect pale, the mesonotum hardly darker than pleura. Abdominal setae erect, sparse, except for denser bands on hind margins of tergites. Upper anepisternal setae 11, lower mesanepisternals 4. Head and appendages as figured. Antennal segments very long, the ascoids short, simple, as figured, paired on all but shortened terminal segment. Palpal formula 1-4-2-3-5, the fifth segment about equal to second and third together. Pharynx slender, with an irregular network of fine ridges at apex. Cibarium unarmed, the pigment patch strong, pear-shaped; no chitinous arch. Genitalia as figured, with six major spines on both styles. Genital pump as figured, the filaments a little over 9 times as long as pump. Second sternite as figured, over twice as long as wide, straight sided, without clear areas. Legs exceedingly long, the femora, tibiae and basitarsi of slide 4913 measuring, in millimeters, as follows: fore leg, 1.45, 2.15 and 1.5; mid legs missing; hind leg, 1.4, 2.8 and 1.75.

Type.—**Holotype** male, slide 4913, Cañon de Lobos, between Cuernavaca and Yautepec, 4100 ft. elev., Morelos, Mexico, 20 Sept. 1955, in small cave, P. Galindo and H. Trapido colls. Type to be deposited in U.S.N.M.

We take pleasure in naming this unique and remarkable species in honor of Dr. Luis Vargas, who has done so much to advance the knowledge of medically important insects in Mexico.

Phlebotomus vargasi, n. sp.: Figs. 7 and 8, male genitalia and genital pump of holotype; fig. 10, wing of holotype. *P. nicaraguensis*, n. sp.: Fig. 9, wing of holotype.



The relationships of this species appear to be with the *vexator* group (Fairchild and Hertig 1957) though the six-spined style is found in only one other unrelated American *Phlebotomus*, *P. alphabeticus* Fons. The very dense basal tuft, long style and very long genital filaments are somewhat like members of the *brumpti* group, but the small eyes, short lateral lobes, and narrow wings do not agree. Dr. O. Theodor has recently pointed out (in litt.) a character apparently peculiar to members of the *brumpti* group. In all of these species we have examined, the upper anepisternal (or post-spiracular) setae extend quite far ventrally on the anterior margin of the anepisternum, while in all other American *Phlebotomus*, including the present species, they are limited to the dorsal margin of the sclerite. Of described species, *vargasi* in general aspect resembles *P. oppidanus* Dampf, but is abundantly distinct, having, aside from the six-spined style, a dense basal tuft on coxite, shorter parameres and lateral lobes, longer genital filaments, and a much longer proboscis. If our single specimen should prove to be an aberrant one, with an extra spine on style, the species will key out to *osornoi* Rist. and Van Ty and *noguchii* Shann. in our key (1957). It can be separated from both these species by the much longer genital filaments, the character of the basal tuft on coxite, stouter parameres and relatively much longer third antennal segment. The wing is narrow as in *noguchii*, but alpha is proportionally much longer in that species.

Phlebotomus (Psychodopygus) nicaraguensis, n. sp.

(Figs. 9, 14-16)

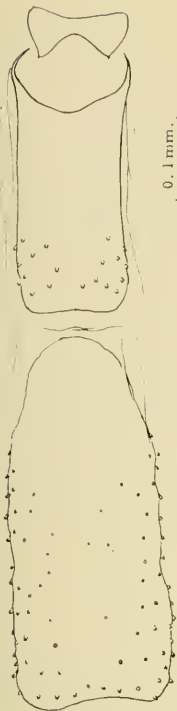
Male.—Wing length 1.7 mm., venation as figured. Mesonotum, abdominal tergites, fore coxae and legs very lightly infuscated, remainder of insect pale. Abdominal setae all recumbent, slender, not scale-like. Upper anepisternal setae 17, lower mesanepisternals 1. There are also much smaller scattered setae on the pleura. Head pale, the eyes large, as in other members of this group. Palpal formula 1-4-5-2-3, as figured. Antennae missing. Pharynx and cibarium as in *panamensis*. Genitalia as figured, the pump similar to related species, the filaments about twice length of pump. Legs rather short, lacking tarsi on fore and hind legs, the femora, tibiae and basitarsi measuring, in millimeters, as follows: fore leg, 0.75 and 1.2; mid leg, 0.7, 1.35 and 0.8; hind leg, 0.8 and 1.6. Second sternite roughly oblong without median clear fenestrae, as in other members of the group. Female unknown.

Type.—**Holotype** male, slide 4321, Villa Somoza, Nicaragua, 15 June 1953, Galindo and Trapido colls.

This species will key out to *hirsutus* Mang. and *colasbelcourii* F. and A. in our key (Fairchild and Hertig 1951). It differs from the former in having the most basal spine of the style basad of the middle

Phlebotomus vargasi, n. sp., holotype: Fig. 11, first three sternites; fig. 12, antennal segment V; fig. 13, head and appendages. *P. nicaraguensis*, n. sp., holotype: Fig. 14, male genitalia, inner aspect; fig. 15, palpus; fig. 16, paramere, outer aspect, the main hair tuft only indicated (genitalia to same scale as *vargasi*).

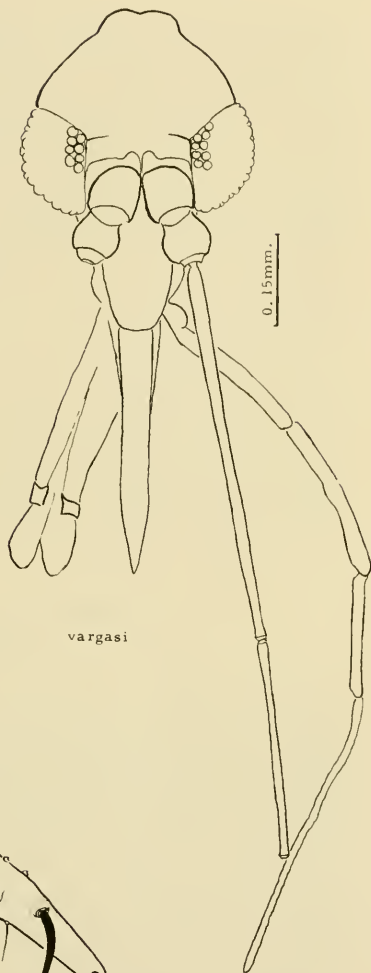
11



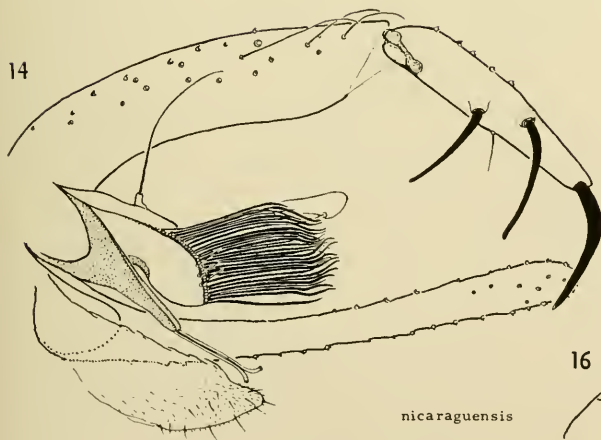
12



13



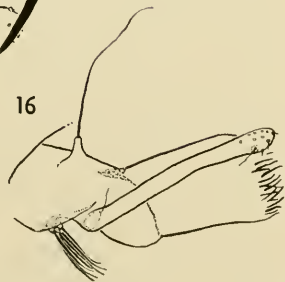
14



15



16



of the style, in having the dense setae of the paramere not blade-like, and the ventral tuft of more numerous setae. From *colasbelcourii* it differs in having a straight outer arm on the paramere and in longer lateral lobes. From both species it differs in possessing a long, strong seta inserted on a prominent tubercle dorso-basally on the paramere, in having a much weaker terminal spine on the arm of the paramere, and in having the fourth and fifth palpal segments together exceeding the length of the third segment. A male and several females of *P. panamensis* Shann. were taken at the same locality.

REFERENCES

- Fairchild, G. B., and Hertig, M., 1951. Notes on the *Phlebotomus* of Panama. VII. The subgenus *Shannonomyia* Pratt. *Ann. Ent. Soc. America*, 44(3): 399-421, Plates 1-7.
- , 1957. Notes on the *Phlebotomus* of Panama. XIII. The Vexator Group, with Descriptions of New Species from Panama and California. *Ann. Ent. Soc. America*, 50 (4):325-334, Plates 1-3.
- Vargas, L. and Diaz Najera, A., 1953. Nuevas Especies de *Flebotomos* de Mexico. *Rev. Inst. Salub. Enf. Trop., Mexico*, 13(1):41-52, Plates 1-6.

EUROSTINA CURRAN, A NEW SYNONYM

(DIPTERA, TEPHRITIDAE)

The genus *Eurostina* was described by Curran in 1932 (*Amer. Mus. Novit.*, No. 556:4) with *Trypeta latifrons* Loew, 1862, as the originally designated type-species. Later (*The Families and Genera of North American Diptera*, 1934: 293) he stated, “. . . the species [*latifrons*] is a true *Eurosta* and does not possess the generic characters of *Eurostina*. The type of the genus should be known as *Eurostina confusa*, Slosson Collection, Delaware Water Gap.”

Through the courtesy of Dr. Willis Gertsch, American Museum of Natural History, I have examined the specimen named *confusa* by Curran in 1934. It agrees in all important characters with the Loew holotype of *latifrons* in the Museum of Comparative Zoology, Harvard University, Cambridge, Mass., and must be considered conspecific.

Curran (1932, *ibid.*) states that *confusa* represents a new genus because its dorsocentral bristles are much closer to the suture than are those of *solidaginis* Loew, the type-species of *Eurosta*. I am convinced that the types of *confusa* and *latifrons* are true *Eurosta* in having a very wide frons, two pairs of lower fronto-orbital bristles, one pair of scutellars, a very broad, dark wing with typical venation, and the large size and heavy, full-bodied appearance of all *Eurosta* species. Contrary to Curran's observations, I conclude that the position of the dorsocentrals is not of generic significance in this case.

I therefore place *Eurostina* Curran, 1932, as a straight synonym of *Eurosta* Loew.

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A SYNOPTIC CATALOG OF THE MOSQUITOES OF THE WORLD, SUPPLEMENT I

(DIPTERA: CULICIDAE)¹

ALAN STONE, *Entomology Research Division, ARS,
U. S. Department of Agriculture, Washington, D. C.*

This paper is a supplement to the *Synoptic Catalog of the Mosquitoes of the World* by Stone, Knight, and Starcke (1959). Two classes of entries occur in this supplement. The first comprises corrections of errors in the original catalog—these are marked by a dagger (†). The second contains entries derived from information published or available since 1958 and includes two new names of the genus group, 70 new names of the species group, and new references and additions or corrections to distributional data or type information.

I have followed the order of the original catalog and have not separated corrigenda from addenda. The number to the left indicates the page of the original catalog. Notations in parentheses to "see pages" refer to these page numbers. This treatment is considered to be the most usable since the original catalog can be annotated by supplement number and page if the change is too extensive to mark directly. I am particularly indebted to J. N. Belkin, E. I. Cober, E. Del Ponte, G. B. Fairchild, P. Fauran, E. N. Marks, and P. F. Mattingly for pointing out errors in the catalog.

Introduction

Page

1. Number of valid genera and subgenera: Change from 110 to 111 †. Number of valid species: Change from 2,426 to 2,428 †. This last figure includes *nomina dubia*. Total names of the species group: Change from 4,067 to 4,070 †. With the additions and corrections in this supplement these numbers become respectively 111, 2,490, and 4,139.

Acknowledgments

8. The name of J. Callot was unfortunately omitted from the original list of those to whom thanks were due †.

Catalog of the Family Culicidae

9. **Biology.**—1960, Nielsen and Haeger, 71-95 (swarming and mating).
General.—1960, Christophers, 1-739 (biol., anat., *Aedes aegypti*).
General Taxonomy.—1959, Foote and Cook: Change "1-159" to "1-158" †.
Australian Region.—1960, Iyengar, 1-102 (South Pacific).
Nearctic Region.—1960, King, Bradley, Smith, and McDuffie, 1-188 (southeastern U. S., keys).
Oriental Region.—1959, Thurman, 1-182 (northern Thailand).
Palaeartic Region.—1958, Kramar, 1-286 (Czechoslovakia); 1959, Senevet and Andarelli, 1-383 (Mediterranean); 1960, Abdel-Malek, 111-128 (Syria, L. key).

¹Reprints are for sale by the Thomas Say Foundation, Entomological Society of America, 4603 Calvert St., College Park, Maryland.

Genus **BIRONELLA** TheobaldSubgenus **BRUGELLA** Edwards

11. *Bironella*, subgenus *Brugella*.—Change "287" to "288" †.

Genus **ANOPHELES** Meigen

Important references: 1959, Hara, 107-119 (key, ♀ terminalia, Japan); 1959, Guy, 1-255 (keys, Morocco); 1959, Vargas, 367-386 (keys, New World); 1960, Otsuru and Ohmori, 33-65 (keys, Japan).

Subgenus **ANOPHELES** Meigen

13. *Important reference*: 1959 Ohmori, 210-225 (key, pupae, Japan).
 14. *algeriensis* Theobald.—Hungary.
annulipalpis Lynch Arribálzaga.—Change "MLP" to "NE."
 16. *claviger* (Meigen).—Tadzhik S.S.R., Hungary.
 17. Insert after line 3.—*bifurcatus* of authors, not Meigen. (This misidentification has been used so commonly that it should have been included here and in the index) †.
 18. *evandroi* Lima.—Argentina.
 20. *hyrcanus* (Pallas).—Hungary.
indiensis Theobald.—Change "*annularis*" to "*sinensis*" †.
 21. *koreicus* Yamada and Watanabe.—Ohmori, 1959, 222 (P*).
lesteri Baisas and Hu.—Ohmori, 1959, 222 (P*).
 22. *lindesayi japonicus* Yamada.—Ohmori, 1959, 222 (P*).
 23. *manalangi* Mendoza.—Philippines.
 1940 Mon. Bull. Bur. Hlth. Philipp., Manila 20(11):368 ♂*, ♀*, L*) [on p. 364 the legends for figures 1 and 2 should be reversed, and on p. 366 the legends for figure 1 should be transposed with that of 2 and that of 3 with that of 4]. Type-loc: J. Panganiban, Camarines Norte, Philippine Islands (LU) †.
minor Lima.—Argentina.
 24. *omorii* Sakakibara.—Japan.
 1959. End. Dis. Bull. Nagasaki Univ. 1: 288 (♂*, ♀*, L*, P*). Type-loc: Mt. Tochu, Misakubo City, Iwatagun, Sizuoka Prefecture, Japan (RIE).
 27. *guttulatus* Harris. This is a *nomen nudum* and should have been on p. 288 with no type-locality †.
 28. *sacharovi*.—Change "Favre" to "Favr" †.
sinensis Wiedemann.—Ohmori, 1959, 221 (P*).
sineroides Yamada.—Ohmori, 1959, 222 (P*).
 29. *vanus* Walker.—Change "1860" to "1859" †.
 30. *yatsushiroensis* Miyazaki.—Ohmori, 1959, 222 (P*).

Subgenus **NYSSORHYNCHUS** Blanchard

- albimanus* Wiedemann.—Change "1821" to "1820" †.
 31. *albitarsis* Lynch Arribálzaga.—Change "LU" to "NE."

Subgenus **CELLIA** Theobald

37. *annularis* Van der Wulp.—Hara, 1959, 110 (♀*).
 39. *balabacensis* Baisas.—Add Formosa †.
brohieri Edwards.—Insert "*theileri* var." after "♀" in first line †.
septentrionalis Evans.—Insert "*theileri* var." after "L" in first line †.

Page

- brucei** Service.—Nigeria.
1960. Proc. R. Ent. Soc. Lond. (B) 29: 85 (♂*, ♀*, L*, P). Type-loc: Lokoja, N. Nigeria (BM).
41. **dthali** Patton.—French West Africa (Mauretania), Morocco.
42. **farauti** Laveran.—Change "D'Entreeasteau" to "D'Entreeasteaux" †.
43. **flavicosta** Edwards.—Hanney, 1959, 169 (♂*, ♀*, L. P*, biol.). Service, 1960b, 89 (♂, ♀, L, P, taxon.).
44. **funestus** Giles.—Service, 1960a, 77 (♂*, ♀*, E*, taxon.).
44. **garnhami basilewskyi** Leleup.—Change "LU" to "CMT." Leleup, 1960, 402 (♂*, ♀*).
- hancocki** Edwards
var. **gilroyi** Service.—Nigeria.
1960. Proc. R. Ent. Soc. London (B) 29: 87 (♂*, ♀*, L*, P). Type-loc: Itchi, near Enurgu, E. Nigeria (BM).
46. **leucosphyrus** Dönitz.—Delete "Ceylon, India, Burma, Formosa" †
47. **ludlowae** (Theobald).—Hara, 1959, 111 (♀*).
48. **maculatus** Theobald.—Hara, 1959, 111 (♀*).
48. **maliensis** Bailly-Choumara and Adam.—Guinea.
1959. C. R. Acad. Sci. Paris 248: 3742 (♂, ♀, L). Type-loc. Mali, Fouta-Djalou, Guinea (IERT). Bailly-Choumara and Adam 1960, 110 (♂*, ♀*, L*, P*).
49. **minimus** Theobald.—Hara, 1959, 110 (♀*).
50. **natalensis** var. **multicinctus** Edwards.—Cameroun.
52. **rhodesiensis** Theobald.—Cameroun.
ssp. **rupicolus** Lewis—Algeria. Senevet, Clastrier, and Andarelli, 1959, 596 (P*).
54. **sergentii macmahoni** Evans.—Algeria.
splendidus Koizumi.—Hara, 1959, 111 (♀*).
55. **squamosus** var. **cydippis** De Meillon.—Cameroun.
subpictus Grassi.—Hara, 1959, 111 (♀*);
var. **malayensis** Hacker.—Reid, 1959, 101 (L).
sundaicus (Rodenwaldt).—Reid, 1959, 101 (L).
56. **tessellatus** Theobald.—Hara, 1959, 112 (♀*).
58. **vanthieli** Laarman.—Laarman, 1959, 147 (♂*, ♀*, L*, P*).

Genus TOXORHYNCHITES Theobald

Subgenus ANKYLORHYNCHUS Lutz

59. **Ankylorhynchus** Lutz.—The type of this subgenus should be considered as *Megarhinus purpureus* Theobald (= *Culex violaceus* of authors, not Wiedemann) †. Although this is basing a genus in a misidentified species, it seems preferable to equating *Ankylorhynchus* with *Lynchiella* Lahille (which involves a problem of dating) and proposing a new name for the genus actually described by Lutz. Action by the I.C.Z.N. should be requested.
- trichopygus** (Wiedemann).—French Guiana.

Subgenus LYNCHIELLA Lahille

60. **haemorrhoidalis separatus** (Lynch Arribáizaga).—Change "MLP to "NE."
- haemorrhoidalis superbus** (Dyar and Knab).—French Guiana.
61. **violaceus** (Wiedemann).—Change "1821" to "1820."

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Subgenus **TOXORHYNCHITES** Theobald

62. **bickleyi** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 14 (♂). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).
- brevipalpis** Theobald.—Add Samoa †.
64. **manopi** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 16 (♂). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).
65. **immisericors** Walker.—Change "1860" to "1859" †.
sunthorni Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 19 (♂). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).

Genus **TRIPTEROIDES** Giles

Important references.—Change "1952" to "1953" †. 1959, Peters, 135-154 (keys, New Guinea).

Subgenus **TRIPTEROIDES** Giles

66. **aeneus** (Edwards).—Thurman, 1959, 34 (♂*);
alboscuteUellatus Lee.—Peters, 1959, 135 (P*);
antennalis Bohart and Farner and **apoensis** Baisas and Ubaldo-Pagayon.—Change "1952" to "1953" †.
aranoides (Theobald).—Thurman, 1959, 30 (A, L*, P);
var. **serratus** (Barraud).—Thailand.
67. **barraudi** Baisas and Ubaldo-Pagayon, **christophersi** Baisas and Ubaldo-Pagayon, **claggi** Bohart and Farner, **delpilari** Baisas and Ubaldo-Pagayon, **dyari** Bohart and Farner, and **dyi**. Baisas and Ubaldo-Pagayon.—Change "1952" to "1953" †.
bimaculipes (Theobald).—Change "(NE)" to "(? BM)."
caeruleocephalus (Leicester).—Thailand. Thurman, 1959, 34 (A, L*, P*);
68. **erlindae** Baisas and Ubaldo-Pagayon, **hoogstraali** Baisas, **indeterminatus** Baisas and Ubaldo-Pagayon, **intermediatus** Baisas and Ubaldo-Pagayon, **knighti** Baisas and Ubaldo-Pagayon, **malvari** Baisas and Ubaldo-Pagayon, **microcala** (Dyar), and **monetifer** (Dyar).—Change "1952" to "1953" †.
hybridus (Leicester).—Thurman, 1959, 35 (♂*);
indicus (Barraud).—Thailand. Thurman, 1959, 33 (♂*, L*, P; to sp. status).
69. **nepenthicola** (Banks), **nitidoventer** (Giles), **powelli** (Ludlow), ssp. **escodae** Baisas and Ubaldo-Pagayon, ssp. **laffooni** Baisas and Ubaldo-Pagayon, ssp. **mattinglyi** Baisas and Ubaldo-Pagayon, and **roxasi** Baisas and Ubaldo-Pagayon.—Change "1952" to "1953" †.
powelli (Ludlow).—Thailand. Thurman, 1959, 32 (♂*, L*, P);
powelli indicus (Barraud).—Transfer to p. 68 as full species.
purpuratus (Edwards).—Delete "? New Guinea, ? Mariana Islands (Guam)" †.
quasiornatus (Taylor).—Peters, 1959, 136 (P*);

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70. **rozeboomi** Baisas and Ubaldo-Pagayon, **simulatus** Baisas and Ubaldo-Pagayon, **sullivananae** Baisas and Ubaldo-Pagayon, **toffalettii** Baisas and Ubaldo-Pagayon, **uichancoi** Baisas and Ubaldo-Pagayon, and **wernerii** Baisas and Ubaldo-Pagayon.—Change "1952" to "1953" †.

Subgenus **RACHISOURA** Theobald

Important reference: Assem, 1959, 35-55 (biol., New Guinea).

adentata Assem.—New Guinea.

1959. Tijdschr. Ent. 102: 48 (♂*, ♀ L*). Type-loc: Cyclops Mountains, near Ifar, New Guinea (LM).

bisquamatus Lee.—Peters, 1959, 137 (P*). Assem, 1959, 41, 50 (♀, L*, biol.).

brevirhynchus Brug.—Peters, 1959, 140 (P*).

cuttsi Assem.—New Guinea.

1959. Tijdschr. Ent. 102: 46 (♂*, ♀, L*). Type-loc: Homejo, Kemabu Valley, New Guinea (LM).

filipes (Walker).—Peters, 1959, 139 (P*). Assem, 1959, 37 (♂*, ♀).

71. **flabelliger** Bonne-Wepster.—Assem, 1959, 38 (♂*, L*).

fuscipleura Lee.—Peters, 1959, 145 (P*).

kingi Lee.—Assem, 1959, 45 (♂*, L*).

leei Peters.—New Guinea.

1959. Proc. R. ent. Soc. Lond. (B) 28: 141 (♂* ♀, L*, P*). Type-loc: Maprik, Sepik District, New Guinea (CSIR).

longipalpatus Lee.—Peters, 1959, 144 (L*, P*). Assem, 1959, 40 (♀, L*).

mabinii Baisas and Ubaldo-Pagayon.—Change "1952" to "1953" †.

plumiger Bonne-Wepster.—Peters, 1959, 146 (♂*, L*, P*).

vanleeuweni (Edwards).—Assem, 1959, 45 (♂*, ♀, L*).

Subgenus **POLYLEPIDOMYIA** Theobald

72. **ater** (Taylor).—Place with its synonym *brugi* Edwards as synonyms of *argenteiventris* (Theobald). See Stone, 1957, 174 †.

caledonicus (Edwards).—Delete "New Hebrides" †.

microlepis (Edwards).—Assem, 1960, 13 (♂*, L*).

73. **standfasti** Peters.—New Guinea.

1959. Proc. R. ent. Soc. Lond. (B) 28: (♂*, ♀, L*, P*).

Type-loc: Maprik, Sepik District, New Guinea (CSIR).

subobscurus Lee.—Delete "New Guinea" †.

Genus **TRICHOPROSOPON** Theobald

Subgenus **TRICHOPROSOPON** Theobald

compressum Lutz.—French Guiana.

74. **soaresi** Lane and Cerqueira.—French Guiana.

Subgenus **SHANNONIANA** Lane and Cerqueira

75. **schedocyclium** (Dyar and Knab).—French Guiana.

Subgenus **RUNCHOMYIA** Theobald

76. **leucopus** (Dyar and Knab).—French Guiana.

77. **pallidiventer** (Lutz).—French Guiana.

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Genus **WYEOMYIA** TheobaldSubgenus **WYEOMYIA** Theobald

- 79.
- medicopalipes**
- Lutz.—Surinam, British Guiana, French Guiana.

Subgenus **DENDROMYIA** Theobald

84. **bourrouli** (Lutz).—Surinam.
clasoleuca Dyar and Knab.—French Guiana.
 85. **confusa** (Lutz).—French Guiana.
 86. **luteoventralis** Theobald.—French Guiana.
moerbista (Dyar and Knab).—Surinam.
mystes Dyar.—French Guiana.
 87. **surinamensis** Bruijning.—Surinam.
 1959. Stud. Fauna Suriname Guyanas 3: 135 (♂*);
 Type-loc: Ornamibo, Surinam (LM).
 88. **ulocoma** (Theobald).—French Guiana.
ypsipola Dyar.—Surinam.

Genus **PHONIOMYIA** Theobald

- 90.
- splendida**
- (Bonne-Wepster and Bonne).—French Guiana.

Genus **LIMATUS** Theobald

- asulleptus**
- (Theobald).—French Guiana.

Genus **SABETHES** Robineau-DesvoidySubgenus **SABETHES** Robineau-Desvoidy

92. **cyaneus** (Fabricius).—French Guiana.
purpureus (Theobald).—French Guiana.
tarsopus Dyar and Knab.—French Guiana.

Subgenus **SABETHINUS** Lutz

93. **identicus** Dyar and Knab.—French Guiana.
intermedius (Lutz).—French Guiana.
 94. **undosus** (Coquillett).—French Guiana.

Genus **MALAYA** Leicester

- genurostris** Leicester.—Thurman, 1959, 49 (♂*, L).
jacobsoni (Edwards).—Thurman, 1959, 50 (♂*, L).

Genus **TOPOMYIA** LeicesterSubgenus **TOPOMYIA** Leicester

95. The subgenus *Suaymyia* has been proposed (See p. 96, below) and the following species placed in it: *argenteoventralis* Leicester, *auriceps* Brug, *decorabilis* Leicester, *houghtoni* Feng, and *imitata* Baisas. The remaining species form the typical subgenus.
aenea Thurman.—Thailand.
 1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 39
 (♂*, ♀). Type-loc: Ngao, Lampang Province, Thailand (USNM).
 96. **imitatus** Baisas.—Change to **imitata** †.
inclinata Thurman.—Thailand.
 1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 41
 (♂*). Type-loc: Buker Cabin Area, Doi Sutep, Chiangmai Province, Thailand (USNM).

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- lindsayi** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 42 (δ^*). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).
- svastii** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 43 (δ^*). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).
- unispinosa** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 44 (δ^*). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).

Subgenus SUAYMYIA Thurman

- Topomyia**, subgenus **Suaymyia** Thurman 1959, Univ. Maryland Agr. Expt. Sta. Bull. A-100: 44. Orthotype: *cristata* Thurman.
- argenteoventralis** Leicester.—Thurman, 1959, 45 (to subg. *Suaymyia*).
- auriceps** Brug.—Thurman, 1959, 45 (to subg. *Suaymyia*).
- cristata** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 46 (δ^*). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).
- decorabilis** Leicester.—Thurman, 1959, 45 (to subg. *Suaymyia*).
- houghtoni** Feng.—Thurman, 1959, 45 (to subg. *Suaymyia*).
- imitata** Baisas.—Thurman, 1959, 45 (to subg. *Suaymyia*).
- leucotarsis** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 47 (δ^*). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).
- papuensis** Marks.—New Guinea.
1960. Pacific Ins. 2: 91 (δ^* , ♀ , L*, P*). Type-loc: Koipa, 4-5 miles from Saiho ($8^\circ 50' \text{ S.}$, $148^\circ 05' \text{ E}$) on the Popondetta road, Northern District, Papua (UQ).
- pseudoleucotarsis** Thurman.—Thailand.
1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 48 (δ^*). Type-loc: Doi Sutep, Chiangmai Province, Thailand (USNM).

Genus FICALBIA Theobald

Subgenus MIMOMYIA Theobald

98. **chamberlaini** (Ludlow).—India. Menon and Tampi, 1959, 13 (E*).
- hispidata** (Theobald).—Natal.
99. **plumosa** Theobald.—Natal.

Genus MANSONIA Blanchard

Subgenus MANSONIOIDES Theobald

104. **Mansonioides** Theobald.—Change "*septemgutta*" to "*septemguttata*" †.
- africana** (Theobald).—Delete "? New Guinea" †. Laurence, 1960, 491 (biol.).
105. **uniformis** (Theobald).—Laurence, 1960, 491 (biol.).

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Subgenus **MANSONIA** Blanchard

106. *humeralis* Dyar and Knab.—French Guiana.
pseudotitillans (Theobald).—French Guiana.

Subgenus **RHYNCHOTAENIA** Brèthes

107. *arribalzagai* (Theobald).—French Guiana.
fasciolata (Lynch Arribálzaga).—Change “MLP” to “NE.”

Genus **URANOTAENIA** Lynch Arribálzaga

108. *Pseudofcalbia* Theobald.—Change “Edwards 1932a: 96” to “Howard, Dyar, and Knab 1917: 899” †
albescens Taylor.—Delete “Solomon Islands” †.
 109. *argyrotarsis* Leicester.—Delete “Solomon Islands” †.
 111. *candidipes* Edwards.—Since *nivipous* and *nivipes* are not homonymous, the correct name for this species is *nivipous* and *candidipes* falls as a synonym (See *nivipous*, p. 117, below) †.
 112. *colocasiae* Edwards.—Delete “? Mariana Islands” †.
 114. *leucoptera* (Theobald).—French Guiana.
 116. *nataliae* Lynch Arribálzaga.—Delete “MLP.” French Guiana.
 117. *albofasciata* Taylor.—Change “(LU)” to “(SAM)” †.
nivipous Theobald.—Insert, with *candidipes* Edwards as a synonym. (See *candidipes*, p. 111, above) †.
 118. *pulcherrima* Lynch Arribálzaga.—Change “MLP” to “NE.”
quadrimaculata Edwards.—Delete “Bismarck Archipelago” and “New Guinea” †.
 119. *socialis* Theobald.—French Guiana.
 120. *unguiculata* Edwards.—Senevet and Andarelli, 1959, 222 (♂, ♀, L*, P*).
ssp. peffy Stone.—Arabia.
 1961 (1960). Proc. ent. Soc. Wash. 62: 249 (♂, ♀).
 Type-loc: Qatif Oasis, Al Hasa Province, Saudi Arabia (USNM).

Genus **HODGESIA** Theobald

121. *lampangensis* Thurman.—Thailand.
 1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 52 (♂*, L*, P*). Type-loc: Ngao, Lampang Province, Thailand (USNM).
malayi Leicester.—Thailand.

Genus **ORTHOPODOMYIA** Theobald

122. *andamanensis* Barraud.—Thailand.
 123. *kummi* Edwards.—United States (Arizona).
lemmonae Thurman.—Thailand.
 1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 58 (L*). Type-loc: Doi Chom Cheng of Doi Sutep Range, Chiangmai Province, Thailand (USNM).

Genus **AEDEOMYIA** Theobald

125. *squamipennis* (Lynch Arribálzaga).—Change “MLP” to “NE.”

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Genus PSOROPHORA Robineau-Desvoidy**Subgenus PSOROPHORA Robineau-Desvoidy***ciliata* (Fabricius).—French Guiana.*molestus* Wiedemann.—Change "1821" to "1820" †.

- 126.
- holmbergii*
- Lynch Arribálzaga.—Change "MLP" to "NE." †.

lineata (Humboldt).—French Guiana.**Subgenus JANTHINOSOMA Lynch Arribálzaga***amazonica* Cerqueira.—Brazil.

1960. Bol. Mus. Goeldi, Zool. 26: 1 (♂*, ♀, L*, P*).

Type-loc: Igarapé do Tarumã, Manaus, Amazonas, Brazil (INPA).

- 127.
- circumflava*
- Cerqueira.—Brazil. Cerqueira, 1960, 5 (♂*).

oblita Lynch Arribálzaga.—Change "MLP" to "NE."**Subgenus GRABHAMIA Theobald**

- 129.
- confinnis*
- (Lynch Arribálzaga).—Change "MLP" to "NE."

- 131.
- varinervis*
- Edwards.—Martinez, Prosen and Carevallo, 1959, 115 (♂*).

Genus HEIZMANNIA Ludlow

- 132.
- mattinglyi*
- Thurman.—Thailand.

1959. Univ. Maryland Agr. Expt. Sta. Bull. A-100: 70

(♀). Type-loc: Rong Kwang, Prae Province, Thailand (USNM).

metallica (Leicester).—Thailand.**Genus UDAYA Thurman***argyrurus* (Edwards).—Maedonald and Mattingly, 1960, 26 (L*, P*).*lucaris* Maedonald and Mattingly.—Malaya.

1960. Proc. R. ent. Soc. London (B) 29: 22 (♂*, ♀,

L*, P*). Type-loc: Ulu Gombak Forest Reserve, Selangor, Malaya (BM).

Genus ERETMAPODITES Theobald

- 133.
- leucopus*
- Graham.—Change to
- leucopous*
- , the original spelling, which should have been retained. Delete "as
- leucopous*
- " †.

- 134.
- melanopus*
- Graham.—Change to
- melanopous*
- , the original spelling, which should have been retained. Delete "as
- melanopous*
- " †.

oedipodius Graham.—Change to *oidipodeios*, the original spelling, which should have been retained. Delete "as *oidipodeios*" †.*semisimplices* Edwards.—Cameroun.**Genus AEDES Meigen**

- 135.
- Important references*
- : 1959, Mattingly, 1-61 (keys, subgenera
- Skusea*
- ,
- Diceromyia*
- ,
- Geoskusea*
- , and
- Christophersiomyyia*
- , Indomalayan Area); 1959, Hedeon, 179-183 (larval key, France); 1960, Price, 544-560, (first instar L. key, Minnesota).

Subgenus MUCIDUS Theobald

- 136.
- aurantius quadripunctis*
- (Ludlow).—After Bohart 1945, 55, change "ssp." to "sp." †.

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laniger (Wiedemann).—Change “1821” to “1820” †
lucianus Muspratt.—Natal.

1959. J. ent. Soc. S. Afr. 22: 64 (♂*, ♀*). Type-loc:
 M'eanduzi, w. side of Lake St. Lucia, Zululand, Natal
 (SAIM).

Subgenus **OCHLEROTATUS** Lynch Arribálzaga

138. *albirostris* (Macquart).—Correct type locality from Akaroa (not D'Akaroa †) to New South Wales. Transfer to synonymy under *vigilar* (Skuse) under pending Suspension of Rules (See p. 157 below). Transfer Edwards' 1924 reference to *subalbirostris* Klein and Marks (See p. 155 below).
andersoni Edwards.—Dobrotworsky, 1960, 68 (♂*, ♀, L*, P*).
annulipes (Meigen).—Yugoslavia.
139. *atlanticus* Dyar and Knab.—Craig and Horsfall, 1960, 17 (E*).
barri Rueger.—Price, 1960, 550 (1st instar L*).
bejaranoi Martinez, Carevallo and Prosen.—Bolivia.
 1960. Rev. Cát. Microbiol. y Parasitol. 28(89): 26 (♂, ♀). Type-loc: Yungas del Palmar, Chapare Prov., Cochabamba Dept., Bolivia (A. Martínez).
140. *camptorhynchus* (Thomson).—Dobrotworsky, 1960, 63 (♂*, ♀, L*).
canadensis (Theobald).—Price, 1960, 550 (1st instar L*).
141. *cantator* (Coquillett).—Craig and Horsfall, 1960, 17 (E*).
142. *cataphylla* Dyar.—China.
clelandi (Taylor).—Dobrotworsky, 1960, 185 (♂*, ♀*, L*, P*).
communis (De Geer).—China. Price, 1960, 552 (1st instar L*).
143. *continentalis* Dobrotworsky.—Australia.
 1960. Proc. Linn. Soc. N. S. W. 85: 71 (♂*, ♀, L*, P*).
 Type-loc: Carpendeit, Victoria, Australia (NMM).
crinifer (Theobald).—French Guiana.
cunabulanus Edwards.—Dobrotworsky, 1960, 65 (♂* ♀, L*, P*).
cyprius Ludlow.—China.
144. *diantaeus* Howard, Dyar and Knab.—China. Price, 1960, 552 (1st instar L*).
dorsalis (Meigen).—Price, 1960, 554 (1st instar L*).
145. *excrucians* (Walker).—Price, 1960, 548 (1st instar L*).
fitchii (Felt and Young).—Price, 1960, 552 (1st instar L*).
146. *flavifrons* (Skuse).—Dobrotworsky, 1960 180 (♂*, ♀*, L*, P*).
variegatus Strickland.—Insert “*vandema* var.” after “*Culicada*” †.
hesperonotius Marks.—Western Australia.
 1959. Pap. Dept. Ent. Univ. Qd 1: 131 (♀). Type-loc:
 2 mi. ne. Bullsbrook, Western Australia, Australia
 (CSIR).
147. *hexodontus* Dyar.—Japan. Suzuki, 1959, 291 (♂*, ♀*, L*, P*).
hodgkini Marks.—Western Australia.
 1959. Pap. Dept. Ent. Univ. Qd 1: 112 (♂*, ♀, L*, P*).
 Type-loc: Woodanilling, 94 mi. n. Albany, Western
 Australia, Australia (CSIR).
idahoensis (Theobald).—Remove to position as subspecies of *spencerii*
 (Theobald) (See p. 154 below).
inexpectatus Bonne-Wepster.—Insert from p. 193 (see below). Marks,
 1957, 72 †.
infirmatus Dyar and Knab.—Craig and Horsfall, 1960, 17 (E*).

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 148. **intrudens** Dyar.—Japan. Suzuki, 1959, 293 (δ^* , ♀ *, L*, P*). Price, 1960, 554 (1st instar L*).
- luteifemur** Edwards.—Dobrotworsky, 1960, 54 (δ^* , ♀ , L*, P*).
- macintoshi** Marks.—Western Australia. 1959. Pap. Dept. Ent. Univ. Qd 1: 117 (δ^* , ♀ , L*, P*). Type-loc: Albany, Western Australia, Australia (CSIR).
- macleayanus** Mackerras.—Place as synonym under *nigrithorax* (Macquart) (See p. 149, below).
149. **mittellae** (Dyar).—Craig and Horsfall, 1960, 16 (E*).
- nigrinus** (Eckstein).—Hungary.
- nigrithorax** (Macquart).—Marks, 1960, 117 (δ^* , ♀ *, syn.).
macleayanus Mackerras, 1927. (See p. 148, above).
- nigromaculis** (Ludlow).—Price, 1960, 556 (1st instar L*).
- nivalis** Edwards.—Change "Mt. Wellington, Tasmania" to "Marysville, Victoria" †. Dobrotworsky, 1960, 60 (δ^* , ♀ , L*, P*).
150. **perventor** Cerqueira and Costa.—Forattini, 1959, 177 (P*).
- procax** Skuse.—Klein and Marks, 1960, 112 (*rubrithorax* of authors, not Macquart; resurrected from synonymy).
151. **punctor** (Kirby).—Price, 1960, 556 (1st instar L*).
- purpureifemur** Marks.—Western Australia. 1959. Pap. Dept. Ent. Univ. Qd 1: 132 (♀). Type-loc: Forrestdale, 15 mi. se. Perth, Western Australia, Australia (CSIR).
152. **purpuriventris** Edwards.—Dobrotworsky, 1960, 183 (δ^* ♀ *, L*, P*).
- ratcliffei** Marks.—Western Australia. 1959. Pap. Dept. Ent. Univ. Qd 1: 123 (δ^* , ♀ , L*, P*). Type-loc: Guangara, 12 mi. n. Perth, Western Australia, Australia (CSIR).
- rubrithorax** (Macquart).—Transfer to subgenus *Finlaya* (See p. 170 below); *procax* validated as shown above.
153. **confirmatus** Lynch Arribalzaga.—Change "MLP" to "NE."
154. **silvestris** Dobrotworsky.—Australia. 1961 (1960). Proc. ent. Soc. Wash. 62: 248 (*nom. nov.* for *waterhousei* Dobrotworsky, *non* Theobald; *Culex*).
waterhousei Dobrotworsky, 1960. Proc. Linn. Soc. N.S.W. 85: 57 (δ^* , ♀ , L*, P*). Type-loc: Wattle Glen, Victoria (NMM).
- sollicitans** (Walker).—Craig and Horsfall, 1960, 16 (E*).
- spencerii** (Theobald).—Nielsen and Rees, 1959, 46.
 ssp. **idahoensis** (Theobald). Nielsen and Rees, 1959, 146 (?spp.).
- sticticus** (Meigen).—Price, 1960, 557 (1st instar L*).
155. **stigmaticus** Edwards.—Martinez, Prosen and Carcavallo, 1959, 112 (δ^*).
- stimulus** (Walker).—Price, 1960, 557 (1st instar L*).
- subalbirostris** Klein and Marks.—New Zealand. 1960. Proc. Linn. Soc. N.S.W. 85: 115 (♀). Type-loc: Invercargill, New Zealand. Edwards, 1924, 375 (♀ ; as *albirostris* Macquart).
- taeniorhynchus** (Wiedemann).—Forattini, 1958, 176 (P*). Craig and Horsfall, 1960, 16 (E*).
156. **thibaulti** Dyar and Knab.—Craig and Horsfall, 1960, 17 (E*).
- trichurus** (Dyar).—Price, 1960, 557 (1st instar L*).
- trivittatus** (Coquillett).—Price, 1960, 558 (1st instar L*).

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157. **varipalpus** (Coquillett).—Utah.
vigilax (Skuse).—Klein and Marks, 115.
albirostris (Macquart).—Klein and Marks, 1960, 112 (♀*;
 syn. under pending Suspension of Rules).
vigilax vansomeranae.—Delete "and Brown." Insert after 1955, "In
 Mattingly and Brown" †.
- Subgenus FINLAYA Theobald**
- Important reference*: 1959, Colless, 166-179, (key *niveus* sub-
 group).
158. **alboannulatus** (Macquart).—Dobrotworsky, 1959, 132 (♂*, ♀, L*,
 E*);
albicinctus (Barraud).—Ryukyu Retto.
albolateralis (Theobald).—Colless, 1959, 173 (♀, ♂, L).
 159. **argyrothorax** Bonne-Wepster and Bonne.—French Guiana.
atropalpus (Coquillett).—Craig and Horsfall, 1960, 14 (E*). Price,
 1960, 550 (1st instar L*);
 160. **bunanoki** Sasa and Ishimura.—Korea.
christophersi Edwards.—Japan.
 163. **hendersoni** Cockerell.—Montana to Texas. Breland, 1960, 601 (♂, ♀*,
 L*; to sp. status, resurrected from synonymy).
 164. **knighti** Stone and Bohart.—Change "Rendova Islands" to "Rendova
 Island" †.
 165. **kochi** (Dönitz).—Delete "? Solomon Islands" †.
koreicus (Edwards).—Maritime Province, U.S.S.R.
leucocelaenus Dyar and Shannon.—French Guiana.
 167. **niveoides** Barraud.—Colless, 1959, 175 (♀, ♂, L).
niveus (Ludlow).—Feng, 1938, 512 (♂*, ♀*, L*) †.
 168. **novoniveus** Barraud.—Colless, 1959, 174 (♀, ♂, L).
similis, queenslandis, demansis, cumpstoni, hybrida.—Transfer to p.
 170 as synonyms of *rubrithorax*.
oreophilus (Edwards).—Japan.
 169. **plagosus** Marks.—New South Wales.
 1959. Proc. roy. Soc. Qd 70: 21 (♀*). Type-loc: Ben
 Lomond, 35 mi. n. of Armidale, New South Wales, Aus-
 tralia (CSIR).
poecilus (Theobald).—Change to **poicilius**, the original spelling,
 which should have been retained. Delete "as" and
 "*poicilia*, emend. by Barraud 1934, 157" †.
pseudoniveus (Theobald).—Colless, 1959, 169 (♀, ♂, L).
 170. **quinclineatus** Edwards.—Marks, 1959, 23 (♂*).
rubrithorax (Macquart).—Dobrotworsky, 1959, 134 (♂*, ♀, L*, E*;
 as *queenslandis*). Klein and Marks, 1960, 109 (♀*; trans.
 from subg. *Ochlerotatus*; syn.).
similis Strickland, *queenslandis* Strickland, *demansis* Strick-
 land, *cumpstoni* Taylor, and *hybrida* Taylor transferred
 from synonymy under *occidentalis* (Skuse) (See p. 168
 above).
rupestris Dobrotworsky.—Australia.
 1959. Proc. Linn. Soc. N.S.W. 84: 136 (♂*, ♀, L*, P*,
 E*). Type-loc: Lorne, Victoria, Australia (NMM).
seoulensis Yamada.—Feng, 1938, 516 (♂*, ♀*, E*, L*) †.
 171. **subniveus** Edwards.—Colless, 1959, 171 (♀, ♂, L).

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172. **togoi** (Theobald).—Change “Yamguti” (Line 5) to “Yamaguti” †.
 Bullock, 1960, 167 (E*).
- triseriatus** (Say).—Price, 1960, 558 (1st instar L*). Change distribution to: Eastern Canada and United States west to British Columbia and Texas; Mexico.
- hendersoni* Cockerell. To valid species (See p. 163 above).
- tubbutiensis** Dobrotworsky.—Australia.
 1959. Proc. Linn. Soc. N.S.W. 84: 139 (♂* ♀, L*, P*).*
 Type-loc: Tubbut, E. Gippsland, Victoria, Australia (NMM).

Subgenus MACLEAYA Theobald

175. **doddi** Taylor.—Change “Hikinumu” to “Itikinumu” †.

Subgenus SKUSEA Theobald

176. **amesii** (Ludlow).—Mattingly, 1959, 25 (♂*, ♀*, L*, P*).*
celebicus Mattingly.—Celebes.
 1959. Cul. Mosq. Indomalayan Area 4: 32 (♂*).* Type-loc: Dongkala, Kabaena, Celebes, Indonesia (BM).
- fumidus** Edwards.—Mattingly, 1959, 29 (♂*, ♀*, L*, P*).*

Subgenus CHRISTOPHERSIOMYIA Barraud

177. **gombakensis** Mattingly.—Malaya.
 1959. Cul. Mosq. Indomalayan Area 4: 56 (♂*, ♀*, L*, P*).* Type-loc: 16th mile, Ulu Gombak, Selangor, Malaya (BM).

Subgenus GEOSKUSEA Edwards

- baisasi** Knight and Hull.—Mattingly, 1959, 50 (♂*, ♀*).*
kabaensis Brug.—Mattingly, 1959, 48 (♂*, ♀*, L*, P*).*

Subgenus ALANSTONEA Mattingly

178. **Aedes**, subgenus **Alanstonea** Mattingly 1960, Proc. R. ent. Soc. Lond. (B) 29: 170. Orthotype: *Scutumyia treubi* De Meijere.
 Two species, *brevitibia* (Edwards) and *treubi* (Meijere) are transferred to this new subgenus from the subgenus *Stegomyia* (See pp. 182 and 188 below).

Subgenus STEGOMYIA Theobald

- aegypti** (Linnaeus).—Craig and Horsfall, 1960, 13 (E*).* Christophers, 1960, 1-739 (biol., anat.).
180. **albolineatus** (Theobald).—Delete “Ogasawara Gunto” and “Hawaiian Islands” †.
- albopictus** (Skuse).—Delete “New Guinea” †. Bullock, 1960, 167 (E*).*
181. **aurotaeniatus** Edwards.—Change “Philippines” to “Philippines” †.
182. **brevitibia** (Edwards).—Change “*Armigres*” to “*Armigeres*” †. Transfer to subgenus *Alanstonea*. Mattingly, 1960, 170 (See p. 178 above).
- chemulpoensis** Yamada.—Feng, 1938, 506 (♂*, ♀*, E*, L*) †. Bullock, 1960, 167 (E*).*
183. **edwardsi** var. **tulagensis** Edwards.—Type locality should be only Tulagi Hospital, Santa Cruz Islands †.
- flavopictus** Yamada.—Delete “India, Pakistan” and “Barraud, 1934, 239 (♂*, ♀, L*)” †.
- galloisi** Yamada.—Maritime Province, U.S.S.R.

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184. **hensilli** Farner.—Singapore †.
impatibilis (Walker).—Change "1860" to "1859" †.
186. **patriciae** Mattingly.—Barraud, 1934, 239 (♂*, ♀, L*; as *flaropictus* Yamada †.
pseudalbopictus (Borel).—Delete "New Caledonia" †.
187. **scutellaris** (Walker).—Delete "Hainan Island" †.
188. **treubi** (Meijere).—Thailand. Bonne-Wepster and Brug, 1932, 109 (to *Aedes*, subgenus *Stegomyia*) †. Transfer to subgenus *Alanstonea*. Mattingly, 1960, 170 (See p. 178 above).

Subgenus **AEDIMORPHUS** Theobald

189. **Aedimorphus** Theobald.—Insert after 290 "(July)" †.
190. **bedfordi** Edwards.—Muspratt, 1959, 67 (♂*).
193. **inexpectatus** Bonne-Wepster. Transfer to subgenus *Ochlerotatus* (See p. 147 above) †.
lamborni Edwards.—Cameroun.
194. **lokojoensis** Service.—Nigeria.
 1959. Rev. Zool. Bot. afr. 59: 244 (♂*, L, P). Type-loc: Lokoja, Northern Nigeria (BM).
mansouri Qutubuddin.—Sudan.
 1959. Ann. Mag. Nat. Hist. 2: 21 (♀, ♂*). Type-loc: Juba, Sudan Republic (BM).
195. **ochraceus** (Theobald).—Qutubuddin, 1959, 22 (♂*);
ovazzai Hamon and Adam.—French West Africa.
 1959. Bull. Soc. Pat. exot. 52: 147 (♂*). Type-loc: Adiopodoumé (Abidjan), Ivory Coast, French West Africa (IERT).
196. **pseudotarsalis** Someren.—Cameroun.
 Yamada) †.
rickenbachi Hamon and Adam.—French West Africa.
 1959. Bull. Soc. Pat. exot. 52: 151 (♂*). Type-loc: Tiébissou, Ivory Coast, French West Africa (IERT).
198. **vexans** (Meigen).—Price, 1960, 560 (1st instar L*);
vexans nocturnus (Theobald).—Delete Australia †.
199. **wendyae** Service.—Nigeria.
 1959. Proc. R. ent. Soc. London (B) 28: 73 (♂*, ♀, L*, P). Type-loc: Iarodu, near Lagos, S. Nigeria (BM) Service, 1960, 90 (lectotype).

Subgenus **NEOMELANICONION** Newstead

200. **aurovenatus** Worth.—South Africa.
 1960. J. ent. Soc. S. Afr. 23:312 (♀). Type-loc: Nduma, Tongaland, n. Natal, South Africa (SAIM).
201. **linealis** Taylor.—Change "10" to "17" †.

Subgenus **DICEROMYIA** Theobald

202. **fascipalpis** (Edwards).—Natal. Muspratt, 1959, 70 (♂*);
franciscoi Mattingly.—Singapore, Malaya.
 1959 Cul. Mosq. Indomalayan Area 4: 42 (♂, ♀* L, P). Type-loc: P. Blakang Mati, Singapore (BM).
iyengari Edwards.—Mattingly, 1959, 38 (♂*, ♀*, L*, P).
platylepidus Knight and Hull.—Mattingly, 1959, 41 (♀; to subgenus *Diceromyia*) (See p. 211, below).

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Subgenus AEDES Meigen

205. **cinereus** Meigen.—Price, 1960, 551 (1st instar L*
 206. **esoensis** Yamada.—Korea.
 208. **rossicus** Dolbeskin, Gorickaja, and Mitrofanova.—Japan.
 209. **varietas** (Leicester).—Change “type ♀” to “♀ ♀ of type series” †.

Subgenus LEPTOSOMATOMYIA Theobald

211. **variepictus** King and Hoogstraal.—Delete Peters’ reference since this was a misidentification.

Subgenus Uncertain

- platylepidus** Knight and Hull.—Transfer to subgenus *Diceromyia* (See p. 202, above).

Genus ARMIGERES Theobald

Important reference: Thurman, 1959, 76-106 (keys).

Subgenus ARMIGERES Theobald

212. **aureolineatus** (Leicester).—Thurman, 1959, 83 (♂*, L).
 213. **jugraensis** (Leicester).—Thurman, 1959, 86 (♂*, L).
malayi (Theobald).—Thurman, 1959, 88 (♂*, L*, P*
 214. **theobaldi** Barraud.—Thailand.

Subgenus LEICESTERIA Theobald

Leicesteriomyia Brunetti.—Maedonald, 1960, 112 (syn.)

Chaetomyia Leicester.

Important reference: Maedonald, 1960, 110-153 (revision, ecology).

- annulipalpis** (Theobald).—Maedonald, 1960, 134 (♂*, ♀, L).
annularis (Leicester).—Maedonald, 1960, 119 (♂* ♀, L)
balteatus Maedonald.—Thailand, Malaya, Sumatra, Borneo.
 1960. Stud. Inst. med. Res. Malaya 29: 128 (♂* ♀, L*
 Type-loc: Ulu Gombak, Selangor, Malaya (BM).
cingulatus (Leicester).—Synonymize under *longipalpis* (See below) but transfer Edwards’ reference to *balteatus* (See above).
dentatus Barraud.—Thailand. Maedonald, 1960, 124 (♂*, ♀, L*
digitatus (Edwards).—Maedonald, 1960, 130 (♂*, ♀*, L*
dolichocephalus (Leicester).—Thailand. Thurman, 1959 (♂*). Maedonald, 1960, 121 (♂*, ♀, L*
flavus (Leicester).—Transfer from subgenus *Leicesteriomyia*, p. 215. Maedonald, 1960, 116 (♂*, ♀, L).
inchoatus Barraud.—Maedonald, 1960, 122 (♂*, ♀, L).
longipalpis (Leicester).—Thailand, Indochina, Boeton. Maedonald, 1960, 126 (♂*, ♀, L).
cingulata Leicester.—Maedonald, 1960, 126 (syn.).
magnus (Theobald).—Maedonald, 1960, 117 (♂*, ♀, L).
 215. **omissus** (Edwards).—Thailand, Maedonald, 1960, 126 (♂*, ♀, L*
pectinatus (Edwards).—Maedonald, 1960, 123 (♂*, ♀, L*
pendulus (Edwards).—Maedonald, 1960, 131 (♂*, ♀, L).
traubi Maedonald.—Malaya.

1960. Stud. Inst. med. Res. Malaya 20: 132 (♂*, ♀, L*
 Type-loc: Ulu Gombak, Selangor, Malaya (BM).

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Subgenus **LEICESTERIOMYIA** Brunetti

Leicesteriomyia Brunetti.—Place with *Chaetomyia* as synonym of subgenus *Leicesteria* (See p. 214 above).

flavus (Leicester).—Transfer with its synonyms to subgenus *Leicesteria* (See p. 214, above).

Nomina Dubia

obturbans (Walker).—Change "1860" to "1859" †.

Genus **HAEMAGOGUS** WillistonSubgenus **STEGOCONOPS** Lutz

216. *bareis* Cerqueira.—Brazil.

1960. Bol. Mus. Goeldi, Zool. 25: 1 (♂*, ♀, L*, P*).
Type-loc: Igarapé de Tarumã, Manaus, Amazonas, Brazil (INPA).

Genus **CULISETA** FeltSubgenus **CULISETA** Felt

219. *glaphyoptera* (Schiner).—Sweden, Finland, Germany, Hungary, Yugoslavia, Bulgaria.

kanayamensis (Yamada).—Korea, China.

220. *tonnoiri* (Edwards).—Transfer to subgenus *Climacura* (See p. 221 below) †.

Subgenus **CULICELLA** Felt

drummondi (Dobrotworsky).—Australia.

1960. Proc. Linn. Soc. N. S. W. 85: 241 (♂*, ♀, L*, P*;
Theobaldia). Type-loc: Sylvan, Victoria (NMM).

minnesotae Barr.—Utah, Delaware.

221. *nipponica* LaCasse and Yamaguti.—Korea.

ochroptera (Peus).—China.

sylvanensis (Dobrotworsky).—Australia.

1960. Proc. Linn. Soc. N. S. W. 85: 245 (♂* ♀, L*, P*;
Theobaldia). Type-loc: Sylvan, Victoria (NMM).

otwayensis (Dobrotworsky).—Australia.

1960. Proc. Linn. Soc. N. S. W. 85: 246 (♂*, ♀, L*, P*;
Theobaldia). Type-loc: Cape Horn, Otway, Victoria (NMM.)

Subgenus **CLIMACURA** Howard, Dyar and Knab

tonnoiri (Edwards).—Transfer from subgenus *Culicella* where it had never been placed †. (See p. 220 above). Change "(?BM)" to "(CSIR)."

Genus **CULEX** LinnaeusSubgenus **LUTZIA** Theobald

223. *Lutzia* Theobald.—Change "*bigotii*" to "*bigoti*" †.

fuscanus Wiedemann.—Change "1821" to "1820" †.

Subgenus **BARRAUDIUS** Edwards

224. *modestus* Ficalbi.—Senevet and Andarelli, 1959, 80 (♂*, ♀, L*, P*).

pusillus Macquart.—Senevet and Andarelli, 1959, 85 (♂*, ♀, L*, P*).

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Spbgenus NEOCULEX Dyar

226. *deserticola* Kirkpatrick.—Syria. Senevet and Andarelli, 1959, 107 (δ^* , φ^* , P*, L*).
227. *judaicus* Edwards.—Senevet and Andarelli, 1959, 117 (δ^*).
228. *kingianus* Edwards.—Cameroun.
martinii Medsehid.—Hungary.

Subgenus LOPHOCERAOMYIA Theobald

232. *atracus* Colless.—New Ireland, New Britain.
1960. Proc. Linn. Soc. N. S. W. 84: 385 (δ^*). Type-loc: Kavieng, New Ireland (BM).
- christiani* Colless.—New Guinea.
1960. Proc. Linn. Soc. N. S. W. 84: 389 (δ^* , φ , L*^{*}).
Type-loc: Minj, Western Highlands, New Guinea (BM).
- cinctellus* Edwards.—Rynkyu Retto.
233. *fraudatrix* (Theobald).—Delete all distribution except New Guinea and Australia. Colless, 1960, 382 (δ^*).
234. *minor* (Leicester).—Rynkyu Retto.
235. *ornatus* (Theobald).—New Britain.
petersi Colless.—New Guinea.
1960. Proc. Linn. Soc. N. S. W. 84: 388 (δ^* , φ , L*^{*}).
Type-loc: Minj, Western Highlands, New Guinea (BM).
- pseudornatus* Colless.—New Guinea.
1960. Proc. Linn. Soc. N. S. W. 84: 386 (δ^* , φ). Type-loc: Edie Creek, New Guinea (BM).

Subgenus CULICIOMYIA Theobald

236. *Neomelanocouion* Theobald. This is based upon a misidentification of *Culex rima* Theobald, which actually belongs to the subgenus *Neoculex*. Since this would be a synonym whether based upon the true *rima* or on misidentified *rima* it is hardly necessary to decide which principles to follow. †
237. *muspratti* Hamon and Lambrecht.—Congo.
1959. Bull. Soc. Pat. exot. 52: 583 (δ^*). Type-loc: Irangi Forest, Kivu, "Belgian" Congo (IERT).
238. *ruthi*.—Change to "*ruthae*." Peters, 1959, 153 †.

Subgenus CULEX Linnaeus

241. *consimilis* Taylor.—Change "8" to "55" †.
242. *atriceps* Edwards.
nigriceps Buxton, 1917. Bull. Soc. Etudes Ocean. 2: 307 (*lapsus* for *atriceps*) †.
243. *bitaeniorhynchus* Giles.—Natal.
abdominalis Taylor.—Change "7" to "53" †.
245. *deanei* Corrêa and Ramalho.—Brazil.
1959. Inst. Med. trop. S. Paulo Rev. 1: 141 (δ^* , φ , L*^{*}, P). Type-loc: Campo de Marte, bairro de Santana, São Paulo, Brazil (FH).
- minutus* Theobald.—Change "type φ " to "syntype φ " †.
246. *dolosus* (Lynch Arribáizaga). Change "MLP" to "NE."
minutus Theobald.—Change "type δ " to "syntype δ^* " †.
247. *forattinii* Corrêa and Ramalho.—Brazil.
1959. Rev. bras. Malariol. (Doenças trop.) 11: 55 (δ^*).
Type-loc: Santa Cruz de Rio Pardo, São Paulo, Brazil (FMSP).

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248. *guiarti* Blanchard.—Muspratt, 1959, 71 (δ , taxonomy).
 249. *ingrami* Edwards.—Service, 1959, 1 (L*^{*}).
 250. *jacksoni* Edwards.—Maritime Province, U.S.S.R.
 251. *mattinglyi* Knight.—Syria.
 253. *perfuscus* Edwards.—Natal.
 256. *goughii* Theobald.—Change “type δ ” to “syntype δ ” †.
 258. *pseudovishnui* Colless.—Change “Singapore, Malaya” to “Oriental Region” †.
renatoi Lane and Ramalho.—Brazil.
 1960. Rev. bras. Ent. 9: 173 (δ *, ♀, L*, P*). Type-loc: Bairro de São Miguel Paulista, Capital, São Paulo, Brazil (FMSP).
 259. *scimitar* Branch and Seabrook.—Bahama Islands.
 1959. Proc. ent. Soc. Wash. 61: 217 (δ *, ♀). Type-loc: Hog Island, Bahama Islands (USNM).
sinaiticus Kirkpatrick.—Transjordan, Israel.
 260. *impellens* Walker.—Change “1860” to “1859” †.
paludis Taylor.—Change “9” to “56” †.
 262. *thalassius* Theobald.—Natal, Syria.
toroensis Edwards and Gibbins.—Cameroun. Service, 1959, 1 (L).
toroensis macrophyllus Edwards and Gibbins.—Cameroun.
torrentium Martini.—Senevet and Andarelli, 1959, 203 (δ *, ♀, L, P).
 263. *tritaeniorhynchus summorosus* Dyar.—Maritime Province, U.S.S.R.
 264. *goughii* Theobald.—Change “type ♀” to “syntype ♀” †.
vishnui Theobald.—Change entire distribution to “India” †.

Subgenus **MELANOCONION** Theobald

266. *albinensis* Bonne-Wepster and Bonne.—French Guiana.
atratus Theobald.—Delete French Guiana.
 267. *breviculus* Senevet and Abonnene.—Transfer to subgenus *Aedinus* (see p. 281 below).
 268. *comminutor* Dyar.—Trinidad.
corentynensis Dyar.—French Guiana.
 269. *crybda* Dyar.—Trinidad.
dunni Dyar.—Trinidad.
educator Dyar and Knab.—French Guiana.
 270. *elevator* Dyar and Knab.—French Guiana.
 271. *evansae* Root.—Trinidad.
idottus Dyar.—Trinidad. Transfer to this species the following references from *thomasi* (p. 276 below): Senevet and Abonnene, 1939a; Floch and Abonnene, 1945; Foote, 1954 (Fauran, *in litt.*).
 272. *johnsoni* Galindo and Blanton.—Panama.
 1961. Ann. ent. Soc. Amer. 54: 1 (δ *). Type-loc: Pacora, Panama (USNM).
keenani Galindo and Blanton.—Panama.
 1961. Ann. ent. Soc. Amer. 54: 1 (δ *). Type-loc: Pacora, Panama (USNM).
maxinocca Dyar.—French Guiana.
 273. *mesodenticulatus* Galindo and Blanton.—Panama.
 1961. Ann. ent. Soc. Amer. 54: 2 (δ *). Type-loc: Almirante, Bocas del Toro Province, Panama (USNM).
nigrescens (Theobald).—Change “Guina” to “Guiana” †.

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274. **phlogistus** Dyar.—Brazil, French Guiana, Panama.
plectoporpe Root.—New synonymy (Fauran, *in litt.*).
vidali Floch and Fauran.—New synonymy (Fauran, *in litt.*).
plectoporpe Root.—Synonym of *phlogistus* (see above).
putumayensis Matheson.—Trinidad.
275. **annulipes** Theobald.—Insert "*Melanoconion*" after "♀*" †.
276. **theobaldi** (Lutz).—French Guiana.
thomasi Dyar.—Delete "Senevet—taxonomy)" which properly refer to *idotus* Dyar (Fauran, *in litt.*).
vidali Floch and Fauran.—Transferred to synonymy under *phlogistus* (See p. 274, above).
vomerifer Komp.—Trinidad.

Subgenus MOCHLOSTYRAX Dyar and Knab

277. **alogistus** Dyar.—French Guiana.
arboricolus Galindo and Blanton.—Panama.
 1961. Ann. ent. Soc. Amer. 54: 3 (♂*, L*, P*). Type-loc: Cerro La Victoria, Panama (USNM).
caudelli (Dyar and Knab).—French Guiana.
pilosus (Dyar and Knab).—Trinidad.
278. **unicornis** Root.—French Guiana.

Subgenus EUBONNEA Dyar

280. **accelerans** Root.—Trinidad, French Guiana.
amazonensis (Lutz).—Trinidad, French Guiana.

Subgenus AEDINUS Bourroul

281. **breviculus** Senevet and Abonnene.—Brazil. Transferred from subgenus *Melanoconion* (See p. 267 above) (Fauran, *in litt.*).
mojuensis Duret and Damasceno.—New synonymy (Fauran, *in litt.*).
282. **mojuensis** Duret and Damasceno.—(See above).
bonnei Dyar.—Transfer to this species the following reference from *iridescens* (p. 283 below): Senevet and Abonnene, 1939a (Fauran, *in litt.*).
283. **iridescens** (Lutz).—Delete French Guiana and Senevet and Abonnene's reference which properly belongs to *bonnei* (Fauran *in litt.*).
mathesoni Anduze.—French Guiana.

Genus DEINOCERITES Theobald

284. **troglydytes** Dyar and Knab.—Transfer to synonymy under *magnus* (See p. 285 below). †.
monospathus Dyar and Knab.—Transfer to synonymy under *melanophylum* (See p. 285 below) †.
285. **magnus** (Theobald).—French Guiana.
troglydytes Dyar and Knab.—Belkin and Hogue, 1959: 430 (syn.) †.
melanophylum Dyar and Knab.
monospathus Dyar and Knab.—Belkin and Hogue, 1959: 434 (syn.) †.

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Nomina Nuda

288. *colon*.—This should have been credited to Harris, not Johnson, and the reference should be, 1835, Harris, in Hitchcock, Rept. Geol. Mass., 2nd Ed.: 595 †.
guttatulus Harris.—Transfer from p. 27.
sahaliensis Senevet and Andarelli.—Change to "*saheliensis*" †.

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292. **Belkin, J. N. and C. L. Hogue.** 1959. A review of the erabhole mosquitoes of the genus *Deinocerites* (Diptera, Culicidae). Univ. Calif. Publ. Ent. 14: 411-458, illus.
293. **Bonne-Wepster and Brug.** 1932.—Insert "Bijblad" after "Ned.-Ind." †.
Bonne-Wepster and Brug. 1937a.—Change "7" to "77" †.
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Type Depositories

327. CMT. Change to Musée Royal de l'Afrique Centrale, Tervuren, Brussels, Belgium.
328. IBBA. This is the same as INM and the collection is in the Departamento de Entomología Sanitaria, Instituto Nacional de Microbiología, Av. Velez Sarsfield 514, Buenos Aires, Argentina.
- INPA. Instituto Nacional de Pesquisas de Amazonia, Belém, Para, Brazil.
- MEPRA. This collection is in the Instituto de Microbiología y Parasitología, Facultad de Medicina, Paraguay 2200, Buenos Aires, Argentina.
329. RIE. Department of Medical Zoology, Research Institute of Endemias, Nagasaki University, Japan.
330. Brazil (INPA), Japan (RIE).

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335. *bifurcatus* Linnaeus.—Also p. 17.
brucei Del Ponte and Cerquiera.—Change to *brucei* †.
337. *chrysothorax* Newstead and Thomas.—Change "268" to "276" †.
chrysothorax (Peryassú).—Change "276" to "268" †.
cornutus Edwards.—Change "244" to "245" †.
coronator Dyar.—Change "244" to "245" †.
339. *domesticus* Galvao and Damasceno.—Change "30" to "21" †.
340. *filipes* (Walker).—Change "71" to "70" †.

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341. *Grabhamia* Theobald.—Change to **Grabhamia** †.
Grahamia Theobald.—Change to *Grahamia* †.
 344. lampropus (Howard, Dyar and Knab.)—Change “75” to “76” †.
 347. marshallii (Theobald).—Change “49” to “48” †.
 348. muticus Edwards.—Change “237” to “238” †.
 349. nigropunctatus Edwards.—Change “237” to “238” †.
 350. ornatothoracis Theobald.—Change “252” to “253” †.
Pallidocephala Theobald.—Change to *pallidocephala* †.
 352. Insert, “*Promacleaya* Surcouf and Gonzalez158” †.
 354. sacharovi.—Change “Favr” to “Favr” †.
 356. *sylvicola* Grossbeck.—Change “147” to “146” †.

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MALE GENITALIA IN THE SUB-FAMILY CHEILOSIINAE.

GENUS BRACHYOPA

(DIPTERA: SYRPHIDAE)

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In an earlier paper (Sedman, 1959), the genitalia of members of the genus *Chrysogaster s. l.* were discussed and a re-classification suggested. The genus *Brachyopa* Meigen together with *Chrysogaster*, comprise the sub-tribe Chrysogastrina and this paper concludes the treatment of this sub-tribe.

Genus **Brachyopa** Meigen

There are two subgenera in this genus, *Brachyopa s. s.* and *Hammerschmidtia* Schummel. The latter group contains three species while the former contains twenty-one. The one species of *Hammerschmidtia* studied is the genotype and is Holarctic in distribution. The genotype of *Brachyopa s. s.* and two Nearctic species were included in this study. This group of flies, while certainly not rare, is rather uncommon in collections and several species are known from very few specimens.

The following synonymy summarizes the classification of this group as indicated by the study of the male genitalia:

Brachyopa Meigen

Brachyopa Meigen, 1822, System. Beschreib. 3: 260 (genotype - *Rhingia bicolor* Fallen).

Hammerschmidtia Schummel

Hammerschmidtia Schummel, 1834, Isis 7: 740.

Male Genitalia

The chief character linking these groups together is the configuration of the axial system which is composed of the sustentacular apodeme and chitinous box. There is an ejaculatory hood, but it lacks a definite articulation with the chitinous box. The species are unusual in that the chitinous box is pubescent over most of the surface.

Subgenus **Brachyopa** Meigen**B. (B.) bicolor** (Fallen) (Figs. 1, 2)

1817. Dipt. Succ., Syrphici p. 32 (*Rhingia*); 1930. Sack, in Lindner, Flieg. der Pal. Reg. 31: 129.

Epandrium deeper than long, subtriangular. Style with many apical bristles; very broad, seemingly divided into two areas, the more dorsal area thumb-like and bearing a ventral lightly sclerotized plate-like extension without a clearly defined articulating surface; with spines on inner walls of styli projecting beyond apex. Cereus small.

Penis sheath rounded ventrally; elongate and highly modified apically giving rise to the superior and inferior lobes without an articulating surface; the basal

one half to three-fourths of the ventral margin is wrinkled. Superior lobe tongue-like, acuminate. Inferior lobe divided into two acuminate projections.

Sustentacular apodeme narrow, relatively short. Chitinous box with an ejaculatory hood-like structure, but without a definite articulating surface between these two; developed vertically with a ventral pyramidal base; dorsal, tapering with an apical, downward projecting portion; entire structure well sclerotized but with two isolated membranous areas medially and dorso-apically; upper one-half to two-thirds covered with delicate, short, dense, clear, appressed hair.

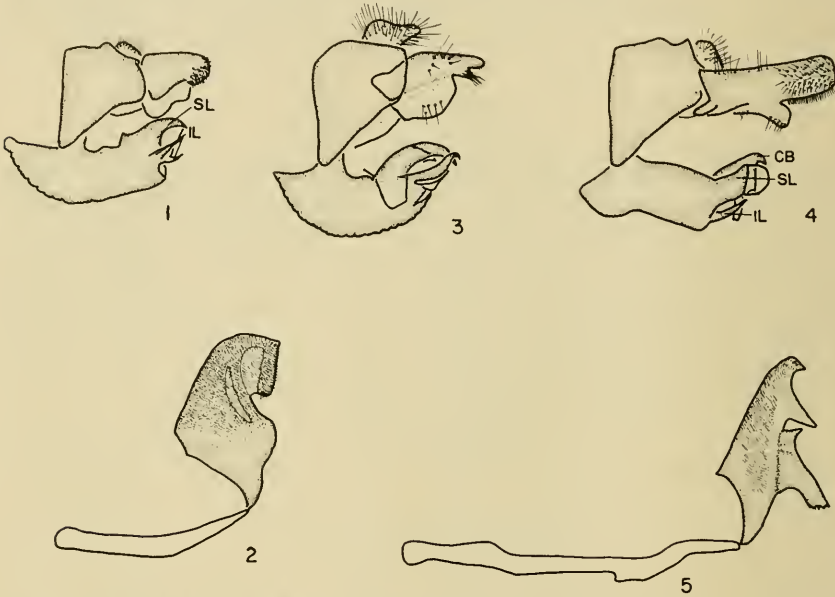


Fig. 1, *Brachyopa (Brachyopa) bicolor* (Fall.), male genitalia; fig. 2, *B. (B.) bicolor* (Fall.), axial system; fig. 3, *B. (B.) notata* Osten Sacken, male genitalia; fig. 4, *B. (Hammerschmidtia) ferruginia* (Fall.), male genitalia; fig. 5, *B. (H.) ferruginia* (Fall.), axial system. Abbreviations: CB-chitinous box, IL-inferior lobe, SL-superior lobe.

B. (B.) notata Osten Sacken (Fig. 3)

1876. Bull. Buffalo Soc. Nat. Hist. 3: 68; 1922. Curran, Ann. Ent. Soc. Amer. 15: 251.

Like *bicolor* (Fall.) but differing as follows: apex of style bilobed, lower lobe with a thick brush ventrally and hair differently arranged; superior and inferior lobes more elongate; chitinous box terminates apically as a pronounced beak and bears medially a pair of arms.

B. (B.) perplexa Curran

1922. Can. Ent. 54: 117; 1922. Curran, Ann. Ent. Soc. Amer. 15: 249.

The male genitalia of this species are identical with those of *notata* O. S.

Subgenus **Hammerschmidtia** Schummel

B. (H.) ferruginia (Fallen) (Figs. 4, 5)

1817. Dipt. Succ., Syrphici, p. 34 (*Rhingia*).

Epandrium deeper than long, subtriangular. Style elongate palmate, dorsal and ventral margins parallel; with a short ventrally projecting thumb at the middle of the ventral surface; with long fine hairs dorso-basally and on the thumb; with short hairs anterior to thumb on apical one-third of style proper, and ventral to this area, an even fringe of hairs. Cersus small.

Penis sheath rectangular. Superior lobe undifferentiated from penis sheath and without a definite joint or articulation.

Sustentacular apodeme elongate and very narrow. Chitinous box much as in *B. (B.) bicolor* (Fall.); with a definite pair of arms originating on the middle of the apical margin; immediately dorsal to this, a narrow membranous area with a small heavily sclerotized plate above it; the apico-dorsal one-third of the chitinous box "C" shaped; basad of the "C" is a membranous area; basally and on the dorsal three-fourths of the chitinous box there are found the same type of hairs as found in *bicolor* (Fall.).

These two subgenera are very closely related and there are only very minor differences in the genitalia. The differences in the adult characteristics are also minor although Curran (1922) has presented arguments to the contrary.

The relationship of these subgenera to the rest of the Chrysogastrina is based on the construction and elaboration of the chitinous box which lacks an articulating surface to separate it from the epaculatory hood when present. Both *Chrysogaster s.l.* and *Brachyopa s.l.* are primitive in general features of the morphology of the genitalia. The presence of generalized inferior and superior lobes and the primitive condition of the epandrium in the species considered as most closely approximating the most generalized condition of recent species is also taken as evidence for the placement of *Brachyopa s.l.* as members of this subtribe.

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- Sedman, Y. S., 1959. Male genitalia in the subfamily Cheilosiniinae. Genus *Chrysogaster s.l.* *Proc. Ent. Soc. Wash.* 61: 49-58.

LASIOPTERA ALLIOIDES, A NEW GALL MIDGE ON GRASS

(DIPTERA: CECIDOMYIIDAE)

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The bulbous galls (Fig. 1) formed at the bases of stems of *Paspalum distichum* are so well known in the West that Robbins, Bellue, and Ball (1941) referred to these galls in their book "Weeds of California" as often being characteristic of this grass. Dr. Paul Arnaud, California State Department of Agriculture, and Dr. E. S. Ross, California Academy of Sciences, reared adults from larvae that make these galls, and they are here described.

The gall-maker belongs to the genus *Lasioptera* Meigen *sens. lat.* Felt based his division of this genus on the wing venation and number of palpal segments, while the European workers, Rübssaamen and

Kieffer, considered the shape of the ventral plate of the hypopygium of the male and characteristics of the lamellae of the ovipositor to be more fundamental for generic segregation. Until there is a modern revision reconciling these generic (or subgeneric) concepts, it appears preferable to employ the generic name *Lasioptera* in the broad sense.

Lasioptera allioides, new species

Alliodes agrees with the genus *Neolasioptera* Felt in regard to the development of M_{3+4} and with both *Neolasioptera* and *Meuniericlla* Kieffer in regard to the noncleft caudal margin of the ventral plate of the male hypopygium, the absence of hooks on the lamellae of the ovipositor, and the four-segmented palpus.



Figure 1. Gall of *Lasioptera allioides* on *Paspalum distichum*.

Lasioptera carbonitens Cockerell makes a similar gall, resembling an onion bulb, on an unidentified grass in New Mexico. *L. allioides* differs from the described female of that species in that the femora are entirely black and the costal margin of the wing bears a conspicuous patch of white scales just beyond the end of R_5 .

Female.—Antenna with $2 + 23$ segments; occiput with scales mostly black. Palpus with four segments. Mesonotum with scales black except for yellow scales laterally, above humeral calli, and sparsely along dorsocentral rows; thoracic pleura with scales yellowish except for black scales on mesepisternum; hair tuft of mesepimeron tawny. Wing with scales on costa mostly black but with a patch of white scales at the end of R_5 ; M_{3+4} strong; Cu simple. Femora and tibiae black with black scales except for yellowish scales anteriorly on femora and white scales proximally on outer face of tibia; anterior and midtarsi black with black scales dorsally and white scales ventrally; hind tarsus with proximal two segments and proximal one-half of third segment black with black scales except for white scales on sole, the distal one-half of second segment and terminal two segments pale with white scales. Abdomen black with black scales dorsally and yellow scales

laterally and ventrally; lamellae of ovipositor slender, without dorsal hooks. Length of wing, 3 mm.

Male.—Antenna with 2 + 20 segments. Mesonotum with yellow scales predominant. Abdomen with a pair of dorsocentral rows of yellow scales; abdominal segments six, seven and eight greatly expanded intersegmentally; hypopygium with dorsal plate deeply emarginate, the ventral plate of similar length but entire.



Figure 2. Male of *Lasioptera allioides* (delineation by Celeste Green).

Holotype.—Female (on cardpoint), Fresno, California, October 17, 1959 (West and Allen), reared from stem gall on *Paspalum distichum*.

Paratypes.—Two males, 7 females, same data as holotype; 1 male, 1 female, Carmel, California, August 1937 (E. S. Ross), reared from grass galls.

LITERATURE CITED

Robbins, W. W., Margaret K. Bellue, and Walter S. Ball. 1941. Weeds of California. 491 pp. California State Department of Agriculture, Sacramento.

**ANOTHER ANT GENUS HOST OF THE PARASITIC
FUNGUS LABOULBENIA ROBIN.**

(HYMENOPTERA: FORMICIDAE)

In a paper published in 1946 (Proc. Ent. Soc. Wash. 48:29-31) I listed all the North American ants known to be hosts of the parasitic ant fungus, *Laboulbenia formicarum* Thaxter. This list of 18 forms included one each of *Prenolepis* and *Polycergus*, two of *Lasius* and 14 of *Formica*. In 1949 Cole (Ent. News 60:117) listed two additional forms as hosts of the fungus, *Lasius sitkacensis* Perg. and *Formica parvipappa* Cole. If one follows the latest usage of names as given in 1958 (Hymenoptera of America North of Mexico Synoptic Catalog, First Supplement, U. S. Dept. of Agr. Monogr. No. 2, pp. 108-162), these 20 hosts would be reduced to 16 because of recent synonymies.

Recently I received for determination a number of workers of the honey ant, *Myrmecocystus mimicus* Whlr., infected with a parasitic fungus believed to be *L. formicarum*. The ants were collected by J. Durkin at the White Sands Missile Range, Otero County, New Mexico, May 3, 1960. Dr. Leland Shanor, Department of Biological Sciences, Florida State University, Tallahassee, Florida, confirmed my tentative identification of the fungus as *Laboulbenia formicarum*. The record is of more than usual interest as it represents the first time that the fungus has been reported from a species of *Myrmecocystus*. This is the fifth genus of ants found infected with the fungus. Perhaps it is more than a coincidence that all of these genera belong to a single subfamily, Formicinae.

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**A NEW GENUS AND SUBFAMILY OF THE DIPLOPOD FAMILY
NEMASOMATIDAE FROM THE PACIFIC NORTHWEST¹**

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Of the four families of juliform diplopods presently referred to the suborder Paraiulidea [= superfamily Arthrophora Verhoeff, 1930], the Paeromopodidae and Zosteractiidae are so far known only from the Nearctic region. The other two families are more widely distributed in the northern hemisphere, but are essentially vicarious in that the Paraiulidae is chiefly American with a few genera in eastern Asia, the Nemasomatidae [= Blaniulidae of European work-

¹This study was undertaken with the aid of a grant from the National Science Foundation.

ers] dominantly Palearctic with a scattering of endemic forms in boreal America.

At the present, four supposedly endemic species referable to the Holarctic genus *Nemasoma*, and one each in the endemic genera *Tiviulus* and *Ameractis* are on record from North America, as well as half-a-dozen introduced and established forms. None of the native species has been sufficiently well described to permit a confident appraisal of its characters, but all seem to be closely related to the Palearctic representatives of *Nemasoma*. The recent discovery in Oregon of a nemasomatid species which differs strikingly from all previously known members of the family is therefore a matter of considerable interest, the more so since the differences are great enough to require the establishment of a new subfamily. Indeed, judged from the characters utilized in the definition of the existing two subfamilies of the Nemasomatidae, some authors might not hesitate to propose a separate new family to receive the Oregon species. But inasmuch as numerous additional nemasomatids assuredly remain to be discovered in this country as well as in eastern Asia, with inevitable disruptions of the classification ensuing, I think that a conservative approach to the disposal of the new genus is desirable.

Our present knowledge of this interesting millipede is due to the interest and kindness of Mr. Richard M. Brown, Assistant Naturalist, Crater Lake National Park, who sent it among other specimens for identification and study.

Family Nemasomatidae

Arosphylosomatinae, new subfamily

Differing from all other known nemasomatids by the following characters: 1, tibiae of legs of the anterior half of body distally perforate, with large ever-visible spongose tibial pads, the tarsi of these legs placed subterminally on the dorsal side of tibiae (figure 6), 2, first legpair of males strongly reduced, with the elements coalesced into a single structure which retains something of the original shape of the legs, sternite, and sternal apodemes (figure 4), the telopodite remnant in the form of a slender projection which inserts into a cavity between the gnathochilarium and mandible on each side. 3, telopodite of anterior gonopods slender and longer than the slightly arcuate coxal elongations, 4, gnathochilarial stipes with but one macroseta on the distolateral edge instead of two, and 5, mandibles with six pectinate lamellae instead of only four.

This subfamily differs also from the Nemasomatinae in the simple, laminate posterior gonopods and in the absence of flagella from the anterior pair; and from the Blaniulinae in having a two-lobed penis, coxites of the anterior gonopods widely separated, and unmodified mandibular stipes in the males.

Arosphylosoma, new genus

Type species.—*Arosphylosoma darcencae*, new species.

Diagnosis.—With the characters of the subfamily. Other features probably of generic significance are included in the definition of the type and only known species.

Aprospylosoma darceneae, new species

(Figs. 1-9)

Holotype.—Adult male, U. S. National Museum Myriapod Catalog No. 2660, Diplopod Collection No. D-578, and Type Slides Nos. 3, 4; from Oregon Caves National Monument, Josephine County, Oregon, "ca. 200 yards northeast of water reservoirs along Big Tree Trail." August 13, 1956, Martin A. Piehl, leg.

Diagnosis.—Both pairs of gonopods well developed, each pair with distinct sternite; coxae of anterior gonopods partially coalesced at base along the median line, the distal elongation curved distolaterad and thence abruptly distomesad with an acute retorse projection; telopodites distinct, long, slender, distally clavate and with a subterminal row of setae on the anterior face. Posterior gonopods simple, the coxae fused with the small sternite, no remnant of a suture between coxal and telopodital elements, the gonopod flattened and lamellate, distally modified into a short curved process from the lateral margin, an apically acute median continuation of the gonopod, and a hyaline median plate, its upper margin subtended by a laciniate-dentata hyaline ridge.

Description of holotype: A small, slender, juliform species, 1.0 mm in diameter and about 16 mm long (broken), with 59 segments.

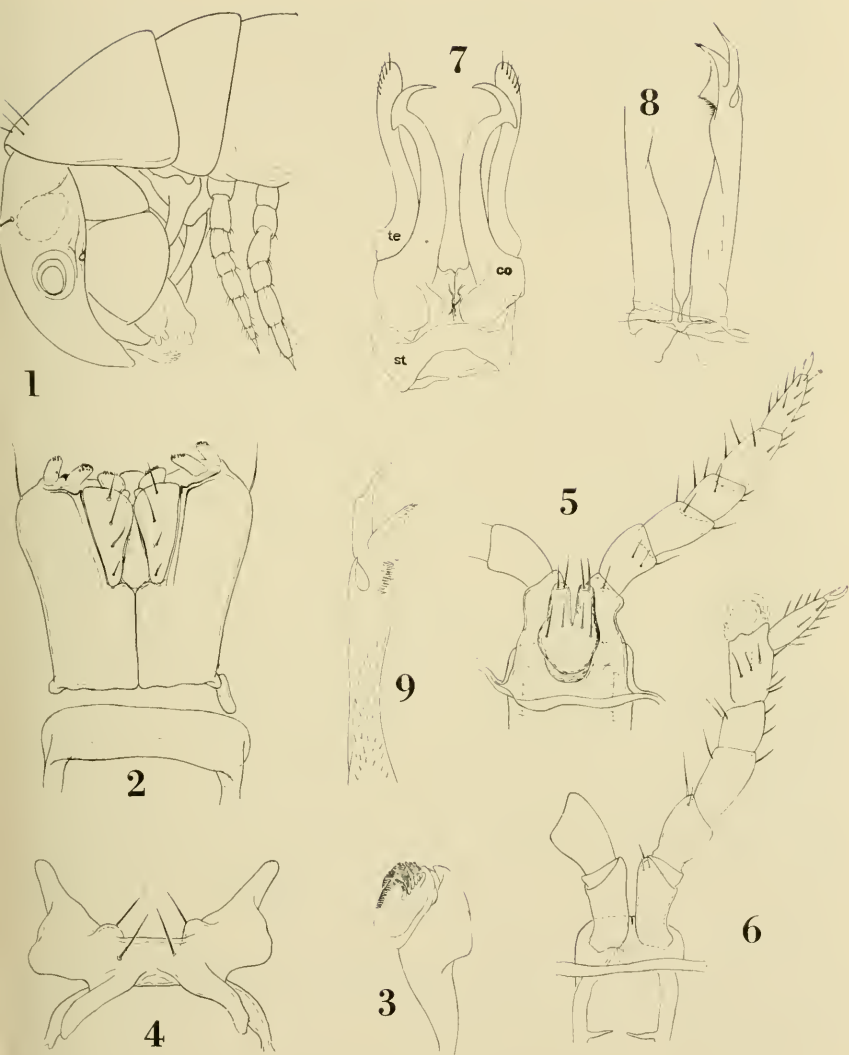
General color yellowish brown, with the median portion of the metazonites darker purplish-brown; prozonites each with a pair of slender, oblique, paramedian yellow marks, and a much larger, vertically elongated, areolated yellow spot around each ozopore. Legs white; extreme caudal margin of each metazonite testaceous.

Head distinctly convex and smooth, but slightly flattened between the ocellaria, glabrous except for a macroseta at the median angle of each ocellarium. The latter small—about as large as an antennal socket—and subreniform, with about 24 small and widely spaced ocelli in 4 or 5 rows. Interocular and median vertical sutures deep and distinct. Labrum with five teeth, the lateral two smaller than the others.

Mandibles large and prominent, the stipes evenly curved and extending beyond sides of cranium, their ventral margin evenly curved and not produced into a terminal dentation. Each mandible with six pectinate lamellae, decreasing in size toward the dentate lamella.

Gnathochilarium typical in shape for the family, the mentum about twice as long as its basal width; lingual lamellae each with four setae. Distal aperture of salivary ducts heavily sclerotized and prolonged lateral behind base of the stipital palps. Each stipe with only one macroseta on the distolateral margin (apparently a unique condition in the family). Intermental sclerites not visible in the preparation and possibly absent; postmental elements apparently fused with the gular plate and represented only by the rounded distolateral corners of the latter. Margins of stipes slightly concave, and contributing, with the correspondingly concave adjoining margins of the mandibular stipes, to a distinct cavity on each side of the gnathochilarium.

First pair of legs reduced to a single heavily sclerotized structure, in which the outlines of the original sternite, sternal apodemes, and legs are retained although no sutures are evident. As shown in figure 1, the leg remnants project cephaloventrad and insert into the cavities on each side of the gnathochilarium.



Aprophylosoma darceneae, n. sp. Fig. 1, ventrolateral aspect of head and first three body segments showing form of mandibles and appendage of the second segment (only largest setae on collum shown); fig. 2, gnathochilarium; fig. 3, distal elements of mandible, internal aspect; fig. 4, appendage of second segment (1st leg pair); fig. 5, caudal aspect of 2nd leg pair; fig. 6, anterior aspect of 3rd leg pair; fig. 7, anterior gonopods, cephalic aspect; fig. 8, posterior gonopods, caudal aspect; fig. 9, distal half of a posterior gonopod, more enlarged, anterior aspect. Abbreviations: *co*, coxite; *st*, sternite; *te*, telopodite.

Second pair of legs (figure 5) with six podomeres, the coxae fused with the sternite. Penis large and conspicuous, somewhat obovate in form, with two divaricate distal lobes, each with two terminal setae and two basal setae.

Legs 3-7 subsimilar, of the form shown in figure 6, the tibia distinctly enlarged and cylindrical, the entire distal end perforate and containing an ever-sizable membranous subtarsal cushion; the tarsus of these legs set on the dorsal side of the tibia to accommodate this modification.

Collum smooth and symmetrical, its surface irregularly set with numerous fine short setae, which increase in size and length toward the middle of the anterior margin. Lateral marginal ridge present, but no other surficial striation evident.

Pleurotergites of all but the last body segment with a distinct dorsomedian suture; prozonites smooth and polished, metazonites distinctly ribbed entirely around body (imparting a strikingly paeromopoid appearance), the costulations becoming strongest dorsally, and slightly convergent anteriorly near the median suture. Caudal margins of segments with a row of numerous short fine setae.

Anal segment smooth and polished, only slightly produced medially into a very short epiproct, its caudal margin with six macrosetae, two laterals on each side and two paramedian, the latter accompanied by several shorter epiproctal setae, and preceded dorsally by two larger setae near the middle of the segment. Paraprocts smooth, convex, their mesial margins meeting at a re-entrant angle, each with two submarginal setae. Hypoproct distinct, smooth, its free margin subcircular.

All sternites apparently free from pleurotergites or at most very loosely attached; the two sternites of each segment approximately equal in size. Legs slender and of moderate length, the distal half of the tarsi being visible from above when legs are extended laterad. Tibial pads occur back to about the 40th segment, their shape changing from subglobose on the anteriormost legs to more elongate and subacute, the tarsi simultaneously shifting to an apical rather than dorsal position on the tibiae.

Gonopods of moderate size, the basal half of each pair concealed within the body. Of the form shown in figures 7-9, the gonopods differ from those of all other nemasomatids, the anterior pair similar to those of the Nemasomatinae, except for lacking a pair of flagella, the posterior elements resembling their homologs in the Blaniulinae although shorter and flatter.

Remarks.—Although considerable convergence is to be expected in the Nemasomatidae as regards characters of taxonomic significance, it is certainly possible to draw some inferences from the structure and distribution of the known species.

The first pair of legs is subject to drastic modification throughout the family. The presumably primitive condition, in which these legs are most like the following limbs, is largely restricted to the subfamily Nemasomatinae. Here the appendages are composed of six articles (the basalmost fused with the sternite, however), and the tibia is provided with a short, acute, retrorse process on the mesal side. The tarsus is slender and fairly long, and carries a normal pretarsus. A second stage in the evolution of these legs involves shortening and thickening of the articles with reduction of the pretarsus and replace-

ment of the tibial process by a blunt peg-like structure. This general form occurs in most genera of the Blaniulinae. *Borcoiulus*, of that subfamily, carries the modification further, with the coxae fused to each other as well as to the sternite, and the telopodites reduced to short, broad, completely fused monoarticular remnants each of which bears a small subglobose terminal article (tarsus?). One genus of each subfamily has the telopodites of the 1st legs reduced and fused into uncate processes, the coxites remaining unmodified, and the occurrence of this form in otherwise widely differing genera is certainly an example of independent convergence of characters. As already remarked, the singular structure of the 1st legpair in *Aprosphylosoma* is a considerably more extreme specialization than in other known genera.

The unspecialized condition of the male gonopods, presumably, is that in which the anterior pair is equipped with flagella, and the posterior pair retains the segmentation of sternite, coxites, and telopodites. The genera of the Nemasomatinae, for the most part, meet these stipulations; in the Blaniulinae the flagella are lost and the posterior gonopods consist of but a single article distad to the sternite. *Aprosphylosoma* partakes of the characters of both groups in this respect, its posterior gonopods approaching those of the Blaniulinae. Although the anterior gonopods have no flagella, the coxal prolongations are relatively small and short, without any approach to the blaniuline character of enormous elongation and fusion into a slender median projection which far overreaches the reduced telopodites.

From the distributional point of view, the Nemasomatinae are represented in Europe, eastern Asia, and boreal America by only a few genera, which are comparatively very poor in number of species. Genera of the apparently more specialized Blaniulinae are largely confined to the Western Palearctic region, particularly in the circum-Mediterranean area, and perhaps constitute a successful adaptation to warm climate by a branch of the older, holarctic ancestral nemasomatid stock which is at present apparently reduced to nearly relict status in high latitudes.

Aprosphylosoma is in general still rather enigmatic with respect to its evolutionary position, having generalized gonopods and mouth parts, but specialized 1st male legs and hypertrophied tibial pads. One observation can be made with some assurance, however—that the genus constitutes the closest known link between the families Nemasomatidae and Paraiulidae, and also bears a striking superficial resemblance to the Paeromopodidae. One major difference between the first two groups named has been the number of pectinate mandibular lamellae: four in the Nemasomatidae and seven or eight in the Paraiulidae. *Aprosphylosoma* bridges the gap with six lamellae, and the form of the male gonopods is not significantly different from that found in several paraiulid genera of the Pacific Northwest region. The knowledge of this interesting annectant species permits the inference that other related forms will be discovered in the region where

the three American families of the Paraiulidea are sympatric, and that, perhaps, the distinction between them will be found to dissolve.

That the nemasomatids and paraiulids are closely related has been appreciated for a long time, Count Attems in particular having maintained the two groups as coordinate subfamilies. At the present the distinction between them lies largely in the form of the anterior legs of the males. There are apparently considerable differentiations in the cyphopod structure as well, but not enough paraiulid genera have been carefully studied for these characters to permit a generalization at the present.

In studying the anatomy of species of the three families mentioned above, I have found that some errors exist in the key recently published by Dr. Chamberlin and me (1958, U. S. Nat. Mus. Bull. 212, p. 122) and take this opportunity to present a revised but nonetheless entirely provisional synopsis of these groups. I am by no means fully assured that the Zosteractiidae can be maintained as a family group, for instance.

KEY TO THE FAMILIES OF THE SUBORDER PARAIULIDEA

1. Coxites and telopodites of anterior gonopods fused and immovable, although the articular suture and coxal musculature may still be evident in cleared specimens. Large species, 50-150 mm. in length, with strongly striate tergites **Paeromopodidae**
 Telopodites of anterior gonopods free from coxae and at least partially movable. Smaller species, 20-80 mm. in length; tergites usually not striate entirely across dorsum 2
2. Anterior and posterior gonopods very unequal in size, the anterior long and exposed, posterior very short and concealed within the body **Zosteractiidae**
 Anterior and posterior gonopods not strikingly dissimilar in length 3
3. First legs of males reduced in size and frequently abortive, composed or from 6 podomeres to a simple syncoxosternum; gnathochilarium of similar form in both sexes; 2nd leg pair of males not modified; legs usually with ventral pads on one or more podomeres; mandibles with 4 to 6 pectinate lamellae **Nemasomatidae**
 First legs of males enlarged in size, with six articles; 2nd pair of legs always, and 7th pair frequently, modified; gnathochilarium of a different shape in the two sexes; legs without ventral pads; mandibles with 7 or 8 pectinate lamellae **Paraiulidae**

REFERENCE

- Brolemann, H. W., 1923. Blaniulidae (Myriapodes), *Biospeologica* XLVIII, in: *Arch. Zool. Exper. et Gen.*, vol. 61, pp. 99-453, pls. I-XVI, text figs. 1-411.

PUBLICATION DATE

The date of publication of Vol. 62, No. 4, of the *Proceedings* was 4 January 1961. The date of publication of Vol. 63, No. 1 will be found in Vol. 63, No. 2

A NEW SPECIES OF ISTHMIADAE FROM BARRO COLORADO
ISLAND, CANAL ZONE
(COLEOPTERA: CERAMBYCIDAE)

E. GORTON LINSLEY, *University of California, Berkeley*

The Rhinotragine genus *Isthmiade* contains five Brazilian species, all of which exhibit a remarkable resemblance to braconid wasps. A sixth species, *Leptura nocydalea* Linnaeus, 1758 (= *Nocydalis glaucescens* Linnaeus, 1767) (= *Nocydalis nitida* DeGeer, 1775), from Surinam, has been referred to this genus by Aurivillius (1912). I do not know this species, but judging from the description and figure provided by DeGeer (1775) it does not appear to be congeneric with the Brazilian species, which include the type of the genus. However, the generic assignment provided by Aurivillius may have resulted from examination of the type specimen. In any event, the species appears to be quite different from the following, which provides the first record of the genus from Central America.

Isthmiade perpulchra Linsley, new species

(Fig. 1)

Female.—Form elongate; pubescence sparse, erect and suberect; integument shining, more or less transparent, predominantly lemon yellow and black; head, including mandibles but not the other mouthparts which are yellow, antennae except outer segments which are brownish, apices of elytra, a transverse median band on hind wings, apices of wings, prosternum at middle, all three pairs of coxae, tibiae and tarsi, femora at base, a post-median transverse band on posterior femora, and the last two abdominal segments black, remainder of legs, thorax beneath, abdomen and elytra lemon yellow, prothorax slightly reddish, yellow. **Head** with frons separating eyes by about the width of an eye when viewed from the front, surface polished, sparsely punctate, a median longitudinal groove extending from antennal tubercles to clypeus, a less well defined longitudinal impression on each side near eye margin, vertex with interocular and postocular area smooth, base of head transversely rugulose near prothoracic margin; antennae slender, reaching to apices of elytra, fourth segment distinctly shorter than third and fifth, the third but little longer than the fifth, segments three to six clothed beneath with moderately long, coarse, black hairs, five to eleven gradually decreasing in length, six to ten expanded at apex and subserrate. **Pronotum** about as long as wide, sides broadly but unevenly rounded, base and apex constricted, dorsal surface uneven, with an elongate median elevation and a pair of obtuse tubercles on each side, surface highly polished and transparent, very sparsely and inconspicuously punctate and very sparsely clothed with erect hairs, prosternum similarly punctate and pubescent on lateral yellow areas, more densely punctate and hairy in black median area and over anterior coxae; metasternum shining, thinly clothed with long erect hairs; scutellum finely punctate, clothed with fine golden pubescence. **Elytra** not exceeding apex of third abdominal tergite (second abdominal sternite), broad at base, abruptly attenuated near middle to the very narrow apices; disc shallowly and inconspicuously punctate, humeral and lateral punctures larger and more evident. **Abdomen** polished, very sparsely, finely punctate, sparsely clothed with suberect hairs; sixth tergite elongate, narrowly rounded at apex, finely sparsely punctate at base, more densely punctate and pubescent over apical three-fourths. Legs with femora clavate, the posterior pair gradually so and not pedunculate, surface finely sparsely punctate, thinly clothed with suberect hairs. Length 16.5 mm.



Fig. 1, *Isthmiade perpulchra*, n. sp.

Holotype.—Female (United States National Museum) from Barro Colorado Island, Canal Zone, June 1939 (J. Zetek) and one paratype female (Museum of Comparative Zoology, Harvard University) from the same locality, September 1, 1924 (N. Banks).

Discussion.—This species differs at once from all of the other known *Isthmiade* by the yellowish pronotum and the black-tipped lemon yellow elytra and much of the ventral surface. The black tips of the elytra and the post-median black band on the femora coincide with the transverse band on the wings, which are otherwise yellow except for the black apices.

It is not yet clear whether or not the species of *Isthmiade* have specific models among the Braconidae but this is suggested by the striking differences in coloration which they exhibit. Thus *I. braconides* (Perty) is black above, reddish beneath; *I. ichneumoniformis* Bates is black with the elytra testaceous yellow and the sides of the thorax and the abdomen, except apex, red; *I. modesta* Gounelle is black with the elytra pale brownish-testaceous and the disk of the pronotum (usually) and basal abdominal segments red; *I. rubra* Bates reddish with the elytra and wings pale brownish, the latter banded with brown; and *I. macilenta* Bates is rufo-castaneous with the elytra paler.

**DESIGNATION OF A LECTOTYPE FOR AMYRSIDEA MEGALOSOMA
(OVERGAARD, 1943)**

(MALLOPHAGA: MENOPONIDAE)

Overgaard in 1943 (Ent. Medd., 23:1-17) described *Menopon megalosomum* from material collected off *Perdix perdix* (Linnaeus) and *Phasianus colchicus* Linnaeus. He did not designate a type or holo-

type from the several series of specimens examined. Since the species of *Amyrsidea* found on these two hosts are not conspecific, the selection of a lectotype is required to fix the name and type host. Through the courtesy of Dr. S. L. Tuxen, a series of syntypes from each host was examined. Figures 5 and 6a-c, as published by Overgaard, agree with syntypes collected off *Phasianus colchicus* Linnaeus. A male with collection data: Fasankylling (*Phasianus colchicus*), Skaetskor (Denmark), 25-6-1937, is designated lectotype. The lectotype male and two syntype females have been mounted and returned to Dr. Tuxen. A syntype male and a syntype female from the same series have been retained by the author. All other syntypes, still in alcohol, are in the Universitetets Zoologiske Museum, Copenhagen, Denmark.

The species has very long slender parameres and endomeres of the male genitalia, as illustrated by Overgaard. The genitalia of *A. perdicis* (Denny, 1842), found on *Perdix perdix* (Linnaeus), are also of the same type. *A. megalosoma* is much larger, in both sexes, than *A. perdicis*.

The U. S. National Museum and the author have specimens, which appear to be conspecific with *A. megalosoma*, as follows: Ring-necked Pheasant, *Phasianus colchicus* Linnaeus, from Illinois, Rhode Island, New Hampshire, and New Jersey; Sharp-tailed Grouse, *Pedioccetes phasianellus* (Linnaeus), from Wisconsin and Minnesota; Greater Prairie Chicken, *Tympanuchus cupido* (Linnaeus), from Wisconsin; and Ruffed Grouse, *Bonasa umbellus* (Linnaeus), from New York.

These records indicate the parasite is now established on native gallinaceous birds in at least part of the established range of the Ring-necked Pheasant.

K. C. EMERSON, *Stillwater, Oklahoma.*

ALICE V. RENK

1908—1960

Alice V. Renk died of a cerebral hemorrhage August 15, 1960. She was a robust, vigorous person who rarely experienced any illness and appeared to be in the best of health until a few hours before her death.

Miss Renk was born in Sauk City, Wisconsin, but at an early age moved to Madison. There she attended precollege schools and the University of Wisconsin, from which she received B.S. and M.S. degrees with her major work in zoology.

In 1940 she came to Washington and worked briefly in the U. S. Department of Labor before coming to the Division of Insect Pest Survey and Information, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. She later served as an editor and cataloguer in the Bureau, and during the latter period assisted in the preparation of the *Index to the Literature of American Eco-*

conomic Entomology and *A Selected Bibliography of the Coccoidea*. She also participated in the preparation of *A Catalogue of the Triatominae of the World* that is now nearing completion. In 1957 she transferred to the Stored Products Insects Branch of the Agricultural Marketing Service, where her work was concerned with the preparation of reports on various aspects of the investigations of that Branch.

Miss Renk was elected to membership in our Society in 1945, and was an active member until her death. She attended meetings regularly, served on picnic committees on several occasions, and was editor of the Proceedings of the Entomological Society of Washington for the year 1958.

Miss Renk enjoyed many interests and activities beside her professional ones. She played the organ, was active in church work and in several sororities, and at the time of her death was president of the District of Columbia Chapter of the Business and Professional Women's Club.

Miss Renk was a most cordial, friendly, hospitable person, and her interest in and regard for others were felt by all who came in contact with her. She is sorely missed by a large circle of friends. She is survived by her parents, Mr. and Mrs. George Renk, and by a brother, Victor, all of Madison, Wisconsin.

KELLIE O'NEILL

LOUISE M. RUSSELL

WILLIAM M. MANN

1886—1960

William M. Mann was born in Helena, Montana, on July 1, 1886. His father, a harness maker who invented the Mann saddle, also was an amateur taxidermist. He took Bill on hunting trips at an early age and imbued in him a love for all wild creatures. During a recess while attending Staunton (Va.) Military Academy, young Bill decided to become a zoo keeper and spent that period cleaning out animal cages at the National Zoological Park in Washington, D. C.

From Staunton Bill went to Washington State College because he was already interested in entomology. His enthusiasm here, as later at other universities, won the interest of such famous scientists as Melander, Doane, Barbour, and Brues. After receiving a bachelor's degree at Stanford University in 1911, Bill became Dr. Mann by obtaining an ScD in 1915 at Harvard University under the inspiring world authority on ants, Dr. W. M. Wheeler.

Mann was a Sheldon traveling fellow in 1915 and 1916 and early showed his extraordinary expertness in collecting insects in such far away localities as the Solomon Islands and Fiji.

Dr. Mann then was appointed as a specialist in ants in the Bureau of Entomology of the U. S. Department of Agriculture, where he

served from 1917 to 1925. In this work he became an authority on ants of the world and on the insects that live with them, as well as with termites.

In connection with his studies he described many new species. An account of this interesting period was to have been published as volume 2 of his 1948 "Ant Hill Odyssey," but illness prevented.



In 1925 "Doc" Mann became Director of the National Zoological Park, under the Smithsonian Institution, and served in this capacity until his retirement in 1956. In this position he became one of the most famous and beloved men in Washington. A Stanford University Expedition in 1911; expeditions to Cuba and Haiti, 1912; Mexico, 1930; Turkey and Asia, 1914; South Sea Islands, 1915-1916, and service as assistant director of the Mulford Biological Exploration of the Amazon Basin, 1921-1922, had proven him to be a marvelous collector of living wild animals. This later became his profession when he was appointed Director of one of the world's important zoological gardens. His broad training in general zoology and his constant interest in living things gave him the background from which he developed outstanding success in this position.

His first expedition for the National Zoological Park was the Smithsonian Institution-Chrysler Expedition to Africa in 1926. On his return he married Lucile Quarry, who accompanied him on subsequent travels to Europe in 1929, Central America in 1930, British Guiana in 1931, and Argentina in 1939. He was director of the Na-

tional Geographic Society-Smithsonian Institution Expedition to the East Indies in 1937, and the Firestone-Smithsonian Institution Expedition to Liberia in 1940. "Ant Hill Odyssey" gives a fascinating account of his boyhood and early travels. His National Geographic Society moving pictures show how animals were captured alive in the East Indies and Liberia.

On his travels Dr. Mann discovered many new species of animals and some plants from all over the world; these were in fifteen groups. Some of these have been named after him, the first a wasp in 1908. Included are a milkweed, ants, termites and insects that live with them, reptiles, amphibians, molluscs, bees and wasps, bugs, flies, butterflies and moths, centipedes, and a fish, named after both Bill (genus) and Lucile (species).

Mann was a member of the Society of Naturalists, a life member of the Entomological Society of America, the Entomological Society of Washington, the Biological Society of Washington, the Society of Mammalogists, Society of Parasitologists, Society of Ichthyologists and Herpetologists, American Ornithologist's Union, and the Pacific Coast Entomological Society. A member of the Cosmos Club for many years, Bill enjoyed playing bridge when the Club was located at Madison Place. He was also a member of the Harvard and Explorer's Clubs, a fellow of the American Institute of Park Executives, honorary director of the Mexican Biological Society, and the International Union of Zoo Directors. Bill was a 32nd degree Mason and Shriner, and was active in the annual Shrine Circus here.

In 1959, Dr. Mann attended the dedication of a new flag pole at the Connecticut Avenue entrance to the Zoo erected in his honor by the Friends of the National Zoo. The flag was flown at half mast on the day of his funeral.

Made an Honorary Research Associate by the Smithsonian Institution on retirement, Bill received many citations and plaques. On September 15, 1960, the American Association of Zoological Parks and Aquariums awarded him a citation for his continued interest in zoology.

At 74, on October 10, 1960, Bill died of a cerebral hemorrhage, following an illness of many years. His Masonic funeral service on the 13th of October was very impressive; at the chapel banked with flowers, his friends paid last respects.

"Doc" Mann was a colorful and distinguished personality, small in stature, wiry, careless of dress, with a puckish expression, and a keen sense of humor. Kindly and generous, he liked people and had friends in many walks of life. As director of the National Zoo he met presidents, congressmen, reporters, circus clowns, executives, "show people," and children, and created great interest in all. He encouraged interest in animals, especially by children whom he loved, and who came constantly to see him at the zoo or at home.

It was this outstanding success in making and keeping friends that assisted materially in his development of the National Zoo, not

only in valuable acquisition of living animals but also in the buildings needed to house them.

Bill was devoted to the circus, and for many years took large groups of children and adults to local showings, always paying the way and refusing passes. A circus fan, "Doc" would travel long distances to see shows and meet old circus friends. Circuses would often lend interesting animals to the zoo during the winter. An honorary member of the (National) Circus Fans of America, he was chairman of the (State) James E. Cooper Top No. 10; also an honorary member of the Circus Model Builders.

Bill and Lucile's hospitality at home and at lunches at the zoo, and more lately at the Anteaters Association wild game lunches, was proverbial. Bill wanted people around him; he liked to give food and drink. He was sensitive and emotional. When any of the baby animals neglected by the mother were taken home to be cared for by Lucile and died, Bill took it very hard.

Even before "Doc" retired as director of the zoo in 1956, he had suffered from arthritis and failed rapidly in the last two years of life when he had to use a wheel chair. In this, with the help of Director Reed he occasionally visited his beloved animals at the zoo. In his last days, faithfully attended by Lucile, in pain and practically helpless, he retained his keen sense of humor.

THOMAS E. SNYDER, *Chairman*

JOHN E. GRAF

MARION R. SMITH

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LUCILE QUARRY MANN
November, 1960

**SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1960
CORRESPONDING SECRETARY**

(For the fiscal year 1 November 1959 to 31 October 1960)

Membership on 1 November 1959 (including 10 retired members omitted by error last year		499
Reductions:		
Resigned	15	
Dropped	14	
Deceased	5	
Total	34	
Increases:		
Elected to membership	25	
Reinstated	5	
Total	30	
Net loss in membership		4
Membership on 31 October 1960		495
Classes of membership:		
Dues paying	467	
Life	5	
Retired	19	
Honorary	4	
Total		495

The membership is distributed among 45 states, 2 territories, the District of Columbia, and 24 foreign countries.

Circulation of the Proceedings (September 1960 issue):		
States	458	
District of Columbia	93	
U. S. Possessions	4	
Foreign Countries	170	
Total		725

Distribution of the Proceedings (September 1960 issue):		
To members	471	
To subscribers	254	
Total		725

The *Proceedings* goes to members and subscribers in 50 states, the District of Columbia, 2 territories, and 48 foreign countries.

Respectfully submitted, PAUL A. WOKE, *Corresponding Secretary.*

TREASURER

(For the fiscal year 1 November 1959 to 31 October 1960)

General Fund

Cash on hand November 1, 1959	\$ 85.88	
Receipts Nov. 1, 1959 to Oct. 31, 1960	5,320.41	\$5,406.29
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Cash on hand October 31, 1960	(Deficit 394.47)	
Expenditures Nov. 1, 1959 to Oct. 31, 1960	5,800.76	5,406.29
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Publication Fund

Cash on hand November 1, 1959	\$6,299.55	
Receipts Nov. 1, 1959 to Oct. 31, 1960	674.65	6,974.18
		<hr/>
Cash on hand October 31, 1960	6,974.15	
Expenditures Nov. 1, 1959 to Oct. 31, 1960	none	6,974.18
		<hr/>

Exclusive of \$252.23 loan to General Fund

Copies of complete Treasurer's report, approved by the Auditing Committee, are on file with the Corresponding Secretary and Treasurer.

Respectfully submitted, PRICE PIQUETTE, *Treasurer*.

EDITOR

(For the calendar year 1960)

Beginning in 1960 with Vol. 62, the *Proceedings* was changed to a quarterly publication. Hence, four numbers were published during 1960. Of the 288 published pages (exactly the same as contained in the six numbers of Vol. 61), 10 were devoted to advertising and 278 to scientific papers, notes, obituaries, book reviews, minutes of meetings, and announcements. This is the fourth year in which the number of published pages has been the same or slightly reduced.

Respectfully submitted, RICHARD H. FOOTE, *Editor*.

CUSTODIAN

(For the fiscal year 1 November 1959 to 31 October 1960)

The value of items sold by the Custodian's office amounted to \$423.57, of which 286.00 was for 40 copies of the *Memoirs*, 25.00 for 14 copies of the *Weld* volumes, 159.77 for miscellaneous volumes and numbers of the *Proceedings*, and 12.50 for reprints and miscellaneous papers.

Sales of the *Memoirs* were as follows: No. 1, 2 copies; No. 2, 3 copies; No. 3, 5 copies; No. 4, 12 copies; and No. 5, 18 copies.

A copy of the complete, detailed report is on file with the Recording Secretary.

Respectfully submitted, H. J. CONKLE, *Custodian*.

SOCIETY MEETINGS

692nd Regular Meeting, October 6, 1960.—President Paul W. Oman presided at this meeting of the Society in the USNM, Room 43, with 48 members and 20 visitors present. The minutes of the 690th regular meeting and the 691st meeting were read and approved.

Three persons were accepted for membership: *Robert C. Bechtel, Theodore D. Godek, and Kenneth H. Kalmbach*. The names of seven candidates were presented for membership: *Joseph E. Webb, Jr., Joseph A. Reeves, Harold E. Small, Jr., Ronald W. Hodges, W. Donald Duckworth, Jack R. Coulson, and Gertraude Wittig*.

President Oman announced that obituaries would be prepared for Alice Renk by Louise Russell and Kellie O'Neill (Note: See present issue.—Ed.) and for Rolla P. Currie by Mary J. Edmands and C. F. W. Muesebeck.

Thomas E. Snyder was unanimously elected as an Honorary Member of the Society.

Alan Stone discussed his recent trip to Canada and his participation in a 2-day conference on blackflies held at Queen's University Biological Laboratory.

The program for the evening consisted of reports from participants of the XIth International Congress of Entomology held in Vienna on August 17-25, 1960. Paul A. Woke noted the highlights of the conference in which there were more than 700 papers presented in 14 sections and 17 symposia. He discussed in more detail the papers dealing with medical and veterinary entomology. W. H. Anderson described his visits to museums on the Continent and to the Insect Identification and Parasite Introduction Laboratories of USDA, and the highlights of the Congress dealing with taxonomy, biological control, and technical movies. J. Colvard Jones discussed the papers presented in insect physiology. George S. Langford completed the program with comments on the papers offered in regulatory and economic entomology. He included informal comments on his impressions of the regulatory programs in Europe.

Among the visitors introduced were: *Leslie A. Kulp, Jose Osorio, Jack Coulson, R. F. Wilkey, Gertraude Wittig, C. C. Blickenstaff, Mrs. Daisy Liu, M. E. Griffith, R. G. Grenier, and Mrs. Clyde S. Barnhart.*

President Oman closed the meeting with an expression of appreciation to the membership for its cooperation during his term of office and of confidence that the same would be shown to Dr. J. F. Gates Clarke. Dr. Oman has accepted a foreign assignment and thus cannot complete his term of office. Dr. Oman presented the gavel to President Clarke.

The meeting was adjourned at 10:00 p.m.—*ERNESTINE B. THURMAN, Recording Secretary.*

693rd Regular Meeting, November 4, 1960.—President J. F. Gates Clarke presided at this meeting of the Society in the USNM, Room 43, with 50 members and 41 visitors attending. The minutes of the 692nd meeting were read and approved.

Seven persons were accepted for membership: *Joseph E. Webb, Jr., Joseph A. Reeves, Harold E. Small, Jr., Ronald W. Hodges, W. Donald Duckworth, Jack R. Coulson, and Gertraude Wittig.* The names of two candidates were presented for membership: *Eileen R. Van Tassell and Carl C. Blickenstaff.*

Officers suggested by the Nominating Committee for 1961 were: President, *J. F. Gates Clarke*; President-Elect, *Harold W. Sheppard*; Corresponding Secretary, *Paul A. Woke*; Recording Secretary, *Ernestine B. Thurman*; Treasurer, *Price Piquette*; Editor, *Richard H. Foote*; Custodian, *H. J. Conkle*; Chairman of Membership Committee, *William S. Murray*; Chairman of Program Committee, *Tom McIntire*; and Delegate to Washington Academy of Sciences, *William E. Bickley.*

Dr. Clarke announced the recent death of Dr. William Mann, citing his interest in entomology. Dr. Clarke appointed an obituary committee composed of Thomas E. Snyder, Chairman, John E. Graf, and Marion R. Smith (Note: See present issue.—Ed.).

A note about aphids on white pine was presented by Ted Bissell along with an exhibit of pine needles infested with aphid eggs.

Among the effects of the late Harry Barber, Honorary Member of the Society, Reece I. Sailer found a group photograph believed to be of the original members of Pershing Rifles taken at the University of Nebraska showing Gen.

Pershing and Mr. Barber together. The photograph, exhibited by William Anderson, will be sent to the National Headquarters of the Pershing Rifles.

The evening's speaker, Dr. Howard A. Schneiderman, gave a most interesting discussion of the juvenile hormone and other insect growth hormones. The subject was enthusiastically presented by this dynamic specialist in an authoritative and entertaining manner. The presentation was followed by a lively discussion by Robert Snodgrass, Robert Jones, John Fales, and others.

More than 40 visitors were welcomed. Among those introduced were: Dr. *Setsuko Nakata* of the Bishop Museum, *Eileen Van Tassell*, Rev. *H. E. Wachowski*, *John MacNamara, Jr.*, Lieut. *Lawrence Johnston*, *Howard R. Bullock*, *James M. Murnighan*, Dr. and Mrs. *H. J. Linder*, *Hans Laufer*, *Charles F. Cohen*, *Ronald E. Monroe*, and *Derrell Chambers*.

Minutes were taken by the Corresponding Secretary in the absence of the Recording Secretary.—ERNESTINE B. THURMAN, *Recording Secretary*.

The meeting was adjourned at 10:00 p.m.

694th Regular Meeting, December 8, 1960.—President J. F. Gates Clarke called this meeting of the Society to order in the Auditorium of the USNM. There were 31 members and 8 visitors who signed the attendance list. The minutes were read and approved with additions. Two candidates were accepted for membership: *Eileen R. Van Tassell* and *Carl C. Blickenstaff*.

Annual reports were given by members of the Executive Committee. These reports were accepted as presented (Note: See present issue.—Ed.).

James W. Gentry, University of Maryland, showed a movie prepared by W. R. Horsfall on the action of the mouthparts of larval mosquitoes. The water currents created by the feeding actions were visible with the aid of dyes. Mr. Gentry reported that a similar movie was available dealing with adult mosquitoes.

W. E. Bickley announced that Dr. Colvin G. Butler, Head of the Bee Department of the Rothamsted Experimental Station, Harpenden, Herts., England, whose tour in the USA is being sponsored by AIBS, would speak at the University of Maryland on January 4 at 8:00 p.m.

R. H. Nelson, Executive Secretary of ESA, reported briefly on the recent annual meeting of ESA, noting that the registration totalled 858, the largest for ESA alone and the second largest on record. The largest attendance was recorded during the 1959 meeting in Detroit held jointly with the Entomological Society of Canada.

The first address of the evening, *Opportunities in the Field of Biological Control of Weeds*, was a discussion by *George Vogt*, ARS, USDA, of his findings on the biotic control agents for alligator weed found on a recent trip to South America.

The second address, *Some Highlights of Livestock Insect Research—Past and Present*, was given by *D. W. Anthony*, ARS, USDA, and was directed toward some of the more significant research developments concerned with controlling pests and vectors of diseases of livestock. Both lectures were illustrated with slides.

New members and new officers were introduced. Among the distinguished members and guests introduced were *W. S. Fisher* and *Virginia S. Wolf*.

The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary*.

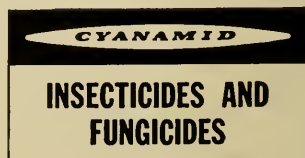
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of the

ENTOMOLOGICAL SOCIETY

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ORGANIZED MARCH 12, 1884

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 63

JUNE, 1961

No. 2

NOTES AND DESCRIPTIONS OF EXOTIC BIBIONIDAE¹

(DIPTERA)

D. ELMO HARDY, *University of Hawaii, College of Agriculture,
Agricultural Experiment Station, Honolulu, Hawaii*

The following descriptions of a new genus, several new species, descriptive notes on poorly known species and nomenclatorial changes have been accumulated over a period of several years and are based upon collections received from the following sources: The United States National Museum; The California Academy of Sciences; The American Museum of Natural History, The Deutsches Entomologisches Institut, Berlin; and from Dr. R. Dreisbach, Midland, Michigan. I greatly appreciate having had the opportunity of studying these interesting collections. Most of the drawings have been prepared by Mrs. Phyllis Habeck, University of Hawaii. I am very grateful for this help.

Enicoscolus, new genus

This most remarkable bibionid is related to *Bibio* Geoffroy but differs very strikingly in the following details: The thorax is elongate, about two times longer than wide and the pronotum and anterior portion of the mesonotum are rugose and covered with spinose setae (fig. 2d). The antennae are short, clavate with only five clearly visible segments in the flagellum. The front tibia is very short and is developed into a large apical spur; the inner spur is rudimentary, represented by just a short bristle-like process (fig. 2b). The m cross-vein is lacking in the wings and the costa and radial sector end at about the apical one-third to one-fourth of the wing (fig. 2e). Also the radial sector is characteristically thickened at the apex.

The genus name is derived from the Greek *enikos*, singular or unique, and *skolos*, anything pointed, thorn. The name is masculine.

The genus contains the following two new species. At present only the females are known.

Type of the genus: *Enicoscolus dolichocephalus*, n. sp.

¹ Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Technical Paper No. 466.

KEY TO KNOWN SPECIES OF ENICOSCOLUS BASED UPON FEMALES

1. Head elongate, two times longer than wide, rostrum produced, sclerotized portion of head in front of eyes two-thirds as long as the eye and nearly equal to the portion of the head behind the eyes (fig. 2a.)
 Thorax all rufous *dolichocephalus*, n. sp.
- Head short, not much longer than wide. Rostrum not produced, sclerotized portion in front of eyes not extending beyond bases of antennae and scarcely as long as one antennal segment (fig. 1). The dorsum of the thorax is shining black *brachycephalus*, n. sp.

***Enicoscolus brachycephalus*, n. sp. (Fig. 1)**

This species is readily differentiated from *E. dolichocephalus*, n. sp. by the characters given in the above key.

Female.—Fitting the characteristics given for *dolichocephalus* in most respects, differing in the head characters, in the all-black dorsum of the thorax, and brownish colored pleura; also the wings are more brownish fumose and the posterior veins are darker colored. *Head*: Short, scarcely longer than wide, the rostrum not at all developed, the sclerotized portion beyond the eye margin is scarcely equal in length to one antennal segment. The last segment of each palpus is long and slender, four or five times longer than wide (fig. 1). The front between the eyes is about two-thirds as wide as one eye. The portion of the head behind the eyes is about two-fifths as long as one eye. The front is rather thickly covered with erect black setae. *Thorax*: Entirely polished black on the dorsum including the scutellum and metanotum. The propleura are yellow, tinged lightly with brown. The remainder of the pleura are predominantly yellow-brown, dark brown along the upper edges of the mesopleura, pteropleura, and over the entire metapleura and hypopleura. *Legs*: Similar to those of *dolichocephalus* except that the hind coxae are dark brown to black. The front tibia is very similar to that of *dolichocephalus* as in figure 2b. *Wings*: Very similar to those of *dolichocephalus* but more distinctly brownish fumose with pale brown posterior veins. *Abdomen*: Dark velvety brown, predominantly black haired but with yellow pile on the cerci and the genital portion of the abdomen.

Length: Body, 4.2 mm.; wings, 5.4 mm.

Male unknown.

Holotype female, Yautepec, Morelos, Mexico, Oct. 29, 1956 (R. and K. Dreisbach). One paratype female, Tepotzlan, Morelos, Mexico, Sept. 26, 1957 (R. and K. Dreisbach).

Type in the United States National Museum. The paratype is in the collection at the University of Hawaii.

***Enicoscolus dolichocephalus*, n. sp. (Figs. 2a-e)**

This species differs from the only other known species of the genus by the characters given in the above key.

Female.—*Head*: Polished black, tinged with red beyond the eyes; the mouth parts are yellow, tinged with brown or black. The antennae and palpi are dark brown to black. From a front view the head is 2.3 times longer than wide. The

rostrum (the sclerotized portion of the front beyond the eyes) is rather strongly developed, equal in length to about two-thirds the length of the eye and almost as long as the portion of the head behind the eye (fig. 2a). The front between the eyes is almost as wide as one eye, as seen from direct dorsal view. The ocelli are moderately large but are not raised on a prominence. The antennae are seven segmented, shaped as in figure 2a, the last two segments are closely joined. The palpi are five segmented, the apical segment is about 1.5 times longer

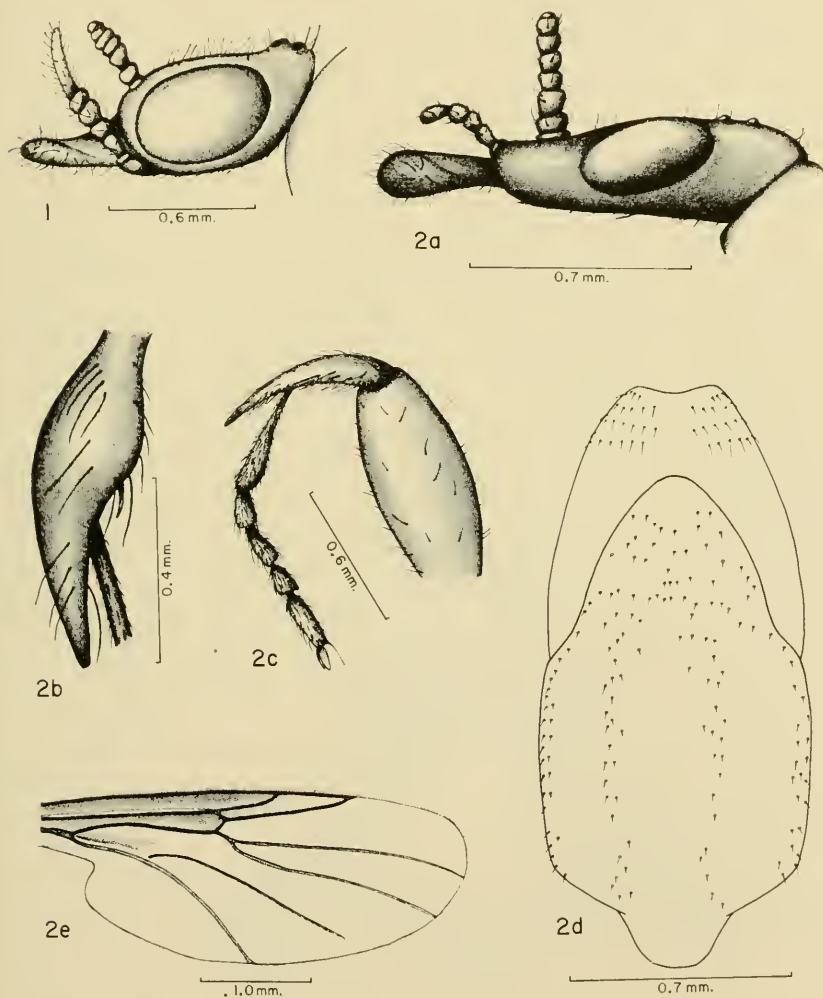


Fig. 1, *Enicoscolus brachycephalus* n. sp., head, lateral view. Fig. 2, *E. dolichocephalus* n. sp. a. head, lateral view; b. front tibia; c. front leg, lateral; d. thorax, dorsal view; e. wing.

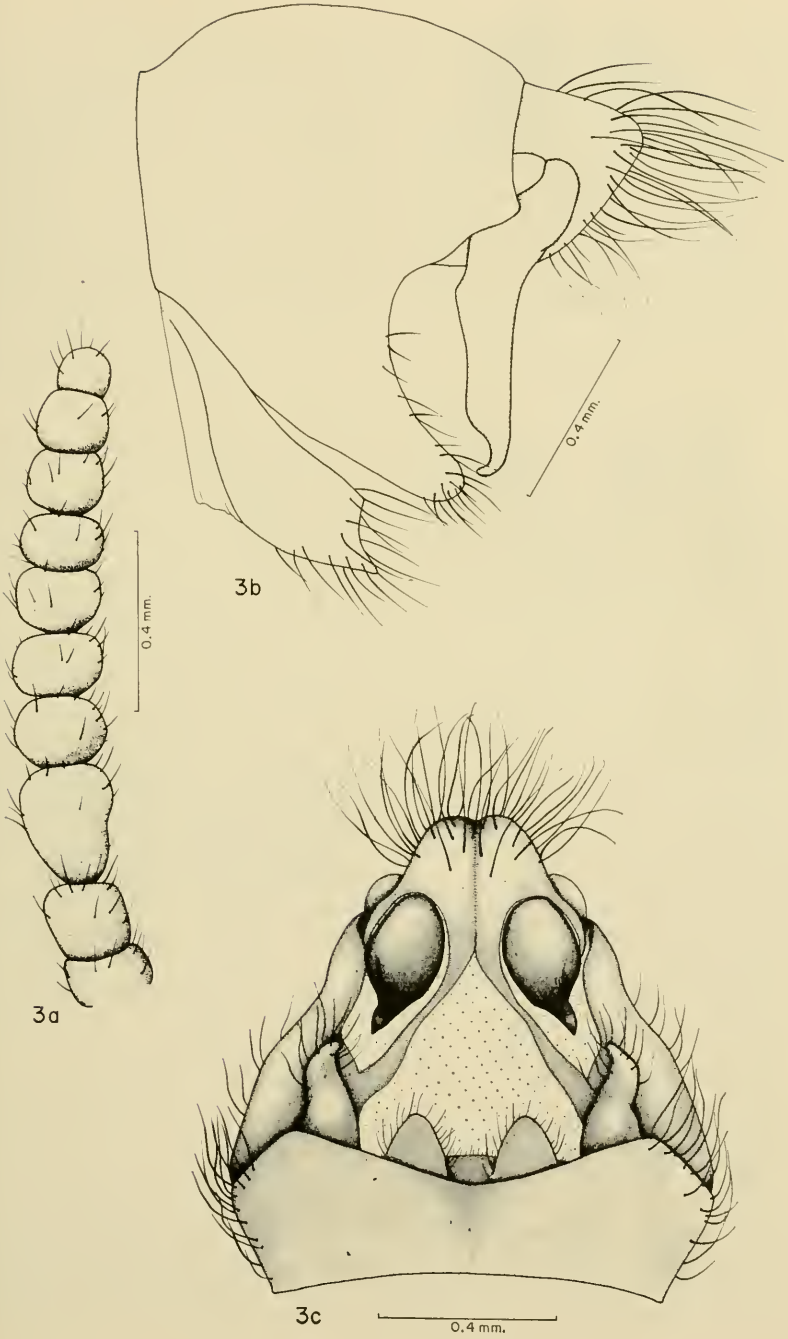
than wide. The penultimate and antipenultimate segments are about as wide as long, the latter has a depressed sensory area on the dorsal surface; the two basal segments are very short and inconspicuous. The head is bare except for about a dozen erect pale setae on the anterior median portion of the front, for a series of short, erect setae extending down the median portion of the under surface, and for a few short hairs immediately behind the ocellar triangle. Mouth parts slightly longer than the rostrum, the labella are fleshy and rather densely setose. *Thorax*: Predominantly red, except for the black pronotum. The vestiture is entirely yellow. The pronotum and the anterior portion of the mesonotum are rather thickly covered with spinose setae, these also extend down each dorsocentral row and along each side of the mesonotum; the areas between these rows are bare. The pleura are devoid of setae. The bases of the halteres are yellow; the knobs are dark brown to black. *Legs*: Front coxae elongate, almost equal in length to the femora. Front femora very short and thick, about two times longer than wide. Front tibia short, the large spur occupying most of the segment. The inner spur is very tiny, it is one-third to one-half as long as the yellow hairs around the edge of the tibia (fig. 2b). The basitarsus is slender, slightly curved, about three-fourths to four-fifths as long as the tibia (fig. 2c). The coxae and trochanters are entirely rufous, the front and middle femora are rufous with a slight tinge of brown on the upper apical portions; the hind femora are predominantly shining black, yellow to rufous on the attenuated basal portion. The front tibiae are rufous except for the brown to black bases. The remainder of the legs is entirely black. The middle tibiae have conspicuous spinose setae rather densely placed over the dorsal surface. The apical spurs of the middle and hind legs are blunt at apices. *Wings*: Lightly fumose, the anterior veins are dark brown, the posterior veins are faintly brownish yellow, just slightly darker than the wing membrane. No distinct stigma is present, but cell R1 and the costal cell are brown fumose. Vein R1 ends at about the apical two-fifths of the wing and the radial sector and the costa end near the apical fourth of the wing (fig. 2e). The basal section of the radial sector is one-half to one-third as long as the r-m crossvein. Vein M1+2 beyond the r-m crossvein is slightly shorter than the crossvein. There is no indication of a m crossvein and vein M3+4 ends well before the wing margin. *Abdomen*: Brown, with mixed yellow and brown pile. The conjunctiva is yellow-brown.

Length: Body, 4.5—5 mm.; wings, 4.5 mm.

Male unknown.

Holotype female Tepoztlán, Morelos, Mexico, Oct. 20, 1957 (R. and K. Dreisbach). Two paratype females from Cuernavaca, Morelos, Mexico, Oct. 20-29, 1957 (R. and K. Dreisbach).

Type in the United States National Museum. One paratype has been returned to Dr. R. R. Dreisbach and one is in the University of Hawaii collection.



Plecia impensa Hardy (Figs. 3a-c)

Plecia impensa Hardy, 1957, Ann. des Naturh. Mus. Wien 61:238, figs. 1-2.

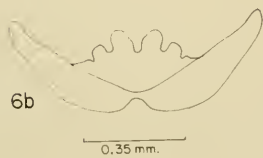
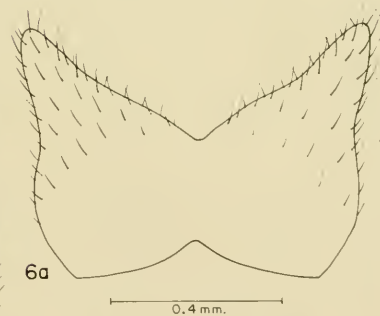
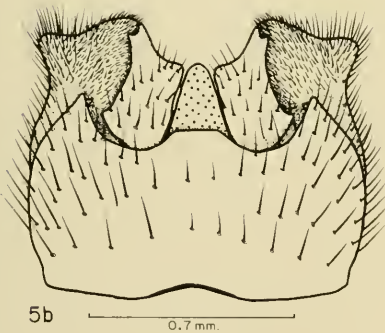
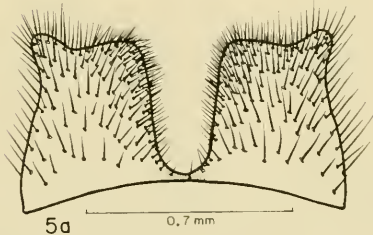
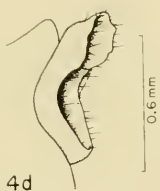
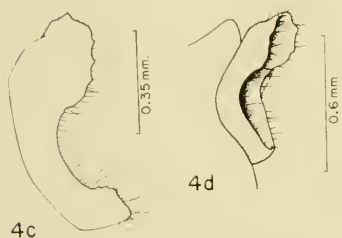
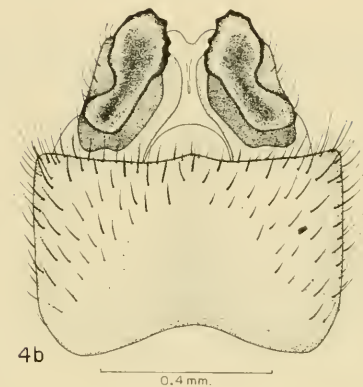
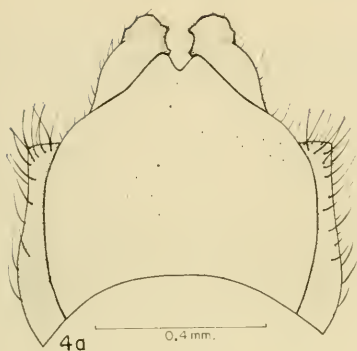
The species has previously been known only from the holotype male from Bilimek, Mexico, taken in 1883. The type is in the Naturhistorisches Museum, Wien. Five specimens have been studied in the California Academy of Sciences collection from Real de Arriba, Temescaltepec, Mexico, May 24, 1933 (H. E. Hinton and R. L. Usinger) and some descriptive details should be added to the original description. This species belongs to the group which has the thorax opaque black, but it will not fit anything beyond couplet 13 in my key to the new world *Plecia* (Hardy, 1945:392). As pointed out in the original, the species appears to be related to *P. nigra* Philippi from Chile. The statement saying that it is differentiated "by the absence of a median projection on hind margin of ninth sternum" is incorrect; this should have read ninth tergum.

The antennae were broken off the type; they are distinctly ten segmented (fig. 3a). The palpi are moderately long and slender, when fully extended they measure slightly longer than the antennae and about the same as the head length (approximately 2 mm.); the segments are approximately equal in length, each is about three times longer than wide. The thorax is entirely opaque black, except for a faint rufous tinge in the middle of the scutellum, behind and under the wing bases, along the upper edge of each mesopleuron and through the upper portion of each pteropleuron. The mesonotum is lightly, but distinctly, gray pollinose. A pair of distinct submedian (down each dorsocentral line) furrows extend down the mesonotum and an indistinct median furrow is also present. The prescutellar depression is well developed and the area is coarsely rugose. In the additional specimens at hand the wings are intensely tinged with yellow, narrowly brown only on the anterior margin from the tip of vein R1 to the wing apex. The stigma is brown, darker than the surrounding membrane in these specimens. In the type the wings are dark brown fumose along the costal margin and at the base. The male genitalia are characterized by having the ninth sternum rather strongly produced on the posterior median margin, extending well beyond the bases of the claspers; this produced median portion is very densely pilose (fig. 3c). The anterior lateral margins of the sternum are also strongly produced around the genital chamber (fig. 3b). The claspers are long, slender, and sharp pointed; in normal position they are folded down over the top portion of the genital chamber. In normal position the ninth tergum is directed ventrally, parallel with the lateral lobes of the ninth sternum (fig. 3c).

The body and wings of the specimens at hand measure 12 to 13.5 mm.

The female has not previously been described. It fits the description of the male in all details except for sexual characteristics. The antennae are eleven segmented. The front is slightly narrower than the width of one eye and has a

Fig. 4. *P. paracollaris* n. sp. a. male genitalia, ventral; b. male genitalia, dorsal; c. male clasper, outside lateral view; d. male clasper, inner end view. Fig. 5. *P. peruviana* n. sp. a. ninth tergum of male; b. male genitalia, ventral. Fig. 6. *P. quasimaculata* n. sp. a. ninth tergum of male; b. posteromedian margin of ninth tergum, end view; c. male genitalia, ventral.



distinct carina down the median portion. The ocellar triangle is very prominent. The portion of the head behind the eyes is about one-half the length of one eye. The humeral ridges and the sides of the mesonotum are rufous, tinged with brown.

Length: Body, 13 mm; wings, 15 mm.

Plecia mallochi Hardy

This is the correct name for *Penthtria thoracica* Guérin-Ménéville, 1838, in Duperrey, Voy. autour du Monde sur la Corvette de la Coquille 2:507. Preoccupied by *Laphria thoracica* Fabricius, 1805, System. Antl., 163, which is a synonym of *Plecia collaris* (Fabricius). I was in error in proposing the name *P. dispersa* for this species since the name *mallochi* (Hardy 1948) is available. Refer to Hardy 1958: 196. *Plecia dispersa* Hardy should be treated as an invalid name.

Plecia paracollaris, n. sp. (Figs. 4a-d)

This species fits very close to *P. collaris* Fabricius and runs to this in my key to the new world *Plecia* (Hardy 1945:393). The brown to black spot on the anterior portion of the mesonotum is smaller and less distinct in *paracollaris* and the male genitalia are distinctive: the median process of the ninth sternum has a much shallower U-shaped cleft on the hind margin (fig. 4a); the ninth sternum has a moderately strong, sharp-pointed lobe on each lateral margin; the claspers are not so distinctly bilobed; and the posterior median margin of the tergum has a dorsally produced process. For a comparison compare the figures of *collaris* (Hardy 1945:526, figs. 135e-e).

Male.—*Head*: Antennae entirely black, rather short, the flagellum is made up of seven closely placed segments. The mouth parts are entirely black, except for a tinge of rufous on the labella; they are approximately equal in length to the head and are folded beneath the head when not in use. Ocellar triangle, prominent, *Thorax*: Predominantly shining, yellow to rufous above and black on the sides and venter. The margins of the mesonotum, and the depressed area in front of the scutellum are yellow-gray pubescent. The dark brown to black spot is confined to the anterior median portion of the mesonotum. The scutellum is yellow, except for a narrow streak of brown extending vertically across the apex. The metanotum is yellow to rufous, tinged lightly with brown. The pleura are black, except for a tinge of rufous below the wing bases. The halteres are black. *Legs*: Entirely black, rather thickly black pilose. The hind basitarsi are four times longer than wide. *Wings*: Pale, infuscated with yellow-brown, darker along the anterior margin; the stigma is just slightly darker than the surrounding membrane. Vein R2+3 is about half as long as the basal portion of Rs; it extends vertically for a short distance, then curves gradually and enters the costa at an angle of about 55° with vein R4+5. *Abdomen*: Entirely black, black pilose and rather densely brown pollinose. From a direct ventral view the ninth sternum is about as long as wide, the posterior median portion is slightly produced and has a shallow U-shaped concavity at the apex (fig. 4a). The sternum has a sharp, spine-like projection developed from each upper lateral margin. The claspers are large and conspicuous, as seen from lateral view they

are bilobate (fig. 4c); the apical lobe is blunt and has two or three teeth-like serrations on the inner surface. From inner end view the claspers are hollowed out, concave apically (fig. 4d). The ninth tergum is nearly two times wider than long, the posterior margin is straight or nearly so (fig. 4b); a longitudinal groove extends the entire length down the middle of the segment, and the posterior median portion is produced into a large blunt lobe which extends into the genital chamber.

Length: Body, 4.7 mm.; wings, 5.5 mm.

Female.—Fitting the description of the male in most respects, the brown marking on the anterior portion of the mesonotum is, however, less distinct; the pleura are brown, tinged with rufous, and vein R2+3 is oblique in position and about three-fourths as long as the basal portion of the Rs.

Length: Body, 6 mm.; wings, 7.3 mm.

Holotype male, allotype female (in copula) and two male paratypes from Buenaventura, Columbia, Nov. 2, 1950 (Michelbacher and Ross).

Type and allotype returned to the California Academy of Sciences. One paratype deposited in the United States National Museum and one in the University of Hawaii collection.

Plecia peruviana, n. sp.

(Figs. 5a-b)

This species belongs in the *confusa* group but appears more closely related to *P. amplipennis* Skuse (from the Pacific) than to any known South American species. It is allied to *confusa* Loew because of the all rufous thorax, short mouth parts and deeply cleft ninth tergum of the male but the genital characters are very different. It runs out with *confusa* in couplet 40 of the writer's key to the new world *Plecia* (1945:394) but is readily differentiated by having the ninth tergum of the male not developed into clasper-like lobes and by the large, strongly developed claspers (fig. 5b).

Male.—The antennae are ten segmented and chiefly black in color, the apices of the two basal segments are yellowish. The ocellar tubercle is moderately developed but not so large as in most species. The rostrum is slightly over half as long as the antennae. *Thorax*: Entirely opaque orange, the mesonotal furrows are moderately developed. The stems of the halteres are yellowish, the knobs are brown to black. *Legs*: All black, thickly covered with black pile. Femora slightly enlarged on the apical halves. The tibiae are slender, with parallel sides. *Wings*: Predominantly light brown fumose, dark brown along the anterior margin. Stigma faint, not clearly differentiated from the wing membrane. Vein R2+3 nearly straight and forming an 80°—85° angle with R4+5. Petiole of cell M1 less than 1.5 times longer than the r-m crossvein. The cubital cell is not narrowed at the apex. *Abdomen*: All black, rather densely black pilose. The ninth tergum is cleft almost to its base, in the middle of the hind margin. The posterior lateral margins are rather broad and are not strongly produced at apices (fig. 5a). The ninth sternum is nearly two times wider than long, the posterior lateral margins are developed into two small lobes at their apices. The posterior median margin of the sternum has a membranous gibbosity which extends over the aedeagus. The claspers are very large and extend nearly to

the hind margin of the ninth tergum. The apical portion of each elasper is attenuated and terminates in a pair of small lobes (fig. 5b).

Length: Body, 7.0 mm.; wings, 7.5 mm.

Female.—Antennae eleven segmented, the apical segment is small and nipple-like. The front has a very strong black tubercle just above the antennae and a rather strong ridge extends to the ocellar tubercle. The wings are darker fumose than in the male.

Length: Body, 7.0 mm.; wings, 8.5 mm.

Holotype male and allotype female: Chanchamayo (Coll. Oldenbert). Dr. Hans Saetlehen has added the following information about the specimens and the type locality: "Chanchamayo is the source (Quellfluss) of the river Ucayali in Peru. The specimens were collected by Wilhelm Schnuse, probably between the 8th and 10th of January, 1904."

Both specimens have been returned to the Deutsches Entomologisches Institut, Berlin.

***Plecia quasimaculata*, n. sp.**

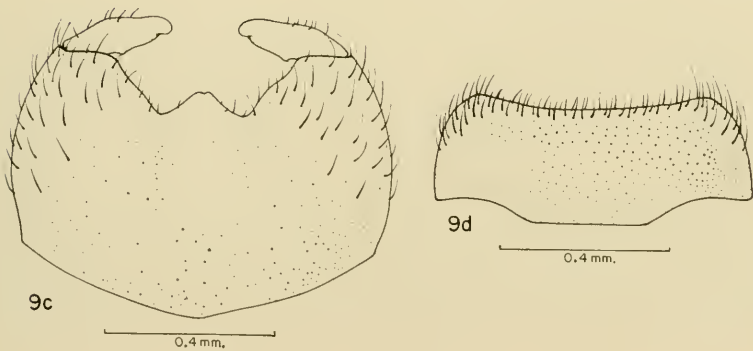
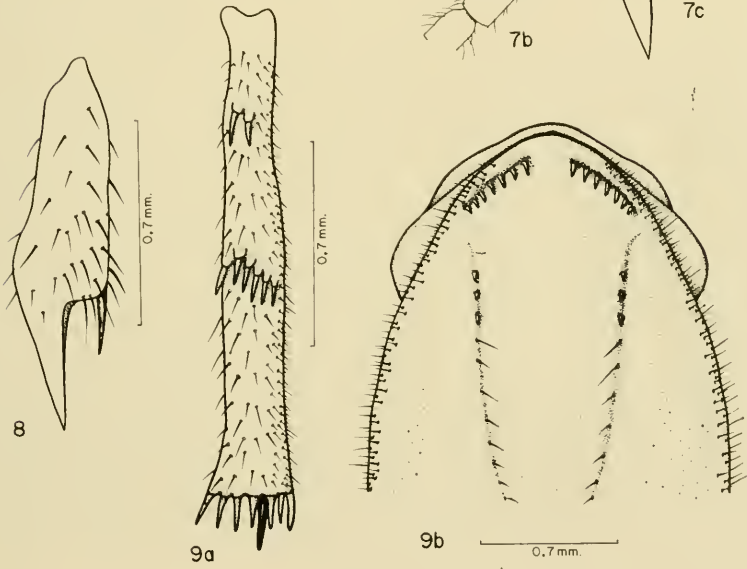
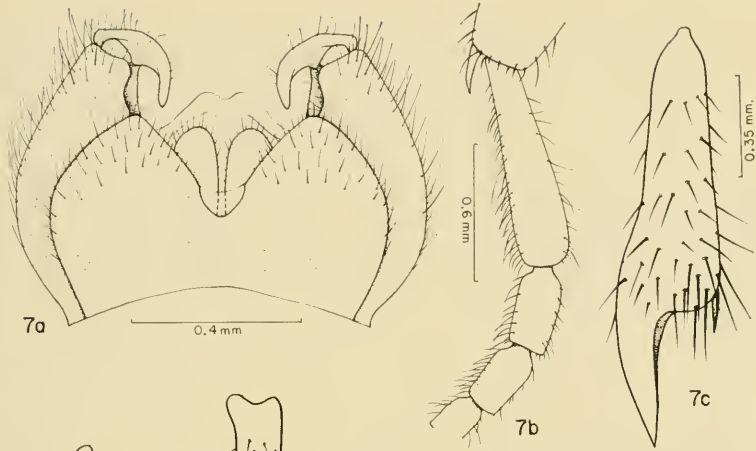
(Figs. 6a-e)

This species superficially resembles *P. maculata* Hardy (1942:110, figs. 151a-d) but the two are not closely related. The genitalia are very different as seen by comparing the above mentioned figures with figures 6a and 6b. On the basis of the male genital characters *quasimaculata* is probably more closely allied to *perplexa* Hardy (1942:112, figs. 159a-d) but the genitalia differ considerably as shown by comparison of the figures.

In my key to the new world *Plecia* (Hardy 1945:393) *quasimaculata* will run in the second part of couplet 39 to *lindneri* Edwards; *P. maculata* Hardy should also be keyed at this point and the couplet should be modified as follows: the second statement, "Pleura and anterior of notum black," should go to number 39a.

- 39a. Posteromedian margin of ninth tergum produced into a strongly sclerotized four-lobed process (fig. 6b). Posterior margin of ninth sternum scarcely extending beyond bases of elaspers (fig. 6c). (Haiti) ***quasimaculata*, n. sp.**
- Posteromedian margin of ninth tergum not produced. Posterior margin of ninth sternum extending nearly to apices of elaspers 39b
- 39b. Posterior median margin of ninth sternum strongly produced, lateral margins not lobate (Hardy 1945:531, fig. 149). Claspers bilobed (loc. cit., fig. 149b). Ninth tergum with a rather shallow V-shaped cleft (loc. cit., fig. 149c). (Boliyia, Western Brazil, and Peru) ***lindneri* Edwards**

Fig. 7, *Bibio illaudatus* n. sp. a. male genitalia, dorsal; b. hind tarsus of male; c. front tibia of male. Fig. 8, *B. obediens* Osten Sacken. Front tibia of male, specimen from the New Hebrides. Fig. 9, *Philia inconnexa* n. sp. a. front tibia; b. anterior portion of male thorax, dorsal; c. male genitalia, ventral; d. ninth tergum of male.



Posterior margin of ninth sternum not developed medianly, but with moderately developed submedian lobes and rather strong lateral lobes (Hardy, 1945:431, fig. 151a). Claspers simple, acute at apices (loc. cit., fig. 151b). Ninth tergum with a rather deep narrow cleft on hind margin (loc. cit., fig. 151d). (Trinidad)

..... maculata Hardy

Male.—*Head*: The ocellar triangle is prominent, raised above the eye margin a distance equal to about five rows of eye facets. The mouth parts are rather strongly produced, equal in length to the remainder of the head. The antennae are broken on the type, the two basal segments are black, tinged faintly with rufous. The last segment of the palpus is 2.5 times longer than wide; the penultimate segment is about as wide as long. *Thorax*: Entirely opaque, predominantly orange colored above, dark brown to black on the sides. The anteromedian portion of the mesonotum is black, the humeral ridges are black except for a rufous spot in the median portion. The scutellum has a black longitudinal vitta over the median portion. Submedian grooves are moderately developed on the mesonotum and a faint median groove is present at about the half-way point before the depression. The pleura are distinctly gray pollinose. The halteres are black, tinged with brown on the knobs. *Legs*: Entirely black, tinged with brown in the ground color, vestiture black. Hind basitarsus about equal in length to the next two tarsal segments, and about one-third as long as the tibiae. *Wings*: Brown fumose, darker along the anterior margin. The stigma is scarcely differentiated from the surrounding membrane. Vein R2+3 is oblique, nearly straight, and forming about a 65° angle with vein R4+5. The costa ends about one-third the distance between the apices of veins R4+5 and M1+2. The basal section of the radial sector is about equal in length to the section of vein M1+2 just beyond the r-m crossvein. *Abdomen*: Entirely black, rather densely gray pubescent, all pile black. The ninth sternum is about two times wider than long and the posterior margin has a pair of rather small submedian lobes. The claspers are rather large, and each is tapered to a sharp point at apex (fig. 6c); from lateral view the inner margin of the elasper is produced into a blunt prominence. The posterior lateral margins of the ninth tergum are moderately lobate (fig. 6a), the median margin is produced into a shelf-like portion which extends vertically into the genital chamber (fig. 6b).

Length: Body, 5.5 mm.; wings, 6—6.3 mm.

Female.—Except for the compound eyes the head is densely gray pubescent. The sclerotized portion of the head in front of the eyes, and the portion of the head behind the eyes, are both about one-third as long as the compound eyes. The compound eye is almost one-half longer than wide. The front is about equal in width to one of the compound eyes, is slightly carinate on the anterior portion and has a distinct pit-like depression in the middle. As seen in direct dorsal view the head is about as wide as long. The thorax is colored as in the male except that a black streak occurs down each side of the mesonotum; I believe much of this, however, might be due to discoloration and may not be typical. In other details fitting the description of the male except for sexual characters, vein R2+3 is more gently curved, however, and the abdomen is tinged with brown.

Length: Body, 6.5 mm.; wings, 7.75 mm.

Holotype male and allotype female from Kenshoff, Haiti, June 24, 1931 (Kisliuk and Cooley).

Type and allotype deposited in the United States National Museum.

Plecia similis Rondani

Plecia similis Rondani, 1850, Nuovi Ann. Delle Sci. Nat., ser. 3, 2:193.

This species was inadvertently left out of my key to the new world *Plecia* (Hardy 1945:391-395). It runs to couplet 21 (page 392) with *P. marginata* Edwards and *nitidipcs* Edwards. The male genitalia of *marginata* have not been studied but that species should be readily differentiated by the continuous orange border around the mesonotum. Both *nitidipcs* and *similis* have the body entirely dull black and the wings are evenly pale yellow fumose. Couplet 21 of this key should be modified as follows: The second part should read "Entirely black species" . . . 21a

- 21a. Face scarcely produced beyond the lower margins of the eyes. Ninth tergum developed into a sharp point on posteromedian margin (Hardy 1945: 533, fig. 156b). Ninth sternum with moderately developed submedian and lateral lobes on posterior margin. Claspers slender (loc. cit., fig. 156a). (Ecuador) *nitidipcs* Edwards
- Rostrum very elongate, extending longer than the head and greater in length than the antennae. Ninth tergum of the male with an indistinctly bilobed development on posteromedian surface (loc. cit., fig. 176c). Ninth sternum without lateral lobes but the posteromedian portion is produced into a bilobed process which extends to the apices of the claspers. Claspers very broad and blunt (loc. cit., fig. 176a). (Brazil and Argentina) *similis* Rondani

P. similis is very closely related to *P. collaris* (Fabricius) in spite of the very different body coloration in the two species. The male genitalia show close affinities and appear to differ only in the development of the male clasping structures. In *similis* the claspers are very broad, about as wide as long and blunt at apices (loc. cit., figs. 176a and 176b). In *collaris* the claspers are more narrowed apically, and more distinctly bilobed (loc. cit., figs. 135c and 135e).

Plecia thulinigra, n. name

A new name for *Plecia nigra* Lundström, 1916, Ann. Mus. Nat. Hung. 14:457 (from Amur Land.), Preoccupied by *Plecia nigra* (Philippi), 1865, Verh. Zool.-bot. Ges. Wien 15:640 (from Chile).

Okada (1938:201) placed *nigra* Lundström as a synonymy of "*Plecia vclutina* (Loew)." I do not believe this synonymy to be correct and feel that *nigra* Lundström is probably a distinct species. *P. vclutina* was described as a *Pcnthetria* and was correctly placed; I have studied the type in the Zoologischen Museum, Humboldt Universität, Berlin. *P. nigra* Lundström has never been clearly defined in the literature. The original was based upon a female specimen and the description would fit several species of dark bodied *Plecia* from the oriental region.

Duda's description (1930:10) of what he called the male of "*nigra* Lundstr." is also very general and gives no specific details which might actually differentiate the species. *P. nigra* Lundström is obviously similar in general details to *P. aterrima* Brunetti but cannot be correctly placed until a study is made of the male genitalia of specimens from near the type locality.

***Bibio illaudatus*, n. sp.**

(Figs. 7a-c)

This species is closely related to *B. obediens* Osten Sacken and may possibly be a subspecies of this. It differs from *obediens* in having the inner spurs of the front tibiae short and poorly developed and by having all femora black.

Male.—Entirely shining black species, except for the pale humeral ridges, reddish tibial spurs and yellowish bases of halteres. Pile all black, very dense and rather elongate. *Head*: Antennae ten segmented, the last three are very closely joined. Eyes densely pilose, ocellar tubercle prominent. *Legs*: Femora very faintly tinged with reddish in the ground color. The outer spur of each front tibia is about half as long as the remainder of the segment. The inner spur is short and not more than one-fourth as long as the outer (fig. 7c); the apical bristles on the tibiae are longer than the inner tibial spur (refer to figure 8 of *obediens* for comparison). The hind tibiae are thickened apically, about equal in width to the femora. The hind basitarsi are slightly swollen, about 3.5 times longer than wide. The other tarsal segments are also slightly swollen (fig. 7b). The apical spurs of the hind tibiae are sharp pointed. *Wings*: Dark brown to black fumose, the stigma is just slightly darker than the wing membrane. All veins are dark brown. The basal section of Rs is just slightly longer than the r-m crossvein. Vein M1+2 forks just before the m crossvein. The costa ends at the tip of Rs. *Abdomen*: Opaque black, densely haired on the sides and sparsely so in the middle of the dorsum. Ninth sternum 1.57 times wider than long, the cleft on the hind margin extends about one-third the length of the segment. Claspers slender, sharp pointed. Ninth tergum twice as wide as long, with a V-shaped cleft extending about two-thirds the length of the segment (fig. 7a).

Length: Body, 7.0—7.4 mm.; wings, 5.5—6.0 mm.

Female unknown.

Holotype male and five paratype males: Hienghene, New Caledonia, June 7, 1944 (W. Crabb).

Type and four paratypes returned to the United States National Museum. One paratype is in the University of Hawaii collection.

***Philia inconnexa*, n. sp.**

(Figs. 9a-d)

This species is apparently related to *P. occipitalis* (Edwards) because of the twelve-segmented antennae and the arrangement of the spines on the front tibiae. It differs by the following characteristics: the legs are entirely dark colored, not chiefly yellowish; the middle row of spines on the front tibia is situated at the middle of the seg-

ment, not beyond the middle, and the single spine is at the basal one-fourth of the tibia, not just before the middle, the anterior comb of the thorax on the females is well separated into two combs, the separation is equal in width to three or four of the teeth, not indistinctly divided; no longitudinal furrow is present between the combs; the area between combs in the female is dark reddish, slightly discolored with blackish, not yellowish; larger species, wing, 9.5 mm. in female of *inconnera* and 6.0 mm. in *occipitalis* (Edwards).

The males are characterized from other *Philia* by having but one transverse thoracic comb. They fit near *P. plaumanni* (Edwards) (male of *occipitalis* not known) but are readily recognized by the following characters: The twelve-segmented antennae, not ten; the presence of just one transverse comb on the thorax; by having six spines in the middle set on the front tibiae, not four; by having two spines in the top set at basal one-fourth of front tibia, not with one spine just before middle; the wings paler in color, not smoky black; and the larger size, wing length 7.5 mm., not 4.0 mm.

Male.—*Head*: Rostrum (sclerotized portion of face beyond the eyes) short, not developed beyond the bases of the antennae. Face and underside of head covered with rather long black hairs. Scape and pedicel of antenna yellow, the latter is about two times longer than the scape and bears a circle of short black bristles near the apex. Flagellum made up of ten very distinct segments, the apical one is two or more times longer than the subapical segments and may be composed of two fused segments. The base of the first flagellar segment is yellow, the remainder of the flagellum is black. The upper portion of each compound eye is reddish in color, the lower portion, composed of smaller facets, is dark brown to black. *Thorax*: Chiefly dark red in color, black on the anterior median portion of the mesonotum in front of the single transverse comb. The comb is located near the front portion of the mesonotum and is separated into two sets of six to seven spines each, these are separated on the middle of the mesonotum by a space equal to the distance between three of the spines in the comb (fig. 9b). Two longitudinal furrows extend three-fourths the length of the mesonotum, each furrow has two to three black spines arranged in a longitudinal row at about the anterior third of the mesonotum; a row of black hairs extends down each furrow. The margins of the mesonotum and the scutellum are rather thickly covered with moderately long black hairs. The scutellum is chiefly brown to black, the metanotum is rufous. Halteres rufous, with a brownish tinge. *Legs*: Coxae, trochanters, tibiae, and tarsi brown to black with a faint to moderate reddish tinge. Femora rufous, the middle and hind pairs are tinged with brown on their apical portions. The front tibiae each have three, rather evenly spaced, sets of spines. The first set has two spines and is located at the basal one-fourth of the tibia. The second set contains six spines, in a slightly oblique row, and is located just beyond the middle of the tibia. The apical set has eight to nine spines and a well-developed spur, the latter is about twice as large as the spines (fig. 9a). The hind femora are clavate, narrowed at bases and enlarged on apical halves. The hind tibiae are also moderately swollen at their apices. *Wings*: Faintly tinged with yellow, darker along the costal margin. The stigma is brown and contrasts rather sharply with the yellow wing margin. The anterior

veins are yellow, tinged slightly with brown, the posterior veins are concolorous with the membrane. The fork of veins M1 and M2 is opposite the m crossvein. The costa extends about three-sevenths the distance between the tips of veins Rs and M1. *Abdomen*: Entirely black, rather thickly black pilose. The ninth tergum is about four times wider than long and the hind margin is straight (fig. 9d). The ninth sternum is about one-fourth wider than long and has a gibbosity in the middle of the hind margin. The claspers are rather short and blunt (fig. 9e).

Length: Body and wings, 8.5 mm.

Female.—Somewhat darker in color than the male, with a distinct black tinge in the ground color. *Head*: Entirely black, the integument is rather roughly rugose, especially on the face and front. The face is more prolonged than in the male but extends just slightly beyond the antennae. The rostrum is slightly more than half as long as the compound eyes. The ocelli are situated on a distinct tubercle. The pedicel of the antenna is more brownish in color than in the males. *Thorax*: Dark red with a faint black tinge, especially around the margins of the mesonotum. Both the anterior and posterior combs are well developed on the mesonotum, these are both rather widely separated in the middle into two sets of spines and there is no furrow between the two combs. The furrows behind the posterior comb each possess three spines in a longitudinal row as in the male. *Wings*: Yellow-brown fumose, somewhat more broad than in the male. *Legs*: The femora are darker red, the hind two pairs are tinged with black. The front tibiae each have just a single spine above the middle set, this is located at the basal one-fourth of the segment. The hind tibiae are not so clavate as in the male.

Length: Body, 8.5 mm.; wings, 11.0 mm.

Holotype male: Northern Venezuela, April 21, 1943 (Rene Lichy).
Allotype female, same data, in copula.

Both have been returned to the United States National Museum.

Philia quinquespinae, n. sp.

(Figs. 10a-d)

This species resembles *P. minima* Hardy, from Costa Rica. It differs from *minima* by having the rostrum produced well beyond the bases of the antennae; by having three spines in the middle set on front tibia, rather than four; by having the legs chiefly black, not rufous; and by having ten segments in the antennae, not eight.

Male.—A small conspicuously marked species, the body pile is rather sparse and entirely brown. *Head*: The rostrum is well developed, almost equal in length to the flagellum of the antenna. The antennae are dark brown to black, composed of ten segments. The rostrum and extended mouth parts are at least one-third longer than the compound eyes. *Thorax*: Predominantly yellow to rufous, the pronotum, the scutellum, and the metanotum are brown to black; the anterior median portion of the mesonotum, in front of and behind the comb, is dark brown on the type and just slightly discolored with brown on the paratype. Only one thoracic comb is present, this is slightly divided in the median portion and has five strong teeth on each side (fig. 10b). The mesonotum is sparsely black haired down the dorso-central lines and on the sides, the scutellum is

rather thickly black haired. The knobs of the halteres are brown, tinged with yellow; the stems are pale. *Legs*: The front coxae and trochanters are yellow to rufous, the legs are otherwise predominantly brown to black, tinged with rufous; the bases of the front and middle femora are yellow, tinged lightly with brown. The front tibia is slender and has three sets of spines; two spines are situated near the basal fourth and three are near the middle of the segment (fig. 10a). The apical spur is about equal in size to the apical spines. The hind legs are slender, the basitarsus is 5.5 times longer than wide. *Wings*: Predominantly

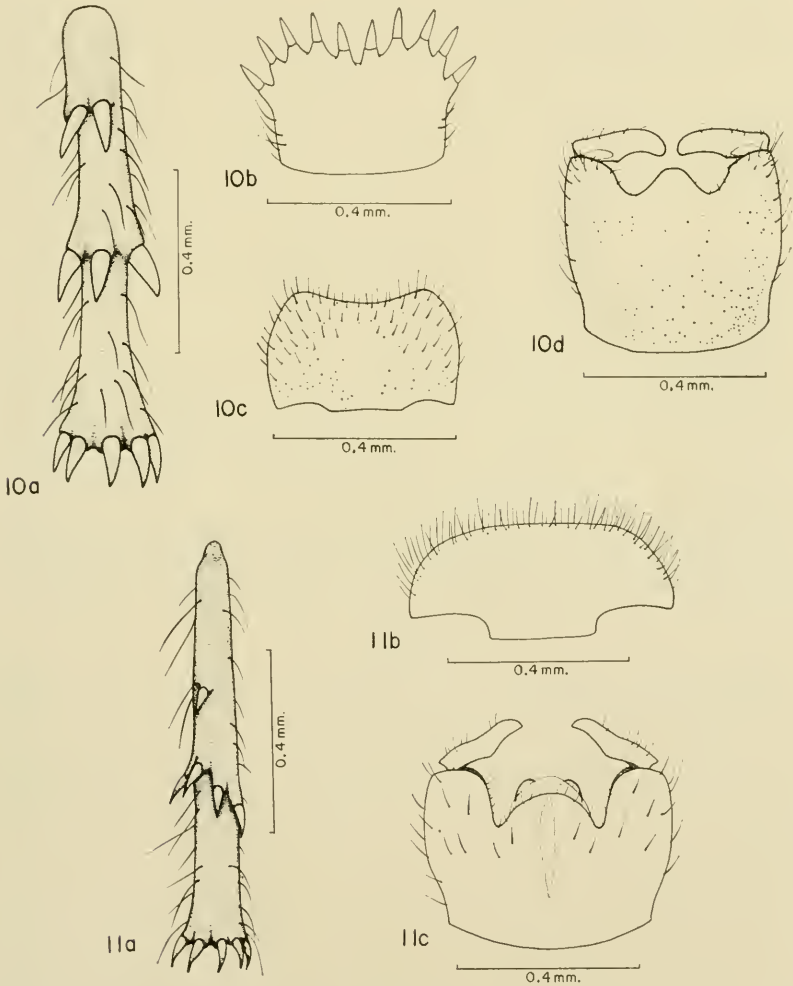


Fig. 10. *P. quinquespina* n. sp. a. front tibia; b. anterior thoracic comb; c. ninth tergum of male; d. male genitalia, ventral. Fig. 11. *P. segregata* n. sp. a. front tibia; b. ninth tergum of male; c. male genitalia, ventral.

hyaline, very faintly tinged with yellow, the anterior margin of the wing is yellow-brown, concolorous with the stigma. The costal margin extends about one-third the distance between the apices of the radial sector and vein M1. *Abdomen*: Dark brown to black, sparsely covered with black pile. The ninth tergum is about one-third wider than long and the hind margin is very gently concave (fig. 10c). The ninth sternum is gibbose in the posterior median portion and the claspers are short and blunt (fig. 10d).

Length: Body, 4.1 mm.; wings, 3.6 mm.

Female.—The head is long and narrow, from a direct dorsal view it is about 2.25 times longer than wide. The rostrum and the portion of the head behind the eyes are both about equal in length to the compound eyes. The extended mouth parts are about equal in length to the remainder of the head. The front is entirely flat, the portion between the eyes is about equal in width to one eye. The ocellar triangle is not strongly produced, it is about as high as one ocellus. The two basal segments of the antennae are yellow. Two well-developed combs are present on the dorsum of the thorax, the anterior comb is divided into two sets of three to four stout, blunt teeth; the posterior comb has nine or ten small teeth. The wings are more distinctly infuscated with yellow-brown. The abdomen is dark brown to black in ground color, densely covered with velvety brown pubescence.

Length: Body, 4.75 mm.; wings, 5.25 mm.

Holotype male from Cayamas, Cuba, "8.6" (E. A. Schwarz). Allotype female, Barceloneta, Puerto Rico, Dec. 8, 1932, on corn leaf (Anderson, Mills, and Faxon). Four paratypes: One male same data as allotype; two females, Saba, Dutch West Indies, Jan. 1937 (S. T. Danforth), and one female, Aibonito, Puerto Rico 11. 10. 1925, no collector given, accession number F5102.

Type and allotype returned to the United States National Museum, two paratypes returned to the American Museum of Natural History, and two paratypes retained in the University of Hawaii collection.

***Philia segregata*, n. sp.**

(Figs. 11a-c)

This species is related to *P. plaumanni* (Edwards) but is readily differentiated by having the thorax of both sexes entirely black, rather than rufous; by having three opaque, finely rugose longitudinal vittae down the mesonotum, rather than the mesonotum being entirely polished and smooth. Also the arrangement of the thoracic combs is different in the two species, and the claspers of *segregata* are pointed, rather than blunt.

Male.—Entirely dark colored, rather thickly black pilose species. *Head*: The antennae are twelve segmented, the last two segments are rather closely joined; the two basal segments are yellow, tinged with brown, the flagellum is brown. The head is not produced beyond the bases of the antennae. The palpi are rather short, the segments are scarcely longer than wide. The ocellar tubercle is strongly developed, about three or four times higher than one ocellus. *Thorax*: Polished black except for three finely rugose longitudinal vittae which extend down the mesonotum; the median vitta extends to the anterior margin of the

mesonotum. The mesonotal combs are each made up of about five small, sharp pointed teeth on each side, with just a narrow separation in the middle of the comb. The posterior comb has several tiny lateral teeth displaced backwards. The halteres are dark brown to black. *Legs*: Dark brown to black, tinged with rufous in the ground color and rather densely black pilose. Each front tibia has one spine on the posterodorsal surface near the basal third of the segment and four spines arranged obliquely near the middle (fig. 11a). The apical spur is nearly two times larger than the apical spines. The hind legs are slender, the tibiae and tarsi are straight sided. The hind tibiae are 2.25 times longer than the basitarsi and the basitarsi are about 7.5 times longer than wide. *Wings*: Faintly infuscated with yellow, yellow-brown along the anterior margin. Stigma and anterior veins dark brown; posterior veins, yellow-brown. The costa extends about three-fifths the distance between the apices of the radial sector and vein M1. *Abdomen*: Entirely black and covered with black pile. Ninth tergum, nearly three times wider than long (fig. 11b), the posterior margin is straight. The cerci are broad and blunt. The ninth sternum is gibbose on the posterior median margin and the claspers are pointed at the apices (fig. 11c).

Length: Body, 4.55 mm.; wings, 4.65 mm.

Female.—Similar in most respects to the male. The pleura are tinged brownish red in the ground color and the wings are more deeply infuscated with yellow-brown than in the male. The head is about one-half longer than wide and is slightly tapered toward the posterior margin. The portion of the head behind the eyes is slightly greater in length than the eyes. The head is not produced beyond the bases of the antennae. The basal two segments of the antennae are yellow, tinged lightly with brown. The abdomen is velvety brown. The middle set of spines on the front tibia sometimes contain five spines.

Length: Body, 4.7-5.5 mm.; wings, 6-6.75 mm.

Holotype male and allotype female, Nova Teutonia, Brazil, 27° 11' B. 52° 23' L., 23-24 Nov. 1940 (Fritz Plaumann). Thirteen paratypes, six males and seven females, same locality and collector as type taken on several dates in September, October and November, 1939 and 1940.

Type, allotype and two paratypes being deposited in the United States National Museum. The remainder of the paratypes are being distributed among the following collections: British Museum (Natural History), Bernice P. Bishop Museum, and the University of Hawaii.

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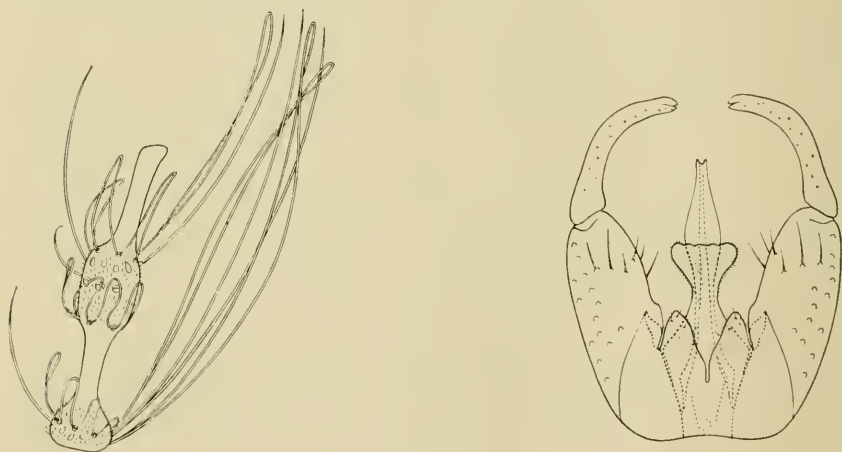
**PHAENOBREMIA DOUTTI, A NEW GALL MIDGE PREDATOR OF
APHIDS IN CALIFORNIA**

(DIPTERA: CECIDOMYIIDAE)

A. EARL PRITCHARD, *University of California, Berkeley*

Larvae of the genus *Phacnobremia* Kieffer (= *Aphidoletes*, Felt not Kieffer) are found commonly preying on aphids in the eastern United States and western Europe. Dr. R. L. Doutt has reared adults from similar larvae found feeding on aphids on shrubs and trees at Albany, California.

According to Dr. Doutt, "The adults are crepuscular and activity begins after sunset. On two successive evenings in mid-June, 1958, observations were made of aphids infesting the growing tips of



Phacnobremia doutti, n. sp., male. Fig. 1, antennal segment; fig. 2, hypopygium.

Salix lasiolepis. No activity of adult *Phacnobremia* was noted until 8:45 P.M. Pacific Daylight Saving Time. By 9:00 P.M. the adult flies were extremely abundant. Both males and females were collected hovering above the aphid colonies, but the failing light prevented closer observation. The field collected adults were placed in a laboratory cage containing an iris plant heavily infested with the tulip bulb aphid, *Anuraphis tulipae* (Fonse.). Oviposition began immediately.

"Dissections of newly emerged females reared in the laboratory showed that they are apparently incapable of oviposition for at least 24 hours. It is probable that copulation occurs on the first night of emergence, and oviposition definitely begins on the second.

"Laboratory rearings were successful not only on the tulip bulb aphid, but also on the green peach aphid, *Myzus persicae* (Sulz.). In

the field the larvae were found primarily on cotoneaster, pyraecantha, apricot, and willow.”

Phaenobremia doutti, n. sp.

The hypogium of *Phaenobremia doutti* is similar to that of *P. recurvata* (Felt), from which it differs in that the distal part of the tegmen is slender. The legs are very long. Dr. R. H. Foote kindly compared specimens with Felt's types.

Male.—Flagellar segments each (fig. 1) with the proximal neck about as long as second node, the distal neck slightly longer than the proximal one. Posterior legs about two and one-half times as long as body; posterior tibia and second tarsal segment each as long as posterior femur; third tarsal segment of posterior leg about one-half length of second. Hypopygium (fig. 2) with tenth tergite (dorsal plate) deeply and triangularly incised; tenth sternite (ventral plate) extending well beyond the tergites, strongly widened and subtruncate distally; tegmen extending well beyond tenth segment, widened somewhat at level of caudal margin of tenth sternite and narrow distally. Length of wing, 2.5 mm.

Holotype.—Male, Albany, California, November, 1958 (R. L. Doutt); in the Pritchard collection.

Paratypes.—Fifteen males; same data as holotype.

This species is named in honor of Dr. R. L. Doutt, University of California, Albany.

A NEW RECORD OF PARASITISM OF *LYGUS LINEOLARIS* (P. DE B.)
(HEMIPTERA) BY TACHINIDAE (DIPTERA)

Tachinid parasites are known from various Hemiptera, but rearing records from *Lygus* appear to be uncommon. This new record may have additional interest because of the method of obtaining the parasites in the laboratory.

In connection with feeding studies on sucking insects in the laboratory, more than five hundred adult *L. lineolaris* were collected from several host plants near Madison, Wisconsin, during late October, 1958. Twenty insects were placed into each rearing container, which consisted of a pint ice cream carton with a Petri dish lid. Fresh green beans were provided for food, and water was supplied through a dental cotton wick. Mature parasite larvae emerged in about three weeks at room temperature, and formed puparia within a few hours on the floor of the container. The puparia were placed singly in glass vials plugged with cotton. Adult flies emerged 10-15 days after puparial formation.

Ten specimens were obtained. These specimens were determined by C. W. Sabrosky, Entomological Research Division, U. S. Department of Agriculture. The males were *Oedematopteryx pulverca*

(Coq.) and *Alophorella aenciventr*s (Will.). The females of the two genera could not be distinguished.

Painter (60th Ann. Rept. Ent. Soc. Ontario 1929, 102) reported on parasitism of *Lygus* by *Alophora* (= *Oedematopteryx*) *opaca* Coq. This species attacked *Lygus* in late summer and overwintered as a partially grown maggot within the body of the host.

The small percentage of parasitism by Tachinidae that exists in Wisconsin may be a factor in the overwintering mortality of *Lygus*. Parasites would ordinarily be undetected except under conditions of mass collections in the field and subsequent incubation in the laboratory. More extensive use of laboratory incubations would give additional knowledge on host-parasite relations in the Hemiptera.

JOHN T. MEDLER, *Dept. of Entomology, University of Wisconsin, Madison.*

ERRATA

The following changes should be made in "A Synoptic Catalog of the Mosquitoes of the World, Supplement I" by Alan Stone, in Vol. 63, No. 1, pp. 29-52 of the *Proceedings*:

- Page 29, Footnote—line 2. Change "St" to "Rd."
- Page 30, 23—line 5. Transpose "2" and "3."
- Page 31, 59—line 4. Change "in" to "on."
- Page 39, 155—line 3. Change "stimulus" to "stimulans."
- Page 40, 158—Raise 158 up two lines.
- Page 41, 177—line 7. Change "kabaensis" to "kabaenensis."
- Page 42, 186—line 2. Insert "("" after "Yamada."
196—line 2: Delete: "Yamada) †."
208—Delete entire line.
- Page 44, 223—line 1. Italicize "bigotii" and "bigoti."
line 2. Delete entire line.
- Page 46, 272—lines 1 and 4. Change "Blanton" to "Mendez."
273—line 1. Change "Blanton" to "Mendez."
- Page 47, 277—line 2. Change "Blanton" to "Mendez."
- Page 51, 339—Change "21" to "31."
355—line 2. Change "brucci" to "brucei."
Index—arboricolus, johnsoni, keenani, and mesodenticulatus.
Change "Blanton" to "Mendez."
—aurovenatus. Change "201" to "200."

**ANNOTATED LIST OF THE TYPES OF NEARCTIC ICHNEUMONIDS
IN EUROPEAN MUSEUMS**

(HYMENOPTERA)

HENRY TOWNES, *Museum of Zoology, The University of Michigan, Ann Arbor*

It is fortunate that most of the types of Nearctic ichneumonids are in North American museums. Excluding those types formerly in North American collections but now destroyed or lost, only 129 types are not in the United States or Canada, and these are (or were) all in Europe. Many of the types in Europe were well described originally, and others have been subsequently clarified by European authors. A few remained enigmas, and their unsettled identity has been a continuous threat to nomenclatural stability. On trips to Europe in 1958 and 1960, efforts were made to see all ichneumonid types of Nearctic origin in European museums. This work was incidental to other studies, but since the majority of the Nearctic types were seen, notes on them are being published to clarify as many names as possible, and to serve as a reference list for anyone who may be able to carry it further. Some of the types listed as "lost" may still be present in museums not visited, or perhaps were overlooked in the museums where searches have already been made.

The locations of the types are indicated by city names. Thus "Munich" means the Zoologische Sammlung des Bayerischen Staates, Menzinger Str. 67, Munich, West Germany. Other names, like Copenhagen, Stockholm, London, Vienna, etc., likewise mean the principal insect collections in those cities. The curators of these collections were all very helpful on my visits to their museums. To all I express my sincere appreciation. Dr. Børge Petersen of the University Zoological Museum in Copenhagen has supplied lectotype data on several of the Greenland types, in cases where I neglected to get this information when traveling in Europe. Dr. J. Aubert has sent supplementary information on the type of *Ichneumon detritus*.

More complete bibliographic data on the species listed than was practical to give here, may be found in my catalogue of the Nearctic Ichneumonidae (1944 and 1945. Mem. Amer. Ent. Soc. no. 11).

This study was supported by grants from the Dow Chemical Company and the National Science Foundation.

ALPHABETIC LIST OF TYPES OF NEARCTIC ICHNEUMONIDS IN EUROPE

- Allocaampus cubitalis** Morley, 1912. Name preoccupied by Szépliget, 1906. Renamed *Enicospilus exebitalis* by Walkley, 1958. Type: ♀, labeled "St. Johns Bluff, east Florida" (London). This is a specimen of *Enicospilus glabratus* Say, 1836 (new synonymy).
- Aneuclis erythrostomus** Cameron, 1903. Type: ♀, labeled "Ormsby Co., Nev., July, Baker" (London). This is a tersilochine of undetermined genus.
- Angitia laticeps** Roman, 1938. Type: ♀, from central Lapland (Stockholm). Paratypes from Greenland are in Oxford. This belongs in *Horogenes*, in the *Exareolatus* Group. The name *laticeps* is preoccupied in *Horogenes* by Viereck, 1925. It was renamed *Horogenes patens* by Townes in 1945.

- Anilasta groenlandica** Roman, 1916. Type: ♀, labeled "Eidi. Grönl. Kleku." (Stockholm). This is a species of *Horogenes*.
- Anomalon flavicorne** Brullé, 1846. Name preoccupied by Say, 1823, renamed *Heteropelma fulvicorne* by Townes, 1945. Lectotype: ♀ (labeled lectotype in 1958), "America Sept." (Paris). This is *Heteropelma fulvicorne* Townes, as commonly understood.
- Anomalon laterale** Brullé, 1846. Type: lost, looked for in Paris and Turin but not found.
- Anomalon nigro-varium** Brullé, 1846. Type: lost, looked for in Paris and Turin, but not found.
- Apechtis rugulosa** Morley, 1914. Type: ♀, labeled "British Columbia" (London). This is a robust, dark colored specimen of *Tromatobia ovivora* Boheman, 1821. It comes under the definition of the subspecies *ovivora* as given in my recent revision of the Nearctic species of *Tromatobia*, but is atypical.
- Astomaspis maesticolor** Roman, 1933. Type: ♀, from East Greenland but data on type not copied (Oslo). This is an *Alegina*. *Alegina maesticolor* Roman is a new combination.
- Ateleophadnus bicarinatus** Cameron, 1903. Type: ♀ (only the tips of tarsi remaining), labeled "Ormsby Co., Nev., July, Baker" (London). According to a paratype (?) in Pomona, Calif., this is a synonym of *Scambus (Ateleophadnus) pterophori* Ashmead, 1890. See Townes, 1944 (Mem. Amer. Ent. Soc. II: 28).
- Atractodes arcticus** Holmgren, 1872. Type: ♂, labeled "Grönland, Nordenskj. Exp." (Stockholm). This is a species of *Atractodes*. Roman (1916. Arkiv för Zoologi 10 (22): 8) considers it a subspecies of *Atractodes bicolor* Gravenhorst, 1829.
- Atractodes aterrimus** Holmgren, 1872. Type: ♂, labeled "Nordenskj. Exp., Grönland" (Stockholm). I did not see it.
- Banchus groenlandicus** Aurivillius, 1890. Lectotype: ♂, labeled "Auleitsivik, 1-12: 7, Grönland, Nordskj Exp. 83" (Stockholm). This is a synonym of *Banchus monileatus* Gravenhorst, 1829.
- Banchus tricolor** Cameron, 1903. Name preoccupied in *Banchus* by Schrank, 1802. Renamed *Banchus reparandus* by Schulz, 1906. Type: ♂, labeled "Ormsby Co., Nev., July, Baker" (London). This is a synonym of *Banchus inermis* Provancher, 1874.
- Bassus groenlandicus** Holmgren, 1872. Type: ♂, labeled "Grönland, Nordenskj. Exp." (Stockholm). This is a *Homotropus*.
- Bassus maculifrons** Holmgren, 1868. The name is preoccupied. Described from San Francisco, Calif. The type is a female, presumably in the Stockholm Museum. I did not search for it. Judging from the original description, this is the same as (*Bassus*) *Homotropus pacificus* Cresson, 1868 (new synonymy).
- Bassus melanogaster** Holmgren, 1872. Type: ♂, from northern Greenland. The type is presumably in Stockholm but I did not see it. *Melanogaster* is a species of *Homotropus*.
- Bathymetis testaceicornis** Cameron, 1908. Type: ♀, labeled "Ormsby Co., Nev." (London). This is a *Phaogenes s. l.*, to which genus *testaceicornis* is hereby transferred.

- Campoplex arcticus** Curtis, 1835. Type: could not be found in London. Some of the Curtis material went to the Melbourne museum. In 1959, Dr. A. N. Burns, Curator of Insects at the Melbourne museum, searched for this type in the Curtis collection. It was not present.
- Campoplex xanthogaster** Brullé, 1846. Type: ♀, without data (Paris). This is a synonym of *Dusona brachiator* Say, 1836.
- Campsocryptus (!) brevicornis** Cameron, 1903. Type: ♀, labeled "Claremont" (London). This represents the Californian subspecies of *Campsocryptus calip-terus* Say, 1836. It will be treated further in my forthcoming revision of the Nearctic *Campsocryptus*.
- Cidaphrurus nigrolineatus** Cameron, 1903. Type: ♂, labeled "Ormsby Co., Nev., July, Baker" (London). This is a *Banchus*.
- Coelichneumon barnstoni** Morley, 1915. Type: ♂, labeled "Hudson Bay" (London). This is a species of *Ichneumon* that is closely related to *Ichneumon ater* Cresson.
- Coelichneumon solutus occidentalis** Roman, 1934. Type: ♂, labeled "E. Greenland, Jameson Land, VIII-33, D. Lack." (London). The type represents a subspecies of *Ichneumon solutus* Holmgren, as indicated by Roman.
- Cratichneumon aurivilli** Roman, 1916. Type: ♀, labeled "Godthaab, Grönl., Klekm." (Stockholm). Heinrich (1956. *Canad. Ent.* 88: 686-689) has discussed *aurivilli*, synonymized it with "*Ichneumon*" *lariae* Curtis 1835, and redescribed the species.
- Cryptocentrum lineolatum** Kirby, 1837. Type: ♂, without locality data (London). This is a species of *Rhyssa*, of which *Rhyssa albomaculata* Cresson, 1864, is a synonym.
- Cryptus arcticus** Schiödte, 1857. Types: 2♂, 6♀, from Greenland (Copenhagen). This is *Trachysphyrus arcticus* Schiödte, as commonly understood.
- Cryptus fabricii** Schiödte, 1857. Types: ♂, ♀, from Greenland (Copenhagen). This is a subspecies of *Trachysphyrus laborator* Thunberg.
- Cryptus retentor** Brullé, 1846. Lectotype: ♀, labeled "Carolina, Bose" (Paris). This is the species commonly known as *Campsocryptus retentor* Brullé. It is not a true "*Campsocryptus*," however, and a new genus will be erected for it in a forthcoming paper.
- Cryptus semirufus** Brullé, 1846. Type: ♀, labeled "Am du Nord, Lesueur" (Paris). This is a *Cubocephalus*, rather similar to *Cubocephalus eximius* Cresson, but a distinct species. We have specimens of it from North Carolina and Maryland. *Cubocephalus semirufus* is a new combination.
- Dinotomus vulpinus** var. **nigrothorax** Strand, 1912. Type: ♂, labeled "aus *Papilio asterius* Cram. Nordamerika" (Berlin). This is *Trogus pennator* Fabricius 1793, a specimen with the mesopleurum and some smaller areas on the thorax blackish brown.
- Ecphoropsis longiceps** Roman, 1914?. Type: ♂, data not copied from label of type (Leningrad). Although the type locality is in Siberia, the species is recorded also from Greenland, so is included in this list. It is an aberrant species of *Campoletis*. *Campoletis longiceps* is a new combination.
- Enytus maculipes** Cameron, 1903. Type: ♀, labeled "Santa Clara Co." (London). This is a synonym of *Horogenes eurcka* Ashmead, 1890.

- Ephialtes brevis** Morley, 1914. Lectotype: ♀, labeled "Hudson's Bay" (London). This is a species of *Pimpla*, related to *Pimpla manifestator* Linnaeus, 1758. It is discussed further in my recent revision of the Nearctic species of *Pimpla*.
- Eriborus triannulatus** Cameron, 1908. Type: ♂, labeled "Santa Clara Co." (London). This is a *Campoplex*. *Campoplex triannulatus* Cameron is a new combination.
- Erymotylus druryi** Kriechbaumer, 1901. Lectotype: ♀ (labeled lectotype in 1958), labeled "New York, Sept. 15, 1898" (Munich). This is a synonym of *Enicospilus americanus* Christ, 1791.
- Erythrocryptus rufus** Cameron, 1903. Type: ♀, labeled "mountains near Claremont" (London). This is a synonym of *Ischnus inquisitorius atriceps* Cresson, 1878.
- Eurycamptus nova-scotiae** Morley, 1912. Type: ♀, labeled "Nova Scotia" (London). This is a synonym of *Ophion nigrovarius* Provancher, 1874 (new synonymy).
- Exochilum diabolus** Morley, 1913. Type: ♀, labeled "India" (Oxford). This is a synonym of *Therion tenuipes* Norton, 1863. The type is discussed further in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).
- Exochilum neglectum** Morley, 1913. Type: ♀, labeled "Hudson's Bay" (London). This is a species of *Gravenhorstia*. *Gravenhorstia neglecta* Morley is a new combination.
- Exochilum verticale** Morley, 1913. Type: ♀, labeled "Hudson's Bay" (London). This is a synonym of *Therion fuscipenne* Norton, 1863 (new synonymy).
- Glypta xanthogastra** Cameron, 1903. Type: ♀, labeled "Ormsby Co., Nev., July, Baker" (London). This is a species of *Glypta*.
- Hemiteles clipeator** Lundbeck, 1897. Type: ♂, labeled "Orpiksuit, 17-7-90." (Copenhagen). Orpiksuit is a locality in Sydostbugten (= South-East-Bay). This is a *Symplecis*. *Symplecis clipeator* is a new combination.
- Hemiteles gastricus** Holmgren, 1868. Type: ♀, labeled "California Kinb." (Stockholm). This belongs in *Charitopes*. *Charitopes gastricus* Holmgren is a new combination.
- Ichneumon ambulatorius** Fabricius, 1775. Type: ♀, without locality data (London). This is a species of *Pterocormus*, of which *P. jucundus* Brullé, 1846, is a synonym. This type is discussed further in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).
- Ichneumon annulatorius** Fabricius, 1775. Type: ♂, lacking head, propleura, and front legs, without locality data (London). This is a *Pterocormus*, of which *P. funestus* Cresson, 1864, is a synonym (new synonymy). The type is discussed further in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).
- Ichneumon astutus** Holmgren, 1868. Type: ♂, labeled "California Kinb." (Stockholm). This is a species of *Cratichneumon*. *Cratichneumon astutus* Holm-

gren is a new combination. *Ichneumon russatus* Cresson, 1877, is probably a synonym.

Ichneumon atratus Fabricius, 1781. Lectotype: ♀, without data, labeled as type by R. A. Crowson in 1959 (Glasgow). I have not seen the type but Dr. R. A. Crowson of Glasgow University has examined it and compared it with specimens sent to him. The type is *Megarhyssa atrata atrata* as defined in my revision of the Nearctic species of *Megarhyssa* (1960. U. S. Natl. Mus. Bul. 216 (2): 427).

Ichneumon banchiformis Megerle, 1802. Type: [♂], lost, presumably destroyed. I looked for the type in the Vienna museum and could not find it. The original description fits *Cryptanura spinaria* Brullé, 1846, very well. *I. banchiformis* is hereby transferred to *Cryptanura* and *spinaria* synonymized with it.

Ichneumon clarimontis Cameron, 1908. Type: ♂, labeled "California" (London). This is a species of *Pterocormus*.

Ichneumon detritus Brullé, 1846. Type: ♀, labeled "Caroline l'Herminier" (Paris). This is a *Probolus*. *Probolus detritus* Brullé is a new combination. *Amblyteles illaetabilis* Cresson, 1877, is a synonym of *detritus* (new synonymy). I am indebted to Dr. J. Aubert for supplementary notes on Brullé's type.

Ichneumon erythromelas McLachlan, 1878. Type: ♀, labeled "surface of snow, 800 ft., 82°29', 8-7-76, Arctic Regions" (London). This is a *Cratichneumon* as the genus is currently understood.

Ichneumon eximius Stephens, 1835. Type: ♀, without locality data (London). This is a species of *Ichneumon*. *Ichneumon caeruleus* Cresson, 1864, is a synonym. The type is discussed further in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).

Ichneumon ferrugator Swederus, 1787. Type: ♀, without locality data (London). Swederus described a female, plus another female which he thought was either the male or possibly a distinct species. His typical specimen is a *Pseudamblyteles*, a species not yet identified in subsequent material but certainly Nearctic, judging from its general appearance. The second specimen, which he described as atypical, is a species of *Spilichneumon* that occurs in northeastern United States and adjacent Canada.

Ichneumon ferrugator Fabricius, 1793. Name preoccupied by Swederus, 1787. Type: ♂, labeled "Caroline, Coll. Bose 1828" (Paris). This is a synonym of *Trogomorpha trogiformis* Cresson, 1864.

Ichneumon ferrugator Kirby, 1837. Name preoccupied by Swederus, 1787. Type: ♀, without locality data (London). This is a *Banchus*, a synonym of *Banchus flavescens* Cresson, 1868 (new synonymy).

Ichneumon georgicus Megerle, 1802. Type: [♀], lost, presumably destroyed. I looked for the type in the Vienna museum but could not find it. The original description fits only *Megarhyssa macrurus* Linnaeus, 1771, and *M. greenei* Viereck, 1911. The type was from Georgia, most likely from the coastal area (Savannah?), which was the most accessible part around the year 1802. This would indicate that the subspecies of the type was either *Megarhyssa macrurus macrurus*, or *Megarhyssa greenei floridana*, with the choice between the two rather arbitrary. Using the right of choice by the first revisor, the name *Ichneumon georgicus* has been assigned to the synonymy of *Megarhyssa macrurus*

macrurus (Townes, 1960. U. S. Natl. Mus. Bul. 216 (2): 434).

Ichneumon grandis Brullé, 1846. Lectotype: ♀, labeled "Coll. Serville, Philadelphia" (Turin). There were 2 ♀ syntypes in Turin, very similar to each other. I labeled one of them as lectotype in 1958. These are *Protichneumon grandis* Brullé, as commonly understood. The species *grandis* is divisible into a northern and a southern subspecies, the northern subspecies averaging smaller, paler, and with longer flagellar segments in the female and the scutellum usually white in the male. Philadelphia is in the zone of intermediates between these two forms. The types of *grandis* are almost intermediate but a little closer to the southern than to the northern form. The southern subspecies is hereby designated *Protichneumon grandis grandis* Brullé and the northern subspecies *Protichneumon grandis ambiguus* Cresson. The type locality of *ambiguus* is also near or in the zone of intermediates but the type is like the northern subspecies. Heinrich has misquoted these observations and reversed the application of the name *grandis* (1961, Canad. Ent., Suppl. 15:25).

Ichneumon groenlandicus Lundbeck, 1897. Type: ♀, labeled "17-8-92, Taser suak" (Copenhagen). This is an *Aoplus*, a rather stout species. *Aoplus groenlandicus* Lundbeck is a new combination.

Ichneumon irritator Fabricius, 1775. Type: ♀ (lacking head and front legs), without data (London). This is *Dolichomitus irritator*, as commonly understood.

Ichneumon jucundus Brullé, 1846. Type: ♀, labeled "Coll. Serville, Amer. Sept." (Turin). This is the species commonly determined as *jucundus*, but is a synonym of *Pterocormus ambulatorius* Fabricius, 1775.

Ichneumon laetus Brullé, 1846. Lectotype: ♂, labeled "Bastard, Am. du Nord, 1832" (Paris). This is *Pterocormus laetus* Brullé, as commonly understood.

Ichneumon lariae Curtis, 1835. Type: could not be found in London. Some of the Curtis material went to the Melbourne museum. In 1959, Dr. A. N. Burns, Curator of Insects at the Melbourne museum, searched for this type in the Curtis collection. It was not present.

Ichneumon lugubator Gravenhorst, 1807. Type: ♂, without locality data (Wroclaw). The type is a specimen of *Pterocormus rufiventris* Brullé, 1846. *Rufiventris* is therefore a synonym of *lugubator* (new synonymy). *Pterocormus lugubator* Gravenhorst is a new combination. This case is discussed also in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).

Ichneumon lunator Fabricius, 1781. Type: 2 ♀, without data (Glasgow). I have not seen the types, but Dr. R. A. Crowson of Glasgow University has examined them and made comparisons with specimens sent to him. They are *Megarhyssa macrurus lunator* as defined in my revision of the Nearctic species of *Megarhyssa* (1960. U. S. Natl. Mus. Bul. 216 (2): 430).

Ichneumon luteus americanus Christ, 1791. Type: lost, presumably destroyed. The original description and figure leave little doubt that this is *Enicospilus americanus* Christ, as commonly understood.

Ichneumon macrurus Linnaeus, 1771. Type: ♀, labeled "lunator Fabr. no. 120" in the handwriting of J. E. Smith (Linnaean Society Collection, London). The type is in reasonably good condition and is a typical specimen of *Megar-*

- hyssa macrurus macrurus* as defined by Townes and Townes in 1960 (U. S. Natl. Mus. Bul. 216 (2): 434).
- Ichneumon mathewi** Cameron, 1907. Type: ♂, labeled "Vancouver's Island" (London). This is a synonym of *Stenichneumon culpator cincticornis* Cresson, 1864, new synonymy.
- Ichneumon morio** Fabricius, 1781. Type: ♀, lacking hind tibiae and tarsi, without locality data (London). This is *Therion morio* Fabricius, as commonly understood. Since the type lacks the hind tibiae and tarsi it is rather difficult to determine. The middle legs, however, are complete and give some characters, and after careful comparison of the type with specimens of *T. tenuipes*, *T. nigripes*, and *T. morio* (of authors), I was able to be sure that it is a specimen of *T. morio*.
- Ichneumon niger** Brullé, 1846. Lectotype: ♀, labeled "Am. Sept. Milbert" (Paris). This is a synonym of *Cratichneumon unifasciatus* Say, 1825. The male which Brullé tentatively associated with the female is a male of *unifasciatus* (= *niger*), also in the Paris Museum, so was correctly determined.
- Ichneumon pennator** Fabricius, 1793. Type: ♀, without data, labeled "pennator" in Fabricius' handwriting (Kiel, but on deposit in Copenhagen). This is *Trogus pennator* Fabricius as commonly understood.
- The species was described from a specimen in Olivier's collection. The specimen now in Fabricius' personal collection is presumed to be the true type. Olivier's collection is lost. Fabricius described two "*Ichneumon pennator*" in 1793, in the same publication (*Entomologia systematica*, pages 155 and 171). The former (p. 155) is the present species, the latter (p. 171) is a European species that is considered a synonym of *Iseropus inquisitor* Scopoli, 1763. If the European "*pennator*" is ever considered a valid species, it should be the one to be renamed, rather than the American *Trogus pennator*. As first revisor of this situation I am permitted the arbitrary choice of which of the two names is to be the junior homonym.
- Ichneumon pulcher** Brullé, 1846. Lectotype: ♀, without data (Paris). This is *Ichneumon pulcher* Brullé as commonly understood. The male described by Brullé is also present in Paris. It represents a different species of *Ichneumon*.
- Ichneumon rufiventris** Brullé, 1846. Lectotype: ♀, without locality data (Paris). This is a *Pterocormus*, a new synonym of *Pterocormus lugubator* Gravenhorst 1807 (new synonymy). This is the species commonly determined as *rufiventris* except that several similar-appearing species are sometimes confused under this name. The true *rufiventris* (= *lugubator*) is the species among these with the most slender hind femur.
- Ichneumon succinctus** Brullé, 1846. Lectotype: ♂, labeled "Bastard Am. du Nord 1832" (Paris). This is *Eutanyacra succincta* Brullé, as commonly understood.
- Ichneumon tibialis** Brullé, 1846. Type: ♀, labeled "Philadelphia" (Paris). This is a synonym of *Pterocormus devinctus* Say, 1825.
- Jethsura ferruginea** Cameron, 1902. Type: ♀, lacking abdomen, labeled "New Mexico" (London). This is a synonym of *Ischnus pyriformis* Provancher, 1875 (new synonymy). The species *pyriformis* has been placed in *Phaeogenes*. It is not a true "*Phaeogenes*," but needs a separate genus. It is hereby transferred to *Jethsura* (type: *Jethsura ferruginea* Cameron = *pyriformis* Provancher).

- Joppa maurator** Brullé, 1846. Lectotype: ♂, labeled "Caroline, Coll. Bose. 1828" (Paris). This is *Limnetha maurator* Brullé, as commonly understood.
- Lampronota aciculata** Cameron, 1903. Type: ♀, labeled "California" (London). This is a *Cylloceria*, at present considered a synonym of *Cylloceria sexlineata* Say, 1829.
- Limneria deichmanni** Nielsen, 1907. Lectotype: ♀, labeled "Hekla Havn, 15-V-1892, Deichmann" (Copenhagen). This is a *Hyposoter*, and a synonym of *Hyposoter pectinatus* Thomson, 1887. The lectotype was selected by Dr Børge Petersen.
- Limneria extrema** Holmgren, 1872. Type: ♀, labeled "Grönland, Nordenskj Exp." (Stockholm). This is a species difficult to place generically. It may well remain in "*Olesicampe*," as in recent catalogues.
- Limneria frigida** Lundbeck, 1895. Lectotype: ♀, labeled "Tasiusak 24. vii. 1899, Lb. leg." (Copenhagen). This is a species of *Hyposoter*. The lectotype was selected by Dr. Børge Petersen.
- Limneria hospita** Holmgren, 1868. Type: ♂, labeled "California Kinb." (Stockholm). This is a species of *Horogenes*. *Horogenes hospitus* Holmgren is a new combination.
- Macrojoppa californica** Cameron, 1911. Type: sex?, from Irukel Pass, Calif. (lost, not found in London). This is a synonym of *Trogus pennator* Fabricius.
- Mesochorus fuscipennis** Brullé, 1846. Type: ♀, Carolina (lost?). The type was originally in the Paris Museum, and may be there now. I did not come across it in 1958 but made no special search for it. The description fits *Labena grallator* grallator Say, 1836, and there is no reason to doubt that *fuscipennis* is a synonym of this.
- Mesolelius groenlandicus** Roman, 1930. Lectotype: ♂, labeled "visit'g Archangelica officinalis, O. U. Exp., 1928, 22.VII., 2000 ft., W. Greenland, Godthaab Fj., Matuola, R. W. G. Hingston" (Oxford). This lectotype was selected by Dr. Børge Petersen. I did not study it.
- Mesostenus spinarius** Brullé, 1846. Type: ♀, labeled "Caroline" (Paris). This is the species commonly understood as *Cryptanura spinaria* Brullé, which is a synonym of *Cryptanura banchiformis* Megerle, 1802 (new synonymy).
- Metopius cordiger** Brullé, 1846. Type: ♂, labeled "Caroline ex coll. Bose" (Paris). This is a synonym of *Metopius pollinctorius* Say, 1836.
- Metopius medianus** Morley, 1912. Type: ♂, labeled "Georgia" (London). This is probably a synonym of *Metopius basalis basalis* Cresson, 1879.
- Neophion crassus** Morley, 1912. Type: ♂, labeled "Nova Scotia" (London). This is a species of *Ophion*.
- Neotheronia septemtrionalis** Krieger, 1905. Type: ♂, labeled "Nord-Carolina, Ralph S. V., Sept. 1900" (Berlin). This is the species commonly interpreted as *Theronia septemtrionalis*. The type has the dark markings poorly developed. Its first tergite is a little brownish medially, where there is usually a fuscous band. The first two segments of its hind tarsus are yellowish (the rest missing).
- Ophion atricolor** Olivier, 1811. Type: ♀, lost, presumably destroyed. It may, however, be in the Bose collection in Paris. I did not search for it there. The original description, plus the type locality "Carolina," leave no doubt that

- Olivier's *atricolor* is the commonly understood *Thyreodon atricolor atricolor* Olivier.
- Ophion bifoveolatus** Brullé, 1846. Type: ♂, labeled "Coll. Serville, Philadelphia" (Turin). This is an uncommon species of *Enicospilus* that occurs mostly in southeastern United States. The "*Ophion bifoveolatus* Brullé" of American authors is not this species but should be called *Ophion nigrovarius* Provancher, 1874. *Enicospilus bifoveolatus* Brullé is a new combination.
- Ophion chloris** Olivier, 1811. Type: lost, presumably destroyed. I see no reason to expect that the type will ever be found. The species was described from "North America." The description will fit a large number of species of *Netelia*. In the absence of a type, the name should be applied according to the first revisor. The only authors to express a definite opinion about the name were Norton (1863. Proc. Ent. Soc. Philadelphia 1: 364) and Morley (1913. Revision of the Ichneumonidae . . . in the British Museum . . . 2: 106). The opinion of both of these authors was that *chloris* is the same as *Netelia* (*Netelia*) *geminata* Say, 1829. In the absence of definite proof to the contrary, it seems necessary to accept their opinion. *Ophion geminatus* Say, 1829, is therefore a synonym of *Netelia* (*Netelia*) *chloris* Olivier, 1811. For a redescription of *chloris* (= *geminata*) see Townes (1938. Lloydia 1: 214).
- Ophion lateralis** Brullé, 1846. Type: ♀, labeled "Caroline, l'Herminier" (Paris). This is a synonym of *Enicospilus purgatus* Say, 1836.
- Ophion relictus** Fabricius, 1798. Type: ♂, without data, labeled "*relictus*" in Fabricius' handwriting (Kiel, but on deposit in Copenhagen). This is a species of *Barylypa*. I have not compared Nearctic specimens with the type so cannot now state its specific identity. *Barylypa relictus* Fabricius is a new combination.
- Ophion rugosus** Brullé, 1846. Lectotype: sex? (lacks abdomen), labeled "Bastard, Amer. du Nord, 1839" (Paris). This is a synonym of *Enicospilus americanus* Christ, 1791.
- Ophion stramineus** Taschenberg, 1875. Type: ♀, without data except "110" (Halle). This is a synonym of *Enicospilus bifoveolatus* Brullé, 1846 (new synonymy).
- Opisorhyssa flavopicta** Kriechbaumer, 1890. Type: ♀, labeled "America septemtrion." (Vienna). This is a species of Lissonotini, near the genus *Lissonota*. I suspect that it is not from America. There is a series of reared specimens in the Washington museum, but these are without locality data so give no information about the range of the species.
- Orona petiolaris** Cameron, 1903. Type: ♀, labeled "San Mateo Co., Cal., Baker" (London). This is a *Phrudus*, subgenus *Mengersenia*.
- Otacustes nigro-ornatus** Cameron, 1908. Type: ♀, labeled "San Mateo, Calif." (London). This is a synonym of *Gelis tenellus* Say, 1836.
- Paniscus immaculatus** Morley, 1913. Type: ♀, labeled "US" (London). This is a synonym of *Netelia* (*Netelia*) *ocellata* Viereck, 1909.
- Parabatus deceptor** Morley, 1913. Type: ♂, labeled "Nova Scotia" (London). This is *Netelia* (*Parabatus*) *deceptor* Morley, as now understood.
- Phygadeuon bicolor** Lundbeck, 1897. Lectotype: ♀, labeled "5-6/1877, Fredrikshaab, Steenstrup" (Copenhagen). This is an *Endasys*, subgenus *Endasys*.
- Phygadeuon plectiscinus** Roman, 1916. Type: ♀, labeled "Eidi, Grönk, Klekm, Typ" (Stockholm). This is a species of *Charitopes*. *Charitopes plectiscinus* Roman is a new combination.

- Phygadeuon solidus** Lundbeck, 1897. Types: 2 ♀, labeled "Tasiusak, 24-7-89" (Copenhagen). This is a species of *Phygadeuon*.
- Pimpla annulipes** Brullé, 1846. Type: ♀, labeled "no. 136" but without locality data (Paris). This is a *Coccygomimus*, of which *Coccygomimus inflatus* Townes, 1938, is a synonym. It is a species of the eastern Nearctic Region, not of South America. The type is discussed further in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).
- Pimpla koltthoffi** Aurivilius, 1890. Type: ♂, labeled "Nunasarnausak, 19-20; 6, Grönland, Nordskj. Exp. 83" (Stockholm). This represents the Greenland race of *Hoptectis quadricingulatus* Provancher, 1881.
- Pimpla melanocephala** Brullé, 1846. Type: ♀, lacking head and abdomen, without locality data (Paris). Name preoccupied by Gravenhorst, 1829. This is a synonym of *Theronia hilaris* Say, 1829.
- Pimpla nordenskiöldi** Holmgren, 1872. Lectotype: ♀, labeled "Grönland, Nordenskj. Exp.," and labeled lectotype in 1958 (Stockholm). This is a synonym of *Coccygomimus sodalis* Ruthe, 1859.
- Pimpla transgressa** Holmgren, 1868. Type: ♀, labeled "California Kinb." (Stockholm). This is a species of *Scambus*, subgenus *Scambus*. The type was borrowed from Stockholm in 1957 and studied in America by both Mr. G. S. Walley and myself. Its identity is discussed in Mr. Walley's recent revision of the Nearctic species of *Scambus*.
- Plectiscus arcticus** Roman, 1930. Lectotype: ♀, labeled "In willow scrub. O. U. Exp., 1928, 17-VII, 2000 ft., W. Greenland, Godthaab Fj., Matuola, R. W. G. Hingston" (Oxford). The lectotype was selected by Dr. Børge Petersen. I did not see it.
- Plectiscus hyperboreus** Holmgren, 1869. Types: ♂, ♀, labeled "Green Harbour, Holmgren" (Stockholm). I did not see these types. The pin label data were supplied by Dr. Børge Petersen.
- Pristomerus bollowi** Enderleien, 1921. Type: ♂, labeled "New York" (Warsaw). This is a synonym of *Pristomerus pacificus melleus* Cushman, 1920.
- Pseudamblyteles ormsbyensis** Cameron, 1908. Type: ♂, labeled "Nevada" (London). This is a species of *Pterocormus*.
- Pseudamblyteles peroratus** Cameron, 1908. Type: ♂, labeled "Ormsby Co., Nev." (London). This is a species of *Pterocormus*. *Pterocormus peroratus* is a new combination.
- Rhyssa laevigata** Brullé, 1846. Lectotype: ♂ (labeled lectotype in 1958), without locality data (Paris). This is a synonym of *Megarhyssa atrata atrata* Fabricius, 1781. Though males of the subspecies *atrata* and *lineata* are not distinguishable, it is probable that Brullé's type came from the range of the subspecies *atrata* rather than of the subspecies *lineata*. In Brullé's series of *Rhyssa laevigata* there was also a male of *Megarhyssa greeni greeni*. This seems to be the specimen he described as a "variety."
- Sagaritis californicus** Holmgren, 1868. Type: ♂, labeled "California Kinb." (Stockholm). This is a species of *Campoletis*, near to or the same as *Campoletis argentifrons* Cresson, 1864.
- Saotis hoeli** Román, 1933. Type: ♀, labeled "Hoels eksp. 1929 Østgrönland" (Oslo). The species is a *Saotis*.
- Spilocryptus cecropiae** Habermehl, 1919. Type: ♀, bred from "*Pl. cecropiae*,"

- in the Habermehl collection (Worms). I did not see the Habermehl collection, but the type undoubtedly is a specimen of *Gambrus extrematis* Cresson, which is our only ichneumonid of the Mesostenini that parasitizes the ceecropia moth.
- Stenomacrus terebrator** Roman, 1934. Type: ♀, labeled "East Greenland, Jameson Land" (London). This is a *Stenomacrus* with an unusually long ovipositor.
- Stiboscopus erythrostomus** Cameron, 1908. Type: ♀, labeled "mountains near Claremont, Calif." (London). This is a *Thycaella*, to which genus it is hereby transferred.
- Thalessa histrio** Kriechbaumer, 1890. Type: ♂, labeled "Morrison, Wh. mont., 1879. I." (Vienna). The type is a dwarf specimen of *Megarhyssa macrurus lunator* Fabricius, 1781, that lacks the areolet in both wings. It seems almost certain that it was collected in the White Mountains of New Hampshire by H. K. Morrison on one of his trips to that area. Kriechbaumer gave the locality only as "White Mts., North America." The name *histrio* is preoccupied in *Megarhyssa* by Christ, 1791.
- Theronia atalantae** var. *americana* Krieger, 1906. Lectotype: ♀, labeled "British Columbia, Heyme Bay" (Berlin). This is *Theronia atalantae fulvescens* Cresson, 1865.
- Tricyphus vulpinus** Szépligeti, 1900. Type: ♀ labeled "Jeanette" (Budapest). This is a specimen of *Tricyphus elegans vulpinus* as defined by Hopper (1939. Trans. American Ent. Soc. 65: 338).
- Trogus exesorius** Brullé, 1846. Lectotype: ♂, labeled "Caroline, Coll Bosc 1828" (Paris). This is a synonym of *Trogus pennator* Fabricius, 1793.
- Trogus nubilipennis** Haldeman, 1846. Type: lost; paratype in Geneva museum. I did not visit the Geneva museum, so did not see the paratype. It has been redescribed by Schulz (1911. Zool. Annal. 4: 38). This is *Conocalama nubilipennis* Haldeman, as commonly understood.
- Trogus obsidianator** Brullé, 1846. Lectotype: ♂, labeled "Philadelphie, coll. Serville" (Turin). This was described from syntypes from Carolina and from Philadelphia, both stated to be females. The specimen from Carolina is in the Paris Museum, lacking head, propleura, legs, and abdomen beyond the third segment. I did not determine its sex. The Philadelphia specimen, designated above as lectotype, is a male. Both lectotype and paratype are *Gnamptopelta obsidianator obsidianator* Brullé, as commonly understood.
- Trogus vulpinus** Gravenhorst, 1829. Type: ♀, labeled "Italia" (Wroclaw). Gravenhorst described the species from "Circa Genuam" [Genoa] but noted a second specimen, similar to the type from "America borealis." This second specimen (also a female) is also in Wroclaw, labeled "America boreal." Both the type and the second specimen represent *Trogus pennator* Fabricius, 1793, as commonly understood. It is generally agreed among later authors that Gravenhorst's specimen from "near Genoa" was mislabeled and actually came from the Nearctic Region. Kriechbaumer (1875. Stettin. Ent. Ztg. 36: 39) was the first to point out the correct type locality.
- Xylonomus tartarus** Morley, 1913. Type: ♀, labeled "India" (Oxford). This is a synonym of *Xorides stigmapterus stigmapterus* Say, 1824. The type is discussed further in my paper on "Some ichneumonid types in European museums that were described from no locality or from incorrect localities (Hymenoptera)" (Proc. Ent. Soc. Washington, in press).

INJURY TO MAN BY EARWIGS

(DERMAPTERA)

References to earwigs that pierce human skin sufficiently to draw blood are rare. Wellman (1909, Proc. Ent. Soc. Wash. 10:159) reported that *Dacnodes wellmani* Burr nipped a man severely with its forceps in Angola, and Baer (1904, Bull. Soc. Ent. France: 163-164) described the discomfort caused by large numbers of *Doru lineare* (Esch.) to people in Argentina. In the latter case, an earwig would get onto the neck or face of a person, and when removed, it would sometimes pinch with its forceps, drawing droplets of blood at the paired points of entry, causing discomfort and inflammation occasionally lasting several days.

On July 17, 1960, in Fort Myers, Florida, I was attacked by a two-thirds-grown nymph of *Lapidura riparia* (Pallas) (det. A. B. Gurney), an earwig which is almost cosmopolitan in warm countries and has recently become prevalent in the southern United States (see Schlinger, *et al.*, 1959, Jour. Econ. Ent. 52:247-249 for California records). After working in my yard for a couple of hours in a pair of work shoes ordinarily stored in my garage, I sat down to rest. I soon felt a peculiar itching in my toe, but wiggling it did not relieve the sensation. After 10 or 15 minutes I removed the shoe and found a hole in the toe of my sock through which the side of my second toe was bleeding profusely. Shaking the shoe caused a rather large nymph, well smeared with blood, to run off. It was captured and seemed distended with blood, so that chewing apparently caused the injury, though the forceps may have been involved. My toe had an abraded area about 5 mm. in diameter, still itching and burning. This area was inflamed and weeped serum for a few hours—in three days it was well healed but still red. After this time I felt no further discomfort.

These earwigs are abundant under debris about our lawn and garden on the Caloosahatchee River, and occasionally enter our house.

FRED C. BISHOPP, 3823 East River Drive, Fort Myers, Florida.

BOOK REVIEW

PSYCHODIDAE, by L. W. Quate. Guide to the Insects of Connecticut. Part 6, The Diptera or True Flies of Connecticut. Fasc. 7. Conn. State Geol. and Nat. Hist. Survey Bul. 92: 1-48, illus. 1960.

The small, delicate "moth flies" have long been among the more difficult families in which to make identifications. This publication makes the task much easier for the fauna of northeastern North America. Thirty-six species in six genera are treated although only ten have been collected in Connecticut. Only adults are treated at the species level and it is to be hoped that some one will undertake a thorough taxonomic study of the immature stages. The keys and illustrations are excellent and the introductory section contains valuable information on biology, anatomy, techniques, and systematics.

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A NEW SPECIES OF *Polygenis* JORDAN FROM FLORIDA, WITH
REMARKS ON ITS HOST RELATIONSHIPS AND ZOOGEOGRAPHIC
SIGNIFICANCE

(SIPHONAPTERA: RHOPALOPSYLLIDAE)

PHYLLIS T. JOHNSON¹ and JAMES N. LAYNE²

Polygenis Jordan is a group of Neotropical origin. Although the majority of its species occur in South and Central America, several are found in Mexico and one species, *Polygenis gwyni* (C. Fox), extends into the southern United States where it is typically found on the cotton rat, *Sigmodon hispidus*.

Recent collections of ectoparasites in the course of ecological studies on small mammals in Florida³ have revealed the presence of a new species of *Polygenis*. Perhaps even more surprising than the occurrence of this undescribed form at the periphery of the geographical distribution of the genus is the fact that it has been found only on the Florida deer mouse, *Peromyscus floridanus*, a species of the wide-ranging genus *Peromyscus*, that is endemic to Florida. The new species belongs to a group which contains *P. gwyni* but it appears no more closely related to *gwyni* than to certain South American species particularly *P. occidentalis* (Cunha).

In addition to diagnosing, describing, and illustrating the new flea, this paper considers the factors involved in its narrow host specificity and the possible zoogeographic significance of its occurrence on *Peromyscus floridanus*.

Polygenis floridanus Johnson and Layne, new species

Type data.—Male holotype from *Peromyscus floridanus*, 10 miles west of Gainesville, Alachua County, Florida, 13 January 1958, J. N. Layne, collector, JNL Mammal No. 3147, deposited in the collections of the U. S. National Museum, type No. 65669. Female allotype as holotype except 31 July 1957, JNL Mammal No. 2883. Paratypes, all from *P. floridanus*, include 122 males and 131 females from Alachua County and 58 males and 59 females from Highlands, Gilchrist, Levy and St. Johns Counties, Florida, all collected by J. N. Layne in 1957 and 1958.

Paratypes have been deposited in the collections of the University of Florida, the U. S. National Museum, the British Museum (Natural History) at Tring, the Chicago Natural History Museum, the Canadian National Collection, Ottawa, and in the collections of the authors.

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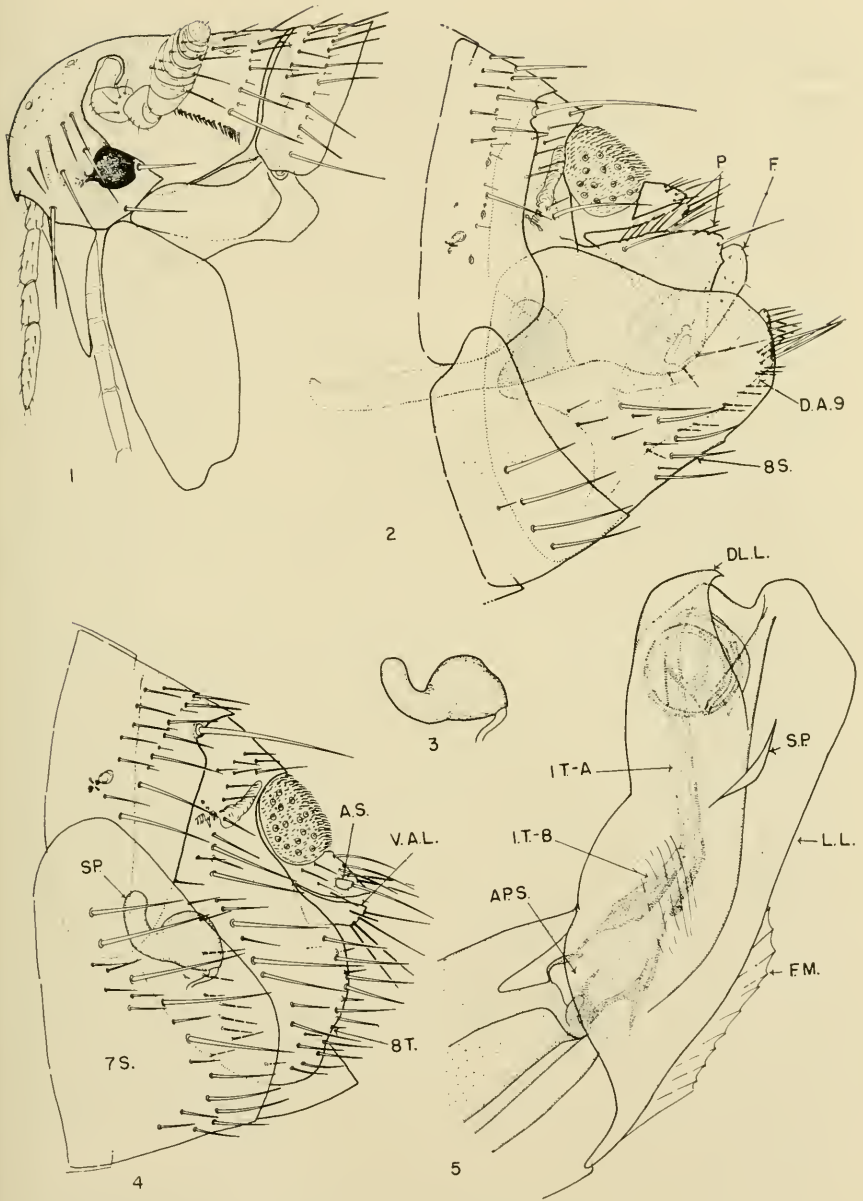
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³This research has been supported in part by Grant G-3215 from the National Science Foundation.

Diagnosis.—*P. floridanus*, n. sp., like all known *Polygenis* except *litus* (J. and R.) has 3 rows of bristles on the postantennal area of the head. It belongs to that group of *Polygenis* which have 6 dorsal notches containing large bristles on the metatibia and with only 2 large bristles in the penultimate notch. It is a typical member of *Polygenis* in that the male aedeagus has the sclerotized inner tube reflected ventrally, and the female spermatheca has the hilla (tail) sharply defined from the bulga (body or head) and the bulga does not have the cribriform area elongate. *P. floridanus*, n. sp., is most likely to be confused with *gwyni* (C. Fox), the only other species of *Polygenis* known to occur in the same area with it, but may be separated by the following characters: In life, *floridanus*, n. sp., is paler in color. Male *floridanus* has the distal arm of the ninth sternum (fig. 10) obliquely truncate apically, with small bristles along its entire ventral (posterior) margin and apex, and has a group of 3 (rarely 2 or 4) much longer bristles at the posteroventral apical angle, rather than being sharply rounded apically and lacking the large bristles as in *gwyni* (fig. 8). The movable finger of the elasper (fig. 9), is broadest subapically so that the anterior and posterior margins are not parallel as in *gwyni* (fig. 7). Female *floridanus* is similar to *gwyni* except in details of the chaetotaxy. In *floridanus* females the seventh sternum (fig. 4) bears the usual vertical row of large bristles, and anterior to this row, an irregularly-spaced row of smaller bristles, some of which extend to the lower level of the sensillum, rather than having only the one row of large bristles. The eighth tergum also has a row of smaller bristles anterior to the vertical median row rather than a patch of small bristles anterior to the median row and all well below the level of the ventral anal lobe. As well, sterna 4 to 6 of *floridanus* females each have from 1 to 5 small bristles anterior to the main row, rather than lacking such bristles or without small bristles on each of these sterna.

Description.—*Holotype, male.* **Head** (fig. 1): Eye large and dark. Preocular row of 3 (3-4)⁴ large bristles; frontal row of 5 (4-6) smaller bristles and 2 large postocular bristles. Genal lobe short, acute apically. Postantennal region with 3 rows of bristles. Labial palpi not extending to apex of coxae. **Thorax:** Prosternosome (fig. 1) not projecting noticeably between coxae. **Legs:** Fifth tarsal segment of first leg normal, claws of equal size and this segment more than twice as long as broad. Hind tibia (fig. 6) with 6 dorsal notches containing bristles as follows (base to apex): 2-2-2-3-2-3. **Abdomen:** Basal abdominal sternum with 5 to 6 small bristles laterally on each side (always less than 10). Sterna 3 to 7 with a few scattered small bristles anterior to normal row of large bristles. Typical tergum with 2 rows of bristles, first of 10 to 14 small, pale bristles on each side; second of 8 to 12 larger bristles separated by intercalary hairs. **Modified segments** (fig. 2): Eighth tergum with 7 to 10 small bristles on each side above spiracle; 1 small bristle and 1 to 2 large ones below or at level of spiracle. Fixed process of elasper (P. and fig. 9) with notch on posterior margin near apex; large acetabular bristle at middle of level of insertion of movable process. Movable process or finger of elasper (F. and fig. 9) with anterior margin almost straight to level of subapical tooth; rounded apically; posterior margin convex so that finger is broadest subapical-

⁴Variations in paratypes given in parentheses.



Polygenis floridanus, n. sp.: Fig. 1, head, holotype; fig. 2, modified segments, holotype; fig. 3, spermatheca, allotype; fig. 4, modified segments, allotype; fig. 5, aedeagal endchamber, paratype from Alachua County. Figures 2 and 4 are not drawn to the same scale.

ly. Eighth sternum (8S), deeply divided ventrally so that the distance from this division to the posterior apex is greater than the distance from the division anteriorly to the row of large bristles. Distal arm of ninth sternum (D.A. 9 and fig. 10) broad, sides parallel, entire structure slightly curved upward toward apex which is obliquely truncate; ventral (posterior) margin and apex with row of small bristles which increase in density as they progress apically; some of small bristles on apex mesal and directed slightly downward; apex with 3 (rarely 2 or 4) much larger bristles at ventroapical angle. **Aedeagus** (fig. 5): Apodeme broad, rounded anteriorly; apodemal and penis rods not much longer than apodeme. Apodemal strut (AP.S.) not greatly flared anteriorly, of normal *Polygenis* type. Basal part of inner tube (I.T.-B) shorter than straight portion of apical part (I.T.-A); apical part reflected ventrally into unevenly coiled spiral. Sidepiece (S.P.) short, subtriangular, with obtuse angle rounded, farther apicad than usual in the genus. Distolateral lobes (D.L.L.) acuminate apically. Crochet indistinct. Lateral lobes (L.L.) apically rounded. Fluted membrane (F.M.) not conspicuously large.

Allotype, female. **Head, thorax and legs** as in male except for usual sexual differences. **Abdomen:** Basal abdominal sternum, each side, with fewer than 15 small bristles on lateral surface. Sterna 3 to 6 each with at least 1 small bristle anterior to vertical row of large bristles on at least one side, usually with 2 to 4 small bristles in this position. Typical tergum, each side, with anterior row of 7 to 12 pale medium-sized bristles and posterior row of 9 to 11 large dark bristles separated by small intercalary hairs. **Modified segments** (fig. 4): Posterior margin of seventh sternum (7S.) more or less evenly rounded; seventh sternum with anterior row of small, unevenly spaced bristles and posterior row of large bristles; posterior row extending about to level of ventral anal lobe. Eighth tergum (8T.) each side with one mesal subapical, one lateral subapical, and two medio-lateral rows of bristles; more posterior of two medio-lateral rows with large dark bristles extending from venter to dorsum; anterior medio-lateral row with small, pale bristles, in some specimens this row complete from venter to dorsum, in other specimens lower part of this row an uneven patch of 5 to 6 bristles followed dorsally by a space and then a more even upper row. Above spiracle on eighth tergum, 5 to 9 large and small bristles. Ventral anal lobe (V.A.L.) obliquely truncate apically, apical bristles long. Anal stylet (A.S.) of variable length, typically one and one-half to two times as long as broad, bearing one long apical bristle and one minute hair on ventral margin. Spermatheca (SP. and fig. 3) with hilla sharply separated from bulga, about as long as bulga and less than half as broad; bulga usually not darkly pigmented, dorsally rounded, cribriform area not produced into snout.

Length.—Male holotype: 1.7 mm.; female allotype: 2.1 mm.

Polygenis floridanus, n. sp.: Fig. 6, hind tibia, holotype; fig. 9, elasper, holotype; fig. 10, distal arm of ninth sternum, holotype. *P. gwyni* (C. Fox): Fig. 7, elasper, male from *Didelphis*, Arkansas; fig. 8, distal arm of ninth sternum, male from *Didelphis*, Arkansas. Figures 7 to 10 are all drawn to the same scale.



HOST RELATIONSHIPS OF *POLYGENIS FLORIDANUS*, N. SP., AND *P. GWYNI*

In a series of 158 *Peromyscus floridanus* from which all fleas were recovered and determined, *Polygenis floridanus*, n. sp., occurred on 150 (94.9%) of the specimens and was the only flea present in 135 cases. *Polygenis gwyni* occurred on 16 (10.1%) of the mice, *Ctenophthalmus pseudagyrtus* on 8 (5.1%), and *Hoplopsyllus affinis* on 1 (0.6%). The relative abundance of these fleas in the total collection of 365 specimens was as follows: *P. floridanus*, n. sp., 92.3% (337); *P. gwyni*, 5.2% (19); *C. pseudagyrtus*, 2.2% (8); and *H. affinis*, 0.3% (1).

These data show that *Polygenis floridanus*, n. sp., is the typical and only common flea occurring on *Peromyscus floridanus*. Large numbers of fleas have been collected from a variety of small mammals in *Peromyscus floridanus* habitats as well as from other habitat-types, yet no other hosts have thus far been recorded for this flea. Although it is probable that its host restriction is not absolute and that further collecting may produce at least an occasional record on other mammals, there seems to be no question that this flea is indeed narrowly host specific and that *Peromyscus floridanus* is the true host. The fact that the biology of the latter has begun to be studied only during the past few years explains why *Polygenis floridanus*, n. sp., has escaped notice until so recently.

In contrast to its low incidence on the Florida deer mouse, *Polygenis gwyni* is the most common flea encountered on other small rodents in Florida. In these studies it has been the only flea recorded from the cotton rat, rice rat (*Oryzomys palustris*), harvest mouse (*Reithrodontomys humulis*), cotton mouse (*Peromyscus gossypinus*), and oldfield mouse (*Peromyscus polionotus*). It occurs with greatest frequency and abundance on the cotton rat, which is probably the true host. Although taken fairly regularly on the rice rat, it has been recorded only rarely from the harvest mouse, cotton mouse, and oldfield mouse. Each of these hosts frequently occurs in association with cotton rats.

The relatively few occurrences of *Polygenis gwyni* on *Peromyscus floridanus* have been in habitats in which cotton rats were particularly abundant and probably can be classed as accidental transfers. In 9 of the 16 instances of *P. gwyni* being found on *Peromyscus floridanus*, *Polygenis floridanus*, n. sp., was also present. That *gwyni* has been the species involved in these transfers is not unexpected, for the variety of hosts known for the former together with its more extensive geographic distribution would appear to indicate a broader environmental tolerance than that of *floridanus*, n. sp.

ZOOGEOGRAPHIC CONSIDERATIONS

Peromyscus floridanus is a distinctive species of the wide-ranging and varied genus *Peromyscus* whose present limited range is suggestive of a relic form. This species has also been recorded from the Pleistocene in Florida (Sherman, 1952). The current classification of *Peromyscus*, essentially that of Osgood (1909), recognizes several sub-

genera and a number of species groups and includes *Peromyscus floridanus* as the sole representative of the subgenus *Podomys*. Although the interrelationships of the various subgenera and species groups of this large and complex genus are still much in doubt, a recent study by Hooper (1958) indicates that on the basis of penial structure *P. floridanus* most closely resembles *P. lophurus* and *lepturus* from southern Mexico and Guatemala. The disjunct distributional pattern of *P. floridanus* and the species with which it presently appears to have its closest affinities may be interpreted in terms of Pleistocene events. Presumably a once continuously distributed, warmth-adapted, coastal plain form of *Peromyscus* was forced into separate refuges in Florida and southern Mexico or Central America during glacial advances, the isolated elements of the original population subsequently undergoing evolutionary divergence in the widely separated eastern and western centers. Blair (1958) discusses a number of other cases of east-west discontinuities in the distributional patterns of related taxa of various mammals, amphibians, and reptiles which appear to reflect a similar Pleistocene history. Further examples could be cited from among birds, arthropods, and plants.

Compared with other known species of *Polygenis*, *P. floridanus*, n. sp., shows great morphological similarity to *P. occidentalis* (Cunha), a South American species. Thus, the distributional pattern of *Polygenis floridanus*, n. sp., and a very closely related species parallels in a striking way that of *Peromyscus floridanus* and its putative allies. The intimate association of the flea and mouse adds further support to the zoogeographic inference based on the morphological evidence of the infrageneric relationships of parasite and host considered separately. The logical explanation of this particular host-flea relationship seems to be that the ancestral *Peromyscus* stock was infested with a species of *Polygenis* whose range was fragmented along with its host's during the Pleistocene. In the case of at least the eastern segment of the *Peromyscus* population the association of the flea with its original host persisted, and both have probably diverged from their respective ancestral species.

FACTORS INVOLVED IN THE HOST SPECIFICITY OF *POLYGENIS FLORIDANUS*, N. SP.

The marked restriction of *Polygenis floridanus*, n. sp., to *Peromyscus floridanus* requires isolating mechanisms which not only prevent completion of the life cycle in association with other small rodent species occurring in the same habitats but also bar cross-host exchanges of adult fleas. Furthermore, the hypothesis that the present mouse-flea relationship is one that originated during or before Pleistocene times presumes that such isolating mechanisms have been functioning throughout the history of the association.

On the basis of present evidence, the observed host specificity of *Polygenis floridanus*, n. sp., appears to be the result of an interaction between several factors involving the ecology and habits of both host and parasite. *Peromyscus floridanus* is typically a burrow dweller. It frequently uses the deep tunnels of the gopher turtle (*Gopherus*

polyphemus) and may also inhabit the extensive underground burrow systems of the pocket gopher (*Geomys pinctis*). These burrows apparently provide a distinctive microhabitat in the generally dry environments inhabited by the animals. It is of interest to note that both the gopher turtle and pocket gopher are forms with western affinities, and it is possible that the utilization of the burrows, particularly those of the former, by *Peromyscus floridanus* has had a long history. The Florida deer mouse frequently takes refuge in small ground holes, but to what extent these are used for the nest is unknown. Although other species of small rodents which may occur in association with *Peromyscus floridanus* occasionally utilize gopher turtle or other types of burrows, there is little overlap with the latter in their nest site preferences.

There is also evidence that the nests of *Peromyscus floridanus* differ from those of other small mammals with which it may occur. Two *Peromyscus floridanus* nests found in excavated gopher turtle burrows consisted of a thick platform composed mainly of dry leaves, grasses, and other plant materials in one case and a crude, more or less spherical mass of similar material in the other. These nests, if typical of the species, are quite unlike the snug, well constructed nests of other small rodents, such as the cotton rat and cotton mouse, that may occupy the same habitats.

It appears, therefore, that the primary basis for the restriction of *Polygenis floridanus*, n. sp., to the Florida deer mouse is the fact that no other mammal species within the range of *Peromyscus floridanus* has nesting habits which provide the proper microclimatic conditions for the completion of the flea's life cycle.

Although the immature stages of *Polygenis floridanus*, n. sp., may be narrowly adapted to the particular microenvironment of *Peromyscus floridanus* homesites, this does not explain why the adult fleas should be so highly restricted to this host. Additional ecological factors plus certain behavioral characteristics of the flea appear to play a role in this connection. *Peromyscus floridanus* is closely confined in its ecological distribution to xeric, sandy habitats of generally open vegetative aspect. The principal plant associations in which the species occurs are sand pine scrublands and longleaf pine/turkey oak woodlands. Detailed descriptions of these associations are given by Laessle (1942, 1958). The Florida deer mouse is the characteristic and often the only common small mammal in these habitats; thus its association with other species of small rodents is usually relatively low and this in turn limits the opportunities for accidental transfer of its fleas.

The over-all incidence of fleas and the mean number per infested host on mice captured outside of their nests have been found to be approximately 33 per cent and 2.3, respectively. These data indicate that only a comparatively small adult flea population is ever present on free-ranging mice. In addition, observations made while handling mice on live-trapping studies and when collecting fleas and other

ectoparasites from specimens brought into the laboratory, indicate that *Polygenis floridanus*, n. sp., is neither an active nor powerful jumper and does not readily abandon its host.

It seems reasonable to infer, therefore, that the relatively low numbers of fleas on mice outside their nests, together with the poorly developed jumping habits of *Polygenis floridanus*, n. sp., and its reluctance to leave a host, combine with the partial ecological isolation of *Peromyscus floridanus* from other small mammals to very effectively reduce the possibilities of direct cross-host transfers.

Although the ecological and behavioral factors discussed above seem adequate to account fully for the narrow host specificity of *Polygenis floridanus*, n. sp., the existence of certain physiological adaptations of the adult flea to the host cannot be ruled out. For example, from the data presently available, it is impossible to determine whether the flea is potentially polyhaemophagous but because of highly effective ecological and behavioral isolating mechanisms is but rarely able to encounter a new host species or whether there are in fact physiological factors which also contribute to its apparent association with a single host.

In summary, the narrow host specificity of *Polygenis floridanus*, n. sp., appears to be attributable to a combination of ecological and behavioral factors that are particularly successful in preventing dispersal to or survival on other host species. The ultimate isolating factor is probably a narrow adaptation of the flea to the particular microenvironment provided by the characteristic nests and nest sites of the true host, *Peromyscus floridanus*. Secondary factors effective in preventing direct dispersal of adult fleas to other mammals include the partial ecological isolation of the host, a low population of fleas on hosts outside their nests and burrows, and the absence of an active jumping habit in this species of flea and its reluctance to leave a host.

It is believed that the flea-host association under consideration originated during or before the Pleistocene and that the continued existence of such isolating mechanisms as described above has prevented transfer of the flea to new host groups, thus preserving the ancestral relationship.

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NOTES ON AMPHOROPHORA RETICULATA MASON

(Homoptera: Aphidae)

Amphorophora reticulata Mason (1925, U. S. Nat. Mus. Proc. 67:51, illus.) should be known as *Masonaphis* (*Ericobium*) *reticulata* (Mason), new combination. MacGillivray (1958, A Study of the Genus *Masonaphis* Hille Ris Lambers, 1939 (Homoptera, Aphididae, p. 123), who had not studied its type, suggested that *reticulata* might belong in *Masonaphis*, subgenus *Oestlundia* Hille Ris Lambers, and might be closely related to *M.* (*Oestlundia*) *marima* (Mason) and *rubicola* (Oestlund). The species does not belong in *Oestlundia* as defined by MacGillivray because it lacks marginal tubercles and a dark apical area in the forewings, and has fewer than 13 setae, in addition to the three apical pairs, on the distal segment of the rostrum. In the subgenus *Ericobium* MacGillivray, it is rather closely related to *borealis* (Mason), *fiumi* MacGillivray and *pepperi* MacGillivray.

The type of *reticulata* is a winged female mounted on a slide, with the body intact but uncleaned, and with the appendages in good position but with debris on some tarsi. Although it is difficult to distinguish some structures, it is possible to determine that the species may be distinguished from other species of *Ericobium* by the following combination of characters: Antennae entirely dark brown, but I, II, and area before sensoria on III, much lighter than remainder; III with 19 and 21 sensoria in a single row on basal 4/5ths of segment; length in microns, III, 688, IV, 544 and 576, V, 592 and 624, VI, base 176, unguis 880 and 960. Legs dark brown distally, from distal 4th of fore femora, from distal 3rd of middle femora, and from basal 3rd of hind femora; 2nd segment of hind tarsi 120 μ long; 1st tarsal segment of each leg with 3 setae. Cornicles entirely dark brown; 600 μ long; diameter, 32 μ at smallest point (basal 4th), 52 at widest point (distal 4th), 48 across narrow flange; 5-6 rows of reticulations on distal 8th, slightly imbricated from reticulations to basal 4th. Cauda pale, conical, 180 μ long, 110 μ wide at base; with 1 dorsal, and 3 setae on each margin. Distal rostral segment 120 μ long, with apparently 5 (exact number not determinable) setae in addition to the 3 apical pairs. Abdomen without marginal sclerites and tubercles. Eighth tergum with 4 slender setae 36-44 μ long.

The unique type of *reticulata* was collected on raspberry, Washington, D. C., July 27, 1907, by T. Pergande, who left no notes pertaining to the collection. It apparently has been assumed that raspberry was the true host of the insect, but I doubt this. The species differs distinctly from any *Masonaphis* recorded from *Rubus*, and is most closely related to species occurring on members of the Ericaceae. No examples of *reticulata* have been found in intensive collecting of aphids from *Rubus* in the Washington area during the last three years.

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CONCERNING THE IDENTITIES OF NANNOCRIX AND SOGONA, WITH
PERTINENT MORPHOLOGICAL NOTES
(CHILOPODA : GEOPHILOMORPHA : SOGONIDAE)

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The Louisianan genus *Nannocrix* was proposed by R. V. Chamberlin in 1918 (p. 376) for the reception of a single species, *porcthus*. There is no record that a subsequent specimen referable to *porcthus* was ever collected, and no other species has ever been described for the genus. The lack of additional records and species should not strike us as extraordinary, however, if we recall how poorly known the Gulf States fauna is.

When Carl Graf Attems presented his revision of the Geophilomorpha in 1929, his arrangement implied a close affinity between *Nannocrix* and the ubiquitous North American *Arcuophilus*, assigning both to the same section of the Geophilinae. This arrangement is entirely consistent with the information in Dr. Chamberlin's original characterization of *Nannocrix*. According to that description, in each genus the ultimate pretarsus is tuberculate, the ultimate pedal sternite is broader than long, and the coxopleural pores are said to be concealed beneath the adjacent sternite. In addition, the overall habitus of *Nannocrix* clearly suggests *Arcuophilus*. As was Attems, so also was Verhoeff impressed with the apparent similarity between the two genera (see Note A).

Nannocrix might have endured as an interesting chilopod rarity known only from the two original and apparently unavailable specimens, had not one of them been rediscovered in the course of my work in the chilopod collection of the Museum of Comparative Zoology at Harvard. Although the specimen has suffered from long immersion in alcohol and also lacks its antennae and parts of its ultimate legs, it is in sufficiently good condition to permit a new delineation of its significant characters with consequent proposals pertinent to its generic affiliation and specific identity.

Curiously enough, the rediscovery of *porcthus* at Harvard was nearly coincident with the reception from Dr. Nell B. Causey of some unidentified Arkansas specimens which have a distinct bearing upon the matter at hand. Before seeing the Harvard cotype I had determined, first that the Arkansas specimens were assignable to *Sogona*, the type-genus of Sogonidae, secondly that they probably represented a new species. It seems apparent now, however, that they are conspecific with the Harvard cotype of *porcthus*.

The reader who is familiar with the southeastern North American geophilomorph fauna should find this disclosure both surprising and confusing, chiefly because, although *porcthus* has an ultimate (tuberculate) pretarsus, the species of *Sogona* have owed their generic assignment to their lack of an ultimate pretarsus of any kind. In his original description of *minima*, the type-species of *Sogona*, Dr. Chamberlin wrote (1912, p. 432): "Anal legs without a claw." (His figure

number 2, however, represents what might be taken for some kind of an ultimate pretarsus). Subsequently he assigned new species to *Sogona* only if they lacked an ultimate pretarsus; species with any kind of ultimate pretarsus were referred to other genera. For instance, in 1943 (p. 17) he presented a key to sogonid genera, part of which is reproduced below:

- “8 (7) Anal legs without a claw 9
 9 (10) Anal legs ending in a short membranous article or
 appendage in place of a claw..... *Pycnona*, n. gen.
 10 (9) Anal legs with no such membranous appendage 11
 11 (12) Ventral pores present; first maxillae with telopodite
 single as usual..... *Sogona* Chamberlin . . .”

It is clear from this key that Dr. Chamberlin ascribed neither an unguiform nor a tuberculate pretarsus to *Sogona*: on the basis of the key, the genus is without any pretarsus on the ultimate leg. In 1946 (p. 69) he repeated these same couplets. It seems clear from what he has written that Dr. Chamberlin did not detect the small tuberculate ultimate pretarsus in the cotypes of *Sogona minima*. I have seen the Johnson City, Tennessee, female cotype upon which the original description was based; this specimen unquestionably has a small, distinct tuberculate ultimate pretarsus. It follows from this that the possession of this structure alone does not disqualify its bearer from membership in *Sogona*. Quite the contrary, for according to current practices pertinent to the evaluation of sogonid generic characters, since *minima* has a tuberculate ultimate pretarsus, the same structure should characterize every species assignable to *Sogona*. In summary: (1) *Nannocerix porcthus* is not a geophilid; it is a sogonid and a member of *Sogona*. (2) Since *minima* Chamberlin, which is the type-species of *Sogona* (original designation and monotypy), is congeneric with *porcthus* Chamberlin, which is the type-species of *Nannocerix* Chamberlin, 1918, is a junior subjective synonym of *Sogona* Chamberlin, 1912. (New synonymy). (3) Since *minima* does possess (a) an ultimate pretarsus, (b) that is an addition tuberculate, on the basis of currently accepted generic sogonoid criteria, all *Sogona* species should have tuberculate ultimate pretarsi. (In this connection it is important to stress that although it is current practice to include in one sogonid genus all species with a given common ultimate pretarsal condition, future revisionary studies may well show this to be untenable. For instance it may be desirable to include several pretarsal conditions in each of certain genera. The following assertion, number 4, is more satisfactory and is a more logically consistent statement of the matter). (4) Furthermore, no species with an ultimate tuberculate pretarsus is to be excluded from *Sogona* solely because it possesses this character, although, as we have seen, species have been so excluded to date.

Having assigned *porethus* to *Sogona*, we must next consider the question of its specific affinities. This is not too difficult, for if *porethus* is not conspecific with *minima*, then they are distinct but very similar species. As I shall attempt to show, there is evidence to favor each interpretation. But since it seems that the facts do not permit a confident resolution of the case, my decision here is to regard them provisionally as distinct species. This decision is contingent upon two considerations: (1) the fragmentary evidence at hand appears to lend slightly more support to the possibility that they are not conspecific; (2) since no convincing resolution is possible now, it is preferable not to bury the name *porethus* in synonymy where it might easily escape the further attention that its case demands.

The type specimens of *minima* and *porethus* are obviously very similar. On this basis of their comparison we could distinguish between the two species by employing the following apparently significant characters.

***Sogona minima*:** (1) poison calyx is small in size and in outline varies from ovate to subcordiform. (2) Both gland pits of each coxopleuron are located beneath the ultimate pedal sternite, i.e. each *anterior* pit is not displaced forward to lie largely or entirely beneath (dorsal to) the penultimate pedal sternite. The papillate lining membranes (Note B) of the gland pits are not greatly folded. (3) The species is apparently smaller in size. (4) The pedal count mode is apparently lower.

***Sogona poretha*:** (1) the poison calyx is large in size; in outline it is conspicuously elongate. It is neither ovate nor subcordiform. (2) Whereas the rear gland pit of each coxopleuron is situated beneath the ultimate pedal sternite, the *anterior* gland pit has been displaced far forward to lie largely or entirely dorsal to the penultimate pedal sternite deeply within the body. This condition gives the erroneous initial impression that there is only one gland and gland pit for each coxopleuron, since only one lies beneath the ultimate sternite on each side, the other having moved forward out of its normal position. The papillate lining membrane of the gland pit is highly folded, being thrown into complex and tortuous convolutions. (3) The species is apparently larger in size. (4) The pedal count mode is apparently somewhat higher in *poretha* than in *minima*.

The foregoing criteria certainly suggest specific dissimilarity; however, through the study of the additional, non-typical specimens and in the light of what we suspect to be true of other geophilomorphs, it is possible to show that the alternate possibility, i.e. that *minima* and *poretha* are conspecific, is not unreasonable. Some or all of the same differences, taken in the same order, might be interpreted alternately as follows. The reader is referred to the reference list of specimens and associated signal characteristics.

(1) Both poison calices are elongate in the two largest specimens (6, 7), while in the third largest specimen (8) one calyx is elongate, and the other is evidently intermediate: in all of the shorter specimens

(1-5) the calices are short. In addition, I have learned that at least in some—but apparently not in all—geophilomorphs the poison calyx can change variously in size and shape as body size increases during growth. Therefore, with reference to the *minima* specimens (1-5), we must not discount the possibility that the smaller calices are a function of ontogeny rather than of stable interspecific difference. (2) Study of the chart will reveal that: (a) coxopleural condition N is true of all of the smaller specimens (1-5) of both sexes; (b) all of the specimens manifesting condition D are larger, and none is a male. The following possibilities are suggested: (a) Forward displacement of the anterior coxopleural pit and associated glandular structure may be a function of growth; that is, it may first appear in position N but thereafter move gradually to position D concurrently with increasing body size, its definitive anterior position being a concomitant of sexual maturity. (b) Forward displacement to position D from N may be a reflection of sexual dimorphism manifest slightly before or with the appearance of sexual maturity. That is, displacement to position D may occur only in the females, for instance, to accommodate the growth of the rear reproductive apparatus within the confines of the rather narrow ultimate pedal segment. This possibility might be tested if a series of large males were available for examination: none is at present. (c) There is the chance that the character, displacement to D, is simply intraspecifically unstable and random, but this seems improbable. (d) Finally, we must not overlook the possibility that strong contractory telescoping of the ultimate pedal segment could conceivably account for the *temporary* displacement of the anterior gland forward. This seems to be weakened by the fact that specimens 6 and 8, whose gland pits are displaced forward, do not appear to be greatly, if at all, contracted posteriorly. (3) Small size could reflect youth rather than interspecific habitus. I cannot be certain that the smaller specimens (1-5) are actually mature adults. (4) The tendency toward lower pedal counts in specimens 1-5 may represent geographical or ecological variability. There is some evidence—however, by no means conclusive—that in some other geophilomorphs (e.g. in *Geophilus*, *Strigamia*, possibly in *Arctogeophilus*) variability of pedal count mode occasionally may be geographically clinal. There is also some reason to suspect modal variability to be related to change in altitude. Considerable additional study is needed and is now being carried out. Although we cannot yet be certain of the existence of geographically-linked modal shifts, or, if they do occur, then of their direction and causes, at least the preliminary evidence at hand does not permit us to discount the possibility of their occurrence, if not in all species, at least in some. Such clinal or ecological mechanisms would be operative in *Sogona*, especially since apparent modal shifts in a few species are suspected to occur in this same general corner of North America.

The foregoing are all possibilities that should be explored very carefully as new material presents itself. The provisional separation

of *minima* and *poretha* is favored at this time both by the morphological considerations above and by the contingent and purely practical device of avoiding the obscurity of synonymy where further investigation is indicated.

The chart below lists the eight specimens used in this study. S = position calyx is short, in outline it is ovate to subcordiform. E = poison calyx is elongate and larger. I = poison calyx is intermediate between E and S. N = normal position, i.e. the anterior gland pit is located beneath (dorsal to) the ultimate pedal sternite. D = displaced position, i.e. the anterior gland pit is displaced far forward to a new position dorsal to the penultimate pedal sternite.

Locality*	Species	Sex	mm.	Legs	Poison	Anterior
					Calyx	Coropleural Gland Pit
1	<i>minima</i> (♀ lectotype)	♀	16	55	S	N
2	<i>minima</i>	♀	18	53	S	N
3	<i>minima</i>	♂	16	53	S	N
4	<i>minima</i>	♂	18	59	S	N
5	<i>minima</i>	♂	19	59	S	N
6	<i>poretha</i> (♀ lectotype)	♀	40	63	E	D
7	<i>poretha</i> (?)	♀	28	63	E	D
8	<i>poretha</i> (?)	♀	21	63	E	D

* Localities: 1 = Tennessee, Johnson City. 2 & 3 = South Carolina, Clemson. 4 & 8 = Arkansas, Boyle State Park (Pulaski County). 5 = Arkansas, Magnolia. 6 = Louisiana, Creston. 7 = Arkansas, Little Rock.

The following description is based upon the Harvard cotype of *Nannocerix porethus*, here designated the lectotype. It has been compared carefully with specimens 7 and 8, with which it agrees closely in all significant particulars. Where it has been desirable to include extracts from the original description, I have enclosed them in parentheses and quotation marks. My own comments are included in brackets within the body of the description.

***Sogona poretha* (Chamberlin), new combination**

Nannocerix porethus Chamberlin, Ann. Ent. Soc. Amer., 11(4), p. 376 (1918).

Nannocerix porethus Chamberlin, Attems, Das Tierreich, Lief. 52, p. 216 (1929).

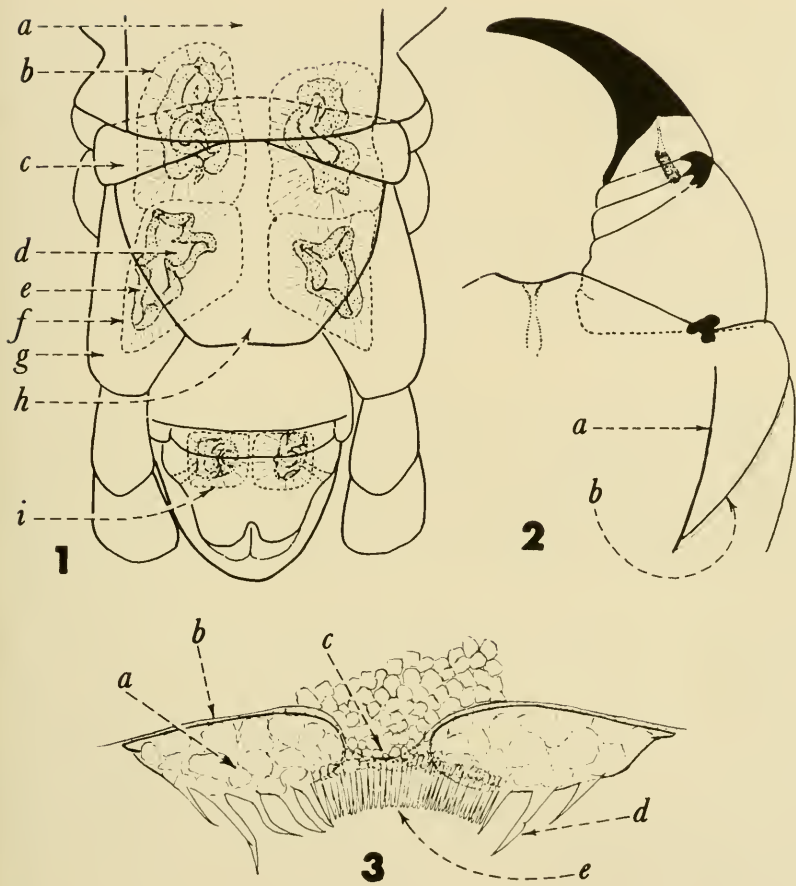
Museum of Comparative Zoology (Harvard) type number TC-38; hereby designated lectotype. Vial label in Chamberlin's handwriting, as follows: "Nannocerix porethus Chamb./Type./La.: Creston/Mar. 9, 1915 K. P. Schmidt."

Introductory.—Female. Length, about 40 mm. Pedal segments, 63. Body shape varying very little in width for most of its length, the last 2 or 3 pedal segments suddenly attenuate. Color: ("General color yellow, becoming dilute ferruginous in anterior region and sometimes in extreme posterior, the head deeper ferruginous. Antennae and legs yellow.")

Antennae.—("Antennae moderately short, three times as long as the cephalic plate. Attenuate distad. The ultimate article equal in length to the two preceding taken together. Proximally sparsely hirsute, becoming densely so distad with the hairs shorter.") [In specimen number 7 the antennae are notably attenuate as is customary in Sogonidae. Articles 1-6 or 7 sparsely, those remaining, densely setose from ventral aspect. Ultimate article with an outer and inner elongate patch of short, thick and hyaline special sensory setae.] **Cephalic Plate.** Dimensions: greatest length, 0.9 mm; greatest width, p. 85 mm, thus about as long as wide. Shape: sides slightly convexly rounded; anterior margin forming a very obtuse angle; rear margin very slightly incurved to expose full width of prebasal plate. Frontal suture absent, posterior divergent depressions not detected. **Clypeus.** Paraclypeal sutures pronounced posteriorly, interrupted anteriorly before reaching antennal sockets. Antero-centrally with two atypical very weak clypeal areas, these identified by paler color and finer areolation, seen with great difficulty; each vaguely elliptical and containing 2-3 setae. Without discernible prelabral plagulae. Setae: limited to approximate anterior half of clypeus, not in distinct rows, numbering about 32 in all; posterior geminate (prelabral) setae absent. Each bucca with a weak, interrupted transbuccal fold. **Labrum** (fig. 3). With no apparent midpiece (see Note C), the wide clypeal weakly areolate extension interposed between the widely separated sidepieces. Nearly the whole labral width with a dense fringe of long delicately hyaline and non-fibrous fimbriae, these more robust and longer on sidepieces and becoming shorter and thinner toward the middle of the labrum where they apparently arise from the clypeal extension. Each sidepiece separated from clypeus by a suture.

Mandible. Of the geophiliform type, i.e. with a row of simple hyaline teeth. **First Maxillae.** Coxosternum not divided or medially diastemate. Medial lobes weakly separated from coxosternum. Each telopodite almost imperceptibly biarticulate. Coxosternal lappets squamulate, thin and short, attaining nearly the base of the second telopodite article; telopodite lappets squamulate, essentially concealed from ventral view, thin and short, nearly attaining the end of the telopodite. **Second Maxillae.** Isthmus continuous, without medial division or indication thereof. Postmaxillary sclerites absent. Telopodite 1st article basally bicondylic; the claw long and thin, apically slightly deflected. **Prosternum** (fig. 2). Coarsely areolate as is most of the entire body. Pleuroprosternal sutures strongly oblique, passing forward to reach antero-lateral margin of prosternum (Note D). Subcondylic sclerotic lines nearly meeting condyles. [The character is apparently variable, since the lines are complete in one of the non-typical specimens.] **Telopodite** (fig. 2). Denticles absent. Ungula robust, slightly concave postero-dorsally, both edges smooth, not serrulate. Poison calyx strongly elongate, nearly uniformly covered with digitiform appendices. Poison gland swollen, passing down into the prosternal segment.

Tergites.—Basal plate widely evenly concave anteriorly exposing the prebasal plate; not sutured or sulcate. Remaining tergites (except the last) distinctly bisulcate. **Spiracles.** First 6 or so broadly weakly, vertically elliptical, thereafter becoming circular. **Legs.** Sparsely setose. Each pretarsus with somewhat swollen base, this with two acicular accessory spines of which



Sogona poratha (Chamberlin), lectotype ♀. Fig. 1, Posterior body segments. (Ventral aspect setae deleted). a, penult sternite. b, glandular tissue within the penult pedal segment. c, lateral extension of ultimate pedal presternite. d, lumen of right posterior glandular mass. e, papillate membrane of right posterior glandular mass. f, outermost limit of right posterior glandular mass. g, right coxopleuron. h, ultimate pedal sternite. i, glandular and papillate lining-membrane of right-hand terminal pore. Fig. 2. Left side of prosternum and left prehensor. (Ventral aspect, setae deleted). Prehensorial poison calyx and canal shown in stipple. a, left subcondylic sclerotie line ("chitin line"). b, left pleuroprosternal suture. Fig. 3. Labrum and adjacent clypeus. (Ventral aspect, most of the clypeal areolation deleted). a, right labral sidepiece, showing the vestigial areolation of its surface. b, prominent hyaline suture separating labrum from clypeus. c, areolate elypeal intrusion separating the two sidepieces and giving rise to delicate, hyaline fimbriae. d, a large fimbria of the left sidepiece. e, thinner, shorter, more delicate fimbriae arising between the sidepieces, anchored to the sidepieces and to the clypeal intrusion.

the anterior is slightly longer; no accessory spine exceeding one-quarter then length of the claw proper. **Sternites.** Sulci and depressions not detected, probably entirely absent or imperceptibly weak. Presternites strongly developed especially on anterior body third to half; each distinctly divided. Pro- and metacoxal glandular poregroups small and extremely difficult to see; apparently persisting to rear of body. Antero-lateral sternal porefields extremely small and vague; on approximately the anterior half of body, thereafter absent. Each sternite from and including the 1st through the penultimate with a postcentral to postero-marginal band of obscure pores, the more anterior bands slightly extended forward medially, the bands apparently not dividing on the rear half of the body.

Ultimate Pedal Segment (fig. 1).—Pretergite broadly bandlike, fused without sutures with its pleurites. Tergite: greatest width somewhat greater than length; sides slightly convexly curved, posteriorly convergent; rear margin rounded. Presternite broadly divided centrally, oriented obliquely to cover antero-lateral corners of sternite proper. Sternite: greatest width much greater than length; without depressions; each side anteriorly convex, thereafter convergent and straight; rear margin straight. Each coxopleuron passing forward to level of presternite; only moderately inflated; sparsely setose. Each coxopleuron with one large posterior gland pit concealed beneath the sternite. The anterior gland pit is displaced forward to lie deep within the body dorsal to the penultimate sternite. Each gland pit surrounded by massive glandular tissue and lined with a greatly folded membrane whose surface is studded with innumerable sclerotic pimple-like (papillate) thickenings; gland pit without pores or discernible porecanals. Ultimate legs: ("Anal legs unarmed, the claw being replaced by a minute transparent terminal article. . . much longer and stouter than the penult in both sexes. The sixth article [distotarsus] much more slender than the fifth [proximotarsus], the appendage replacing the claw minute.") [Remnants of the legs adhering to the coxopleuron suggest they were clothed ventrally with a rather dense vestiture, as are those of specimens 7 and 8. The distotarsus of number 7 from lateral aspect is slightly more than 75% as long as the proximotarsus and somewhat less than half as thick].

Postpedal Segments (fig. 1).—Female gonopods bandlike, broadly fused medially. Terminal pores present, opening laterally and continuous with a large internal cavity lined with a convoluted papillate membrane. [The terminal pores are extremely difficult to see if the specimen is not cleared and examined at high magnifications, which probably accounts for Professor Chamberlin's failure to find them originally in the specimen.]

NOTE A

K. W. Verhoeff called attention to similarity actually among three genera, *Nannocrix*, *Arenophilus*, and his then new Mexican *Aztekophilus* with its new sub-genus *Thylakiophilus* (1934, pp. 26-29). Like the Chamberlin genera, his *Aztekophilus* (s. str.) had an ultimate tuberculate pretarsus, and, like *Arenophilus*, it had terminal pores. He could not have known that *Nannocrix* (= *Sogona*) also had terminal pores. He was impressed with the remarkable coxopleural gland pits of his new species. His words leave little doubt that they are of the same extraordinary kind that I have detected in *minima* and *poretha*:

“Wir haben es somit bei *Aztekophilus* mit Coxopleurientdrüsen zu tun, welche im Gegensatz zu denen der übrigen in dieser Hinsicht bekannten Geophilinen-Gattungen, nicht mit engen runden und stark chitinisierten Poren und ebenfalls kleineren, kräftig chitinisierten Sammelbläschen ausgerüstet sind, sondern deren im Verhältnis grosse Mündungen etwas unregelmässig gestaltet sind, weil weichrandig und die mit einem ebenfalls etwas unregelmässigen Sammelbehälter zusammenhängen, dessen Wandung läutig erscheint.” (p. 27).

The evidence that he presents makes it clear that both genera are sagonid; moreover, that *Thylakophilus* is very probably a junior synonym of *Garrina* Chamberlin, whereas *Aztekophilus* (s. str.) is almost surely a junior synonym of *Sogona*. The two new species that he described are too poorly characterized to permit a confident conclusion pertinent to their possible identities.

NOTE B

In speaking of the coxopleural glandular apparatus of the Geophilomorpha it is easy to give a misleading impression of the facts through the use of imprecise and vacillating terminology. It is also easy to misinterpret the facts themselves. Let us attempt to stabilize the former and to approach a common understanding of the latter by distinguishing briefly among three frequently encountered and basic manifestations of the coxopleural glandular apparatus. Important designations are italicized.

Type I. The coxopleural pores are small and numerous; they pierce some part of or all of the coxopleural surface. (Examples: *Geophilus* (s. str.), *Strigamia*, *Arctogophilus*).

- a) Each such pore is external, and each is continuous internally with a short, tubular, sclerotized pore canal.
- b) Each pore canal is surrounded by dense glandular tissue in which the secretions are elaborated.

Type II. Certain areas of the coxopleural surface invaginate, carrying their coxopleural pores inward to line the walls of the gland or coxopleural pits thus formed. These pits form typically along or under the sternite and tergite margins; usually freely-opening pores (as in *I*) vanish from the uninvaginated and exposed coxopleural surface. Superficially, this type of coxopleuron usually appears to lack pores. Instead of pores one sees a slit-like or ovate pit opening, dorsal to which is the gland pit whose walls are pierced with the invaginated pores. (Examples: *Nesogophilus* (sensu Attems), *Gosiphilus*).

- a) Each pore is internal and pierces the walls of the invagination cavity, the gland pit, which is entirely or largely concealed. Each pore is continuous with a pore canal.
- b) Partitioned or continuous glandular tissue surrounds the pore canals.

Type III. As in Type II, invagination has created gland pits; in addition, freely-opening external pores are usually absent. *Type III* is different in that its invaginated pores and sclerotic pore canals have vanished. Now the dense glandular tissue surrounding each gland pit liberates its secretions directly into the enclosed lumen. (Examples: *Schendylurus*, *Sogona*, *Garrina*).

- a) *Pores* and *pore canals* have vanished.
- b) *Glandular tissue* is continuous around the *gland pit*.

These three basic patterns manifest numerous modifications. For instance, there are species of types II and III in combination with type I. Conditions intermediate between II and III are known, as we should expect, since conditions II and III have developed from I independently by convergent evolution in different genera and even in different families. Indeed, even within the single genus *Arcnophilus* there is evidence of a sequential development. In *bipuncticeps* each gland pit has poorly-defined pores and pore canals; apparently they are vestigial. In *watsingus* there is a simple gland pit lined with a papillate membrane. Evidently *bipuncticeps* is intermediate between types II and III, whereas *watsingus* is distinctly a type III species, as are *Sogona minima* and *poretha*, and *Garrina ochra*.

NOTE C

The sogonid labrum has been inaccurately described repeatedly. Originally Chamberlin described it as being: “. . . of a single piece apparently, free laterally but fused in middle; free margin as a whole concave, . . . fringed with long spines or teeth.” (1912, p. 430). The single qualifying word “apparently” has been overlooked; for instance, in his 1929 key (p. 27) Attems said of the Sogonidae: “Oberlippe aus einem ungeteilten Stück bestehend.” And on p. 344: “. . . in der Mitte ganz mit dem Clypeus verwachsen.” Such a description is erroneous and misleading, for on the one hand it is suggestive of the schendylid or himantariid types of labra; on the other hand it does not stress what is really significant, that the sogonid labrum is fundamentally of the tripartite geophilid type, departing from it in the direction of apparent degeneracy.

The accompanying drawing (fig. 3) of the labrum of *S. poretha* (lectotype) reveals it to be basically tripartite. The prominent sidepieces are well-developed, discrete, and very widely separated. Most importantly, the midpiece has either atrophied entirely, or else it has fused imperceptibly with the broadly intruded elypeal extension. It is impossible to say which has happened: it is possible only to assert that both in *poretha* and *minima* a *developed, distinguishable* midpiece is absent. In summary: We can only describe it as being fundamentally tripartite and lacking a distinguishable midpiece.

This peculiar labrum together with the short, attenuate antennae and curious coxopleural glandular apparatus taken together should facilitate the identification of most or all sogonids. These characters' occurrence singly or together, it should be understood, is not to be construed as conclusive indication of the group's valid status as a family coordinate with, e.g., the Geophilidae, Schendylidae, et al.

NOTE D

That the pleuroprosternal sutures represent a diagnostic device of importance has been recognized but only minimally utilized. It is well known that Attems relied heavily upon their *course* and *direction* as accessory characters for delineating several of the geophilid subfamilies in his 1929 monograph. Despite his precedent, these sutures are rarely described today; indeed, there are scores of genera whose pleuroprosternal sutures are unnoted in the literature.

Apart from their course and direction, attention has been called to one other of their characteristics which is at least of equal importance. In 1928 (p. 256)

Verhoeff made brief mention of the fact that their level of anterior termination is distinctly different in two superficially similar genera. Thereafter neither he nor anyone else pursued the study further.

In general we can distinguish between two basic termination types.

Type I. Pleuroprosternal Sutures Complete. Each pleuroprosternal suture passes forward to terminate on, or essentially on, the antero-lateral prosternal margin. (Examples: *Pachymerium ferrugineum* (C. L. Koch), *Sogona minima* Chamberlin and *poretha* (Chamberlin) (lectotypes)).

Type II. Pleuroprosternal Sutures Incomplete. Each pleuroprosternal suture passes forward to terminate laterally far from the antero-lateral prosternal margin. (Examples: *Necrophlocophagus longicornis* Newport, *Arenophilus bipuncticeps* and *watsingus*, *Garrina ochra* Chamberlin (holotype)).

Sutures of type II show very little intraspecific variability pertinent to level of termination; apparently the character is relatively stable. At the same time there is evidence of interspecific variability among many type II species. For instance, termination level in *Arenophilus* is consistently posterior to that found in *Necrophlocophagus longicornis*.

This character is probably of particular importance in the systematics of Sogonidae where it may be intragenerically stable. Whereas the sutures are complete in *Sogona minima* and *Poretha*, they are widely incomplete in *Garrina ochra*, the type-species of the genus. All descriptions of sogonids, or for that matter of all geophilomorphs, should record clearly the course, direction, and the level of termination of the pleuroprosternal sutures.

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DISTRIBUTIONAL AND SYNONYMICAL NOTES FOR SOME SPECIES OF EULEPIDOTIS HBN. (LEPIDOPTERA: NOCTUIDAE)

Three species of the genus *Eulepidotis* Hübner, *E. dominicata* (Guénée), *E. micca* (Druce) and *E. merricki* (Holland), have been reported from the United States of America. These records are based on single specimens representing strays or incorrectly labeled examples. A Cuban species, *E. metamorpha* Dyar, is now recorded from Florida.

E. dominicata (Guénée).—First recorded by Grote, 1879, N. Amer. Ent., 1(2): 13, from a specimen collected by Belfrage in Texas. The size and other comments by Grote could apply only to *dominicata*.

There is a specimen of *dominicata* in the collection of the U. S. National Museum labeled "Chokoloskee, Fla., Septem. 07," but it is extremely doubtful that the locality is correct. (See Klots, *A Field Guide to the Butterflies*, 1951, pp. 275-6, and 284 in discussion of *Eurema messalina* F.)

E. micca (Druce).—Listed by Barnes and McDunnough, 1917, Checklist of the Lepidoptera of Boreal America, p. 86, no. 3355. I have been unable to locate any earlier reference to the occurrence of the species in the United States. The record undoubtedly was based on a specimen from the Barnes collection, now in the U. S. National Museum. The specimen is labeled "San Benito, Texas, May 8-15." The species occurs in Mexico and probably strays into Texas occasionally.

E. merrieki (Holland).—Described from a specimen reputedly collected near New Brighton, Pennsylvania. The type is now in the U. S. National Museum. I believe the specimen to be of Cuban origin as it agrees with a specimen from that island. Both are larger, darker and slightly differently marked than examples from South America. Cuban specimens were identified as *Palindia striatia* (Cramer) (sic!) by Herrich-Schäffer, 1869, Corresp.-Blatt Zool.-Min. Ver. Regensburg, 23: 153 and *Palindia striataria* (Cramer) by Gundlach, 1881, Contribución á la Entomología Cubana, pt. 1, Lepidopteros, p. 345. I do not believe that the Cramer description refers to this species, certainly the illustration does not agree at all with it. Personally, I think Guénéé, 1852, Histoire Naturelle des Insectes, Species Général des Lépidoptères, vol. 6 (Noctuérites, II), p. 278, was in error in referring the Cramer species to his genus *Palindia* (= *Euleptidotis* Hbn.).

E. metamorpha Dyar.—Described in 1914, Proc. U. S. Nat. Mus., 47: 109, from a male from Matanzas, Cuba in the collection of the U. S. National Museum. Other specimens, including a male labeled "S. Fla.," are now available for study. This is the species identified by Herrich-Schäffer (loc. cit., p. 153) and Gundlach (loc. cit., p. 344) as *Palindia rectimargo* Guénéé. The latter species is not known to occur in the Antilles. *E. metamorpha* Dyar differs from *rectimargo* and other related species in that the oblique brown band of the forewing has the basal margin bent basad before reaching the costa, and extending to base of wing. In all the other closely related species the basal margin of the oblique brown band reaches the costa at a distance from the thorax equal to or greater than the width of the thorax. Also in *metamorpha*, the "ocellate" spot of the hindwing is differently colored (bluish, not black) and the tail is longer. A photograph of a specimen supplied by Ing. Fernando de Zayas, Habana, Cuba, confirms Gundlach's comment (loc. cit., p. 344) that a dark apical spot may be present on the hindwing. None of the specimens before me, all males, possess this spot, so it may be a sexual character.

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TAXONOMIC NOTE ON *METOPHTHALMUS FALLIANA* (SHARP)

(Coleoptera: Lathridiidae)

Sharp, in 1902 (Biol. Centr.-Amer. Col. II, pt. I, p. 633, t. 19, f. 4), described a new lathridiid species, *Cartodere falliana*, from Mexico. This species belongs in the genus *Metophtalmus* Wollaston.

That Sharp realized his species was not correctly associated generically is evidenced in his sentence: "*C. falliana* is very distinct from *C. filum*, but it is not necessary to separate it as a genus at present."

Sharp cited Fall's 1899 lathridiid paper (Trans. Amer. Ent. Soc. v. 26, pp. 101-190, 3 plates) among others and undoubtedly used Fall's key to the genera of the Lathridiini (p. 113) which takes his species to *Cartodere*. Fall's first couplet in this key separates the genera of the Lathridiini into two groups: One (including *Metophtalmus*, *Lathridius*, and *Coninomus*), with dorsal pronotal costae and the other (including *Eniemus*, *Cartodere*, *Adistemia*, *Belonia*, and *Revelicria*), without such costae. Sharp's species has no pronotal costae, but neither do the species Fall placed in *Metophtalmus*! Wollaston's original descriptions of the genus and of the type species, *M. asperatus*, do not mention pronotal costae but both mention the very uneven dorsal surface of the pronotum, a characteristic very evident in *M. falliana* (Sharp) and in the Fall species.

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 ERRATA

The following changes should be made in "Spurious records of the genus *Pyrgomorpha* Audinet-Seville, 1839, in the Americas" by D. Keith McE. Kevan, in Vol. 63, No. 1, pp. 13-16 of the *Proceedings*:

Page 15, line 16 from bottom of page: Delete entire sentence beginning "Since neither . . ."

Page 16, line 14, should read as follows: ". . . shows. The name of this form should thus be *Pyrgomorpha dispar semlikiana* (Rehn)—**stat. nov.**, with the following . . ."

Page 16, line 3 from bottom of page, should read: ". . . = *Pyrgomorpha dispar* (Miller) [*nec* Bolivar] . . ."

 ROLLA PATTESON CURRIE

1875—1960

Rolla Patteson Currie, one of the best known and most admired entomologists in the history of the United States Department of Agriculture, died on September 20, 1960, after a long illness. He had been a member of the Entomological Society of Washington more than sixty years, having been elected to membership in 1896. From

1901 to 1906 he served as Recording Secretary, and from 1902 to 1904 he was chairman of the Publications Committee.

Mr. Currie was born in Preemption, Illinois, on March 25, 1875, the son of an Episcopal clergyman. His family soon moved to Iowa and then to North Dakota, where during his boyhood he learned to love animals, especially birds. He attended the University of North Dakota and graduated with the B. A. degree in 1893, at the age of eighteen. As a young man he was torn between two careers, natural science and the church, but upon his father's sudden death soon after he graduated from the University he accepted an appointment at the Smithsonian Institution, where he was employed from 1894 to 1904. Early in this period he developed an interest in the dragon-flies and damsel-flies (Odonata) and, more especially still, in the antlions (Mymeliontidae) and the brown lacewings (Hemerobiidae). Intermittently he worked on the systematics of these groups and published some fifteen papers, including descriptions of a number of new species.

In 1898 Mr. Currie was detailed by the National Museum to accompany Professor O. F. Cook, the well-known specialist on myriapods, to Liberia for the purpose of obtaining natural history collections, more particularly birds, insects, fishes, mollusks and marine invertebrates. In addition he was to give special attention to securing objects and photographs illustrating the arts and industries of the Liberian natives. He succeeded in gathering a vast amount of material including a large number of insects, and also many birds, among the latter one which he later described as a new Bird of Paradise.

The summer of 1903 he spent with H. G. Dyar and A. N. Caudell on an insect collecting trip to the Kootenay District of British Columbia. The headquarters of the party was the town of Kaslo on the western shore of Kootenay Lake. A large quantity of insect material was obtained for the collections of the National Museum. At the October 8, 1903, meeting of the Entomological Society of Washington Mr. Currie presented a paper giving details of this trip. This was subsequently published in the Proceedings of the Society (vol. 6, 1904, pp. 24-37). In the same volume he also published a paper on Hemerobiidae from the Kootenay District of British Columbia, and the following year one on the dragon-flies collected on that expedition.

In 1904 Mr. Currie joined the Department of Agriculture's Bureau of Entomology. One of his first assignments was supervision of the Bureau's exhibits at the Lewis and Clark Centennial Exposition in Portland, Oregon, in 1905. In the same year he published a catalogue of the exhibits of economic entomology at that exposition (U. S. Dept. Agric. Bull. 53, new ser., 127 pp.). About this time he was placed in charge of the Bureau's Editorial Office, and for the remainder of his Government service he helped other entomologists prepare their papers for publication. Because of the high standards he established and maintained the Bureau acquired a reputation for publications that were well above the average in clarity of presentation.

Upon his retirement from Government service in 1945 at the age of seventy Mr. Currie entered upon his second career. After studying a year at the Virginia Theological Seminary he was ordained a priest in the Episcopal Church, by the Right Reverend Angus Dun, presiding Bishop of the Washington Diocese, thus fulfilling a lifetime



ambition. He served as curate in the Church of St. Stephen and the Incarnation, in Washington, until he became ill about four years ago.

In 1954 Wesley College, in Grand Forks, North Dakota, awarded him an honorary degree of Doctor of Divinity. The following statement at the end of the citation expresses the feeling of all who were closely associated with him during his life:

“What an admirable way to live the life God has given him; as a scientist devoted to discovering truth about God’s creation and acquainting mankind with it; as a Christian layman and minister, devoted to gaining an acquaintance with God himself and introducing Him to others!”

Mr. Currie is survived by a daughter, Mrs. Dora C. Lewis, of Arlington, Virginia; a son, Captain John P. Currie, USN, of Norfolk, Virginia; and a sister, Bertha P. Currie, of Washington. His wife died when the children were small.

MARY J. EDMUNDS and C. F. W. MUESEBECK

SOCIETY MEETINGS

695th Meeting, January 5, 1961

The 695th regular meeting of the Society was held in Room 43 of the USNM on January 5, 1961, with President J. F. Gates Clarke presiding. Forty-nine members and thirty-four visitors were present. The minutes were read and approved. Two candidates were presented for membership: *Cluff E. Hopla* and *Margaret C. Thornburg*.

William S. Murray announced that Helen Sollers, Ted Bissell, Horace Lancheester, and Samuel Dews would compose the Membership Committee for 1961.

C. C. Blickenstaff, a new member, was introduced.

P. S. Yuill indicated the need for additional books on insects prepared for children to stimulate interest and to allay fears on the part of the youngsters. He exhibited an example, *The How and Why Wonder Book of Insects*, which was written and illustrated for the child with a 5th to 7th grade reading level.

J. F. G. Clarke displayed two hand lenses of historical interest. One, of solid gold, was a gift to Dr. Clarke from Dr. W. Schaus who had received it from the original owner, Dr. Henry Edwards. The date, 1878, appears on the instrument. The other one, owned by the late Dr. William Mann, recently was presented by Mrs. Mann to the Smithsonian Institution through the courtesy of Dr. Thomas Snyder.

A. B. Gurney spoke of the contributions made by the late Joseph Wade, a great bibliophile. He commented on Mr. Wade's outstanding talent for writing biographies and bibliographies and noted particularly his 50th anniversary address to the Society. President Clarke announced that committees were being appointed to prepare obituaries for both Mr. Wade and Mr. Caffery.

The guest speaker, Dr. Roman Vishniae, producer of the Living Biology Film Series, New York City, conveyed greetings from the Entomological Society of New York. He presented a delightful and lively commentary on his movies and still pictures depicting flight and motions of animals with emphasis on insects. Dr. Vishniae freely discussed the details and techniques involved in producing such superb pictures, and acknowledged the valuable assistance of Mrs. Vishniae in the project. The project, supported in part by the National Science Foundation, is to produce educational films of living organisms as teaching aids for all age levels.

Among the members and visitors introduced were: *Mrs. Roman Vishniac*, *James L. Huggans*, *Davy* and *Jan Blickenstaff*, *John de Groat, Jr.*, *Avery Hoyt*, *W. J. Brown* (Canada), and *W. R. M. Mason* (Canada).

The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary*.

696th Meeting, February 2, 1961

President J. F. Gates Clarke presided at the 696th regular meeting of the Society held in the USNM, Room 43, on February 2, 1961, at 8:00 p.m. Twenty members and 13 visitors attended the meeting. The minutes were approved as read.

James L. Huggans was presented as a candidate for membership. *Cluff E. Hopla* and *Margaret Cochran Thornburg* were accepted as members. Miss Thornburg was present and introduced.

President Clarke announced the appointment of obituary committees as follows: M. D. Leonard, Chr. and W. H. Larrimer for the late Joseph Wade; L. B. Reed, Chr. and A. M. Vance for the late Donald Caffrey.

R. H. Nelson announced the death of B. B. Fulton, a member of ESA.

A. B. Gurney spoke of the contributions of the late Drs. E. Martini and B. B. Fulton.

T. J. Spilman exhibited a new book on beetles of the United States by R. H. Arnett. R. H. Nelson announced the publication of Vol. 6 of *Annual Review of Entomology* and Vol. 17 of the *Index to American Economic Entomology*. Another new book, *Early Stages* of Japanese Butterflies in Colour*, Vol. I, was displayed by J. F. G. Clarke. President Clarke also displayed a set of 12 plates, unpublished original paintings of 199 species of Indian Lepidoptera, painted by an Indian artist. The set, which is signed but not dated, was acquired recently by the Smithsonian Institution.

The evening's speaker, W. E. Waters of the U. S. Forest Service, USMA, discussed the analysis of observed spatial distributions in natural insect populations, particularly as applied to aggregated distributions. The presentation was discussed by Drs. Clarke and Gurney.

Among the visitors introduced were: *Dr. and Mrs. Philip B. Dowden* and *Dr. and Mrs. C. J. Flint, Jr.*

The meeting was adjourned at 10:00 p.m.

The minutes were recorded by the Corresponding Secretary P. A. Woke in the absence of the Recording Secretary.—ERNESTINE B. THURMAN, *Recording Secretary*.

697th Meeting, March 2, 1961

The 697th regular meeting of the Society was called to order by the President, Dr. J. F. Gates Clarke, on March 2, 1961, at 8:00 p.m. in Room 43 of the U. S. National Museum. Thirty-four members and 15 visitors were present. The minutes were approved as read.

James L. Huggans was accepted as a member. Names of candidates for membership presented were: *Philip B. Dowden, Oliver S. Flint, Jr., Preston E. Hunter, Arthur D. Moore, and Arlo M. Vance*.

President Clarke presented the report of the Auditing Committee, L. D. Christenson, Chairman, and accepted the report as read.

J. S. Yuill exhibited a book submitted by F. W. Poos, *Ten Little House Mates* by Prof. K. von Frisch, which is a naturalist's treatment of household pests.

J. F. Gates Clarke introduced a new book, *Spiders of Japan in Colour*, and mentioned Erlich's book, *Illustrated Keys to North American Butterflies*.

F. L. Campbell commented on the new research plans undertaken by the United Fruit Co. Research will be supported by UFC in an independent institute in Honduras with branch laboratories in Texas. Accommodations will be available for resident investigators.

The evening's program was composed of three very interesting talks followed by informal discussions. The speakers and their topics were: K. V. Krombein, Associations between Aculeate Hymenoptera and Mites (illustrated); A. B. Gurney, A Trip to Puerto Rico (illustrated); and A. L. Steinhauer, Speculations on Alfalfa Weevil Research.

The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary*.

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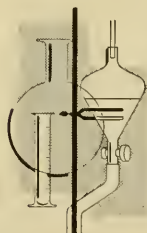
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PUBLICATION DATE

The date of publication of Vol. 63, No. 1, of the *Proceedings* is 12 April 1961. The date of publication of Vol. 63, No. 2, will be found in Vol. 63, No. 3.

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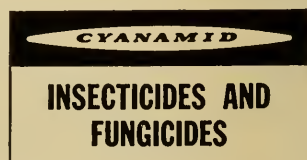
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(Continued on back cover)

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ORGANIZED MARCH 12, 1884

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Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are \$5.00; initiation fee is \$1.00 (U. S. currency).

PROCEEDINGS

Published quarterly beginning with March by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are \$6.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

The Society does not exchange its publications for those of other societies.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 63

SEPTEMBER, 1961

No. 3

TAXONOMIC RELATIONSHIPS WITHIN THE *DROSOPHILA VICTORIA*
SPECIES GROUP, SUBGENUS PHOLADORIS

(DIPTERA: DROSOPHILIDAE)¹

SARAH BEDICHEK PIPKIN, *The Gorgas Memorial Laboratory, Panama, R. of P.*

The victoria species group, designated by Wheeler (1949) and discussed by Mather (1955), has been investigated in order to clarify the taxonomic status of *D. lebanonensis* Wheeler 1949. This species was listed as a possible synonym of *D. victoria* Sturtevant 1942 by Wheeler (1959). In the course of study, a species belonging to the victoria group, kindly collected for the author in Tucson, Arizona by Dr. William B. Heed from the cottonwood, *Populus fremontii* Wats., proved to be smaller, shinier, and different in certain respects in the male genitalia from a laboratory strain originating from Prescott, northern Arizona, hitherto considered to be *D. victoria*. Meanwhile, a strain of the true *D. victoria* was collected from the type locality, Andreas Canyon, Palm Springs, California, by Dr. Lynn H. Throckmorton, and generously sent to the author. The Palm Springs *victoria* is one half millimeter shorter than the specimens from Tucson, slightly browner, and lacks the color polymorphism of the latter. Sturtevant (1942) states that strains considered to be *D. victoria*, collected by Professor J. T. Patterson in western United States and Mexico, differ slightly in the number of egg filaments and chromosomes from *victoria* from Palm Springs, California.

In the present study the Tucson species is described as *D. brooksi*, sp. nov. Reexamination of specimens of *victoria* from the type locality shows it to correspond closely with the original description (Sturtevant 1942). The species from Prescott called *victoria* by subsequent students (Patterson, 1943, Wheeler, 1947, 1949; Hsu, 1949; Pipkin, 1956; Mather, 1955, 1957) proves to be distinct and is here described as a subspecies of *lebanonensis* Wheeler 1949. The taxonomic relationships within the victoria species group are reviewed in the light of these findings.

¹ This work was supported by a research grant, RG 6813, from the United States Public Health Service.

The author collected several strains of the polymorphic species, *lebanonensis*, as well as *pattersoni* and *stonei* in The Lebanon during the years 1947 to 1949. A strain from Rasco, Jerusalem, Israel was obtained through the courtesy of Dr. Elisabeth Goldschmidt. *D. brooksi*, sp. nov., was collected in Tucson, Arizona by Dr. William B. Heed. The true *D. victoria* Sturtevant was collected by Dr. Lynn H. Throckmorton. The material from Prescott, Arizona was obtained through the courtesy of Dr. M. R. Wheeler. Slides for the study of male and female genitalia of the members of the victoria species group were prepared according to the method of Fairchild and Hertig (1948).

***Drosophila (Pholadoris) brooksi*, sp. nov.**

External characters of imagines. Male. Arista with 3 branches above, 2 below, in addition to the fork. Second and third joints of the antennae dark brown, the second joint with one bristle directed laterally, six bristles of varying lengths, directed ventrally; the third joint covered with short pale hairs. Front velvety dark brown; the lateral extremities of the lunula shining pale pruinose when viewed at an angle. Frontal triangle plainly delimited by a shallow groove, bearing on each side 6 mesially directed frontal hairs, the apical hair being flanked on each side by 2 short hairs; the groove delimiting the frontal triangle shining pale pruinose when viewed from an angle. Ocellar triangle black; anterior ocellar bristles divergent; ocelli pale pink. Orbits semi-shining, dark brown; orbital hairs 5. Proclinate orbital bristle equal to the posterior reclinate orbital; mid-orbital thin and $1/5$ the other two. One oral bristle prominent; the second, half the length of the first. Face dark brown, carina almost black, wider below, bulbous. Clypeus black, proboscis brown. Palps dark brown, almost black in old specimens; one subapical bristle and 4 shorter bristles on the lateral margin of the palps. Cheeks black; distance between the eye border and the base of the oral bristle $1/12$ the greatest diameter of the eye. Occiput dark brown. Eyes light maroon, darkening with age, with short pale pile. Greatest antero-posterior measurement of the eye $2/3$ the greatest dorso-ventral measurement.

Mesonotum and scutellum shining black; pleurae shining dark brown, thinly pollinose. Acrostichals in 6 rows; 4 bristles in the prescutellar row, the median pair definitely enlarged. Anterior scutellars divergent; distance from anterior to posterior dorsocentrals $4/9$ the distance between the two anterior dorsocentrals. Anterior sternopleural $6/7$ the posterior sternopleural and twice the mid-sternopleural. Halteres yellow. Apical bristles on first and second pairs of legs; preapicals on all three. Coxae and femora dark brown; tibiae and tarsi yellowish brown.

Wings unicolorous, tan; costal index approximately 2; fourth vein index 2.3; five x index 1.75; two bristles at the apex of the first costal section; third costal section with heavy hairs on the basal $6/11$.

Abdominal tergites shining black except for tergite 2, which is brownish medially; sternites gray. Hypopygium retracted into the abdomen, possessing the general characteristics of *D. lebanonensis* as figured by Hsu (1949); lobe-like process on the heel of the forceps prominent; primary teeth of forceps varying from 8 to 11; median 10; five bristles on the upper part of the genital arch (Fig. 1B); four to five bristles on the posterior margin of one concha of the hypandrium (Fig. 1A,C).

Female. Abdomen with black apical bands slightly more than one half the width of the tergites and extending to the lateral borders. Second tergite pale medially; apical bands of tergites 3, 4, 5 with fuzzy medial extensions. Ovipositor yellowish with 24 to 26 teeth (Fig. 1F).

Color polymorphism. The preceding description applies to the darkest color form of both sexes. In this species a balanced polymorphism of body color exists in nature and is maintained in laboratory cultures. The mesonotum of both sexes varies from shining black through dark brown to shining yellowish tan. The tan flies are also paler on the pleurae and bases of the legs. At the time of collection of about 300 individuals of this species, Dr. W. B. Heed estimated from 60 to 70% dark brown or black and from 40 to 30% light brown (personal communication). Exact counts were not made at this time because it was undesirable to etherize the flies as they are difficult to carry in culture. Three generations after the original collection, a sample of 117 flies was composed of 92 black or dark brown and 25 light brown. This color polymorphism was mentioned by Wheeler (1949) at a time when it was not realized that *brooksi* was a distinct species from the northern Arizona material.

Body length (etherized) male, 2.5 mm; female, 3 mm.

Length of wing, male, 2.5 mm; female, 2.7 mm.

Internal characters of imagines. Anterior malpighian tubules free and about twice as long as the posterior malpighian tubules; posterior malpighian tubules apposed but no continuous lumen. Testes elliptical, dull orange. Spermathecae with brown chitinized centers and pronounced apical indentation; ventral receptacle a short sac pressed against the ventral side of the uterus.

Eggs. With from 4 to 8 filaments; 35% with 5; 43% with 6; and 14% with 7 filaments (Table 2). Tips of filaments curly.

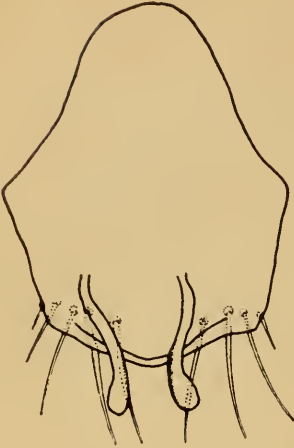
Larvae. White in color; skip; very active.

Puparia. Dull gold; each anterior spiracle with from 5 to 8 (median 7) very short pale filaments; stalk of anterior spiracle very short. Posterior spiracles contiguous, pale. Pupation either at the top or bottom of culture bottles.

Chromosomes. Larval brain preparations show males with one pair of large V's, one pair medium V's one pair small V's a rod-shaped X, a short rod-shaped Y chromosome with a pronounced constriction (Fig. 1E). Salivary gland chromosomes with 3 long arms, 2 medium arms, 2 short arms; a pronounced chromocenter; one gland larger than the other.

Physiological characteristics. Recovers rapidly from anaesthetization with ether; difficult to keep on standard culture medium.

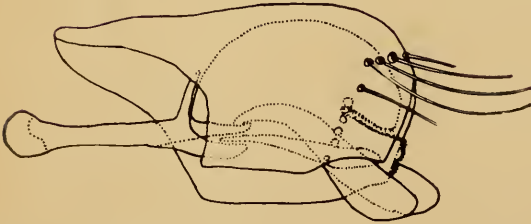
Relationship. This species belongs to the victoria species group with *victoria*, *lebanonensis*, *pattersoni*, *stonei*, and *nitens*. *Brooksi* is closest to *victoria* Sturtevant (Palm Springs, California). *Brooksi* and *victoria* differ by the color polymorphism found in *brooksi*; the larger size (by $\frac{1}{2}$ mm.) of *brooksi*; the darker color of the dark color form of *brooksi*, *victoria* being browner; the larger size of the mid-sternopleural bristle in *brooksi*; presence of two hairs flanking the apical frontal hair in *brooksi* compared with one such hair in *victoria*; the different chromosome configuration in the two species; and the differences in number of egg filaments in the two species (see section on variation in egg filaments in the victoria group).



A



B



C



D



E



F

Distribution. Tucson, Arizona, collected May 25, 1960 from *Populus fremontii* Wats. by Dr. William B. Heed.

Types. Holotype male and a series of paratype males and females have been placed in the *Drosophila* Type and Reference Collection of The Genetics Foundation, The University of Texas, Austin, Texas.

Dedication. This species is named in honor of Mrs. Sarah Brooks Martin, the artist who prepared the color plates for Professor J. T. Patterson's *The Drosophilidae of the Southwest* and (with G. B. Mainland), *The Drosophilidae of Mexico*.

***Drosophila (Pholadoris) lebanonensis casteeli*, subsp. nov.**

External characters of imagines. Male. Arista with 3 branches above, 2 below, in addition to the terminal fork. Second and third joints of the antenna black, the second joint with one bristle directed laterally and 6 bristles directed ventrally, the third joint covered with short pale hairs. Front dark reddish brown, pollinose. Ocellar triangle and orbits black, semishining; ocelli brown. Small elevation interior to the base of the proclinate orbital bristle and also one at base of mid-orbital shining silvery when viewed at an angle. Frontal hairs arranged in two rows, forming a V, the apex of the V directed anteriorly, 7 frontal hairs on each side; 2 frontal hairs lateral to the apex of the V. Orbital hairs 5. Proclinate orbital bristle 4/5 posterior reclinate; mid-orbital 1/4 the proclinate orbital. One oral bristle prominent, the second half the length of the first. Face brown, carina black, wider below, bulbous. Clypeus black, proboscis tan. Palps tan, one subapical and three shorter bristles on the lateral margin of the palps. Cheeks tan, dark brown below. Distance between the eye border and base of the oral bristle 1/11 the greatest diameter of the eye. Eye maroon, darkening with age, with short pale pile. Greatest antero-posterior diameter 9/11 the greatest dorsoventral measurement of the eye. Occiput dark brown.

Mesonotum and scutellum semishining dark brown, without markings; pleurae dark brown, pollinose. Acrostichals in 6 rows; four hairs in the presecutellar row, the median pair definitely enlarged. Anterior scutellars divergent; distance from anterior to posterior dorsocentrals 4/7 the distance between the two anterior dorsocentrals. Anterior sternopleural 6/8 the posterior sternopleural; mid-sternopleural 5/8 the posterior. Halteres pale yellow. Coxae and femora of first pair of legs dark brown; dusky yellowish on second and third pairs of legs and on all three pairs of tibiae and tarsae.

Wings unicolorous tan; costal index, 2.2; fourth vein index 2.6; five x index, 2. Two bristles at the apex of the first costal section; third costal section with heavy hairs on the basal 6/11.

Abdominal tergites shining black, the basal one somewhat less so, sternites dark gray. Hypopygium retracted into the abdomen; lobe like process on the heel of the forceps prominent; primary teeth of forceps vary from 11 to 14 (median 12); 3 prominent bristles on the upper part of the genital arch; 9 bristles on the posterior ventral margin of one concha of the hypandrium (Table 1).

Fig. 1, terminalia and chromosome configuration of *brooski*, sp. nov. A, hypandrium and conchae of male, dorsal view; B, genital arch and forceps of male; C, hypandrium and penis of male, side view; D, seminal receptacle of female; E, chromosomes, larval brain, male; F, vaginal plate of female.

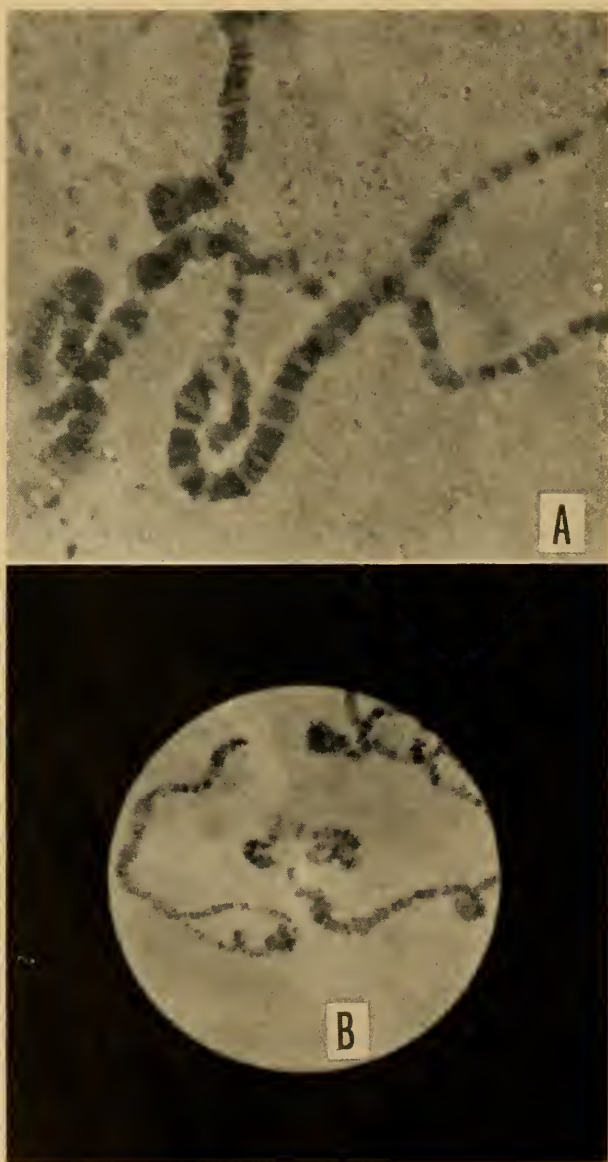


Fig. 2, Salivary chromosomes of hybrid larva of (A) *I. lebanonensis* and (B) *I. casteeli*, showing partial lack of pairing. Microphotographs by Dr. Alan C. Pipkin.

Female. Abdomen with broad shining dark brown apical bands covering the entire tergites 2, 3, 4. Corners only of tergites 5 and 6 are yellow as is the mid region of the circumanal tergite. Anterior-most sternite gray, remaining four paler. Ovipositor yellowish with 23 to 24 teeth.

Body length (etherized) male, 2.7 mm.; female, 3 mm.

Length of wing, male 2.5 mm; female 2.8 mm.

Internal characters of imagines. Anterior malpighian tubules free and much longer than the posterior; posterior tubules apposed without the formation of a continuous lumen. Testes elliptical, rusty brown in color. Seminal receptacles with brown chitinized centers; ventral receptacle a short sac pressed close to the ventral surface of the uterus.

Eggs. With from 5 to 8 filaments; 52% with 6 filaments; 36% with 7 filaments; 4% with 8 filaments (see Table 2).

Larvae. White in color; skip; very active.

Puparia. Golden; each anterior spiracle with from 5 to 6 branches; stalk of anterior spiracles very short. Posterior spiracles tightly apposed, golden yellow. Pupation is on the sides or near the plug of laboratory bottles.

Chromosomes. Larval brain preparations with 2 pairs large V's; one pair smaller V's; and one pair rods (Wharton, 1943). Salivary gland chromosomes with 3 long arms, 2 medium arms, 2 short arms; a pronounced chromocenter; one gland larger than the other.

Relationship. A subspecies of *D. lebanonensis* member of the victoria species group. *D. l. castecli* lacks a light and dark mesonotum color polymorphism dependent upon an autosomal pair of alleles found in *l. lebanonensis* (Pipkin, 1956). The cheeks of *l. castecli* are dark below; those of *l. lebanonensis*, entirely pale. The occiput, mesonotum, pleurae, and bases of legs are darker in *l. castecli* than in the dark form of *l. lebanonensis*, but a mixture of the two forms could not be separated with complete accuracy. The testes of *l. castecli* are rusty brown, whereas these are deep yellow in *l. lebanonensis*, a difference noted by Wheeler (1949).

Patterson and Stone (1952) cite numerous cases of gametic mortality in interspecific crosses as illustrating an isolating mechanism between closely related species. The possibility of sperm damage in crosses between *l. lebanonensis* and *l. castecli* has been investigated. The results are presented in Table 4. For each of the crosses listed in this table, two day old females were exposed to males the same age for one hour only. Twenty-four hours later, the females were dissected and their seminal receptacles and vesicles examined for the presence of sperm. Table 4 gives the percentages of dissected females with motile sperm, non-motile sperm, disintegrating sperm, and no sperm. One hundred females were dissected in each case. According to Table 4, the percentage of females in which no sperm reach the receptacles and vesicle is somewhat higher in the crosses between subspecies than in the control crosses. Further, Table 4 shows a lower percentage of females with motile sperm and a higher percentage with non-motile and disintegrating sperm in the heterogametic crosses between *l. lebanonensis* and *l. castecli* than in the control homogametic crosses.

TABLE 1. VARIATION IN NUMBER OF FORCEPS TEETH AND BRISTLES ON ONE SIDE OF THE HYPANDRIUM

species	forceps teeth	hypandrium bristles
victoria (palm spr.)	8-11 median 10	4
brooksi (tucson)	8-11 median 10	4,5
pattersoni (beirut)	10-13 median 11	5,6,7
stonei (sofar)	11-13 median 11	5,6
<i>l.</i> lebanonensis	11-13 median 12	8,9,10
<i>l.</i> casteeli	11-14 median 12	9

Correction: The second species should read "*brooksae*."

This last difference is explained as owing to the deleterious effect of the secretions of the seminal receptacles or vesicle upon the alien sperm.

Larval salivary gland cells of hybrids between *l. lebanonensis* (Beirut strain) and the Prescott strain of *l. casteeli* were studied in aceto-orcein preparations, each containing the glands of a single larva. In half of the preparations in which all chromosome arms could be followed, there was a complete pairing of all seven chromosome arms (3 long, 2 medium, and 2 short). The remaining preparations showed a complete lack of pairing in the medium length chromosomes, giving a total of 9 arms (3 long, 4 medium, 2 short); or a partial lack of pairing in one medium arm accompanied by a complete lack of pairing in the other medium arm (giving a total of 8 arms); or a partial lack of pairing in one medium arm accompanied by a partial lack of

pairing or by complete pairing in the other medium arm. Fig 2A and 2B are microphotographs illustrating partial pairing in two different hybrid larvae. The unpaired portions of the chromosome are seen to be half the thickness of the paired portions. One small inversion was found in a long arm of two preparations, and one medium-sized inversion was found in a different long arm of a hybrid between the two subspecies. A more thorough analysis of this lack of pairing and other structural differences in hybrid salivary cells is being undertaken.

A last difference between the subspecies *l. lebanonensis* and *l. castelli* is the presence of modifier(s) of the main pair of color alleles in polymorphic populations of *l. lebanonensis*, absent from *l. castelli* (Pipkin, unpublished). Furthermore, the modifier(s) producing a more extreme pale body color, introduced by the pale Beirut or Rasco strain of *l. lebanonensis* into hybrid populations of the two subspecies, do not become recombined so as to become expressed in 16 generations of such populations. Whether the modifier(s) are in one of the homologs which fails to pair regularly in the salivary gland chromosomes of the hybrid and presumably fails to undergo normal crossing over at meiosis, or whether the *l. lebanonensis* chromosome bearing the modifier(s) soon becomes lost from the hybrid population is not yet known. Further cytological work on such hybrid populations is being carried out.

Similarities between *l. lebanonensis* and *l. castelli* include the previously described range in number of teeth in the forceps and number of bristles on the posterior ventral border of the conchae, a like range in number of egg filaments, and similar crossability with *brooksi*. Further, the wing indices of the two subspecies are practically identical. A comparison of the wing indices, giving those of *l. lebanonensis* first, are as follows: costal index, 2, 2.2; fourth vein index, 2.8, 2.6; five x index, 2.2, 2. When *l. lebanonensis* females are crossed with *l. castelli* males, daily food transfers made, and all progeny hatching counted, the sex ratios are approximately equal. Seven such bottles gave the following sex ratios, males listed first: 124, 130; 115, 109; 116, 172; 177, 110; 138, 141; 111, 106; 70, 85. The reciprocal cross, *l. castelli* females crossed with *l. lebanonensis* males gave similar sex ratios, though the progeny hatch was lower owing to a mold infection: 23, 26; 30, 27; 47, 52. Deviations from a 50:50 sex ratio occurred in two bottles of the first cross, but they are opposite in direction. Hybrids between the two subspecies are fertile inter se and in either back cross, according to Table 3.

Distribution. The strain of *l. castelli* used in these studies was collected at Prescott, Arizona by collectors of The Genetics Foundation, The University of Texas, Austin, Texas. The same subspecies is believed to occur at Veyo, Utah and other points in New Mexico and Arizona listed in Wheeler (1949) under the name "*victoria*."

Types. Holotype male and a series of paratype males and females have been placed in the *Drosophila* Type and Reference Collection of the Genetics Foundation, The University of Texas, Austin, Texas.

TABLE 2. VARIATION IN NUMBER OF EGG FILAMENTS

	2	3	4	5	6	7	8	9	10	total
victoria (palm springs)			1	4		25	4	3		37
brooksae (tucson)			6	26	28	9	2			71
pattersoni (beirut)		7	26	48	15	3	1			100
stonei (sofar)	3	6	16	33	19	3	1			81
^{l.} lebanonensis (ain anub)				4	38	36	19	3		100
(rasco)				9	31	46	11	3		100
l.casteeli (prescott)				7	46	32	3			88

Dedication. *D. lebanonensis casteeli*, subsp. nov. is named in honor of the late Professor D. B. Casteel, Department of Zoology, The University of Texas.

RELATIONSHIP BETWEEN MEMBERS OF THE VICTORIA GROUP.
COMPARISON OF MALE AND FEMALE GENITALIA WITHIN THE GROUP

In order to further study the relationship between members of the victoria species group, the male and female genitalia of the members of this group available for study were reinvestigated. The forceps (primary clasper) and genital arch of *l. lebanonensis* and of *l. casteeli* were studied by Hsu (1949). Genital arches and forceps of *pattersoni* and of *stonei* were figured by Pipkin (1956). In all of the species of the victoria group studied, the penis and its apodeme, encased ventrally and laterally by the hypandrium and conchae, are located anterior to the genital arches and forceps. The hypandrium is continuous with its conchae. The apodeme of the penis is rod-like. The head of the penis is a hair-covered inverted bowl, the opening of which possesses a scalloped margin flanked by two clasper like lobes arising from the hypandrium. The surface of the head of the penis appears






to be made of small spindle shaped particles of chitin, each supporting a hair. The forceps is curved in all members of the victoria species group, in contrast with the straight forceps found in members of the coracina species group studied by Mather (1955). Drawings of male and female genitalia of *brooksi* appear in Fig. 1A, B, C, D, F. Aside from slight variations in dimensions of the hypandrium and penis, the main differences found among genitalia in the victoria species group consist in variations in the number of teeth in the forceps and in the number of bristles on the ventral posterior border of the conchae (Fig. 1A and C). Both the exact number of teeth in the forceps and the number of concha bristles vary slightly within a species and even on different sides of the same individual. Table 1 presents variation in the number of forceps teeth and the number of bristles on the ventral posterior border of one concha. Ten or more individuals of each species were examined to determine the extent of the variation. *Victoria* and *brooksi* are seen to possess the lowest number of concha bristles (4, for *victoria* and 4 to 5 for *brooksi*). A median of 11 to 12 forceps teeth is found in *pattersoni*, *stonci*, *l. lebanonensis*, and *l. castecli*.

Females of the various members of the victoria group all possess a long bristle on each side near the apical end of the vaginal plates. From 6 to 8 (median 7) bristles are found distal to this long bristle. Proximal to the long bristle are from 15 to 20 short stubby bristles along the edges of the vaginal plates. Considerable variation in numbers of these bristles occurs within each species. These bristles are shown for *brooksi* in Fig. 1F.

VARIATION IN NUMBER OF EGG FILAMENTS IN THE VICTORIA SPECIES GROUP

A variation in number of egg filaments is characteristic of the victoria, coracina, maculosa, and levis species groups according to the work of Mather (1955). Table 2 presents information with respect to variation in number of egg filaments in the victoria group. For the group, a range of from 2 to 9 filaments occurs. The variation pattern is characteristic of each species. Thus the median number for *brooksi* is 6; for *pattersoni* and *stonci*, 5. Variations in egg filament number for both the Ain Anub and Rasco strains of *l. lebanonensis* and for the Prescott strain of *l. castecli* do not differ statistically. Here the median classes are eggs with 6 and 7 filaments, respectively. These counts are in disagreement with Wheeler's 1949 count of filaments of the Ain Anub strain of *l. lebanonensis* (listed by him as being from "near Beirut"). The present author sent the Ain Anub strain to Dr. Wheeler in 1947; the Beirut strain was not sent to The Genetics Foundation, The University of Texas until 1960. Since the first dark strain of *l. lebanonensis* was collected in the mountain village of Ain Anub, it is better to refer to this strain by its collection locality. The present Beirut light strain is homozygous for the light color alleles and was derived from a heterozygous light strain collected in Beirut, Lebanon in 1947. Wheeler's finding the median egg fila-

TABLE 3. HYBRIDIZATION TESTS, VICTORIA GROUP

female parent	male parent				
	brooksae	pattersoni	stonei	l.lebanonensis	l.casteeli
brooksae		sterile	not made	larvae, few pupae	larvae, few pupae
pattersoni	3♂ 48♀ sterile		imagines sterile inter se, ♀ fertile to pattersoni ♂	larvae, pupae 2 imagines	larvae, pupae 2 imagines
stonei	not made	sterile		early larvae	sterile
l.lebanonensis	larvae, pupae	sterile	sterile		imagines fertile inter se and in back crosses
l.casteeli	larvae, few pupae	sterile	sterile	imagines fertile inter se and in back crosses	

ment numbers to be 7 and 8 in the original *Ain Anub* strain indicates either a genetic change in the strain or influence of some environmental factor on the number of egg filaments. Twenty-five of the 37 eggs of *victoria* (Palm Springs) examined possessed 7 filaments. One filament was thick and split into two branches along its length at varying distances from its base. In 4 eggs the split was complete, resulting in 8 filaments; 3 eggs possessed 9 filaments. One egg possessed 4 filaments but the thick filament was split apically into 3 branches. Four eggs possessed 5 filaments, the thick filament being split apically into 3 branches. Sturtevant (1942) describes the eggs of *victoria* as having 8 filaments; this count agrees with the observations of the present author if the apical ends of the filaments are counted.

HYBRIDIZATION TESTS

Table 3 presents the results of hybridization tests within the *victoria* species group. Neither *nitens* nor *stonei* (culture lost in 1957) was available for testing with the newly described *brooksi*. Only preliminary tests have been made with *victoria*, owing to the difficulty of maintaining the stock on laboratory culture medium. All hybridization tests were made in standard 92 x 25 mm. culture vials, using corn meal medium, 20 females and 20 males to each vial. Daily food transfers were made for two weeks.

Females of the only yellow species, *pattersoni*, were the most successful, giving hybrid larvae, pupae, and few or many imagines in crosses with other members of the group. Pipkin (1956) found numerous hybrids produced by the cross of *pattersoni* females and *stonci* males. These hybrids were sterile *inter se*, but hybrid females were fertile when back-crossed with *pattersoni* males. Hybrids of a number of cultures of *pattersoni* females crossed with single dark *brooksi* males died as larvae or pupae, but one such culture yielded three males and 48 female. The *pattersoni-brooksi* hybrids were sterile *inter se*. The female hybrids were also sterile in back crosses with either *pattersoni* or *brooksi* males, whereas the male hybrids died before they could be tested in a back cross. Of the *pattersoni-brooksi* hybrids, 29 females and one male were intermediate in color between the "dark" of *brooksi* and "yellow" of *pattersoni*. Nineteen females and two male hybrids were shining yellow. Assuming the single dark *brooksi* parent male to have been heterozygous for the pale color allele, these results suggest a monogenic inheritance of the polymorphism in *brooksi* and an allelism between the "yellow" of *pattersoni* and the "pale" color allele of *brooksi*. *Pattersoni* females crossed either with *l. lebanonensis* or with *l. casteeli* produce hybrids usually dying as early larvae or pupae, but two imagines have hatched from each of these crosses (Pipkin, 1956). *Brooksi*, used as a female parent, gives hybrid larvae, a few of which pupate, with males of *l. lebanonensis* or *casteeli*. The reciprocal crosses, *l. lebanonensis* or *l. casteeli* females crossed with *brooksi* males, give a similar hybrid progeny, dying in larval or pupal stages. *Stonci* females rarely produce early larvae with *l. lebanonensis* males (Pipkin, 1956). Hybridization tests of females of *brooksi*, *pattersoni*, and *l. lebanonensis* crossed with males of *victoria* (Palm Springs) give no hybrid larvae though many eggs are laid in each case. Females of each of these species dissected after being with *victoria* males for two weeks showed no sperm in their seminal receptacles or vesicles. This does not mean that no copulation occurred, because the sperm could have disintegrated and been absorbed in this time.

In all of the cases in which interspecific hybrids occurred in Table 3, the crosses were characterized by sporadic success (but not by slowness of the hybrid larvae to appear after the cross was made), slow development of hybrid larvae, usual death of the hybrids in various larval or the pupal stages. Hybridization tests between the subspecies *l. lebanonensis* and *l. casteeli* have been discussed previously in this paper.

DISCUSSION

The present taxonomic studies have shown the male and female genitalia to be remarkably similar in the members of the *victoria* group studied. Considering the number of teeth in the forceps and the number of bristles on the posterior ventral border of the conchae of the hypandrium, the members fall into three pairs of closely related forms; *victoria* and *brooksi*; *pattersoni* and *stonci*; and, finally,

TABLE 4. PERCENTAGE FEMALES WITH SPERM DAMAGE IN CROSSES OF L. LEBANONENSIS AND L. CASTEELI

	motile sperm	non-motile sperm	disintegrating sperm	absence of sperm
L. lebanonensis ♀ x L. casteeli ♂	13	27	10	50
L. casteeli ♀ x L. lebanonensis ♂	7	11	15	67
L. lebanonensis ♀ x L. lebanonensis ♂	44	11	4	41
L. casteeli ♀ x L. casteeli ♂	50	22	0	28

l. lebanonensis and *l. casteeli*. The range in number of egg filaments likewise shows greater resemblance among these three pairs (with the exception of *brooksi* and *victoria*). Hybridization tests show that hybrids dying as larvae or pupae may result from crosses of species widely distant geographically. The close similarity of male and female genitalia in all the species studied shows that no mechanical isolation barrier to the success of these crosses exists. Mather (1957) found that transfer of sperm can take place between the maculosa species group (*novamaculosa* female) and the victoria group (*l. casteeli*, called "*victoria*" male).

The designation of *l. lebanonensis* and *l. casteeli* as subspecies rests chiefly upon the finding of sperm damage in crosses between the two and upon the lack of pairing of one chromosome pair in the salivary glands of the hybrids between these two forms. Lack of pairing in the salivaries of hybrids presumably means lack of pairing at meiosis, and consequent barrier to free recombination by crossing over, according to the work of Dobzhansky (1933) on hybrids between *pseudo-obscura* and *persimilis*. Wasserman (1954) states that in the salivaries of the closely related *arizonensis* and *mojavensis*, the region near the centromere of the X chromosome is usually unpaired. Townsend (1954) reports that "pairing is often complete," though certain inversions are present, in the salivary chromosomes of hybrids between

tropicalis tropicalis and *tropicalis cubana*. Pairing in the salivaries of hybrids of *pallidipennis pallidipennis* and *pallidipennis centralis* is complete, with one inversion present. (Patterson and Wheeler, 1947).

A part of the marked similarities between *l. lebanouensis* and *l. castcecli* is owing to their wide geographical separation. These two forms would probably not have diverged, owing to their free interbreeding capacity if they had remained in the same area. *Nitens* (Italy and Switzerland) is the nearest European relative of *l. lebanouensis* according to a morphological comparison. The two species differ in chromosome configuration, and *nitens* lacks a color polymorphism.

The members of the victoria species group are distributed in both Palaearctic and Nearctic regions. *Nitens* is known from Italy (Buzati-Traverso, 1943) and Switzerland (Burla, 1948). *l. lebanouensis* is found in the Lebanon (Wheeler, 1949, Pipkin, 1953, 1956), and Israel (Goldschmidt, unpublished). *Pattersoni* and *stonei* occur in The Lebanon (Pipkin, 1956). A group of three species, *brooksi*, *victoria*, and *l. castcecli*, occur in the western United States. Wheeler (1949) states that extensive trap collections by the University of Texas group have not revealed a victoria species group member east of Nebraska. Further undescribed members of this group probably occur, as Sturtevant suggested (Sturtevant, 1942). The victoria group flies are not attracted to fruit baited traps as readily as many of the *Sophophora* and *Drosophila*. Most of the collections have been made from such traps. (Wheeler, 1949, Pipkin, 1953, Buzati-Traverso, 1943). Dr. Throckmorton's collection of *victoria* was from the sap of *Populus fremontii* Wats., the flies refusing his fruit baited traps nearby (personal communication). *Brooksi* was likewise taken from the sap of this tree by Dr. Heed. A further study of the ecology of this group will prove profitable.

The existence of a Palaearctic and a Nearctic species polymorphic for light and dark mesonotum color (*l. lebanouensis* and *brooksi*) indicates similar mutability with similar survival value in related species. Sturtevant and Novitski (1941) noted similar mutations in a number of *Drosophila* species. Similar polymorphic abdominal patterns occur in the *cardini* group (Da Cunha, 1949; Stalker, 1953; Heed and Wheeler, 1957) and in the *melanogaster* group (Freire-Mai, 1949; Oshima and Taira, 1956; Moriwaki, 1952; Züreher, 1958).

Gene exchange is possible between two of the Palaearctic victoria group species, *pattersoni* and *stonei*. Whether introgressive changes have occurred here is not known. It is interesting that a polymorphic species, *l. lebanouensis*, exists in the same area with its yellow and black relatives.

The author is indebted to Mr. Orlando Ortiz for his extensive technical assistance in this work, also to Mr. Aurelio Powers for technical assistance. To Dr. G. B. Fairchild the author is indebted for instructions in the preparation of the male genitalia slides and for criticising

the manuscript. Thanks are due Major Verne Tipton, MSC, U.S. Army, Corozal, Canal Zone, for the use of his equipment for making projected drawings. The author thanks Dr. M. R. Wheeler for the use of a translation (by Dr. M. J. D. White) of the description of *D. nitens* in Dr. Buzzati-Traverso's paper). To Dr. William B. Heed the author owes the suggestion that *D. victoria* Sturtevant should be collected in its type locality and reinvestigated taxonomically. His suggestion was based on his observation that the Sonoran Desert of Tucson, Arizona where he collected *brooksi*, penetrates Palm Springs, California. He predicted that the Tucson species would either be the same as or close to the true *victoria* originally described by Sturtevant. (1942).

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A NEW SPECIES OF *ANTICHAETA* HALIDAY, WITH NOTES ON OTHER SPECIES OF THE GENUS
(DIPTERA: SCIOMYZIDAE)^{1,2}

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The new species described below was discovered too late to be incorporated into the recent paper by Steyskal (1960) revising the genus *Antichaeta*.

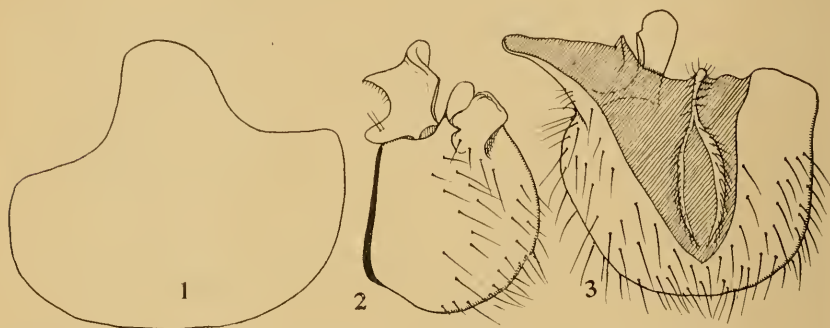
Antichaeta borealis, sp. nov.

Male.—Length of body: 4.5 mm. Length of wing: 4.0 mm. **Head:** Frons dull yellowish except for shining meso- and parafrontal stripes and very narrow pruinose stripes bordering eyes; occiput with two elongate pruinose spots; face strongly pruinose; palpi wholly yellow; antennae with two basal segments yellowish, third segment bicolored with basal half yellowish, apical half blackish, arista

¹Published with the approval of the Director of the Idaho Agricultural Experiment Station as Research Paper No. 483.

²This investigation was supported, in part, by a research grant (E-743) from the National Institute of Allergy and Infectious Diseases, U. S. Public Health Service.

with loose, black hairs; anterior fronto-orbital bristle nearly as long as posterior bristle. **Thorax:** Largely yellowish-brown; pleura lightly pruinose; mesonotum with two dark stripes centrally that are bounded laterally by broader pruinose stripes, sides of mesonotum pruinose; scutellum wholly yellowish-brown. **Wings:** Membrane wholly hyaline; halteres light yellow. **Legs:** Largely yellowish; fore legs with coxae lighter, femora and tibiae somewhat infuscated distally, tarsi strongly darkened; middle and hind legs uniformly yellow. **Abdomen:** Yellowish-brown, more yellowish distally; andrium yellowish and shining; terminalia as figured.



Antichacta borealis, sp. nov. Fig. 1, outline of fifth abdominal sternite; fig. 2, dextral lateral view of postabdomen; fig. 3, posterior view of postabdomen. (Drawings by George C. Steyskal)

Female.—Length of body: 4.6 mm. Length of wings: 4.2 mm. Coloration and non-genitalic structural characters as in male.

Holotype (male) and allotype.—Eight miles north of Sandpoint, Bonner County, Idaho, June 1, 1959 (B. A. Foote). Deposited in Cornell University collection. **Paratypes.** Three males, same collection data as for holotype; one male, Upper Enfield State Park near Ithaca, New York, April 2, 1957, reared from puparium, biological note F-5706; one male, one female, White Church marsh, Tompkins County, New York, May 15, 1958, reared from puparia; one male, Inlet Valley, Ithaca, New York, June 14, 1958. All paratypes collected by B. A. Foote. Two paratypes in University of Idaho collection, one paratype in United States National Museum, one paratype in collection of George C. Steyskal, three paratypes in Cornell University collection.

Remarks: The presence of long anterior fronto-orbital bristles indicates that this species is close to *A. robiginosa* Melander and *A. testacea* Melander, differing chiefly by the bicolored third antennal segment, by the differently patterned thoracic dorsum and by the distinctive male terminalia.

The Idaho specimens of *A. borealis* were swept from herbaceous vegetation growing in a small, partially shaded marsh located in a borrow pit between U. S. Highway 95 and the road bed of the Great Northern Railway.

In Steyskal's key the new species runs to couplet 17, at which place the following may be substituted:

- 17(18) Anterior fronto-orbital bristle much shorter than posterior bristle;
third antennal segment bicolored, yellow basally, blackish
apically **A. fulva** Steyskal
- 18(17) Anterior fronto-orbital bristle nearly as long as posterior bristle
and sometimes reduplicated
- 19(20) Third antennal segment bicolored **A. borealis** n. sp.
- 20(19) Third antennal segment wholly yellow
- 21(22) Thoracic dorsum dark gray to blackish **A. robiginosa** Melander
- 22(21) Thoracic dorsum yellow **A. testacea** Melander

***Antichaeta analis* (Meigen)**

Mr. Steyskal has asked me to include the results of his recent examination of a specimen that apparently forms the basis for the only record of *A. analis* (Meigen) (synonym, *vittata* Haliday) in North America (Osten Sacken, 1858). The specimen is in the Museum of Comparative Zoology and was examined through the courtesy of P. J. Darlington, Jr.

The specimen is labelled "Massac, Austin/Loew Coll./ *vittata* Hal." and consists of a part of the posterior mesonotum, the scutellum, two wings, one fore and most of one middle leg. It agrees in all those parts with the female allotype of *A. fulva* Steyskal and *A. borealis*, sp. nov. According to descriptions of *A. analis* by Hendel and Sack, it differs from the former two species by having black palpi (palpi yellow in *fulva* and *borealis*) and by having the third antennal segment wholly black (this segment yellow basally in *fulva* and *borealis*). They also mention that *analis* has darkish mesonotal stripes that converge and unite on the scutellum. Both the examined specimen in the Loew collection and the types of *fulva* and *borealis* have no darkening on the scutellum.

Thus the old record of *A. analis* occurring in North America may be considered as referring either to *A. fulva* or *borealis*.

***Antichaeta melanosoma* Melander**

A single specimen collected on June 1, 1959 at Copeland, Boundary County, Idaho (B. A. Foote) extends the known range of this species into the Pacific Northwest. Previous records were from the north-central states and from the Northeast. The specimen was taken by sweeping hydrophilic vegetation bordering a shallow, partially shaded pond.

***Antichaeta testacea* Melander**

Recent records for Idaho and Utah are given below:

IDAHO: four miles east of Shoshone, Lincoln County, May 22, 1959, one male, one female, (B. A. Foote); two miles west of Gannet, Blaine County, May 22, 1959, six males (B. A. Foote). UTAH: Parowan, Iron County, July 15, 1941, one female (F. C. Harnston, G. F. Knowlton); Midvale, Salt Lake County, August 18, 1953, one

male (G. F. Knowlton); Payson, Utah County, August 7, 1942, one female (W. E. Peay, G. F. Knowlton). The Idaho specimens are in the University of Idaho collection; the Utah material is in the Utah State University collection.

LITERATURE CITED

- Steyskal, G. C., 1960. The genus *Antichaeta* Haliday, with special reference to the American species (Diptera, Sciomyzidae). Papers Mich. Acad. Sci., Arts and Letters XLV: 17-26.
- Osten Sacken, C. H., 1858, Catalogue of the described Diptera of North America. Smithsonian Miscellaneous Collections 3. (Reference on page 177.)

BOOK REVIEW

A MANUAL OF COMMON BEETLES OF EASTERN NORTH AMERICA, by Elizabeth S. Dillon and Lawrence S. Dillon. Row, Peterson and Company, Evanston, Illinois and Elmsford, New York. 884 pages, 81 pls. 1961. \$9.25.

The amount of work involved in preparing this manual would have deterred many of less stout heart! The task of selecting and describing approximately 1,200 species (from an estimated 10,000 species in Eastern North America) must have been difficult enough but the work involved in preparing the 1,344 (17 in color) illustrations is equally as impressive.

The introduction provides information on collecting, methods and materials, pinning and labeling, structure, beetle larvae and keys. An interesting chapter on ecology illustrates how beetles have adapted to many unusual ecological niches. Keys to 64 common families and most of the keys to the genera included in this manual are amply illustrated. However, keys to species are not abundantly illustrated. The book closes with a useful glossary, bibliographies arranged by subject and by geographic areas, and an index to all taxa referred to in the manual.

It is not unexpected that a few errors have been made in a manual covering such a wide scope. For example: In the Preface, Dr. Chapin, who is currently active in research, has been referred to as "the late Dr. Chapin." The scientific names of some common pests are not up to date. The description of the dermestid genus *Thylotrias* (p. 378) reads "elytra soft, parallel-sided; wingless." Apparently "female" was omitted before "wingless," because only the female is wingless. Two figures are reversed on two plates. On plate 41, fig. 4 is *Anchicera ephippiata* and fig. 5 is *Antherophagus ochraceus*. On plate 74, fig. 8 is *Metriona bivittata* and fig. 9 is *Plagiometriona clavata*.

Regardless of the few minor errors in the manual, it will be especially useful to beginning students of Coleoptera and will also serve as a handy reference for anyone interested in beetles of Eastern North America.

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SOME ICHNEUMONID TYPES IN EUROPEAN MUSEUMS THAT WERE DESCRIBED FROM NO LOCALITY OR FROM INCORRECT LOCALITIES

(HYMENOPTERA)

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In 1958, I had an opportunity to study ichneumonid types in European museums, concentrating on types of genotypes and types of species described from the Americas, Asia, the Pacific Islands, and Australia. In compiling lists of types to be seen, one comes across a few species described without locality, and in seeing a large number of types, one finds some cases where the published type locality is obviously incorrect. Both these kinds of cases are very troublesome in taxonomic work, and the list below has been prepared to rectify as many of them as is possible at the present stage of knowledge.

More accurate work of this kind can be done after the distribution and local variants of the species of the World are better known, and there are certainly many more cases of incorrect type localities that have not yet been detected. Since types of European and African species were studied hardly at all on my recent trip, some additional cases can be expected among them.

Lest it appear that European authors are the sole offenders in these ways, it should be stated that some similar cases can be found among ichneumonid types in North American museums. Most of them (the known cases) involve only Nearctic species, and have been or are being corrected in North American literature. Several cases involving exotic species described by Ashmead are discussed by Cushman (1942. Proc. U. S. Natl. Mus. 44: 179-183), and I have called attention to the fact that five species of Ichneumoninae described by Ashmead from "Wisconsin" are actually from New Zealand (1945. Mem. Amer. Ent. Soc. 11: 762-763).

There are some additional cases where the original author gave the type locality correctly but later authors gave it incorrectly. These kinds of errors can readily be corrected by reference to the original description, but some have caused a degree of confusion. Dalla Torre's catalogue is the origin of some of these confusions, but most of his mistakes have long since been corrected, a number of them by Schulz (1906. Spolia hymenopterologica). A few residual cases are discussed in the annotated list, below. Correction of some others is deferred till later papers. An interesting set of cases arises from a misinterpretation of Dalla Torre's catalogue. Vollenhoven (1873. Tijdschr. v. Ent. 16: 209-220) described some species from the Netherlands. Dalla Torre (1901-02. Catalogus hymenopterorum vol. 3) cites these as being from "Eur.: Batavia," Batavia being the Latin name for the Netherlands. This has sometimes been misinterpreted as meaning Batavia, Java, particularly by Schmiedeknecht (1907. Genera insectorum, fasc. 62) and Enderlein (1912. Stettin Ent. Ztg. 73: 121). Various kinds of *lapsi* have made other such errors, as for instance Schmiedeknecht's (*ibidem*) listing of *Xorides erosus* Tschek

and *Xylonomus annulatus* Gravenhorst as being from "Australia" instead of Austria. It would be a tedious job to collect a reasonably complete list of such secondary errors in type localities, but perhaps it would be of value to straighten out the literature. The present list is confined mostly to errors by the original authors.

There are two lists below, both of them alphabetic. The first list gives the original reference, original type locality, data on the type, and summary of findings. The locations of the type specimens are shown by inserting in parentheses the names of the cities where they are found. These city names refer to the largest entomological collections in those particular cities, where the types are preserved. The second list gives the synonymies and correct type localities that are indicated in the first list, but in a more definite and tabulated form for the convenience of cataloguers. The "correct" type localities in this list are my best guess for the present. Further studies will lead to further restrictions and to some modifications.

These studies have been made with the help of grants from The Dow Chemical company and the National Science Foundation. A large part of the supporting detailed work for this, as for my other studies on ichneumonids, was contributed by my wife.

ANNOTATED LIST OF CASES

Ateleonotus ruficeps Cameron, 1909. Trans. Amer. Ent. Soc. 35: 438. ♀. Described from "Mendoza, Argentina" Type: ♀, labeled "Mendoza" (London).

This is a species of *Coccygodes*, an Ethiopian genus. I have not seen any additional specimens of the species *ruficeps*, but it is very close to several African species in both color and morphology. The genus is not known from South America. The generic name *Ateleonotus* (genotype: *ruficeps*) is hereby synonymized with *Coccygodes*.

In 1957 I referred certain African species to the genus *Cochlidionostenus* (Proc. Ent. Soc. Washington 59: 120), which on the basis of more material for study and examination of all the genotypes involved now appear to belong to the genus *Coccygodes*. The species in question are: *Oneilella subquadrata* Waterston 1927, *O. brevispicula* Waterston 1927, and *Cryptus corpulentus* Tosquinet 1896. The name *Cochlidionostenus* (genotype: *Cryptaulax coreanus* Szépligeti) is a synonym of *Chlorocryptus*. *Chlorocryptus* is only weakly differentiated from *Coccygodes*, but may be distinguished by the fact that the petiole is prismatic and the postpetiole has a prominent angle between its dorsal and lateral faces. In *Coccygodes* the petiole is subcylindric and the postpetiole rounded or weakly angled laterally. *Chlorocryptus* occurs in the Oriental Region and eastern Palaearctic. *Coccygodes* is Ethiopian.

Baryceros guttatus Gravenhorst, 1829. Ichneumonologia europaea 2: 779. ♀.

Described from "in valle Plauensi prope Dresdam" (Germany). Type: ♀, without data (Wroclaw).

The type represents a species known only from eastern and northeastern South America, particularly the Guianas and vicinity. There are specimens of it from the Guianas in old collections in most of the larger museums of Europe. Gravenhorst's type probably came from some of this material. Other authors have

had specimens of the same species and redescribed it several times. *Mesostenus dorsostrigatus* Spinola 1840, *Mesostenus quadrilineatus* Brullé 1846, and *Joppa spinosa* Brullé 1846 are synonyms of *B. guttatus* (new synonymies). The type of *Joppa spinosa* is a female with the ovipositor broken off.

Taschelenberg (1865. Ztschr. f. die Gesam. Naturw. 25: 2) was the first author to point out that this is a Neotropic, not a German species.

The genus *Christolia* (type: *Christolia punctata* Brullé) is a synonym of *Baryceros* (type: *Baryceros guttatus* Gravenhorst), new synonymy. *Crypturopsis* (type: *Crypturus texanus* Ashmead) and *Neochristolia* (type: *Neochristolia eucleides* Blanchard) are additional synonyms. The synonymy of *Neochristolia* is also new.

Cryptus elegantulus Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 198. ♀. Described from "Ile de Java." Type: ♀, labeled "Java" (Paris).

The type represents a species of *Goryphus* which is moderately common on Waigeo Island, Misool Island, and nearby New Guinea. A second specimen from "Java" has not been found. See also the case of *Mesostenus vesiculosus* Brullé. *Buodias nigripes* Cameron 1913 is a synonym.

Cryptus striatus Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 197. ♀. Described from an unknown locality, but believed to be non-European. Type: ♀ (lost). I was unable to find the type either in Paris or in the Spinola collection in Turin.

This species is unknown to me. My guess is that it is from the Old World tropics.

Dinotomus basalis Morley, 1915. Review of the Ichneumonidae . . . in the British Museum . . . 4: 67. ♂. Described from "Patria incog" Type: ♂, without data (London).

The type is a species of *Holcojoppa*. The only other known specimen of the species is a male from Mt. Banahoa, Luzon, in the Heinrich collection in Warsaw, labeled "*Trogus basalis* Morl., compared with type 1939, J. F. Perkins." Heinrich mentioned this specimen and a male from Celebes in 1934 (Mitt. Zool. Mus. Berlin 20: 82). Later (1937. Mitt. Deut. Ent. Gesell. 8: 53) he used the Celebes specimen as type of a new species (*Holcojoppa? celebensis*) but considered the Philippine specimen to be correctly determined as *basalis*.

Echthromorpha conopleura Krieger, 1908. Mitt. Zool. Mus. Berlin 4: 321. ♂, ♀. Described from "Brasilien." Lectotype: ♀, numbered "8390" (Berlin).

The lectotype and three male paratypes represent the sub-species of *Echthromorpha agrestoria* that occurs only on the Mariana islands. The correct locality of *conopleura* has previously been established by study of the original description (see Yasumatsu, 1941. Insecta Matsumurana 15: 144; and Townes, 1958. Insects of Micronesia 19: 46). I was able to study the types in Berlin, which confirmed previously published opinions about their identity. The type series consists of 3 ♂, 1 ♀. The female and two of the males bear the number "8390." One of these two males has a handwritten label that could be interpreted as "Brazil?," plus another word that is quite illegible. The third male is in the Krieger collection (now in the Berlin Museum) and has no number, but a label apparently written by Krieger: "Brasilien, Berl. Mus."

Echthromorpha notulatoria var. *immaculata* Morley, 1913. Revision of the Ichneumonidae . . . in the British Museum . . . 2: 46. ♂. Described from "India." Name preoccupied by Krieger, 1908. Lectotype: ♂, without locality (London).

The lectotype and male paratype represent the subspecies of *Echthromorpha agrestoria* that occurs only in the Mariana islands. *Immaculata* Morley is a synonym of *Echthromorpha agrestoria conopleura* Krieger 1908.

Eriostethus pulcherrimus Morley, 1914. Revision of the Ichneumonidae . . . in the British Museum . . . 3: 35. ♀. Described from "somewhere in Australasia." Type: ♀, without locality (London).

The genus *Eriostethus*, of which *E. pulcherrimus* is the genotype, is known to occur from Japan and India south to New Guinea. A second specimen of *E. pulcherrimus* has not yet been identified, so the type locality still remains "Australasia."

Exochilum diabolus Morley, 1913. Revision of the Ichneumonidae . . . in the British Museum . . . 2: 73. ♀. Described from "India." Type: ♀, labeled "India" (Oxford). Morley commented again on this species in 1913 in Fauna of British India, . . . Hymenoptera 3: 413.

The type is a specimen of *Therion tenuipes* Norton 1863, a species of eastern United States and Canada. Presumably the label "India" on the type meant "Indiana." See also the case of *Xylonomus tartarus*.

Exolytus egregius Foerster, 1876. Verh. Naturh. Ver. Preuss. Rheinlande 33: 65. ♂. Described from "Fundort unbekannt." Type: ♂, without locality data, labeled "*Exolytus egregius* Först.," standing in the series *Mesoleptus laevigatus* in the Gravenhorst collection (Wroclaw).

When in Wroclaw I neglected to study the type of *egregius*, but it has been seen and mentioned in literature by Pfankuch (1906. Ztschr. Syst. Hymen. Dipt. 6: 84). Pfankuch seems to have considered *egregius* a synonym of *Mesoleptus laevigatus* Gravenhorst 1820. Gravenhorst's material of *laevigatus* (including the type of *egregius*) came from various localities in Europe (see Ichneumonologia europeae 2: 113). The specimens in his collection bear no locality, hence Foerster's "Fundort unbekannt." His entire series, however, came from Europe, mostly from central Europe.

Ichneumon ambulatorius Fabricius, 1775. Systema entomologiae p. 329 [♀]. Described from "Anglia." Type: ♀, without locality (London).

The type is a specimen of *Pterocormus jucundus* Brullé 1846, which is therefore a synonym of *Pterocormus ambulatorius* Fabricius. This species is known only from the eastern Nearctic Region. Perkins (1952. Entomologist 85: 66) has already indicated the synonymy and the correct locality.

Heinrich (1953. Jour. Washington Acad. Sci. 43: 149) has reduced "*jucundus*" (= *ambulatorius*) to subspecific rank under the European *Pterocormus sarcitorius* Linnaeus. The relationship of *ambulatorius* with *sarcitorius*, involving two closely related allopatric forms, is one for careful consideration and no guarantee of an entirely satisfactory answer. It is my opinion that on the basis of present knowledge the two should be called distinct species. One important fact is that *ambulatorius* could just as well be called a subspecies of the European *Pterocormus lautatorius* Desvignes as of *sarcitorius*. It seems to have just as much in common with the former as with the latter, and is about as distinct from both as these two essentially sympatric European forms are from each other.

Ichneumon annulatorius Fabricius, 1775. *Systema entomologiae* p. 330. [♂].

Described from "Anglia." Type: ♂, without data (London).

The type is a specimen of *Pterocormus funestus* Cresson 1864, a species known only from the eastern Nearctic region. *P. funestus* is therefore a synonym of *annulatorius*. Perkins (1952. *Entomologist* 85: 67) recognized *annulatorius* as a Nearctic species and corrected the type locality to Boston, Mass. His willingness to give a definite North American locality is based on a statement by Trentepohl (1829. *Isis, von Oken* 8: 812) that one of two specimens of *annulatorius* in Fabricius' collection is labeled "Boston in England."

Ichneumon barbator Fabricius, 1793. *Entomologia systematica* . . . 2: 171.

Sex not given. No locality given. Type: lost. The type was described from the Banks collection (London), but is not in the Banks collection now, nor was it present when Banks collection was first catalogued (see Morley, 1909. *Entomologist* 42: 131).

The type is lost and the original description does not bring to mind any particular species, except possibly some of the small *Xorides* males of Europe. Its identity and locality remain unknown. It may not even have been an ichneumonid.

Ichneumon declinans Kriechbaumer, 1897. *Ent. Nachr.* 23: 120. ♂, ♀. Described from an unknown locality. Types: ♂, ♀ (lost).

The types are lost and the original description does not seem to fit any species that I know. The types were sent to Kriechbaumer from the university museum in Graz (Austria). I could not find them in Kriechbaumer's collection or among other material in Munich. Possibly they were returned to Graz. Berthoumieu (1904. *Genera insectorum* 18: 32) referred the species to *Coelichneumon* and stated that it was from "Europe centrale," but his conclusions may have been based on only the original description.

Ichneumon eximius Stephens, 1835. *Illustrations of British entomology* . . .

Mandibulata 7: 186. ♀. Described from "Yorkshire, England." Type: ♀, no locality data (London).

The type is a specimen of *Ichneumon caeruleus* Cresson 1864, which is known only from the eastern Nearctic Region. *I. caeruleus* is therefore a synonym of *Ichneumon eximius* Stephens. Perkins has already published the synonymy and correction of the type locality (1953. *Bul. British Mus., Ent.* 3: 107). I have confirmed the synonymy by comparing specimens first with the type of *caeruleus* and then the same specimens with the type of *eximius*.

Ichneumon gestator Thunberg, 1822. *Mém. Acad. Imp. Sci. St. Pétersbourg* 8: 262, key. 1824. *Mém. Acad. Imp. Sci. St. Pétersbourg* 9: 312, description, ♀.

Described from "Habitat in Indiis." Type: ♀, labeled "Ind. Or." (Uppsala).

The type is a specimen of the subspecies of *Theronia atalantae* that occurs in Japan and Korea. *Atalantae* does not occur in the East Indies. Roman described the type in 1912 (*Zool. Bidrag Från Uppsala* 1: 257), and I examined it in 1958. *Theronia japonica* Ashmead, 1906, is a synonym of *Theronia atalantae gestator* Thunberg.

Ichneumon lugubator Gravenhorst, 1807. *Vergleichende Uebersicht des lineischen und einiger neuern zoologischen Systeme* . . . p. 256. No locality given. Type: ♂, without data (Wroclaw).

The type is a specimen of *Pterocormus rufiventris* Brullé 1846, which is transcontinental in the Canadian and Transition zones of North America. *Rufiventris* is a synonym of *Pterocormus lugubator* Gravenhorst.

The type of *lugubator* was redescribed by Gravenhorst in 1829 (*Ichneumologia europaea* 1: 541), where he stated that the country of origin was unknown. Kriechbaumer (1875. *Stettin Ent. Ztg.* 36: 41) identified a male from Philadelphia, Pa., as belonging to *lugubator* and noted that the species was similar to *Pterocormus rufiventris* as described by Brullé. He believed, however, that *rufiventris* was a distinct species because its description implied an entirely black face in the male. Though the male of the true *lugubator* usually has yellow marks on the face, the face is sometimes entirely black. In any case, the lectotype of *rufiventris* is a female and belongs to the present species.

Ichneumon multipunctor Thunberg, 1822. *Mém. Acad. Imp. Sci. St. Pétersbourg* 8: 262, key. 1824. *Mém. Acad. Imp. Sci. St. Pétersbourg* 9: 313, description, [δ , ♀]. Described from Eastern India and Cape of Good Hope. Types as follows: Alpha, a ♀ labeled "*multipunctor*, Cap.. *Pedator* F." Beta, a male labeled "*multipunctor*, Cap." Gamma, a female labeled "*multipunctor*, Ind." Delta, a male labeled "*multipunctor*, Cap. B. sp." All are in the Thunberg collection in Uppsala.

Specimens alpha, beta, and gamma all represent a species of *Xanthopimpla* of the Princeps Group, near *X. iaponica* Krieger, differing among themselves in the extensiveness of the black markings. Specimen delta is *Xanthopimpla punctata* Fabricius. Specimen alpha is hereby designated lectotype. The Princeps Group is primarily Oriental in distribution. The type almost certainly came from the general vicinity of southeastern Asia, the East Indies, or Japan. My guess is that it will prove to be the same as *X. iaponica*, but this is a suggestion rather than a conclusion. Direct comparisons of specimens of the Princeps Group with this type have not yet been made. Roman (1910. *Zool. Bidrag från Uppsala* 1: 267) has already diseused these types, and published a figure of the abdomen of one of them.

Ichneumon nigratorius Fabricius, 1804. *Systema piezatorum* p. 55. [♀]. Described from "America boreali." Name preoccupied by Brünnich 1766, by Müller 1776, and by Panzer, 1891. Renamed *Ichneumon nigriculus* by Walkley (1958. U. S. Dept. Agr. Agr. Monogr. 2, first suppl. p. 52). Type: ♀ , labeled "Mus. de Sehestedt," without locality data (Copenhagen).

The type is a specimen of *Amblyjoppa proteus proteus* Christ 1791, which occurs only in Europe. My guess is that the type was collected in Denmark.

Ichneumon nitrator Dalla Torre, 1902. *Catalogus hymenopterorum* 3: 957. Cited from an unknown locality. Dalla Torre's *nitrator* is a *lapsus* for *Ichneumon nitratorius* Trentepohl (1829. *Isis von Oken* 8: 810), which is itself a typographic error for *Ichneumon intratorius* Fabricius (1793. *Entomologia systematica* . . . 2: 132). Fabricius' *intratorius* was described from "Barbarbia." Trentepohl (*ibidem*) redescribes his type and disusses the synonymy.

Ichneumon pygmaeus Poda, 1761. *Insecta musei graecensis* . . . p. 104. Described very briefly ("I. niger, abdomine subpetiolate falcate, rufo, immaculato alis nigris"), without mention of sex or locality. The species has not been identified since it was described, and the location of the type (if it exists) is not known.

Labium bicolor Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 316. ♂. Described from New Guinea. Lectotype: ♂ (lacks abdomen), without locality (Paris).

The genus *Labium* occurs in Tasmania and the southern half of Australia. Except for Brulle's record it has not been reported from New Guinea. In the Paris Museum there is a short series of *Labium bicolor*, labeled "Victoria." It seems probable that the type of *L. bicolor* is part of this same series but lost its locality label and was erroneously described from New Guinea. *L. bicolor* was not known to Turner and Waterston when they wrote their revision of *Labium* (1920. Proc. Zol. Soc. London 1920: 1-24). It runs in their key to the new species *sculpturatum*. Mr. J. F. Perkins has compared for me a specimen of *bicolor* from the series mentioned above with the type of *sculpturatum*. He reports that it is not the same as *sculpturatum*, differing in having the striae on the metapleurum mostly oblique. In the type of *sculpturatum* the striae are mostly horizontal.

Mesostenus ferrugineus Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 232. ♀. Described from "Brésil." Types: 3 ♀, without data (Paris).

The types represent a species of the Ethiopian genus *Brachycoryphus* near *B. arcularis* Holmgren. *Brachycoryphus* is unknown from South America.

Mesostenus ruficoxis Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 215. ♀. Described from "Hab. inconnue." Type: ♀, without data (Paris).

This belongs in *Lamprocryptidea*, a genus restricted to the Neotropic Region. Roman (1910. Ent. Tidskr. 31: 151) reported a specimen of the species from Brazil.

Mesostenus vesiculosus Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 240. ♀. Described from "Ile de Java." Type: ♀, labeled "Java" (Paris).

The type represents a species of *Xanthocryptus* which seems to be common on New Guinea, Arn, and Mysol. A second specimen from "Java" has not been found. See also the case of *Cryptus elegantulus elegantulus* Brullé. Synonyms of *Xanthocryptus vesiculosus* (new combination) are *Mesostenus pictus* Smith 1858, *Mesostenus multipictus* Smith 1863, *Stenarella nigratarsis* Szépligeti 1916, and *Xanthocryptus monstratus* Cheesman, 1936.

Metopius pinatorius Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 120, ♂. Described from "la Caroline." Lectotype (hereby designated): ♂, with abdomen present, from Bose collection (Paris). There is a second male, conspecific and also from the Bose collection. This one lacks the abdomen.

The types are a European species of *Metopius*, subgenus *Tylopius*, identical with *Metopius micratorius* of Clément and other authors, not the *micratorius* of Fabricius. See Townes and Townes, 1959. U. S. Natl. Mus. Bul. 216: 62 and 99. I suppose that Brullé's type came from France.

Occia pulchella Tosquinet, 1904, Mém. Soc. Ent. Belgique 10: 48. ♀. Described from "Mysol." Type: ♀, labeled "Ile Mysol 1878" (Brussels).

The type represents a species of Lissonotini common in most of South America. The genus to which it belongs is known only from the Neotropic region.

Pulchella is the genotype of *Oecia*, which genus has previously been known under the names *Opheltoideus* Enderlein (misdetermination of *Opheltoideus* Ashmead), *Spilanomalon* Morley, *Enderleinia* Cushman (name preoccupied), *Caligulina* Strand, *Aulosita* Strand, and *Hymenenderleinia* Cushman. All these are synonyms of *Oecia* (new synonymies). The described species, which are hereby transferred to *Oecia* are: *Anomalon elegans* Cresson 1873, *Opheltoideus ashmeadi* Enderlein 1912, and *Opheltoideus politissimus* Enderlein 1912. *Opheltoideus sannio* Enderlein 1912 is a synonym of *Oecia pulchella* (new synonymy).

Ophion albigena Taschenberg, 1875. Ztschr. f. die Gesam. Naturw. 46: 431. sex? Described from "Patria?" (country unknown). Type: lost.

The curator of the Taschenberg collection at Halle searched for this type for me in 1958, but could not find it. The identity of the species and its country of origin remain unknown. According to characters in the original description it belongs in *Enicospilus*, to which it is now transferred.

Ophion arcuatus Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 146. Described from "Chine." Type: sex? (apex of abdomen covered with dirt, concealing sex), data illegible, but could be read as "Chinie" or something similar (Paris).

The type is a specimen of *Enicospilus undulatus* Gravenhorst. It is atypical in having the thorax unusually short, rugosities on propodeum unusually strong, prepetal earina very faint dorsad of sternaulus, and pleural punctation rather coarse. Nevertheless, it seems to be a specimen of *E. undulatus* (new synonymy). This species is not known from China. My guess is that the type came from France.

Ophion femoratus Olivier, 1811. Encyclopédie méthodique . . . Histoire naturelle. Insectes. 8: 508, 517. ♀. Described from "environs de Paris." Type: lost. Dalla Torre (1901. Catalogus hymenopterorum 3: 190) stated that the type locality is unknown, but Olivier says "Il se trouve aux environs de Paris." The original description indicates that *femoratus* is a species of *Odontocolon*, probably the same as *O. pinetorum*. As first revisor I hereby restrict the name *Ophion femoratus* Olivier to the species defined by Clément (1938. Festschrift zum 60. Geburtstag von Professor Dr. Embrik Strand 4: 512) as "*Odontomerus*" *pinetorum* Thomson. Again as a revisor, I restrict the names *Ichneumon ruspator* Foureroy 1785 and *Ichneumon dentipes* Gmelin 1790 to this same species. The correct name for the species is therefore *Odontocolon ruspator* Foureroy.

Ophion infuscatus Taschenberg, 1875. Ztschr. f. die Gesam. Naturw. 46: 429. sex? Described from "Brasilien?" Type: sex? (lacks abdomen beyond sixth segment), without data (Halle).

The type is a specimen of *Stenoproctonus bombycivorus* Gravenhorst, 1829. This is a Palaearctic species, ranging from Europe to Japan. The European form averages smaller and darker than the one from Japan and eastern Asia. The type is like European specimens and is presumably from Germany.

Ophion latipenne Kirby, 1896. Ann. Mag. Nat. Hist. (6) 18: 263. ♀. Described from "Ogové River," Gabon, Africa. Type: ♀, labeled "Ogové" (London).

O. latipenne is the genotype of *Eurycamptus*, which is an African genus. Although Kirby gave the locality correctly, Dalla Torre (1901. Catalogus hymenopterorum 3: 192) cited the type locality incorrectly as being Australia,

Ophion rufus Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 149. Described from "L'île de France," "Le Bengale," "Malabar," and "Java." Lectotype (hereby designated): ♀, labeled "isle de France [=Mauritius], Leschenault" (Paris).

The type is a species of *Enicospilus*, the same as *Ameosopilus insidiosus* Enderlein 1921, which is therefore a synonym of *E. rufus* Brullé. *A. insidiosus* was described from Madagascar. In the Paris museum is also the paratype from "Bengale." This is also an *Enicospilus* but a different species from *rufus*. The paratypes from Malabar and Java were not seen, but it is almost certain that they are not conspecific with the lectotype.

Although the localities cited by Brullé are probably all correct, his type series was mixed. The true *E. rufus* is known to occur only on Madagascar and Mauritius.

Pimpla annulipes Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 102. ♀. Described from "l'Amérique méridionale." Type: ♀, without data except "no. 136" (Paris).

The type is a large specimen of *Coccygomimus inflatus* Townes 1938, which is known only from eastern United States. For further discussion, see Townes and Townes, 1960. U. S. Natl. Mus. Bul. 216, part 2, p. 347.

Pimpla continua Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 92. ♀. Described from "Hab. inconnue." Type: ♀, without data (Paris).

The type is a specimen of *Echthromorpha agrestoria notulatoria* (Fabricius), similar to the race that occurs on Java. The subspecies *notulatoria* is widely distributed in the Oriental Region.

Pimpla interrupta Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 91. ♀. Described from "Nouvelle-Hollande." Type: ♀, without data (Paris).

The type represents the subspecies of *Echthromorpha agrestoria* that occurs only on New Caledonia. Synonyms of *Echthromorpha agrestoria interrupta* (new status) are *Notiopimpla platymischa* Vachal 1907, and *Echthromorpha inermis* Morley 1913 (new synonymies).

Pimpla nigricornis Kirby, 1896. Ann. Mag. Nat. Hist. (6) 18: 263. ♀. Described from "Ogové River," Gabon, Africa. Name preoccupied by Smith, 1864. The species was renamed *Pimpla ogovensis* by Dalla Torre in 1901 (Catalogus hymenopterorum 3: 443). Type: ♀, labeled "Ogové" (London).

The type is a specimen of *Xanthopimpla*. Although Kirby gave the locality correctly, Dalla Torre (*l.c.*) cited the type locality incorrectly as being Australia.

Pimpla rufipes Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 102. ♂, ♀. The ♀ is described from "l'Amérique septentrionale"; the ♂ from "l'Amérique méridionale." Lectotype (hereby designated): ♀, "Montevideo" (Paris).

The type series of 3 ♀♀ apparently bore only numbers in Brullé's time and the locality "Montevideo" was added later. In his descriptions of ♂ and ♀ Brullé appears to have confused localities. The ♀ is a *Coccygomimus* which should have been described from South America. The ♂ described is *Coccygomimus pedalis* which occurs in North America,

Pimpla stramentaria Kriechbaumer, 1890. Ann. Naturh. Hofmus. Wien 5: 483. ♀. Described without locality. Type: ♀, with label 27/7 and with a cocoon on the pin (Vienna).

The type appears to be an abnormally colored specimen of the European *Scambus* (*Scambus*) *nucum* (Ratzeburg), 1844. The abdomen is largely pale brown and the other colors pale, as if the specimen were teneral. The date 27/7 on the label is written in the European fashion, with the sevens crossed. I believe that the type came from near Vienna. The cocoon on the pin with the type is apparently not the cocoon from which the parasite emerged. It is too small and has the shrivelled remains of a caterpillar inside, not the remains of an ichneumonid pupal skin and meconium.

Proboloides glabratus Morley, 1903. The Ichneumons of Great Britain 1: 161. ♂, ♀. Described as British. Lectotype: ♀, labeled "British. ex coll. Gorham" (London).

The type is a specimen of (*Ichneumon*) *Degithina sollicitoria* (Fabricius), 1775 (new combination), which species is known only from New Zealand. Morley (1909. Entomologist 42: 119) has already corrected the type locality and synonymized his species with *Ichneumon sollicitorius* Fabricius. He referred *sollicitorius* to *Proboloides*, which genus is a synonym of *Degithina* (new synonymy). See also the case of *Proboloides maculatus*.

Proboloides maculatus Morley, 1903. The Ichneumons of Great Britain 1: 161. ♂, ♀. key, des. Described as British. Lectotype: ♀, labeled "British. ex coll. Gorham" (London).

The type is a specimen, of *Degithina*, a genus known only from New Zealand. Morley (1909. Entomologist 42: 119) has corrected the type locality and synonymized his species with (*Ichneumon*) *Degithina deceptus* (Smith), 1876 (new combination). He referred *deceptus* to his genus *Proboloides*, which is a synonym of *Degithina*. See also the case of *Proboloides glabratus*.

Rhyssa marginalis Brullé, 1846. Histoire naturelle des insectes hyménoptères 4: 79. ♀. Described from "Hab. inconnue." Type: ♀, without data (Paris).

The type is a specimen of *Rhyssa persuasoria*, a large specimen with unusually large white markings, almost as large as in the Himalayan race of *persuasoria*. The species is Holarctic in distribution. My guess is that Brullé's type came from France.

Skeattia annulipes Cameron, 1906. Ann. S. Afric. Mus. 5: 153. ♀. Described from "Cape Colony." Type: ♀, labeled "Cape" (London)

The type is a species of *Gotra*, a genus common in the Indo-Australian area but not known from Africa. The type has a color pattern that is very common in the Oriental Region. I have not seen a second specimen of the species. Cheesman (1936: Nova Guinea 17: 363) says that the type is from Queensland, but does not elaborate on this statement.

Stauropodoctonus alienus Morley, 1912. Revision of the Ichneumonidae . . . in the British Museum . . . 1: 17. ♀. Described from: "patria incog. (?Asia)." Type: ♀, without data (London).

The type is a species of *Enicospilus*. I have not seen a second specimen. A

more definite locality for the species awaits the collection and identification of additional specimens.

Trogus vulpinus Gravenhorst, 1829. *Ichneumonologia europaeae* 2: 389. [♀]. Described from "circa Genuam" [near Genoa, Italy]. Gravenhorst mentioned also a second specimen, from North America. Type: ♀, labeled "Italia" (Wroclaw). The specimen from North America (labeled "America boreal.") is also in Wroclaw.

Both these specimens are the common Nearctic *Trogus pennator* Fabricius, 1793. The species does not occur in Europe. Kriechbaumer was the first to point out that Gravenhorst's type locality was incorrect (1875. *Stettin Ent. Ztg.* 36: 39).

Xanthopimpla macrura Krieger, 1914. *Archiv. f. Naturg.* (A) 6: 42, 56. ♀. Described from "Bolivien." Type: ♀, labeled "Bolivia" (Berlin).

The type is a specimen of *Xanthopimpla regina* Morley 1913, described by Morley from Nepal, Sikkim, Bengal, and Burma. It matches very well a series of *regina* from Sikkim in the Berlin Museum, determined by Morley. One might presume that the type of *macrura* was originally part of the series of *regina* from Sikkim but was separated from the rest and mislabeled. The species belongs in the Principis Group, which has many species in the Oriental Region but is unknown in America.

Xylonomus tartarus Morley, 1913. *Fauna of British India*, . . . Hymenoptera 3: 78. ♀. Described from "India." Type: ♀, labeled "India" (Oxford).

The type is a specimen of *Xorides stigmapterus stigmapterus* Say, 1824, from eastern United States and Canada. Presumably the label "India" on the type meant "Indiana." See also the case of *Exochilum diabolus*.

LIST OF NOMENCLATORIAL SHIFTS AND CORRECTED TYPE LOCALITIES

- albigena* Taschenberg (*Ophion*) = *Enicospilus albigena* Taschenberg, **new combination**. Type locality unknown.
- alienus* Morley (*Stauropodoctonus*) = *Enicospilus alienus* Morley, **new combination**. Type locality: Unknown (Asia?).
- ambulatorius* Fabricius (*Ichneumon*) = *Pterocormus ambulatorius* Fabricius, **new combination**. Type locality: eastern United States.
- annulatorius* Fabricius (*Ichneumon*) = *Pterocormus annulatorius* Fabricius, **new combination**. Type locality: Boston, Mass.
- annulipes* Brullé (*Pimpla*) = *Coccygomimus annulipes* Brullé. Type locality: eastern United States.
- annulipes* Cameron (*Skeatia*) = *Gotra annulipes* Cameron. Type locality: Queensland?
- arcuatus* Brullé (*Ophion*) = *Enicospilus undulatus* Gravenhorst, **new synonymy**. Type locality: France.
- ashmeadi* Enderlein (*Opheltoideus*) = *Occia ashmeadi* Enderlein, **new combination**.
- Ateleonotus* = *Coccygodes*, **new synonymy**.
- Aulosita* Strand = *Occia*.
- barbator* Fabricius (*Ichneumon*). Type locality and correct genus unknown.
- basalis* Morley (*Dinotomus*) = *Holcojoppa basalis* Morley. Type locality: central Luzon, Philippines.

- bicolor* Brullé (*Labium*). Type locality: Victoria, Australia.
- brevispicula* Waterston (*Oncilella*) = *Coccygodes brevispicula* Waterston, **new combination**.
- Caligulina* Strand = *Occia*.
- Christolia* = *Baryceros*, **new synonymy**.
- Cochlidionostenus* = *Chlorocryptus*, **new synonymy**.
- conopleura* Krieger (*Echthromorpha*) = *Echthromorpha agrestoria conopleura* Krieger. Type locality: Mariana Islands.
- continua* Brullé (*Pimpla*) = *Echthromorpha agrestoria notulatoria* Fabricius. Type locality: Java?
- coreanus* Szépligeti (*Cryptaulax*) = *Chlorocryptus coreanus*, **new combination**.
- corpulentus* Tosquinet (*Cryptus*) = *Coccygodes corpulentus* Tosquinet, **new combination**.
- deceptus* Smith (*Ichneumon*) = *Degithina decepta* Smith, **new combination**.
- declinans* Kriechbaumer (*Ichneumon*). Type locality and correct genus unknown.
- diabolus* Morley (*Exochilum*) = *Therion tenuipes* Norton, **new synonymy**. Type locality: Indiana, U. S. A.
- dorsostriatus* Spinola (*Mesostenus*) = *Baryceros guttatus* Gravenhorst, **new synonymy**.
- egregius* Foerster (*Exolytus*) = *Mesoleptus laevigatus* Gravenhorst. Type locality: central Europe.
- elegans* Cresson (*Anomalon*) = *Occia elegans*, **new combination**.
- elegantulus* Brullé (*Cryptus*) = *Goryphus elegantulus* Brullé, **new combination**. Type locality: Northwestern New Guinea or adjacent islands.
- Enderleinia* Cushman = *Occia*.
- euclides* Blanchard (*Neochristolia*) = *Baryceros euclides*, **new combination**.
- eximius* Stephens (*Ichneumon*). Type locality: eastern United States.
- femoratus* Olivier (*Ophion*) = *Odontocolon ruspator* Foureroy, **new synonymy**. Type locality: near Paris, France.
- ferrugineus* Brullé (*Mesostenus*) = *Brachycoryphus ferrugineus* Brullé, **new combination**. Type locality: southern Africa.
- funestus* Cresson (*Ichneumon*) = *Pterocormus annulatorius* Fabricius, **new synonymy**.
- gestator* Thunberg (*Ichneumon*) = *Theronia atalantae gestator* Thunberg, **new status**. Type locality: Japan.
- glabratus* Morley (*Proboloides*) = *Degithina sollicitoria* Fabricius. Type locality: New Zealand.
- guttatus* Gravenhorst (*Baryceros*). Type locality: Guiana.
- Hymenenderleinia* = *Occia*.
- immaculata* Morley (*Echthromorpha notulatoria* var.) = *Echthromorpha agrestoria conopleura* Krieger, **new synonymy**. Type locality: Mariana islands.
- inermis* Morley (*Echthromorpha*) = *Echthromorpha agrestoria interrupta* Brullé, **new synonymy**.
- inflata* Townes (*Pimpla*) = *Coccygomimus annulipes* Brullé.
- infuscatus* Taschenberg (*Ophion*) = *Stauropoctonus bombycivorus* Gravenhorst, **new synonymy**. Type locality: Germany.
- insidiosus* Enderlein (*Amesospilus*) = *Enicospilus rufus* Brullé, **new synonymy**.

- interrupta* Brullé (*Pimpla*) = *Echthromorpha agrestoria interrupta* Brullé, **new status**. Type locality: New Caledonia.
- japonica* Ashmead (*Theronia*) = *Theronia atalantae gestator* Thunberg, **new synonymy**.
- latipenne* Kirby (*Ophion*) = *Eurycamptus latipennis*, **new combination**. Type locality: Ogové River, Gabon, Africa.
- lautatorius* Desvignes (*Ichneumon*) = *Pterocormus lautatorius*, **new combination**.
- lugubrator* Gravenhorst (*Ichneumon*) = *Pterocormus lugubrator*, **new combination**. Type locality: eastern United States.
- macrura* Krieger (*Xanthopimpla*) = *Xanthopimpla regina* Morley, **new synonymy**. Type locality: Sikkim.
- maculatus* Morley (*Proboloides*) = *Degithina decepta* Smith. Type locality: New Zealand.
- marginalis* Brullé (*Rhyssa*) = *Rhyssa persuasoria* Linnaeus, **new synonymy**. Type locality: France.
- monstratus* Cheesman (*Xanthocryptus*) = *Xanthocryptus vesiculosus* Brullé, **new synonymy**.
- multipictus* Smith (*Mesostenus*) = *Xanthocryptus vesiculosus* Brullé, **new synonymy**.
- multipunctor* Thunberg (*Ichneumon*) = *Xanthopimpla multipunctor* Thunberg. Type locality: Southeastern Asia?
- nigratorius* Fabricius (*Ichneumon*) = *Amblyjoppa proteus proteus* Christ, **new synonymy**. Type locality: Denmark.
- nigricornis* Kirby (*Pimpla*) = *Xanthopimpla ogovensis* Dalla Torre. Type locality: Ogové River, Gabon, Africa.
- nigriculus* Walkley (*Ichneumon*) = *Amblyjoppa proteus proteus* Christ, **new synonymy**.
- nigripes* Cameron (*Buodias*) = *Goryphus elegantulus* Brullé, **new synonymy**.
- nigritarsis* Szépligeti (*Stenarella*) = *Xanthocryptus vesiculosus* Brullé, **new synonymy**.
- ogovensis* Dalla Torre (*Pimpla*) = *Xanthopimpla ogovensis* Dalla Torre, **new combination**. See *Pimpla nigricornis* Kirby, for which *ogovensis* is a new name.
- Opheltoides* Enderlein (not Ashmead) = *Occia*, **new synonymy**.
- pictus* Smith (*Mesostenus*) = *Xanthocryptus vesiculosus* Brullé, **new synonymy**.
- pinatorius* Brullé (*Metopius*). Type locality: France.
- platymischa* Vachal (*Notiopimpla*) = *Echthromorpha agrestoria interrupta* Brullé, **new synonymy**.
- politissimus* Enderlein (*Opheltoideus*) = *Occia politissima* Enderlein, **new combination**.
- Proboloides* = *Degithina*, **new synonymy**.
- pulchella* Tosquinet (*Occia*). Type locality: South America.
- pulcherrimus* Morley (*Eriostethus*). Type locality: "Australasia."
- punctata* Brullé (*Christolia*) = *Baryceros punctatus* Brullé, **new combination**.
- pygmaeus* Poda (*Ichneumon*). Correct genus and type locality unknown.
- quadrilineatus* Brullé (*Mesostenus*) = *Baryceros guttatus* Gravenhorst, **new synonymy**.
- ruficeps* Cameron (*Atoleonotus*) = *Coccygodes ruficeps* Cameron, **new combination**. Type locality: southern Africa.

- ruficoxis* Brullé (*Mesostenus*) = *Lamprocryptidea ruficoxis* Brullé, **new combination**. Type locality: Neotropic Region.
- rufipes* Brullé (*Pimpla*) = *Coccygomimus rufipes*, **new combination**. Type locality, Montevideo, Uruguay.
- rufiventris* Brullé (*Ichneumon*) = *Pterocormus lugubator* Gravenhorst, **new synonymy**.
- rufus* Brullé (*Ophion*) = *Enicospilus rufus* Brullé, **new combination**. Type locality: Mauritius.
- ruspator* Foureroy (*Ichneumon*) = *Odontocolon ruspator* Foureroy, **new combination**.
- sannio* Enderlein (*Opheltoideus*) = *Occia pulchella* Tosquinet, **new synonymy**.
- sollicitorius* Fabricius (*Ichneumon*) = *Degithina sollicitoria*, **new combination**. *Spilanomalon* = *Occia*, **new synonymy**.
- spinosa* Brullé (*Joppa*) = *Baryceros guttatus* Gravenhorst, **new synonymy**.
- stramentaria* Kriechbaumer (*Pimpla*) = *Scambus nucum* Ratzeburg, **new synonymy**. Type locality: Austria.
- striatus* Brullé (*Cryptus*). Type locality and correct genus unknown.
- subquadratus* Waterston (*Oneilella*) = *Coccygodes subquadratus* Waterston, **new combination**.
- tartarus* Morley (*Xylonomus*) = *Xorides stigmapterus stigmapterus* Say, **new synonymy**. Type locality: Indiana, U. S. A.
- texanus* Ashmead (*Crypturus*) = *Baryceros texanus* Ashmead, **new combination**.
- vesiculosus* Brullé (*Mesostenus*) = *Xanthocryptus vesiculosus* Brullé, **new combination**. Type locality: New Guinea or adjacent islands.

A REVIEW OF THE GENUS *PALMODES* IN NORTH AMERICA

(HYMENOPTERA: SPHECIDAE)

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In connection with a study of North American Sphecine wasps it was discovered that the common and widespread black species, *Palmodes laeviventris* Cresson, was a composite involving at least six species. One of these is *morio* Kohl which has been reposing in synonymy. Two additional species have been confused with *dimidiatus* (deGeer), which has been generally known by the later name, *rufiventris* Cresson. About 1,000 specimens have been examined from the following institutions:

American Museum of Natural History, California Academy of Sciences, California State Department of Agriculture, Canadian National Collection, Cornell University, Los Angeles County Museum, Nevada State Department of Agriculture, Oregon State College, U. S. National Museum, University of California at Berkeley, Davis, and Riverside, University of Idaho, University of Kansas, and University of Nevada. Holotypes of the new species will be deposited in the California Academy of Sciences (CAS), paratypes in the U. S. National Museum and as many other institutions as possible.

We would like to thank Dr. Karl Krombein of the U. S. National Museum and Mr. Harold Grant, Jr. of the Academy of Natural Sciences at Philadelphia for help in comparison of type specimens under their care.

Biology: Insofar as known, these fossorial wasps provision their nests with Dectine Tettigoniidae of the genera *Atlanticus*, *Neduba*, *Platylyra* and *Anabrus*.

Systematics: We are treating *Palmodes* Kohl as a distinct genus with the following combination of generic characters: Claws with two rounded, basoventral teeth; second submarginal cell higher than wide, approaching a parallelogram, second and third submarginal cells each receiving one recurrent vein; clypeus of male flattened, apical margin essentially quadrilobate; clypeal apex of female with truncate or slightly concave median lobe delimited sublaterally by a shallow or deep concavity; head and thorax covered with long erect black hair, male sternites IV-V with satiny pubescence in contrast to that of III; male flagellar segments faintly carinate but without strong tyloides or flat depressions; psammophore well developed in female; suture from hind coxa to metathoracic spiracle well defined posteriorly only.

The specific characters of *Palmodes* are disappointingly few. Male genitalia offer useful differentiations in most cases but male antennal structure is nearly uniform, and the eighth sternite appears to be individually variable. Wing color is helpful in identifying several species. Abdominal color has been used by other authors but its significance has been misunderstood. Our studies indicate that six species

have the abdomen all black in both sexes. The remaining four have more or less advanced tendencies toward red markings in one or both sexes, the red appearing first just beyond the petiole, and usually more extensive in the female. The presence or absence of silvery appressed facial pubescence is distinctive except in females of one species. The degree of bristliness is of some slight value. Sculpture is often significant, particularly with respect to the scutum and scutellum. As in most wasps, clypeal shape is usually characteristic in *Palmodes*, at least at the species-group level.

KEY TO THE NEARCTIC SPECIES OF PALMODES

Males

- | | |
|---|-----------------------------------|
| 1. Clypeus without appressed silvery pubescence, hairs brown or black..... | 2 |
| Clypeus covered with appressed silvery pubescence..... | 6 |
| 2. Median apical margin of clypeus strongly produced, narrowly bilobed (fig. 11); body all black..... | <i>stygicus</i> Bohart and Menke |
| Median apical margin of clypeus not strongly produced, broadly and slightly emarginate (about as in fig. 9)..... | 3 |
| 3. Flagellar segment IX about twice as long as broad in dorsal (non-carinate) view; body 13 mm. or less in length, all black; California coastal or insular species..... | 4 |
| Flagellar segment IX more than twice as long as broad in dorsal (non-carinate view); body usually 15 mm. or more in length; abdomen red to black, some smaller forms with red-marked abdomen as short as 14 mm..... | 5 |
| 4. Hindwing rather evenly brown-stained and violaceous; inner angle of cuspis sharply protruding as in figure 14; coastal species..... | <i>pacificus</i> Bohart and Menke |
| Hindwing nearly clear in cellular area; inner angle of cuspis moderately protruding, about as in figure 15; insular species..... | <i>insularis</i> Bohart and Menke |
| 5. Petiole with abundant hair on distal one-half above; scutum with long, dense hair anteriorly; abdomen black; row of teeth toward apex of aedeagus nearly straight in flat, dissected mount (fig. 17)..... | <i>morio</i> (Kohl) |
| Petiole nearly bare on distal one-half above; scutum with shorter, sparser hair anteriorly; abdomen red to black (usually partly red in California specimens); row of teeth toward apex of aedeagus sinuate in flat, dissected mount (fig. 15)..... | <i>dimidiatus</i> (deGeer) |
| 6. Tegular pubescence dark or fulvous, not very pale; body length 17-24 mm.; cross-striae of propodeal enclosure coarse..... | 7 |
| Tegular pubescence partly silvery or very pale (sometimes scanty and best viewed from above and in front); body length usually less than 15 mm.; cross-striae of propodeal enclosure fine..... | 8 |
| 7. Anal lobe of hindwing nearly clear; clypeus medially with two prominent, glabrous, polished lobes; abdomen black..... | <i>laeiventris</i> (Cresson) |
| Anal lobe of hindwing plainly brown-stained; clypeus medially with weakly developed lobes; abdomen with basal segments red..... | <i>praestans</i> (Kohl) |

8. Scutellum mostly shiny, not indented nor shagreened medially; scutum with posterior one-third mostly shiny with well separated punctures; abdomen black **lissus** Bohart and Menke
 Scutellum rather dull, shagreened and often indented; scutum with posterior one-third covered with close, swirling micro-ridges 9
9. Scutum heavily shagreened in front, minute longitudinal and transverse ridges giving a "frosted" appearance; abdomen black
 **californicus** Bohart and Menke
 Scutum somewhat polished in front, the punctures well separated; abdomen black or reddish basally **hesperus** Bohart and Menke

Females

1. Flat or concave margin of median clypeal lobe shorter than flagellar segment II, and shorter than antennal socket expanse (fig. 1, 3, 6); scutum rather shiny posteriorly and often extensively smooth 2
 Flat or concave margin of median lobe equal to or greater than length of flagellar segment II, or antennal socket expanse (figs. 2, 4, 5, 7, 8); scutum rather dull posteriorly except in one species 5
2. Clypeus deeply notched submedially (fig. 1); large black wasps about 23 mm. long **stygius** Bohart and Menke
 Clypeus broadly and shallowly emarginate submedially (figs. 3, 6); body usually less than 20 mm. long 3
3. Scutellum flattened, ungrooved, with scattered punctures but highly polished; abdomen black **lissus** Bohart and Menke
 Scutellum distinctly raised, largely or all shagreened, usually grooved medially 4
4. Abdomen all red; face and clypeus with all dark pubescence
 **californicus** Bohart and Menke
 Abdomen with last 3 or more segments black; face and clypeus usually with some silvery or pale golden appressed pubescence, particularly in specimens from the Great Basin fauna **hesperus** Bohart and Menke
5. Hindwing partly clear in cellular area or suffused with orange 6
 Hindwing rather evenly brown, violaceous 7
6. Wings extensively orange; abdomen red **praestans** (Kohl)
 Wings partly clear in cellular area, otherwise brown-stained
 **insularis** Bohart and Menke
7. Clypeal margin with a deep, submedian notch (figure 4); body all black
 **laeviventris** (Cresson)
 Clypeal margin with a shallow and obtuse submedian notch (figure 7) 8
8. Terminal sternite rather sharply ridged along median line opposite bristled area; body usually 14 mm. or less in length; abdomen black
 **pacificus** Bohart and Menke
 Terminal sternite narrowly but not very sharply rounded along median line; body usually 18-23 mm. in length 9
9. Abdomen partly or all red (rare exceptions); ventral surface of sternite VI with 6-8 stout bristles on either side of median ridge
 **dimidiatus** (deGeer)
 Abdomen black; ventral surface of sternite VI usually with 10 or more stout bristles on either side of median ridge **morio** (Kohl)

Palmodes californicus Bohart and Menke, new species
(Figures 3, 13)

Male.—Length of body 14 mm.; forewing 10 mm.; black, wings dark brown, lighter toward base of median cell; head, thorax, and petiole with abundant long, erect black hair; clypeus, most of frons, tegula basally and posttegula with silvery appressed pubescence; dorsum of thorax finely and closely punctate and shagreened, dull, scutum in front with dense longitudinal and cross shagreening; propodeum above finely cross striate; apical margin of clypeus slightly undulate; least interocular distance 1.35 times length of flagellar segment I; tenth flagellar segment 2.35 times as long as broad in ventral view; scutellum somewhat raised and medially grooved. Genitalia (fig. 13) with aedeagal teeth numerous, a little irregular; inner angle of cuspis hardly indicated; distal projection of cuspis large and about as broad as long; digitus rather slender and strongly arched.

Female.—Body length 13-18 mm.; forewing 11-13 mm.; abdomen all red except petiole; body without silvery pubescence; dorsum of thorax subshining with small shiny areas on scutum and scutellum; shape of clypeus as in figure 3; least interocular distance 1.32 times length of flagellar segment I; tenth flagellar segment 2.3 times as long as broad in ventral view; scutellum raised, indented medially.

Holotype (CAS).—Male, Tanbark Flat, San Gabriel Mts., Los Angeles Co., California, June 19, 1956 (B. M. Bartosh).

Topoparatypes.—157 males, 60 females (two pair in copula) collected by many individuals from June 17-July 19 during 1950, 1952, and 1956.

Metatypes.—90 males, 40 females from the following California counties: CONTRA COSTA: Mt. Diablo; EL DORADO: Chile Bar, Fallen Leaf Lake, Kyburz, Strawberry Valley; HUMBOLDT: Redwood Creek, Weott; KERN: Searles Station; LOS ANGELES: Altadena, Arcadia, Arroyo Seco Canyon, Big Dalton Dam, Crystal Lake Road, Glendale, Gorman, Pasadena, San Francisquito Canyon, San Gabriel Mts.; MARIPOSA: Yosemite National Park; MENDOCINO: Fort Seward, Hopland Grade, Ryan Creek; MONTEREY: Arroyo Seco Camp, Tassajara Hot Springs; NAPA: Mt. St. Helena, Samuel Springs; PLUMAS: Meadow Valley, Quincy; RIVERSIDE: Beaumont, Piñon Flat; SAN BERNARDINO: Camp Baldy, 12 mi. E. Mentone, Snow Creek Camp, Lytle Creek, Wildwood; SANTA BARBARA: Figueroa Mt.; SIERRA: Gold Lake, Sardine Lakes; SISKIYOU: Mt. Shasta; TRINITY: Preacher Meadow; TUOLUMNE: Strawberry; VENTURA: Foster Park, Santa Paula, Sespe Canyon. Also, 1 male metatype, Colestin, Oregon; and 1 female metatype, Robson, British Columbia.

Systematics.—A close relationship with *hesperus* is obvious and sometimes they are collected in the same locality. The shagreening on the anterior part of the scutum in the male of *californicus* and the all

red abdomen of the female appear to be diagnostic. Also, the clypeus of *californicus* female is always dark-haired and has a more sharply impressed lip than in *hesperus*. The strongly arched digitus of the male genitalia (fig. 13) is diagnostic for *californicus*.

Prey.—Topoparatypes were collected carrying a mature female *Platylyra californica* Seud. and immature *Neduba morsei* Caudell of both sexes.



1. *stygicus*



2. *praestans*



3. *californicus*



4. *laeviventris*



5. *lissus*



6. *hesperus*



7. *dimidiatus*



8. *pacificus*



9. *pacificus*



10. *laeviventris*



11. *stygicus*

Palmodex spp. Figs. 1-8, clypeus of female; figs. 9-11, clypeus of male.

Palmodes hesperus Bohart and Menke, new species
(Fig. 6)

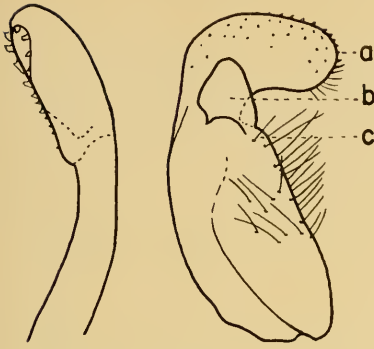
Male.—Length of body 11 mm.; forewing 8 mm.; black, abdominal segments II-III red, wings moderately and rather evenly brown; clypeus, most of frons, tegula basally and posttegula with silvery appressed pubescence; dorsum of thorax finely and rather closely punctate and shagreened except toward front of scutum where punctures are well separated, shagreening is faint and the integument is somewhat shiny; propodeum above very finely, transversely striate; apical margin of clypeus slightly undulate; least interocular distance 1.27 times length of flagellar segment 1; tenth flagellar segment 2.2 times as long as broad in ventral view; scutellum raised, faintly indented medially; genitalia similar to those of *lissus* (fig. 12).

Female.—Body length 13-17 mm.; forewing 9-12 mm.; abdominal segments II-III or IV usually red, sometimes all black; facial pubescence usually about as in male but often tarnished, silvery pubescence sometimes reduced or absent; dorsum of thorax subshining with small shiny areas on scutum; scutellum barely indented, raised, but extensively smooth and punctures separated by one or more diameters; shape of clypeus as in figure 6; least interocular distance 1.5 times length of flagellar segment I; tenth flagellar segment 2.3 times as long as broad in ventral view.

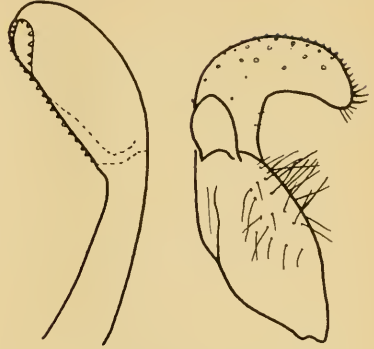
Holotype (CAS).—Male, Golconda, Humboldt Co., Nevada, June 17, 1952 (E. I. Schlinger).

Paratypes.—24 males, 13 females, May 10 to Sept. 10, 1922-1958 from the following states: CALIFORNIA: Bishop Creek, Lone Pine, Inyo Co. (E. C. Van Dyke); 14 mi. E. Alturas (W. C. Bentinck), Cedar Pass (A. J. Mueller) Modoc Co.; Convict Lake (A. Menke, L. Stange), Mammoth (G. E., R. M. Bohart), Mono Co.; Boca, Nevada Co. (R. M. Bohart, R. H. Goodwin). OREGON: Baker (E. C. Van Dyke); Hermiston (H. A. Scullen); Lake of the Woods (M. F. McClay); Sand Creek, Klamath Co. (E. I. Schlinger); Summit Prairie, Grant Co. (R. E. Rieder). WASHINGTON: "W.T.". IDAHO: Bear Pass Creek, Butte Co. (R. M. Bohart); 5 mi. N. Bliss, Gooding Co. (J. E. Gillaspay); Craters of the Moon (E. I. Schlinger); Dixie (W. F. Barr), High Prairie (W. F. Barr), Elmore Co.; 5 mi. NE Midvale, Washington Co. (W. F. Barr); Rock Creek Ranger Sta., Minadoka Co. (J. E. Gillaspay). WYOMING: Roosevelt Lodge, Yellowstone (E. C. Van Dyke). NEVADA: Alamo, Lincoln Co.; 6 mi. W. Carlin (R. H. Beamer, et al), 7 mi. S. Carlin (J. C. Downey); Lamoille Canyon, Ruby Mts. (F. D. Parker); Pequop Summit, Elko Co. (J. C. Downey). UTAH: Beaver Creek Hills, Beaver Co. ARIZONA: Grand Canyon, North Rim (R. M. Bohart). Two male paratypes, May 23 to June 4, 1923, Oliver, BRITISH COLUMBIA (C. B. Garrett).

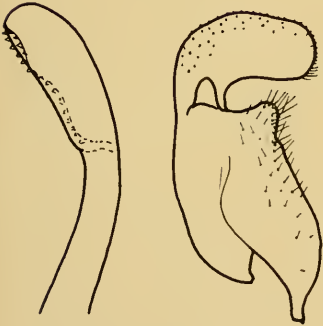
Mctatypes.—18 males, 18 females, April 8 to Aug. 15, 1910-1959 from the following states: CALIFORNIA: Friant (E. S. Ross), Kings River Canyon (E. C. Van Dyke) Fresno Co.; Palo Verde, Imperial Co. (P. D. Hurd); Mojave, Kern Co. (R. G. Howell);



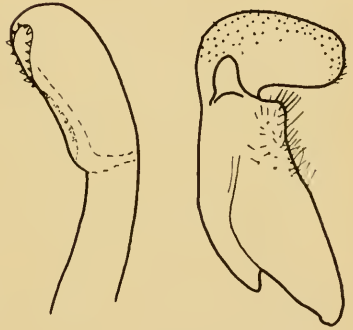
12. *lissus*



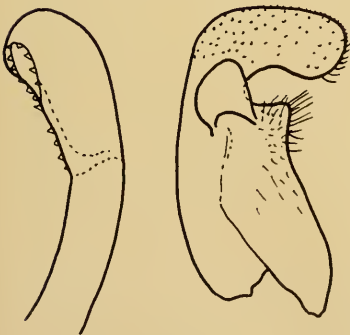
13. *californicus*



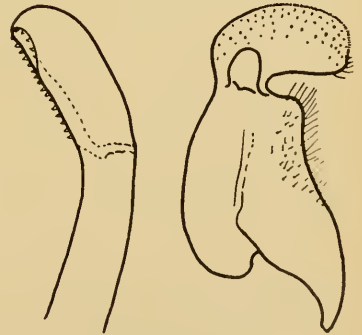
14. *pacificus*



15. *dimidiatus*



16. *stygicus*



17. *morio*

Palmodes spp. Figs. 12-17, tip of aedeagus, cuspis and digitus in dissected lateral view; fig. 12, a: digitus, b: distal projection of cuspis, c: inner angle of cuspis.

Tanbark Flat, San Gabriel Mts., Los Angeles Co. (R. M. Bohart, J. C. Hall, L. W. Hellwig, W. O. Marshall, H. F. Robinson, L. A. Stange, K. G. Whitesell); 2 mi. E. Anza (E. G. Linsley, A. S. Menke, L. A. Stange), San Jacinto River (R. Husbands), Riverside Co.; Kramer Hills (J. C. Hall), Lytle Creek (W. C. Reeves), Victorville (C. Dammers), San Bernardino Co.; Anza State Park (R. C. Bechtel), Borrego Valley (P. D. Hurd, R. O. Schuster), San Diego Co.; Big Flat, Coffee Creek, Trinity Co.; Hackamore, Modoc Co. (L. G. Smith); Mineral King, Tulare Co. (G. E., R. M. Bohart). COLORADO: Steamboat Springs (O. Bryant). NEVADA: Charleston Mts. (P. H. Timberlake).

Systematics.—Intermediate in many respects between *californicus* and *lissus* but differing as indicated under these species and in the key. Females from Great Basin areas including the eastern slopes of the Sierra have the face and clypeus silvered. Those from southern California are usually dark. Both dark and silvery forms occur near Anza, and specimens with a few silvery hairs have been seen from here as well as from Tanbark Flat. The abdomen is characteristically red on segments II-III but all-black forms occur in many areas. We have seen 22 bicolored individuals and 7 all-black ones. Three partly red males are from Conviet Lake, Mineral King and Kings River Canyon.

Prey.—The female paratype from 6 miles west of Carlin, Nevada was collected bearing an immature male of *Anabrus simplex* Hald.

***Palmodes insularis* Bohart and Menke, new species**

Male.—Length of body 14 mm., forewing 10 mm., black, wings only faintly stained in cellular area, a little more so beyond, median cell of forewing practically clear; dorsum of thorax finely and closely punctate and shagreened, dull; propodeum above finely but distinctly cross striate; apical margin of clypeus undulate; least interocular distance 1.4 times length of flagellar segment I; tenth flagellar segment 1.8 times as long as broad in ventral view; scutellum rather flattened, with a faint longitudinal median ridge. Genitalia similar to those of *dimidiatus* (fig. 15), aedeagus with many small teeth in a curved line; inner angle of cuspis moderately developed, obtuse; distal projection of cuspis small.

Female.—Body length 14-15 mm., forewing 10-11 mm., a little darker than in male; scutum and scutellum more finely punctate than in male, subshining; apical margin of clypeus about as in figure 8; least interocular distance 1.7 times length of flagellar segment I; tenth flagellar segment 1.6 times as long as broad; terminal sternite narrowly rounded along median line.

Holotype male (CAS).—San Clemente Island, Los Angeles Co., California, June 20, 1938 (J. T. Scott).

Paratypes (collected by Los Angeles County Museum Channel Islands Biological Survey team and by others as indicated).—34 males, 22 females, Channel Islands, California: Anacapa, San Miguel (W. P. Cockerell and E. P. Van Duzee), San Clemente (P. H. Timberlake, T. D. Cockerell), Santa Rosa.

Systematics.—The combination of partially pale wings, non-indented scutellum, dark face, black abdomen, and rather short antennae characterize this species. It is related to *pacificus* but male genitalia, scutellar structure, wing color, and the less sharply ridged terminal female sternite differentiate *insularis*.

***Palmodes laeviventris* (Cresson)**

(Figs. 4, 10)

Sphex laeviventris Cresson, 1865. Proc. Ent. Soc. Phila. 4:463, lectotype female, Colorado Territory, Academy of Natural Sciences, Philadelphia.

The type specimen was studied by the senior author. This is the largest species of *Palmodes* and the clypeus is distinctive in both sexes.

P. laeviventris is mainly a Great Basin species and apparently is restricted to the Transition and Canadian life zones. We have seen 24 males and 36 females from the following localities: CALIFORNIA: Hallelujah Junction and Blue Lake, Lassen Co.; Lake Tahoe, El Dorado Co.; Owens Valley, Inyo Co.; Convict Lake and Topaz Lake, Mono Co.; NEVADA: Elko; Reno; Winnemucca; Pyramid Lake; Buffalo Valley, Lander Co.; Lawton Valley, Washoe Co.; UTAH: Rock Canyon; Stansbury Island, Tooele Co.; Farmington; Wildeat Valley, Beaver Co.; Vernon Canyon; Benmore; Hassell Ranch, Juab Co.; IDAHO: Fort Hall; American Falls, Power Co.; Craters of the Moon; Ashton; Corral Creek; MONTANA: Hot Springs; Camas Prairie; Hamilton; WASHINGTON: Grand Coulee; COLORADO: Salina; WYOMING: Laramie Mts.

***Palmodes lissus* Bohart and Menke, new species**

(Figs. 5, 12)

Male.—Length of body 13 mm.; forewing 9 mm.; black, wings brown along veins, otherwise light, somewhat darker beyond venation; clypeus, most of frons, tegula basally and posttegula with silvery appressed pubescence; dorsum of thorax finely and rather closely punctate, subshining; scutum shiny in front where there are both coarse and fine punctures; most of scutellum shiny, punctures mostly separated by two or more diameters; propodeum above finely granulate with faint indication of fine cross striae; apical margin of clypeus slightly undulate; least interocular distance 1.17 times length of flagellar segment I; tenth flagellar segment twice as long as broad; scutellum slightly raised, not indented. Genitalia (fig. 12) with aedeagal teeth moderately small, irregular; inner angle of cuspis weak, obtuse; distal projection of cuspis broader than long.

Female.—Body length 15-19 mm.; forewing 12-14 mm.; wings moderately and rather evenly brown-stained; clypeus, frons, tegula and posttegula dark; scutellum flattened, extensively polished, punctures faint; clypeus as in figure 5; least interocular distance 1.27 times length of flagellar segment I; tenth flagellar segment 2.6 times as long as broad in ventral view.

Holotype (CAS).—Male, Surprise Canyon, Panamint Mts., Inyo Co., California, on *Eriogonum inflatum*, April 24, 1957 (P. D. Hurd).

Paratypes.—10 males, 9 females, April 19 to June 27, 1917-1958, from the following California localities: Inyo Mts., Mazourka Canyon (N. W. Frazier), Olancho (C. L. Fox), Surprise Canyon (R. M. Bohart, L. A. Stange), 7 mi. W. Westgard Pass (J. W. MacSwain); RIVERSIDE CO.: Banning (W. V. Gainer), Tahquitz Canyon (A. Menke and L. Stange); SAN BERNARDINO CO.: Calico Mts. (D. Meadows); SAN DIEGO CO.: Borrego Valley (R. M. Bohart, J. C. Hall, P. D. Hurd, R. Schuster). Three metatype females: S. W. Research Station, 5 mi. W. Portal, Arizona (F. X. Williams). Kaibab National Forest, Arizona (M. Wasbauer); and Santa Elena Canyon, Big Bend National Park, Texas (M. Wasbauer).

Systematics.—The polished scutellum, flattened in the female; hardly striate propodeum, partially clear wings in the male, and all-black body in both sexes are characteristic features which help to separate it from its nearest allies, *californicus* and *hesperus*.

***Palmodes morio* (Kohl)**

(Fig. 17)

Sphex morio Kohl, 1890. Ann. K. K. Naturhist. Hofmus. 5:321 (lectotype female by present designation, Spence's Bridge, British Columbia, Vienna Museum).

Through the kindness of Dr. Max Fischer we have been able to examine the 3 syntypes of *morio* Kohl, a male from Lytton, British Columbia, a female from Spence's Bridge, B. C., and a female from California. We are designating the Spence's Bridge specimen as lectotype. We have seen 50 males and 65 females of this species, mostly from California where it has been taken from May through October in Upper Sonoran, Transition and Canadian life zones. The distribution includes also northern Arizona, Nevada, British Columbia, Northwest Territory, Idaho, Wyoming, Montana, Colorado and New Mexico.

Although previously confused with *laeviventris*, clypeal characters separate it readily in both sexes. In females the abdominal color will almost invariably distinguish it from *dimidiatus*. Black males of the two species are much more difficult to tell apart. In general *morio* is more robust and hairier. Doubtful cases can be decided on the basis of dissected genitalia mounts.

***Palmodes pacificus* Bohart and Menke, new species**

(Figs. 8, 9, 14)

Male.—Length of body 13 mm., forewing 10 mm.; black, wings dark brown, violaceous in some lights, darker beyond venation; head and thorax without silvery appressed pubescence; dorsum of thorax finely and closely punctate, shagreened, dull; propodeum above finely but distinctly cross striate; apical margin of clypeus undulate (fig. 9); least interocular distance 1.44 times length of flagellar segment I; tenth flagellar segment 1.6 times as long as broad in ventral view; scutellum slightly indented. Genitalia (fig. 14) with many small aedeagal teeth; inner angle of cuspis a sharp right angle; distal projection of cuspis small.

Female.—Body length 13-15 mm., forewing 11 mm.; scutellum more finely punctate than in male, subshining; apical margin of clypeus as in fig. 8;

least interocular distance 1.5 times length of flagellar segment I; tenth flagellar segment 2.1 times as long as broad in ventral view; terminal sternite rather sharply ridged along median line opposite bristled area.

Holotype male (CAS).—3 miles west Cachuma Lake, Santa Barbara Co., California, July 6, 1959 (R. M. Bohart).

Paratypes.—40 males, 14 females, April 27 to Sept. 29, 1910-1959 from the following California counties: ALAMEDA: Alameda Foothills (W. M. Gifford); KERN: Mill Potrero (J. E. Bath); LOS ANGELES: Santa Monica (F. C. Clark), West Hollywood Hills (R. G. Howell), Voltaire (J. D. Gunder), Pasadena, San Gabriel Mts. (F. Grinnell, Jr.), El Segundo (L. A. Stange); MONTEREY: Arroyo Seco Camp (R. C. Bechtel), Asilomar (D. J. Burdick and E. G. Meyers), Bixby Creek (M. Wasbauer), Monterey (B. J. Adelson), Seaside (J. A. Chemsak); ORANGE: Corona; RIVERSIDE: San Jacinto Mts. (J. C. Bridwell); SAN BENITO: Idria (E. G. Linsley and R. F. Smith); SAN DIEGO: La Jolla (J. C. Bridwell), Coronado Island (F. Baker); SAN LUIS OBISPO: Morro Bay (J. C. Hall), Oso Flaco Lake (R. M. Bohart); SANTA BARBARA: Bluff Camp, San Rafael Mts. (R. R. Granados), 3 mi. W. Cachuma Lake (R. M. Bohart), Goleta (C. A. Campbell), Nojoqui Park (W. A. Steffan), Santa Ynez Mts. (C. A. Campbell, F. D. Parker); SANTA CLARA: Alum Rock Park (D. J. Burdick), Los Gatos (C. A. Hamsher); VENTURA: Sespe Canyon (J. L. Bath, E. C. Cherry, F. D. Parker).

Systematics.—The all-black body including pubescence, dark wings, relatively small size, and short antennae characterize this Pacific Coast species. It is close to *insularis* but differs in wing color and details of scutellar and male genitalie structure.

***Palmodes praestans* (Kohl)**

(Fig. 2)

Sphex praestans Kohl, 1890. Ann. K. K. Naturhist. Hofmus. 5:323, female, California, Hamburg Museum, presumably destroyed.

The orange wings of the female are diagnostic. The male, which has wings of a more ordinary hue, has not been described. In general it resembles the male of *dimidiatus*, but the clypeus and frons are silvered.

Male.—Length of body 16-21 mm., forewing 12-14 mm.; black with abdominal segments II-III and sometimes tergites II-VI orange-red; clypeus, frons below and laterally covered with silvery appressed pubescence; dorsum of thorax closely shagreened and dull, propodeum with distinct cross striae; apical margin of clypeus undulate; least interocular distance 1.1 times length of flagellar segment I; tenth flagellar segment twice as long as broad in ventral view; scutellum raised, hardly indented. Genitalia with aedeagal teeth relatively few, large and irregular (about as in fig. 16); inner angle of cuspis rather sharp and about 125°; distal projection of cuspis narrower than its median length.

We have seen 31 males and 18 females of this species from NEVADA (Reno; Arden; 3 mi. S. Genoa; Fairbanks Spring, Nye Co.; Pyramid Lake; Alamo; and Minden), ARIZONA (Sabino Canyon, Santa Catalina Mts.), UTAH (Beaver Canyon), COAHUILA, Mexico (Tlahualilo), OREGON (Dixie), NEW MEXICO (Jemez Springs) and the following counties in CALIFORNIA: Calaveras (Big Trees), Fresno (Cascada), Inyo (Surprise Canyon, Panamint Mts.), El Dorado (Placerville), Mono (Topaz Lake), Monterey (Santa Lucia Mts.), Santa Barbara (San Rafael Mts.), San Diego (Pine Valley), Riverside (2 mi. E. Anza; Palms to Pines hwy. at 1000 feet; Palm Springs Sta.), Siskiyou (15 mi. NE Weed). Collecting dates are May through August.

***Palmodes dimidiatus* (deGeer)**

(Fig. 7, 15)

- Sphex dimidiatus* deGeer, 1773. Mem. Hist. Insect. 3:587. pl. 30, fig. 5, male, Pennsylvania, Riksmuseum, Stockholm.
- Sphex rufiventris* Cresson, 1872. Trans. Amer. Ento. Soc. 4: 211, female, Texas, Academy of Natural Sciences, Philadelphia.
- Sphex abdominalis* Cresson, 1872. Trans. Amer. Ent. Soc. 4:211, male, Texas, U. S. National Museum (not *Sphex abdominalis* Drury, 1773 nor *Sphex abdominalis* Fabricius, 1775).
- Chlorion rufiventris opuntiae* Rohwer, 1911. Proc. U. S. Natl. Mus. 40:257, female, Texas, U. S. National Museum.
- Sphex daggyi* Murray, 1951. In Muesebeck *et al.*, U. S. Dept. Agric. Monogr. no. 2, p. 974 (n. name for *abdominalis* Cresson).

The priority of the name, *dimidiatus*, over *abdominalis* Cr. was mentioned by Schultz, 1912, Berlin. Ent. Zeit. 57:52-102, but this has been ignored by later workers. Through the kindness of Dr. Eric Kjellander we have examined deGeer's male type. It has the basal two gastral segments and part of the third tergite red.

This species, which is widespread in this country and northern Mexico is clearly related to the Palearctic genotype, *occitanicus* Lep. and Serv., differing mainly in minor points of thoracic sculpture in the female, and the black rather than silvery face of the male. Considerable variation in markings and size occurs over the range of *dimidiatus*, and erection of subspecies is a possibility. An Atlantic Coast form which has the abdomen red and black in both sexes seems to be a rather discrete entity. With rare exceptions the females from the other areas have the abdomen all red beyond the petiole. Males from Texas are usually large and all black, but occasional red and black forms occur and it was one of these which Cresson named *abdominalis*. Arizona males vary from black to nearly all red on the abdomen, with the latter variety predominating. Californian specimens are mostly rather small and have the abdomen half-red or rarely all black. We have seen a male from Chihuahua (Camargo), and another from Coahuila (Saltillo), both all black.

Specimens in our collection have been compared with the types of *abdominalis*, *opuntiae*, and *rufiventris* by the senior author. Altogether we have studied 165 males and 147 females of this species.

***Palmodes stygicus* Bohart and Menke, new species**

(Figs. 1, 11, 16)

Male.—Length of body 19 mm., forewing 14 mm.; black, wings dark brown stained; head and thorax without silvery appressed pubescence; dorsum of thorax finely and closely punctate and shagreened, dull; propodeum above coarsely cross striate; apical margin of clypeus strongly quadrilobate, the two middle lobes distinctly produced (fig. 11); least interocular distance 1.12 times length of flagellar segment I; tenth flagellar segment 2.55 times as long as broad in ventral view; scutellum raised, hardly indented (more distinctly so in some paratypes). Genitalia (fig. 16) with 15 irregular aedeagal teeth; inner angle of cuspis a rather sharp right angle; distal projection of cuspis large and broad.

Female.—Body length 21-24 mm., forewing 16-17 mm.; dorsum of thorax somewhat shiny, punctation of scutum rather close but without much shagreening, punctation of scutellum fainter than in male; clypeus deeply notched sublaterally (fig. 1); least interocular distance 1.3 times length of flagellar segment I; tenth flagellar segment 2.75 times as long as broad in ventral view.

Holotype male (CAS).—Delta, Utah, July 8, 1954 (G. F. Knowlton).

Paratypes.—5 males, 5 females from the following states: CALIFORNIA: Deep Springs Valley, Inyo Co., July 17, 1953 (J. W. MacSwain, W. D. McLellan); NEVADA: Smith Valley, Lyon Co., July 14, 1949 (I. La Rivers); UTAH: Delta, July 8, through Aug. 8, 1947-1954 (G. E. Bohart, G. F. Knowlton), Logan, July 24, 1953 (G. E. Bohart); ARIZONA: Oraibi, July 13, 1937 (R. P. Allen), Tuba City, August 1, 1937 (R. P. Allen); NEW MEXICO: Albuquerque (J. R. Watson).

Systematics.—The dark and 4-lobed male clypeus, together with the deeply incised female clypeus distinguish this species from *laeviventris* and *morio* which it resembles.

**LECTOTYPE SELECTION FOR AND A SYNONYM OF
ALEPTINOIDES OCHREA B. AND McD.**

(LEPIDOPTERA: NOCTUIDAE)

Recently, Mr. R. R. McElvare, Southern Pines, North Carolina, donated to the U. S. National Museum some noctuid specimens that he collected in the southwestern United States. In the course of identification of one specimen, a female of *Aleptinoides ochrea* B. & McD., it was discovered that *Oslaria haematosticta* Dyar is a synonym of *ochrea*. *Aleptinoides ochrea* B. & McD. was described in 1912 (Contr. Nat. Hist. Lep. N. Amer., 1(5): 24, pl. 2, fig. 17). Dyar described *haematosticta* in 1923 (Ins. Inse. Menst., 11: 18).

When Barnes and McDunnough described *ochrea*, they had two female specimens from Deming, New Mexico, one specimen bearing a date label, "Sept. 1-7." The latter specimen is labeled, "♀ Cotype," the other "♀ Type." Both specimens are now in the collection of the U. S. National Museum. Since they did not indicate in the original description which specimen was the type, the specimens are syntypes and a lectotype must be selected. The specimen marked, "♀ Cotype," is the specimen illustrated by Barnes and McDunnough, but the other specimen is in better condition. Accordingly, I have selected and labeled as lectotype the specimen marked "♀ Type" by Barnes and McDunnough.

The type of *Oslaria haematosticta* Dyar, a unique female from Mesilla Park, New Mexico, is also in the collection of the U. S. National Museum. This type and the specimen collected by McElvare, Alpine, Davis Mts., Texas, Sept. 1, 1960, have rust pink sealing on the forewing at the base, along the antemedial line and on the costa at the postmedial line and beyond. This maculation can scarcely be observed on the rubbed specimens of the type series of *ochrea*. However, all four specimens possess the very characteristic frontal process described by Barnes and McDunnough in the generic description of *Alcptinoides*, loc. cit., p. 24—E. L. TODD, *Entomology Research Division, A.R.S., U.S. Department of Agriculture, Washington, D. C.*

BOOK NOTICE

FOREST ENTOMOLOGY, by T. O. Thatcher. Burgess Publishing Co., iii + 225 pp, illus. Offset. Price: \$4.50.

This book is intended as a text on the entomological aspects of forestry for use by forestry students having little previous training in entomology and by professional entomology students.

A general review of the history and importance of forest entomology, presented in the first two chapters, is followed by fairly detailed discussions of the structure and metamorphosis of insects. In succeeding chapters, the general principles of ecology and their application to forest insect problems are considered at length, the basic practices of taxonomy are outlined, and keys to adults and immatures of the principal families of forest insects are given. The discussion of control of forest insects begins with a consideration of the economic justification of control measures. The principal types of control, defined as biological, chemical, and cultural control, are discussed separately, and the application of these types of control is then considered. In the final chapter, the life histories of a number of forest pest species are cited as examples of types of insect attack, and possible control measures are given in each case. A few examples of beneficial insects are also included. The book concludes with a list of selected references.

A manual of laboratory exercises in forest entomology, prepared by the author to accompany this text, is available through the same publisher.—D. M. ANDERSON, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

**AESHNA PERSEPHONE, A NEW SPECIES OF DRAGONFLY FROM
ARIZONA, WITH NOTES ON AESHNA ARIDA KENNEDY**
(ODONATA: AESCHNIDAE)

THOMAS W. DONNELLY, *Department of Geology, Rice University, Houston, Texas*

On 16 September, 1954, while on a collecting trip with George H. Beatty III, the author collected two males of an apparently undescribed species related to *Aeshna palmata* Hagen along Cave Creek, a vigorous and beautiful stream on the east side of the Chiricahua Mountains, Arizona. The identity of these dragonflies remained uncertain until an investigation of the type specimens of *Aeshna arida* Kennedy was undertaken in 1956. This investigation revealed that *Aeshna arida* was synonymous with *Aeshna palmata*, and that the Cave Creek specimens were of an undescribed species.

Prior to 1908 *Aeshna constricta* Say was the only species in the *Aeshna cyanea* complex recognized in North America. Walker (1908, pp. 379, 380) showed that three species had been included under the name *constricta*: *A. constricta* (a dominantly northeastern species), *A. palmata* Hagen (A Rocky Mountain and Cordilleran species originally described from Kamchatka), and a new species, *A. umbrosa* (a common trans-continental species). Subsequent to Walker's (1912) monograph two additional species were described, both by C. H. Kennedy from the southwestern United States: *A. walkeri* (Cordillera of central California to Baja California), and *A. arida* (New Mexico and Arizona) (Kennedy, 1918, p. 298). Kennedy had before him specimens of the species here described as new when he described *arida*; however, he selected as holotype of *arida* not the distinctive male specimen from Oak Creek Canyon, Arizona (Snow Collection, University of Kansas), but instead a male collected by himself at Fort Wingate, New Mexico. Thus the necessity of reducing Kennedy's species *arida* to synonymy with *palmata* stems solely from Kennedy's choice of holotype.

Aeshna persephone is most closely related to *A. palmata*, and appears to be confined to Arizona, whereas *palmata* has not been taken in that state. The name is suggested by the habitat of this large and colorful dragonfly. In contrast to the sunny streams and ponds favored by most of its North American congeners, it inhabits mountain streams which are lighted by the sun's rays for only a few hours each day, though it ascends periodically through the forest gloom to the sun-lit mountain slopes.

***Aeshna persephone*, new species**

Holotype male (Pl. I, fig. 1; Pl. II, figs. 7, 10).—Face pale greenish white, darkening slightly upwards. "T" spot black, distinct. Fronto-clypeal suture marked by a fine black line. Vertex black with a small yellow central spot. Occiput pale. Rear of head black.

Prothorax dark brown with a pale posterior lobe. Mesothorax and metathorax dark brown, with yellow markings, as follows: Dorsal thoracic stripes

well developed, brownish yellow, narrowed anteriorly. Anterior lateral stripe yellow, nearly 2 mm. broad, anterior border with a notch at $3/5$ of its height, narrowed above notch. Posterior border of anterior lateral stripe straight. Borders of stripe well defined. There is a small dorsal-posterior "tail" on this stripe. Posterior lateral stripe yellow, 2.5 mm. broad ventrally expanded to over 3 mm. broad dorsally, but with an indistinct posterior border. No pale markings on the mesepisternum. Legs dark brown. Wings hyaline, with one cell between A2 and A3 and an anal loop of 9-10 cells. Stigma dark brown. Costa dark on dorsal surface and pale brown on ventral surface.

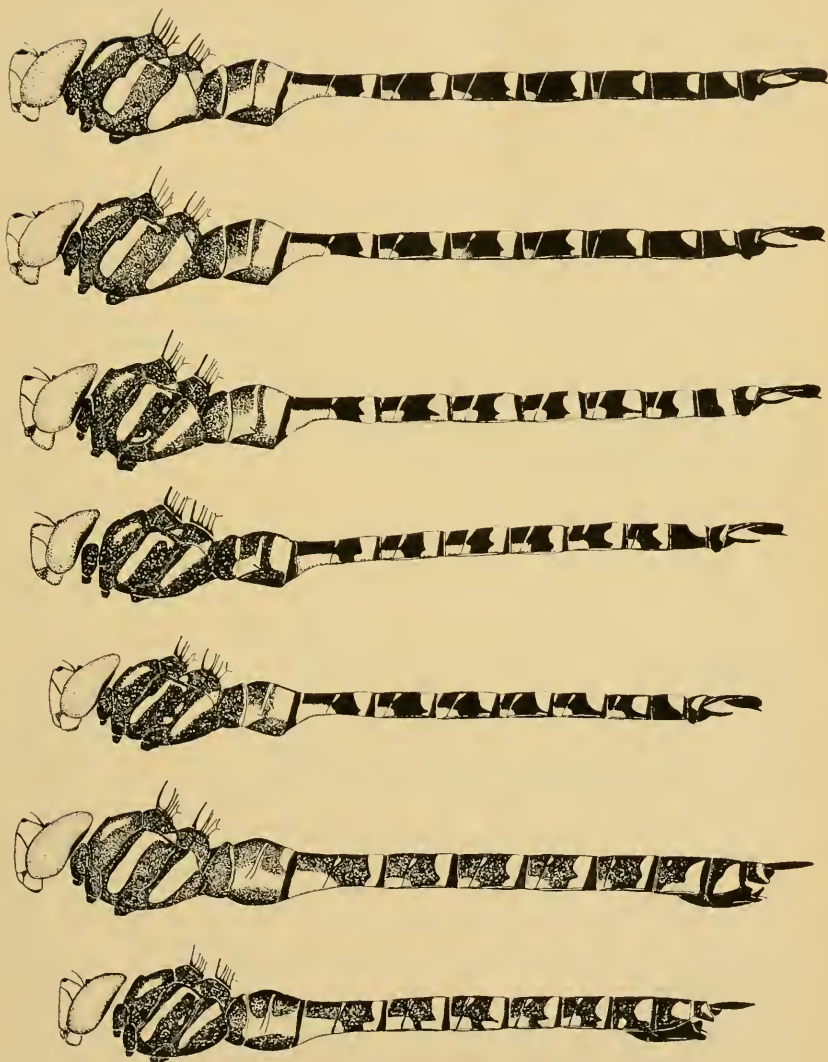
Abdomen very dark brown, blue markings as follows (System of designation of abdominal markings from Walker, 1912): On 1, PD and PL, narrowly joined laterally. On 2, MD (narrow) and AML (broad), joined laterally; PD and PL (both broad) joined laterally and dorsally; two small pale spots along ventral margin of tergum. On 3, AL very broad, ML distinct, PD and PL joined laterally but not dorsally. On 4-6, AL, PD, and PL present, diminishing in size rearward with PD and PL joined laterally. On 7, AL a tiny spot, PD rather broad, but not joined dorsally. On 8, PD smaller than on 7. On 9, PD joined dorsally. On 10, a small, diffuse PD. Anterior hamules similar to those of *A. palmata* (Pl. II, fig. 11), but with mesal-apical angle of the ventral portion of the hamule distinctly sharper than that of *Palmata*, and the apical notch of this portion of the hamule (immediately dorsal to the spine) wider than that of *palmata*. Terminal appendages black, the dorsal appendage broader than that of *palmata* (Pl. II, fig. 8).

Total length 77 mm., length of abdomen 57 mm., length of hind wing 51 mm., length of hind femur 8.5 mm.

Allotype female.—Head and thorax similar to that of male. Abdomen brown with yellow markings as follows: On 1, narrow PD and PL joined laterally. On 2, very broad AML, PL, and PD, all joined laterally. On 3, very broad AL; PD and PL joined laterally, but not dorsally. On 4-6, distinct AL, with PD and PL joined laterally, but not dorsally, and all spots diminishing in size rearward. On 7, a small PD-PL joined laterally. On 8 and 9, a larger PD and PL joined laterally, but not dorsally. On 10, a very small PD. Ovipositor similar to that of *A. palmata* (Pl. II, fig. 1,2), but with ventral-apical angle of genital valves sharper in outline and directed more to the rear than in *palmata*. Appendages 5 mm. long, with rounded apices, as in *palmata*. Styli about 1 mm. long. This specimen was reared, and had probably not attained the full color of the mature imago.

Length of abdomen 54 mm., hind wing 51 mm., length of hind femur 8 mm., length of terminal abdominal appendage 5 mm.

No noteworthy differences between any of the paratype males and the holotype male were found. There is some variation in the color of the pale lateral thoracic stripes towards green, but these colors are elusive and of no taxonomic usefulness. The paratype males vary in abdominal length from 54 to 59 mm. The paratype female is an incompletely developed reared specimen; it appears to be identical with the allotype female.



Color pattern of *Aeshna persephone*, *palmata*, and *constricta*, all natural size. Fig. 1, *A. persephone*, holotype ♂; fig. 2, *A. persephone* ♂, Oak Creek Canyon, Arizona; fig. 3, *A. palmata* ♂, City Creek Canyon, Utah (this is the largest male seen of this species); fig. 4, *A. palmata* ♂, Fort Wingate, New Mexico (holotype of *A. arida*); fig. 5, *A. palmata* ♂, Colorado Springs, Colorado; fig. 6, *A. persephone* ♀, Oak Creek Canyon, Arizona; fig. 7, *A. palmata* ♀, vic. of Baggs Wyoming.

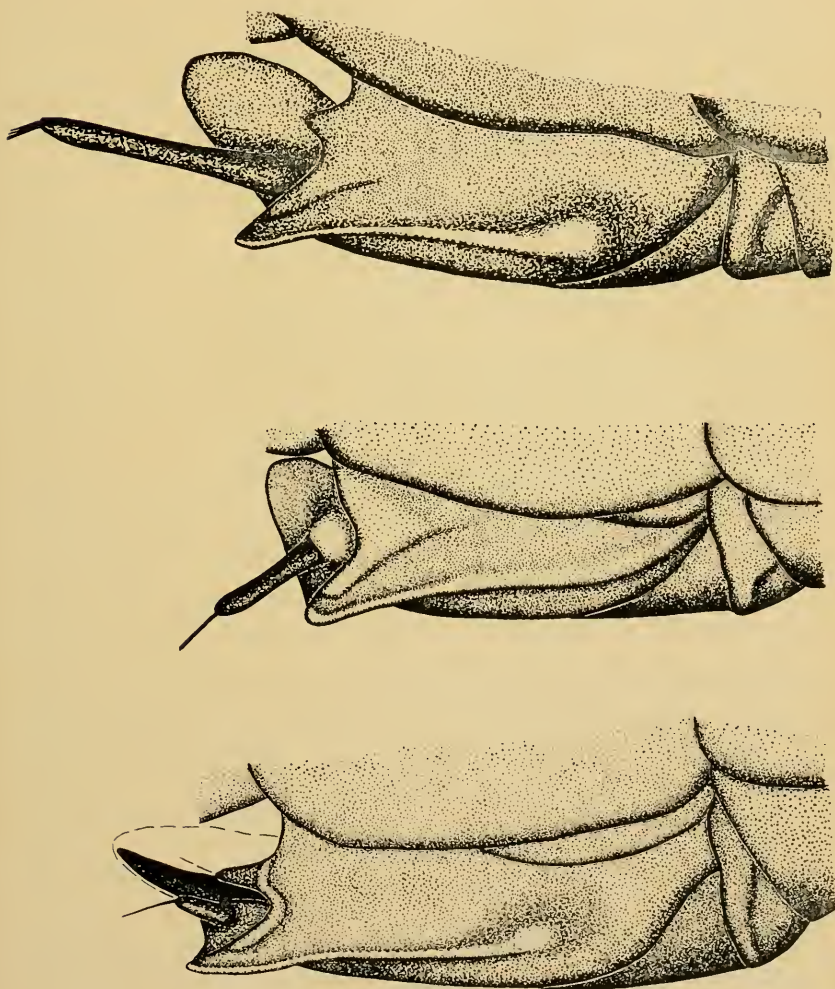
The Oak Creek Canyon male (described also by Kennedy as a paratype of *A. arida*) and female differ slightly from the Cave Creek series. The male (Pl. I, fig. 2) has the abdominal length 58 mm. and the hind wing length 52 mm., the thoracic stripes narrower (the anterior lateral is just over 1.5 mm. and the posterior lateral is 1.75 mm. wide). The abdomen has a tiny MD on 4 to 6 and a tiny PL on 7 joined to PD. The female (Pl. I, fig. 7) has narrower anterior lateral pale thoracic stripes (1.75 mm.), a larger PL on 8 and 9, a diffuse ML on 9 joined to PL, and a tiny MD on 3 to 7. The female appendages (Pl. II, fig. 4) are 6 mm. long, pointed apically, and markedly asymmetrical in dorsal view, with a nearly straight lateral margin.

Material examined.—*Aeshna persephone*, n. sp., 10 ♂♂, 3 ♀♀. Holotype ♂: Herb Martyr Dam, on Cave Creek, near Portal, Cochise Co., Arizona, 16 September 1954, collected by T. Donnelly. Allotype ♀: reared by Minter Westfall from the Southwest Research Station five miles west of Portal, emerged September, 1958. Paratypes: 8 ♂♂, 1 ♀: One ♂ has the same data as the holotype, 2 ♂♂ and 1 ♀ were reared in 1956 and 1958 by Minter Westfall from Cave Creek. Other specimens examined: 1 ♂ and 1 ♀: Oak Creek Canyon, Arizona, elevation 6000 feet, August (no year), collected by F. H. Snow. The latter two specimens were rather badly damaged in transit back to the University of Kansas collection. The holotype ♂, allotype ♀, and all but two of the paratypes are in the collection of the University of Florida. The remaining two paratype males are in the collections of George H. Beatty III and the author.

***Aeshna palmata* Hagen**, 87 ♂♂, 13 ♀♀: The majority of the specimens examined (54 ♂♂, 9 ♀♀) were collected by the author in the vicinity of Baggs, Carbon Co., Wyoming, during the summer of 1955. Another large lot of specimens (23 ♂♂, 3 ♀♀) were collected by Minter Westfall in Gunnison Co., Colorado, in 1959. The remaining specimens are as follows: 3 ♂♂, 1 ♀: Fort Wingate, New Mexico, 5 September, 1908, collected by C. H. Kennedy, Academy of Natural Sciences, Philadelphia. This lot includes the holotype and cotype males of *A. arida* (The existence of more than one specimen of *Aeshna* from Fort Wingate was not mentioned by Kennedy. 1 ♂: Colorado Springs, Colorado, August (no year), collected by E. S. Tucker, University of Kansas collection. 1 ♂: City Creek Canyon, Salt Lake Co., Utah, 5 July 1899, Academy of Natural Sciences, Philadelphia. 1 ♂: Denver, Colorado, no date, collected by C. C. Adams, Academy of Natural Sciences, Philadelphia. 3 ♂♂: Klamath Lake, Oregon, 1 August, 1954, collected by R. H. Gibbs, 1 ♂: Donnelly and Biek collections. Franklin, Idaho, 1 October, 1949, collected by R. P. Parkinson, G. H. Biek collection.

Several *Aeshna constricta* from the central and western United States were examined. Of these, one male from Minnesota and two males from Nebraska appeared to be very close to typical northeastern specimens. An additional male, labeled *Aeshna constricta*, was collected along the Humboldt River, near Golconda, Nevada, on 8 Au-

gust, 1914, by C. H. Kennedy. This specimen differs in several respects from the typical eastern *constricta*: the thoracic pale stripes are narrow and resemble those of *palmata*, and the abdominal markings are slightly different from the typical *constricta*. Kennedy (1917, p. 622) mentions the capture of several females of this species at



Figs. 1-3, ovipositor. Fig. 1, *A. persephone*, Oak Creek Canyon, Arizona (identical to that of the allotype); fig. 2, *A. palmata*, Baggs, Wyoming; fig. 3, *A. constricta*, Manchester, Maine.

Golconda on the preceding day and the following day, but he mentions no males. Possibly his failure to mention this male indicates that he recognizes the peculiarities of this male and intended to study the problem further. The problem of Nevada *constricta* appears to be quite distinct from *palmata-persephone* problem, but inasmuch as *constricta* is the next most closely related species to *palmata* and *persephone*, further study of *constricta* from the Great Basin should be undertaken.

VARIATION OF AESHNA PALMATATA AND THE PROBLEM OF AESHNA ARIBA

A long series of *Aeshna palmata* from southern Wyoming showed relatively little variation. The average abdominal length is 51.5 mm. (varying from 49 to 55 mm.), the average hind wing length is 43.5 mm. (varying from 41 to 46 mm.), and the average widths of the anterior and posterior lateral thoracic stripes are both 1 mm. (varying from .75 to 1.5 mm.). Abdominal spot PL persists rearward to segment 6 and is joined to PD rearward to 3 or 4 in most specimens. MD and the pair AL-ML are prominent and reach segment 8 in all specimens. The western Colorado specimens have the abdominal length 52.5 mm. and the posterior lateral thoracic stripes about 1.25 mm. wide on the average; otherwise, these specimens are identical to those from Wyoming. Two more southern specimens of *palmata*, from Colorado Springs and Fort Wingate, New Mexico (not *arida*), and the Oregon and Idaho males are likewise nearly identical to the Wyoming specimens.

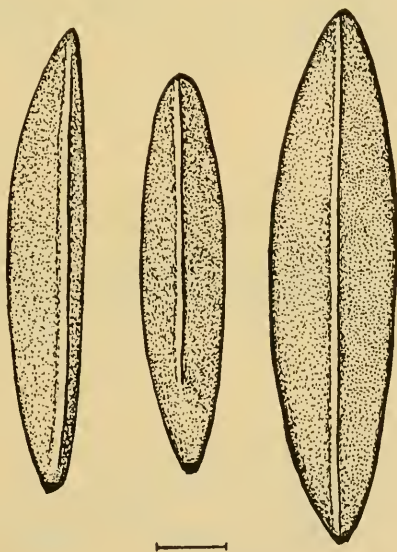
Four specimens, including the holotype (Pl. I, fig. 4) and cotype of *A. arida*, are slightly larger and paler than the typical northern *palmata*. These vary in length of abdomen from 53 to 57 mm., and the dark line on the fronto-clypeal suture is narrow, except for the Denver specimen. The thoracic stripes are slightly broader (The anterior lateral stripe is 1.3 to 1.5 mm. wide; the posterior lateral stripe is about 1.5 mm. wide), and the abdomen has more extensive pale markings than do the Wyoming *palmata*. The PL of the holotype of *arida* reaches segment 8 and is joined to PD on 8 and 9. The PL of the City Creek Canyon specimen (Pl. I, fig. 3) reaches 9 and is joined to PD on 2 to 8. The Wyoming specimens have PL on 2 to 6 joined to PD rearward to 3 or 4. Thus there is a tendency for southern specimens of *palmata* to be larger and paler than more northern or higher elevation specimens. The absence of distinguishing structural characteristics and the variability in size and color marking at the type locality of *arida*, however, both suggest that *arida* is not a valid species.

Southern specimens of *Aeshna palmata* are similar to *persephone* in only two respects: overall size and breadth of thoracic stripes, although *persephone* distinctly exceeds *palmata* in both these characters. Southern *palmata* show no tendency towards the restriction of pale markings that is so marked in *persephone*. Further, no specimens of *palmata* show the form of the anterior hamule found in

persephone, although this structure is frequently distorted during drying and is not always easy to observe. Only one southern *palmata* female was examined, but this had the typical *palmata* ovipositor.

DIAGNOSIS OF AESHNA PERSEPHONE

The most distinctive character of this species is its size and robustness, which greatly exceed all but one *Aeshna palmata* specimen examined. *Persephone* has much broader thoracic stripes than either *palmata* or *constricta*. *Persephone* lacks the distinctive lateral abdominal spots PL and ML on 6 to 8, and has AD greatly reduced on 4 to 5. *Palmata* and *constricta*, on the other hand, have these spots



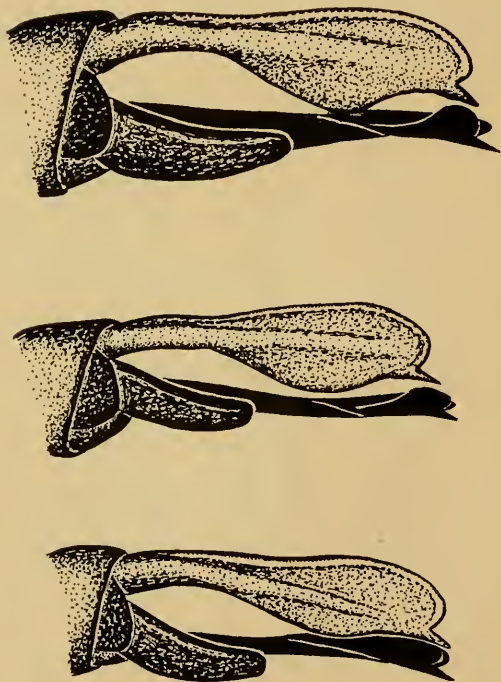
Figs. 4-6, terminal appendage of female, viewed ventrally, oriented apically upwards. Fig. 4, *A. persephone*, Oak Creek Canyon, Arizona; fig. 5, *A. palmata*, Baggs, Wyoming (the allotype of *A. persephone* is very similar to this); fig. 6, *A. constricta*, Manchester, Maine.

well developed on 4 to 8. The fronto-clypeal suture of *persephone* has a fine black line, as in some southern *palmata*, whereas northern *palmata* have a heavy black line on this suture and *constricta* has a fine brown line. The female of *persephone* resembles *palmata* in color markings but has the broad thoracic stripes of the male *persephone*.

Structurally, *persephone* differs in several ways from *palmata* and *constricta*. The ventral aspect of the anterior hamule (Pl. II, figs. 10-12) shows some important differences: the ventral-mesal angle of the ventral portion of this hamule is more angular in *persephone* than in either *palmata* or *constricta*. The apical notch of this portion

of the anterior hamule is narrowest in *constricta*, less so in *palmata*, and broadest in *persephone*. The terminal abdominal appendage (Pl. II, figs. 7-9) is broadest in *persephone*, less so in *palmata*, and narrowest in *constricta*.

The female ovipositor (Pl. II, figs. 1-3) is distinctive in each of these species. The stylus is about 1 mm. long in *persephone* and

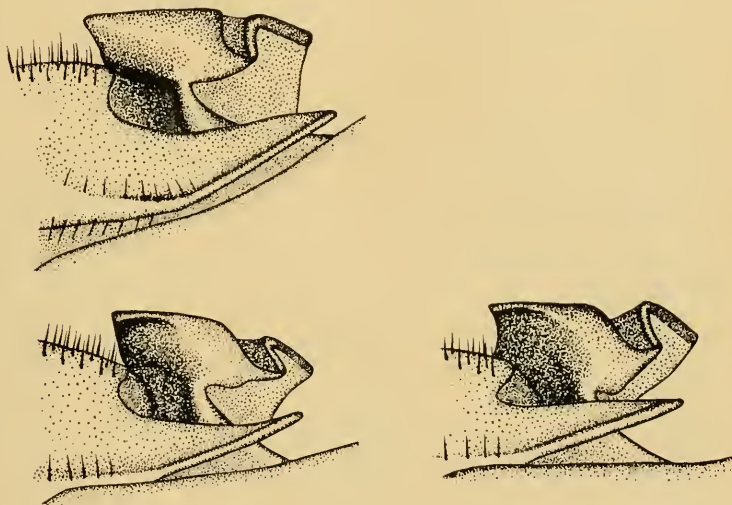


Figs. 7-9, terminal appendage of male, viewed latero-ventrally. Fig. 7, *A. persephone*, holotype; fig. 8, *A. palmata*, Baggs, Wyoming; fig. 9, *A. constricta*, St. Lawrence Co., New York.

palmata and about 2 mm. long in *constricta*. The terminal appendage of the female (Pl. II, figs. 4-6) is long and broad in *constricta* and narrower and shorter in the other two species. The allotype female of *persephone* has an appendage which is very similar to that of *palmata*, but the Oak Creek Canyon female of *persephone* has curiously asymmetrical appendages, with the outer edges nearly straight.

CONCLUSIONS

Aeshna persephone, which is known only from two widely separated localities, is specifically distinct from *palmata* and *constricta*, neither of which has been taken in Arizona, but which occur in adjoining states. *A. arida* is not specifically distinct from *palmata*, but represents only a variant of that species occurring at lower elevations. Further study might well show that *arida* is a recognizable subspecies of *palmata*.



Figs 10-12, anterior hamule of male, viewed ventrally, oriented apically upwards. Fig 10, *A. persephone*, holotype; fig. 11, *A. palmata*, Baggs, Wyoming; fig. 12, *A. constricta*, Ithaca, New York. The bar is 1 mm. long for each group of figures.

There is clearly much to be learned about the dragonflies of this group in the American Southwest. Confined as they are to rushing mountain streams in a dominantly desert region, they may be found to show many degrees of infraspecific differentiation through isolation. The author hopes that this note will encourage further collecting of *Aeshna* in this area with the aim of a better appreciation of the relationships among the insects of this group.

ACKNOWLEDGEMENTS

Specimens of this new species were collected during a trip made jointly by the author and George H. Beatty, III, who loaned one of the paratype males from the collection of G. H. and A. F. Beatty. Beatty studied this specimen and expressed the view that it repre-

sented an undescribed species, and Edmund M. Walker studied the same specimen and corroborated Beatty's opinion. Beatty has read the MS of this paper critically and has made many useful suggestions. Dr. Walker also read a preliminary draft of this paper and suggested several improvements. Harold Grant of the Academy of Natural Sciences, Philadelphia, and Ashley Gurney of the United States National Museum made specimens in these collections available to the author. Charles D. Michener loaned the Oak Creek Canyon specimens from the University of Kansas collection. Minter Westfall loaned several specimens of the new species, and he has read the MS of this paper. George Bick loaned several specimens of *Aeshna* from his collection. The author is greatly indebted to all of the above for their assistance.

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KEYS TO SUBFAMILIES, TRIBES, GENERA AND SUBGENERA OF THE GERRIDAE OF THE WORLD by H. B. Hungerford and R. Matsuda, Univ. Kansas Sci. Bull., vol. 41(1), pp. 3-23, figs. 1-64. and **MORPHOLOGY, EVOLUTION AND A CLASSIFICATION OF THE GERRIDAE (HEMIPTERA-HETEROPTERA)**, *loc. cit.* vol. 41 (2), pp. 25-632, figs. 65-1151.

These important contributions are not as separate as the titles would imply, the figure numbers being consecutive and references in one may apply to the other.

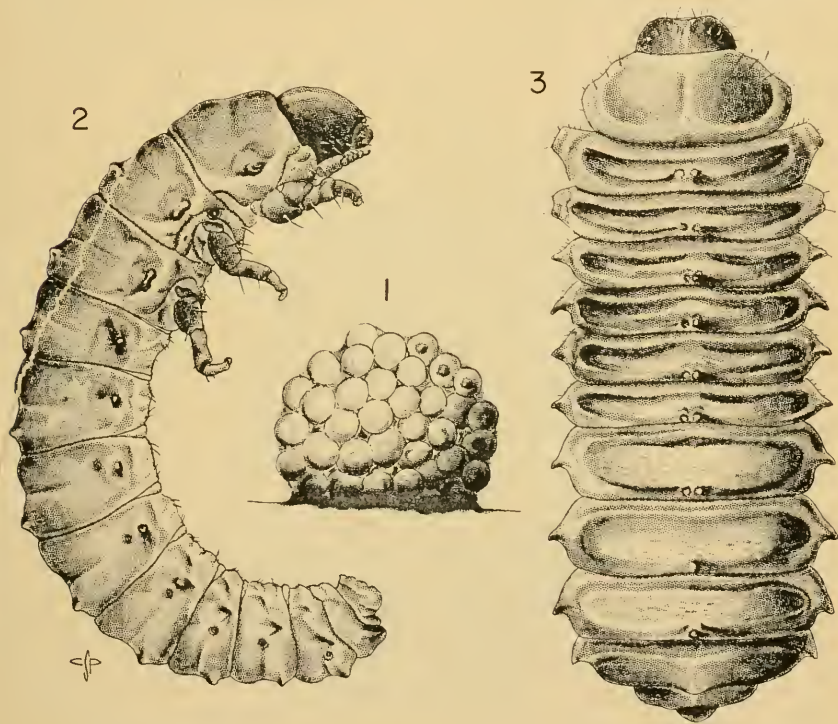
Verbal, pictorial and statistical treatment of descriptive, developmental and comparative external anatomy is full and leads to selection of phylogenetic characters not conventionally used; the resulting suprageneric categories, including the family, have limits differing from those previously applied. The "List Indicating Primitive and Specialized Alternatives for Certain Characters" should be a challenge for other authors to present their ideas on such important matters in as concise a form.

The abundant illustrations are of the clear, helpful type expected from Dr. Matsuda.—RICHARD C. FROESCHNER, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

THE LARGER ELM LEAF BETTLE, *MONOCESTA CORYLI* (SAY)
 (COLEOPTERA: CHRYSOMELIDAE)

L. D. ANDERSON and C. S. PAPP, *University of California Citrus Experiment Station, Riverside.*

Between 1933 and 1940 a moderately large population of the larger elm leaf beetle occurred on native elms in a nursery and in neighboring forests close to the Dismal Swamp area south of Norfolk, Virginia. The following report includes information on the presently known



Monocesta coryli(Say). Fig. 1. egg mass; Figs. 2 and 3, larvae.

distribution of the species *Monocesta coryli* (Say), and a bibliography. It also summarizes the life history observations made by the senior author in the infested area and in the laboratory at the Virginia Truck Experiment Station in 1939-40.

LIFE HISTORY

This beetle is reported as feeding on the foliage of native and Japanese elm, hawthorn, hazelnut, red birch and peacans. A good description of the various stages of this beetle and of the life cycle

and habits has been given Riley (1878), Beutenmüller (1890), Packard (1890), Felt (1906), Baerg (1935), Kelsheimer (1945), Peterson (1951) and others, so only a summary will be given here of the life cycle, description and habits.

Life history studies were made in the field and laboratory from March 1939 to the spring of 1940. The full-grown, reddish-brown, metallic-lustered third instar larvae over-winter in cells a few inches below the surface of the soil. In 1939 these larvae began pupating the last few days of April and adults began emerging the end of May. The pupal period varied from 12 to 24 days. The adult (see fig. 5) is a large chrysomelid beetle nearly $\frac{1}{4}$ inch wide and $\frac{1}{2}$ inch long.

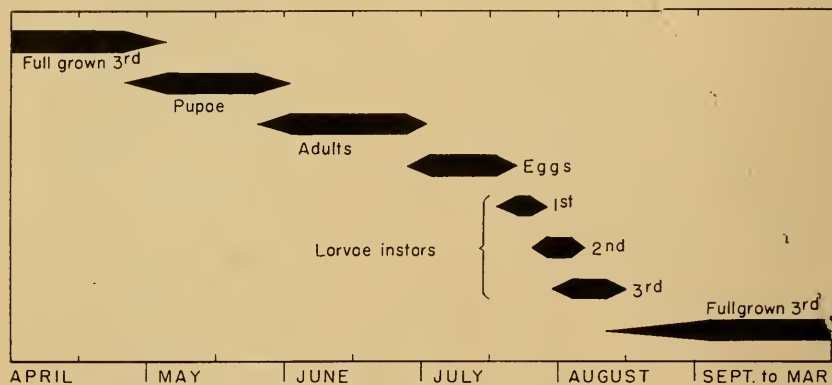


Fig. 4, summary of the life cycle of *Monocesta coryli* (Say) as observed in Virginia in 1939.

These yellowish beetles with metallic greenish-blue markings were present in the field from the last few days in May until the end of the first week of July. Mating was frequently observed in the field during June, and most of the eggs were laid during a short period the last few days of June and the first few days of July. The yellow egg masses (fig. 1) were usually glued to the underside of the leaves. These masses of 30 to 50 eggs each hatched in from 7 to 15 days. The newly-hatched larvae devoured the egg shells and then fed gregariously on the foliage during the first instar which lasted 3 to 11 days. The second instar larval stage lasted 8 to 15 days and the third instar larvae (figs. 2 and 3) fed 8 to 20 days before they entered the instar as full-grown larvae ready to overwinter. Figure 4 shows a summary of the approximate life cycle as observed in Virginia in 1939.

DISTRIBUTION OF *M. CORYLI* (SAY)

Monocesta is a tropical genus with species widely represented in North, Central and South America and in the West Indies. *M. coryli* (Say) is recorded from the following states (numbers in parenthesis indicating references): Mississippi (16-27); Alabama (16-19-24);

Florida (8-9-10-16-17-18-24); Georgia (16-24-26); South Carolina (24-26); North Carolina (16); Virginia (7-8-14-15-16-17-20-23-24-25-26-28); Maryland (16-24-25-29-30); Pennsylvania (2-24); West Virginia (2-15-24); Ohio (24); Indiana (7); Illinois (7-9-14-18-24-28); Missouri (2-9-11-18-20-23-24-25); Kansas (8-9-14-18-24-28); Oklahoma (24); Arkansas (1-2-3-4-16). It is rather interesting to note that this beetle is not recorded from Kentucky and Tennessee, which are in the center of the known distribution area.

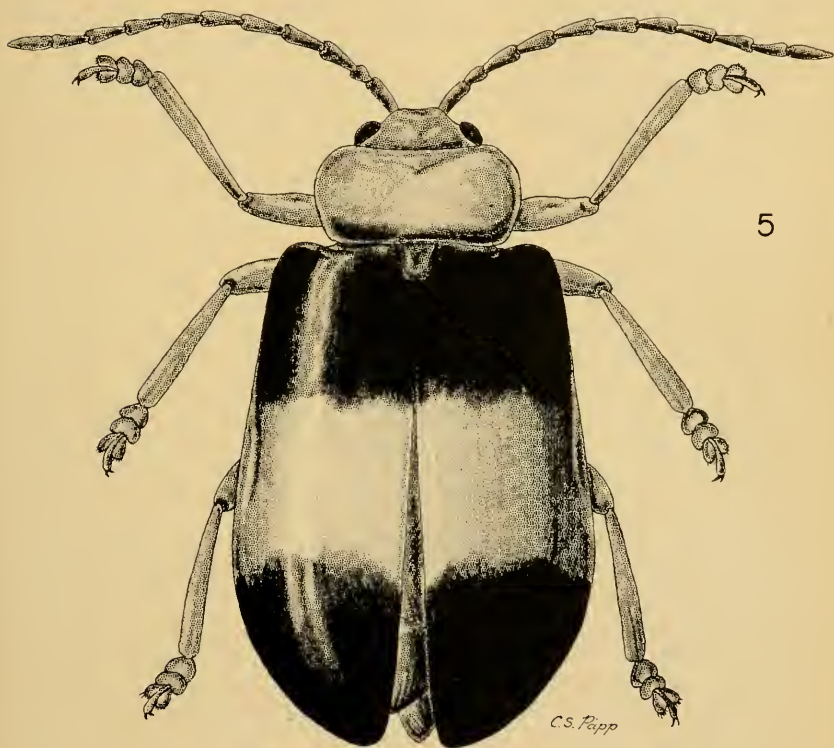


Fig. 5, adult of *M. coryli* (Say).

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A NOTE ON THE MONROS COLLECTION

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The Monrós collection of chrysomelid beetles came to the United States National Museum in 240 small (7½ by 10 inch) paper boxes with glass tops. The original figure given of 54,245 specimens is too small. A later count of the number contained in this collection was 58,364.

The beetles are mounted European fashion on oblong paper mounts, with the legs and antennae nicely spread. The labels are for the most part entirely legible and uniform in size, printed beautifully in Monrós' hand. Placed under his label is the original name label (which is frequently not so legible). In his locality labels Monrós tended to use different colors for different countries—the South American labels are white, United States yellow, European pink, African green, Australian gray, etc. This is not invariably the case, however.

Monrós' interest in certain subfamilies is reflected naturally in the number of specimens as well as the type material in these groups. The following shows the original number of boxes in each subfamily: Sagrinae 4, Donaciinae 2, Orsodacninae 2, Criocerinae 12, (7½ boxes of the genus *Lema*), Megascelinae 2, Megalopodinae 5, Clytrinae 20, Cryptocephalinae 14, Chlamydiae 7, Lamprosominae 3, Eumolpinae 36, Chrysomelinae 34, Galerucinae 13, Alticinae 25, Hispinae 24, Cassidinae 37.

Of the following genera Monrós had species, subspecies, and aberrations: 293 of *Lema*, 40 of *Megascelis*, 73 of *Mastostethus*, 18 of *Agathomerus*, 224 of *Chlamisus*, 76 of *Lamprosoma*, 58 of *Nodonata*, 47 of *Colaspis*, 139 of *Maecolaspis*, 36 of *Rhabdopterus*, 91 of *Chalcophana*,

53 of *Typophorus*, 81 of *Zygogramma*, 236 of *Strichotaenia*, 94 of *Chrysolina*, 46 of *Plagiodera*, 106 of *Cephalolia*.

The Galerucinae and Alticinae are not so well represented, as Monrós never worked on these groups. At first glance it would appear that there had been little attempt at arrangement of his specimens of them. When I came to examine them, however, I found in these boxes of apparently miscellaneous beetles, a large number of specimens that bore handwritten name labels all folded up and stuck inconspicuously on the pin. These labels consisted usually of only an initial for the genus and the specific name without authority. Sometimes only the specific name was given. But when I had written out these labels I found that these specimens, which had evidently been taken one of a kind from a named collection (probably the Bowditch collection) formed the frame work for the genera and species of the Galerucinae and Alticinae. Monrós had not found time to write his usual neat labels and arrange them properly.

The source of many of Monrós' exchanges may never be known. He was in touch with entomologists all over the world, as his collection plainly shows, and in the groups in which he was most interested he had specimens from everywhere. Many African, southern Asiatic, Indonesian, Chinese, Japanese and Australian beetles are there. There are also European, North American, and, of course, predominantly South American collections.

By far the largest number of types are his own. Next in order is Jacoby cotype material. A great deal of this came from the Bowditch collection in which Monrós exchanged specimens. But some of the Jacoby material must have come from some other source that I cannot trace. There is a fair amount of Bechyne type material. Besides these is Weise type material, some Uhmann and Spaeth, and some of Lefèvre, Lacordaire, Clavareau, Fairmaire, and a few Pic, Bowditch, Baly and Lea cotypes. There are many specimens bearing Monrós label "comparado con tipo."

At least 212 authentic holotypes are in this collection. Some that Monrós labelled "Holotipo," however, seem questionable. The early taxonomists did not often designate a type, and where there is a series of several specimens, one can only say until a type is selected that they are all cotypes. Possibly Monrós fully intended later to designate his specimen as the type, and so labelled them in advance. But since he never published anything to that effect, these specimens must remain cotypes.

The paratypes, allotypes, cotypes, "adelphotipos" (whatever they are) roughly represent about 700 species besides the 212 holotypes and 83 doubtful holotypes.

One can only marvel at the industry and painstaking care of this young entomologist who managed to accumulate such a collection, so beautifully mounted and laboriously hand labelled, when he was teaching classes, writing many papers, going on collecting trips, and even spending two years of study in foreign lands.

**ADDITIONAL DISTRIBUTION RECORDS OF NORTH AMERICAN RAKE-
LEGGED MITES**

(ACARINA: CAECULIDAE)

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Rake-legged mites have been found over the western part of North America wherever intensive collections have been made. Specimens have been found in the United States from the Atlantic to the Pacific Oceans and from Mexico to Glacier National Park, Montana. Although one species, *Caeculus oregonus*, was originally found on moss bordering a marsh, most species to date have been found in rather dry areas. Intensive collecting will undoubtedly reveal additional species and specimens in more diversified habitats.

Inasmuch as little of the ecology of this interesting group of mites is known, it was felt that the following list extending the ranges and habitats would be of value to future studies.

Procaeculus brevis (Mulaik)

Caeculus brevis Mulaik, 1945. Bull. Univ. Utah 35(17):11.

New Records.—4 specimens were collected from the Chiricahua Mts., Southwestern Research Station, 5 miles west of Portal, Arizona, by K. Bohnsack, June 18, 1958; 13 found 32 miles southeast, Laredo, Texas, by S. Mulaik, Sept. 3, 1946, under rocks in a relatively desert area where the rainfall is scarcely 12 inches a year.

Procaeculus oregonus (Mulaik and Allred)

Caeculus oregonus Mulaik and Allred, 1954. Proc. Ent. Soc. Wash. 56(1):28-30.

New Record.—1 specimen was found on a rotting log under redwoods, Underwood Park, California, by H. Higgins, Aug. 25, 1956.

Caeculus archeri Mulaik

Caeculus archeri Mulaik, 1945. Bull. Univ. Utah 35(17):13.

New Record.—1 specimen was collected from log mold at Cumberland Mt. State Park, Cumberland Co., Tenn. by M. Engelmann and O. Park, July 7, 1956.

Caeculus calechius Mulaik

Caeculus calechius Mulaik, 1945. Bull. Univ. Utah, 35(17):5-6.

New Records.—5 specimens were collected from under rocks at Moab, Utah, by Ted Tibbetts, June 1, 1955; 5 from a nest of wood rat, (*Neotoma*) in a juniper plant association on Little Granite Mt., Tooele Co., Utah, by W. Thomas, July 23, 1953; 24 under junipers (*Juniperus utahensis* (Englm.) Lemmon) and squawbrush (*Rhus trilobata* Nutt.) near Cane Springs, Cedar Mountains, Tooele Co., Utah, by W. Thomas, July 2, 1953; 2 from aspen-douglas fir area, Old Ibapah-Callao Pass, Deep Creek Mts., Juab Co., Utah, by R. L. Gering, Sept. 25, 1953; 2 from debris and wood rat nest under junipers, SE end of Cedar Mts., Tooele Co. Utah, by W. Thomas, Sept. 17, 1953; 2 from wood rat nest on Beckworth Pass, 5500 ft., Cedar Mts., Tooele Co., Utah, by W. Thomas, May 21, 1953; 4 from sand dunes, SE of Research Laboratory, Dugway, Tooele Co., Utah,

by R. Gering and E. Roseoe, June 22, 1953; 4 under greasewood (*Scarcobatus vermiculatus* (Hook.) Torr.), ½ mile N. Simpson Butte Gate, Tooele Co., Utah, by W. Thomas, Sept. 10, 1953; 4 from Cut Bank Pass, 7600 Ft., Glacier National Park, Montana, by H. Levi, Aug. 15, 1953; 4 from pass above Cobalt Lake, El. 7300 ft., Glacier National Park, Montana, by H. Levi, Aug. 11, 1953.

Caeculus tipus Mulaik

Caeculus tipus Mulaik, 1945. Bull. Univ. Utah, 35(17):7.

New Records.—1 specimen was collected from under a rock beneath junipers, 5 miles west of Duchesne, Duchesne Co., Utah, by H. Higgins, June 4, 1953; 2 under shadscale (*Atriplex confertifolia* (Torr.) S. Wats.), 300 yds. SSE of Area D, Dugway, Tooele Co., Utah, by R. Gering, March 3, 1953.

Caeculus valverdius Mulaik

Caeculus valverdius Mulaik, 1945. Bull. Univ. Utah, 35(17):6-7.

New Records.—3 specimens from Chiricahua Mts., near Southwestern Research Station, El. 7600 ft., 5 miles west of Portal, Arizona by K. Bohnsack, June 18, 1958, and two additional specimens from the same locality, June 29, 1959.

A NEW DISTRIBUTION AND HOST RECORD FOR IXODES MURIS BISHOPP AND SMITH, 1937

(ACARINA: IXODIDAE)

One engorged female of *Ixodes muris* collected from a dog in Orono, Maine, was found among several lots of ticks identified for Dr. W. H. Anderson of the Insect Identification and Parasite Introduction Research Branch, E.R.D., U.S.D.A. This specimen was referred to Dr. Anderson by Drs. I. N. McDaniel, Department of Entomology, and J. F. Witter, Department of Pathology, University of Maine, Orono. It appears to represent the first record of the occurrence of *I. muris* in this state, although this species has been reported from several adjoining states and from eastern Canada. This specimen is also the first to be recorded from a dog; the usual hosts for the adults are small rodents.

The following remarks by Dr. Witter concerning the effect of the tick on the dog are of additional interest. "One tick was attached to the skin of the left shoulder over the area in front of the shoulder joint, making the dog lame. The area was highly congested, swollen and discolored as in a severe bruise. The area around the tick was exuding serum. After the tick was removed and the dog treated subcutaneously with antibiotics, the swelling subsided."

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THE GROWING IMPORTANCE OF PALEOENTOMOLOGYW. DWIGHT PIERCE, *4025 Halldale Ave., Los Angeles 62, Calif.*¹

For many years the records of fossil insects were confined to the coal measures of the Carboniferous Period, to the shales of the Permian, Jurassic, Triassic, Eocene, and Oligocene Periods, and to deposits of Baltic amber. These fossil insects are of tremendous importance in tracing the phylogeny of the insect orders, but, except for the amber material, practically all of the insect specimens have been crushed to the two-dimensional state.

In the last 16 years however, there have been added many deposits of three-dimensional fossils that give us true dimensions and more perfect pictures of the ancient insects. These three-dimensional specimens are being found in new amber deposits and in other gums such as kauri, copal, and copalite, in asphalt deposits, in lignite and peat, and in calcium carbonates formed in hot mineral wells, often resulting in onyx marble. Most exciting of all are the silica-replaced three-dimensional insects found in nodules formed in volcanic polluted waters. In addition there are slabs with arthropod foot prints from Arizona, and the borings of insects in petrified wood from many locations.

Whereas the older materials were flat, no particular techniques of study were possible, other than drawing and photography. The new kinds of fossils require new techniques, in many of which various liquids come into play, some requiring considerable skill, in their use and most of them necessitating binocular microscope search because we are now finding whole petrified insects less than 1 millimeter in size as well as tiny petrified insect eggs. It is even possible that some of the new techniques which have been worked out in the past decade may be applied to the older flat fossils.

A new group of enthusiastic workers is developing, but as yet without basic training in paleogeology and systematic zoology. Again we need zealous rock hounds, alerted to the field of fossil insects, but with the patience of the men who once handled waste coal day after day, rejoicing if one specimen a day was found. The coal measures of Pennsylvania, Illinois, and West Virginia have added greatly to knowledge gained in Europe concerning the earliest insects. But there is coal in Colorado and Washington, and on a brief stop at Bellingham, Washington, I was told that the workers had found fossil insects, emphasizing the necessity of continued, tedious, tireless searching.

The Permian field of Kansas has within the last few months been greatly extended into Oklahoma, and workers are now beginning to study the new finds, but there are many Permian deposits in America that must be carefully studied. The Oligocene shales of Florissant, Colorado, and the various cañons of Idaho and Wyoming have

¹W. Dwight Pierce has the longest record of membership in the Society of any living person.—Ed.

recently been joined by fine insect deposits in Montana, Oregon, and other parts of Colorado.

In my recent examination of some of the Montana material I began to wonder if some new information of value could be gained by liquid treatment.

Peat and lignite occur in many parts of the world, and I have found insect material in every lot I have examined. A simple system of examination was found almost by accident. Having occasionally used glycerine to soften dried insect larvae, etc., I thought it might serve in the treatment of British Columbia lignite. But glycerine was then off the market, and the Los Angeles County Museum had a barrel of propylene glycol which had been bought as a possible replacement for glycerine. It was not satisfactory for the purpose intended, but when I placed lignite and peat in the propylene glycol for 24 hours, and then soaked it in water for another 24 hours, it was possible to raise the plant material layer by layer, and recover the beautiful insect remains. Beetle elytra have not lost color in peat and lignite and are still three-dimensional. Only the British Columbia material has been reported on, but I have hundreds of fine, only partly studied, specimens from Pennsylvania interglacial peat. Certain genera such as *Donacia* occur in interglacial deposits across the Continent.

Dr. Herman Weyland, a paleobotanist of Wuppertal-Elberfeld, Germany, recently reported to me that he is finding many kinds of insect eggs in Bavarian lignite. He is doing excellent microphotography of these eggs and will soon publish his preliminary results. The difficulty is that we entomologists have not yet worked up the comparative morphology of insect eggs. This pioneering work by Dr. Weyland means that we must reexamine the entire American field of Pleistocene peat and lignite for evidence of microscopic insects.

Amber, copal, copalite, and kauri gum contain excellent specimens of insects. They are found in the Baltic area, Manchuria, Canada, Mexico, Zanzibar, Australia, and other countries. The Baltic amber and Zanzibar copalite fluoresce violet under ultraviolet light, and some of the recent pine resins fluoresce yellow. I believe that the paleoentomologists should seek suitable solvents to release specimens from various gums for slide mounting.

Onyx marble found in Arizona and Mexico contains remains, some of which are of very rare insects of Oligocene origin; these are primitive insects, caught in rock cracks by the upwelling of boiling calcium carbonate waters. In the Arizona deposit the onyx marble is intrusive in Permian and Devonian rocks. Because the surface of crude onyx marble is very rough, one cannot immediately tell whether there is any value in a piece of it, but if propylene glycol is brushed over the surface one can see into it for the depth of about a quarter of an inch or more. Since this is a calcium carbonate product I believe we can use 20% formic acid for the release of the hidden insects. There are numerous onyx marble deposits in Arizona and California, and

it is said that insect remains have been found in Mexican onyx marble, revealing another field for research.

The asphalt fields of Los Angeles, McKittrick, and Carpinteria, California, have yielded multitudes of insects, most of which are still unreported. Liquid recovery is also used for this material. Skulls and similar objects are soaked in kerosene to soften the asphalt so that it can be poured out of the cavity. Benzene or xylol is used to separate the asphalt completely from the dirt and biological fragments. When laboratory equipment is available, the best separation is the distillation of benzene in a Soxhlet apparatus through a cup containing the asphalt. The particles of different sizes are then sorted by sifting them through geological sieves, making them easier to examine under the microscope. Fossil insects also occur in South American asphalts but have as yet not been studied.

Forty pounds of asphalt will keep one busy for weeks. In the sifted dirt there are plant material (seeds, leaves, stems, fruits); bones of mammals, birds, reptiles, and batrachians; molluses, insects and other arthropod material. Everything should be saved. The finest dirt will be wanted by the pollen experts.

Our procedure is to first lay the separated fragments in pill boxes according to type of material. At first it takes considerable skill to separate plant, bone, and insect material. For example, there are many kinds of ring particles—millipede segments, tracheal bones of birds, axis and atlas vertebrae of batrachia, reptiles, birds, and proventriculi of insects, prothoraces of beetles, and possibly even plant segments. The insect parts are arranged on cotton in Riker mounts for each skeletal element. When a cue is found to place an insect fragment in family or genus, then modern insects of that group are dissected and laid out as an Atlas plate for reference and identification of all other parts.

The new paleontologist will soon find that there has been too little done in comparative morphology of insects, in spite of the wonderful work by Dr. Snodgrass, and he must extend his efforts for the benefit of others. A related field is the sorting of insect remains from bird stomachs and lizard and bird droppings. We find such collections of insect parts in droppings in peat and lignite, and even in the nodules.

The newest finds are silicified insects in calcareous lakebed nodules. These nodules are built up either concentrically or in level layers. Those beds containing nodules with silicified insects are only known as yet from lakes which were polluted by volcanic waters and gases; and, in fact, only andesitic volcanoes, which produced boron deposits.

It is my opinion that algae living in the waters took the carbon dioxide from bicarbonates and precipitated calcium carbonate. There are two annual layers or varves, and the rate of deposit was about 25 years to the inch. The deposits are found in the Calico Mountains at from 2400 to 3000 feet, and it is evident that there were long periods free from volcanic disturbance. Algae have an affinity for silica,

transforming it to the colloidal state. Boron probably acted as the killer of the insect and other life, and probably as the catalyzer to cause the transfer of the colloidal silica and the tissues, and then to transform the removed tissues into petroleum. These two catalytic processes took place, and it seems to me that boron fits best as the provocative agent. It remained as colemanite deposits in the immediate vicinity of the deposits of nodules. The complete silica transfer has brought about perfect replicas of the original insects, algae, bird feathers, mammal hairs, and eggs of insects and fairy shrimp. Even the tiny hairs on the antennae of heleid flies and the compound eyes are preserved in silica.

The processes which took place must have been very rapid, almost instantaneous; for the embryos in the eggs are clearly visible; a mayfly was killed in front of her cluster of eggs and embedded in the rock; flies partly emerged from the pupa case and insects in copula are so preserved.

Because I believe that these processes took place rapidly in highly heated waters, I believe that our modern chemists, *in vitro*, can produce petroleum by boron catalysis if they use the same ingredients that were present in the ancient lakes. As far as we know now there were present calcium bicarbonate, sulphuric acid, boric acid, or salts, silicic acid or silicates, some strontium, undoubtedly hydrogen gas, carbon dioxide, living algae, and living invertebrates. Many processes in chemistry today are started by microorganisms—algae and bacteria. Perhaps such conditions are needed as a starter, as we find that at Hot Mineral in the Imperial Valley, algae are dwelling in the hot calcareous waters, and insects killed in the hot water are being coated or crystallized and imbedded in the bottom.

Thus I challenge well-equipped chemists to solve the problem of petroleum production from waste vegetable and animal refuse, and give the next generation a new supply of the fuel which is rapidly being depleted.

The recovery of insects from the nodules, which are now found in the Calico, Frazier, and Tehachapi Mountains and which I expect will be found wherever primary boron occurs, is a liquid process. We can accomplish it with 20% formic or acetic acid, or with 2 to 5% hydrochloric acid or nitric acid. The nodules can be wrapped in silk, rayon, or nylon cloth, which can be made into little bags, or simply wrapped in squares large enough to tie up. The solution of the nodule takes several days to weeks. On removal, the bag is rinsed in hot water, then opened and inverted in a flat dish. After washing with water, the solids that remain are gently removed by brush into alcohol and examined by microscope. The specimens are then gently removed to xylol and mounted on slides, using glass pieces to lift the cover glass if necessary. The specimens are very brittle.

One percent of the nodules have petrified larvae or impressions on the outside. These larvae are not silicified and must be removed by the slower use of hydrogen peroxide. The impressions are often very

distinct, and when latex is poured in, a perfect cast of the insect is obtained. A certain percentage of white nodules formed by rolling contain dragon fly nymphs, usually disintegrated but sometimes preserved in an entirely different state of crystallization. The cast of the impression can, however, give a good representation of the occupant.

Other kinds of nodules with insect remains have been found in Kansas and Oklahoma. Nodules also occur in Utah, Nevada, and California that are of different origin, but should receive careful study.

We have found insect remains, in addition to the conditions already cited, by cracking pebbles from the sea shore, and by breaking up oil-well cores.

The study of insect and arthropod footprints is interesting. At Ashfork, Arizona, the shales used for structures and stepping stones often are covered with footprints of many animals. That of a large scorpion indicated a gigantic species. This study necessitates making plaster casts of the footprints of living creatures, and from these measuring the size of the body relative to the length and width of the stride.

The droppings of arthropods are often of value. In the asphalt we have found pellets of dry wood and dampwood termites and other pellets yet to be identified. In the nodules, the coprolites of fairy shrimp are very numerous. Fecal matter of wood boring insects is often found in fossil wood. When I train candidates for state license in structural pest control, I teach them how to recognize the various kinds of droppings. So, too the paleontologist must make a collection of the droppings of the kinds of insects he expects to find in his work. The study of the insect borings in fossil wood often necessitates sectioning and polishing of the rock. This then will require carefully selected collections of borings and pellets of modern wood borers.

Inasmuch as insects are good criteria of the type of climate, the paleontologist may ultimately reconstruct the story of the climate of ancient days. For an idea of my thought in this line I use the Calico Mountains nodules as an example. In Miocene times, twenty to twenty five million years ago, there was a great fresh water lake, where now the Calico Mountains stand. There were active volcanoes around the lake, and even in its midst, because this area was on the center line of the great terrestrial squeeze upon the triangle now known as the Mojave Desert. The Garlock Fault, bordered on its north side by the volcanic Tehachapi and El Paso Mountains and pressed upon by the southward pushing Sierra Nevada, lies on the northern edge. The San Andreas Fault, bordered on its southwestern side by the San Gabriel and San Bernardino Mountain ranges of volcanic mountains, was the boundary of the pushing upward from the southwest. The fulcrum of the squeeze was at Tejon Pass, anchored by volcanic Mt. Pinos in the Frazier Mountains. The Calico Mountains are on the axis of the squeeze.

Our nodules come from the Tehachapi Mountains, from the slopes of Mt. Pinos, and from the Calico Mountains, and there are evidences that we can expect them in the San Gabriel Mountains, as near Lang, where primary boron exists and blue rock is reported. This blue rock is an indicator of boron, and our upper strata nodules are bluish.

Living in the water were tiny fish, two of which have been found in nodules. Prowling around were mammals, some of them with hairs over an inch long. Birds were present because their feathers have been preserved. There was woody vegetation, and five species of termites were living at its expense. One genus of these termites forms earthen tubes around stems, and retires in the heat of the day into the ground, where there is considerable moisture, indicating a high water table. Leaf hoppers of several species, thrips, and various bugs were living on the plants. A dermestid beetle lived upon the dead material. Moths and grasshoppers were present. In the water many kinds of algae were growing, and there were also mosses. Blood sucking midges (*Ceratopogonidae*) of at least seven species were breeding on the algae. Dytiscid larvae fed on the midges. A few *Hydrophilidae*, *Nepidae*, and *Notonectidae*, and other predaceous water bugs were present. Tiny water mites were preying on the insects. *Collembola* (spring tails) of both suborders, and aquatic moths, also other aquatic flies, stone flies, mayflies, damsel flies, and dragon flies, were breeding in the water.

When catastrophes came, and these occurred from time to time over a period of hundreds of thousands of years, everything in the water was suddenly killed and instantly preserved. The nodules give us an ecological picture of these ancient times.

Another kind of story was learned in the asphalt study, in which we had a modern flow at McKittrick, adjoining an ancient Pleistocene field of asphalt. Here we saw the insects, scorpions, reptiles, birds, and mammals caught in the living flowing tar, and watched the processes of disintegration. Then from the literature on the fauna and flora of cadavers, we found that at each step of disintegration of an animal, the bacterial flora, and the insect scavengers are distinct. Thus we determined that an animal caught in the tar slowly died and disintegrated, and we found the insects of each stage of disintegration. One raven which came down to feed on a caught rabbit, and was itself caught, was watched for two years as these processes continued until finally it was covered. And so we knew that the great animals caught in the asphalt attracted others to feed on them, and one by one they were slowly imbedded in the liquid and accumulating debris. It may have been a water-covered pool of asphalt, or it may have been a thin flowing seep only a small fraction of an inch thick, but few creatures escaped when they accidentally stepped into the sticky stuff. We know that occasionally there was escape, because we have seen it happen.

Thus the paleoentomologist strives to interpret the past.

For the records of the Society I give a brief abstract of my bibliography in this field.

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USE OF POISON BY THE ANT, *TAPINOMA NIGERRIMUM*
 (HYMENOPTERA: FORMICIDAE)

NEAL A. WEBER, *Swarthmore College, Swarthmore, Pennsylvania*

The poison of the widespread Mediterranean and southwestern Asiatic ant, *Tapinoma nigerrimum* Nylander, has been found (Trave and Pavan, 1956) to contain methyl-heptenone, propyl-isobutyl-ketone and a dialdehyde. The investigators refer to it as a defensive poison with insecticidal properties. The ants of the genus *Tapinoma* have a

peculiar odor, often likened to rancid coconuts, that is easily perceptible to the human olfactory sense. The general winter activity and marriage flights of this species in Baghdad, Iraq in 1950-51 have been noted (Weber, 1952). Circumstantial evidence indicated that they caused the deaths of some driver ants, *Dorylus fulvus*, that are well known predators. Later in the season, and in the following year in Baghdad, other and unpublished observations were made, of which the following refer to the use of poison for the first time.

The ants were well established in our brick and tile house and garden in 1951-52. By April 20, 1952 they were concluded to be definitely combative, rather than innocuous scavengers. One was then found to be carrying a dead *Paratrechina longicornis* ant and others were carrying spider legs. Some were seen to curve their gasters around in the direction of nearby smaller ants of the genera *Pheidole*, *Nylanderia*, and *Monomorium subopacum* F. Smith. They probably sprayed the ants with poison, or were prepared to, but this could not be seen. Both the *Pheidole* and the *Monomorium* are equipped with a stinging apparatus. By this date the *Tapinoma* appeared to have driven the *Pheidole* out from the corner of the house. It was the most active and numerous ant on the adjacent terrace. The *Paratrechina* was by far the quickest ant in its movements but less generally active.

Positive reactions between the *Tapinoma* and the *Monomorium* were finally witnessed on April 25. The latter ants were clustered about a fallen flower of phlox on the terrace step, taking nectar. The *Tapinoma* would wander by and always hostility would be evidenced. Several *Monomorium* maintained constant guard, head down, gaster vertical. As the *Tapinoma* approached, the guards quickly flicked their gasters towards the others exactly like scorpions. The *Tapinoma* then were seen to curve their gasters around and clearly must have sprayed the guards since the latter writhed about, curling up and then extending themselves before running off.

Such dolichoderine ants as the above, *Tapinoma melanocephalum* and *Iridomyrmex humilis* have driven out native ants and other insects in many parts of the world. Their success would appear to be due not only to their possession of a poison, which might act passively in rendering nesting or foraging sites uninhabitable by the other insects, but also to their actively spraying their opponents. They lack a stinging apparatus and do not appear to attack with their mandibles. This does not appear to prevent such ants, and in addition *Azteca* in Tropical America, from dominating large areas.

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JOSEPH SANFORD WADE
1880-1961

Joseph Sanford Wade, entomologist, bibliographer, biographer, reviewer of books and lover of art, was born on July 20, 1880, in Cumberland County in southern Kentucky. He was a son of James Ballanger and Nancy (Beek) Wade. Here he lived until, at the age of 15 in 1895, he moved with his parents to Wellington, Kansas. His boyhood in Kentucky must have been spent in an entirely rural setting, surrounded by woods and streams filled with birds and other wild life. Possessed of a sensitive and observing nature, it was undoubtedly during these early years that he developed a love for natural history that remained with him during the rest of his long life.

Although Joe Wade lived in Kansas for more than twenty years, he was very proud of the fact that he was born in Kentucky and always talked as if he considered it his real home. He published several articles on Kentucky history

and on the activities in the State of such well-known naturalists as Rafinesque, John Muir, Audubon and Alexander Wilson. An autobiographical sketch of Joseph Wade appeared in "Who's Who in Kentucky" in 1936. He was a member of the well-known Filson Club in Louisville.

After the move to a farm near the little town of Wellington, Kansas, young Wade attended the local schools and worked on the family farm but he never took to farm work kindly. His interest was in books and intellectual pursuits and his far from robust physique rebelled at the long cold winters and hot summers and the hard physical work for which he was neither constitutionally nor temperamentally fitted. In his meagre spare time he devoured such books as were locally available and read as widely as was possible under the circumstances.

In 1905-06 Wade attended Fairmount College (which later became Wichita University) in nearby Wichita. His only further study in an institution of higher learning was taking courses offered by the University of Chicago, 1923-25.

Wade returned to the family farms for the next seven years but in this period he found time to publish a score of articles (a dozen of these in 1913) about local farming problems and local historical subjects. It is just possible that one of these, "The grasshopper year of 1874," in the Wellington Kansas Daily Journal in March 1913 so attracted the attention of Professor F. M. Webster, Chief of the Division of Cereal and Forage Crop Insects of the Bureau of Entomology, U. S. Department of Agriculture, that he later in that year appointed Joe as a field assistant in a newly established field laboratory at Wellington, Kansas. This laboratory was set up to study the problem of the Hessian fly of wheat and of other insects affecting cereal and forage crops in the Central Plains States and to devise measures for the prevention or reduction of insect losses.

While working at and out from the field laboratory in Wellington, Kansas, Wade became interested in the life histories of the false wireworms about which little was known up to that time. He made many observations on them and later deposited his collection of the beetles and their larvae in the USNM. He later published three papers on false wireworms, one by himself, "Notes on ecology of injurious Tenebrionidae" (Ent. News 32:1-6, 1921); one with Dr. Böving, "Biology of *Embatheon muricatum*" (J. Agri. Res. 22: 323-334, 1921); and another with Dr. St. George on "Biology of the false wireworm, *Eleodes suturalis* Say" (J. Agr. Res. 26: 547-566, 1923).

In 1917 Joe Was called to his Division's Head Office in Washington, D. C., to be an assistant to Mr. W. R. Walton who had been appointed as successor to Professor Webster following the latter's death. He later had the titles of Associate Entomologist and then Entomologist. Here in the Nation's Capital, he was to remain for the rest of the 43 years of his long life, during the last 10½ of which following retirement in 1950 he was a Collaborator with the U.S. Department of Agriculture. He never married, but his older sister, Mary E., came to Washington with him—here they lived together in a mutually harmonious and beneficial companionship until her death in 1956.

Having developed a growing acquaintance with biological scientists in Washington, Wade began to affiliate himself with several organizations. He had already joined the American Association for the Advancement of Science in 1913 (Fellow in 1925), and in 1915 had become a member of the American Association

of Economic Entomologists and of the Entomological Society of America (he was elected a Fellow in 1937). A large part of his life, outside his official duties, was devoted to these organizations. They are really an index to his breadth of interests.

The Entomological Society of Washington was quite naturally the first of these he joined. This was in 1917, during his first year in Washington. He became its President in 1934. His address as retiring president was entitled "The Officers of our Society for Fifty Years (1884-1934)" (Proc. Ent. Soc. Wash. 38(6):99-145, 1936). This was biographical in nature and its preparation required a great deal of painstaking research. As Recording Secretary, he prepared the minutes of the meetings from 1927-31, most of which were published in the Proceedings of the Entomological Society of Washington.

He was elected to the Biological Society of Washington in 1921, and was Corresponding Secretary from 1933 to 1943, Vice President from 1943 to 1946, and President in 1946-47.

In 1929 Mr. Wade was admitted to the Cosmos Club. He was very proud of this honor, especially since he was sponsored by no less a personage than Dr. L. O. Howard, Chief of the Bureau of Entomology of the U. S. Department of Agriculture and co-sponsored by his immediate Chief, Dr. W. H. Larrimer, Head of the Division of Cereal and Forage Crop Insects of the same Bureau. Throughout the rest of his life, Joe Wade was a familiar figure at the Club where he regularly attended the lectures and other activities and where he enjoyed entertaining his many friends at lunch or dinner.

The American Ornithological Union elected Mr. Wade a member in 1929 and later made him an Honorary Life Member. He published several book reviews and at least one obituary (Charles Popenoe) in the *Auk*, the official journal of the A.O.U. He attended the Diamond Jubilee Meeting of the Union in New York City in 1957.

In 1933 Mr. Wade was elected a member of the Audubon Society of the Central Atlantic States, Inc., when it was known as the Audubon Society of the District of Columbia, Inc. He served, from 1933, on the Library Committee and was a member of the Board of Directors from 1936 to 1947. In the March, 1956, issue of the *Atlantic Naturalist*, official publication of the Society, he published a paper, "Vignettes of Early Days of the Audubon Society of the District of Columbia."

The year 1930 saw Mr. Wade honored by election to the Washington Academy of Science. From 1942 to 1945 he was on the Membership Committee, in 1947 he was the Delegate of the Biological Society of Washington to the Academy and in 1949 and 1950 he was on the Scientific Achievement Committee.

Libraries had a particular fascination for Joe Wade but of them all the Library of Congress was undoubtedly his favorite. He knew what it contained and how to use its facilities to an extent possessed, possibly, by few individuals outside of the key members of the staff. In 1941 he prepared at the request of and for the use of the Library a list of his entomological and other publications for the 40-year period, 1902-1941 inclusive, 528 titles with subject index. In 1955 he deposited in the Library a collection of 2500 of his papers. He often said that among his happiest hours throughout many years were those spent at his desk in the Jefferson Room surrounded by books which he was consulting

in connection with the preparation of his many manuscripts. He made many trips to consult books in the New York and Boston Public Libraries and the great Harkness Memorial Library at Yale in New Haven. He was well acquainted with the National Archives and often consulted its extensive files.

No account of the life of Joseph Wade would be complete without reference to his church. A deeply religious man, he had abiding faith in its teachings. He was a regular attendant at the New York Avenue Presbyterian Church and was a great admirer of its famous late pastor, the Rev. Peter Marshall. He contributed many articles on widely different subjects of interest to the Presbyterian Advance.

A constant student of the literature of the subjects in which he was interested, Mr. Wade published, among others, the following three major bibliographies on entomological subjects:

"An annotated bibliography of the Hessian Fly, *Phytophaga destructor* Say." USDA Misc. Publ. 198. 100 pp., 1934.

"A contribution to a bibliography of the described immature stages of North American Coleptera. USDA, E 358, 114 pp., (mimeo) 1935."

"A selected bibliography of the insects of the world associated with sugar cane, their predators and parasites." 8 vo., cloth, 116 pp. Honolulu, Hawaii. International Society of Sugar Cane Technologists, Memoir No. 1, 1951.

As a reviewer of literature, Mr. Wade accomplished a considerable feat by publishing a little over 300 reviews of books and articles. According to his own classification, these fall into the following categories: biographical 12, biological 18, botanical 45, entomological 95, ornithological 23, travel and exploration 64, zoological 28, miscellaneous 28.

And so we come to the close of the life of a cultured gentleman of the old school, a distinguished writer and historian and above all else a thoughtful and helpful friend to many more than we can count. During his last few months he was in poor health following an operation in March from which he could not fully recover. He died early Sunday morning on New Year's Day, 1961, of a heart attack at his home in the Argonne Apartments in Washington, D. C.

The following paragraph, found in his personal papers, apparently written to describe someone unknown to us, so aptly fits Joe Wade himself (except for the statement as to "length of days"), that we here quote it as a tribute to him:

"While we may not lament the release of our friend and co-worker from pain and weakness, we deplore the loss of one in whom we recognize the highest qualities of intellect and personality. Though denied the strength of body or length of days, it has been his high privilege to love nature and to extend widely the bounds of human knowledge. Possessed of unrivalled power of observation and depth of insight, broad culture, accurate judgment, and a kindly spirit, he has lived a life and accomplished a work which render his memory secure in the affectionate regard of his contemporaries, as well as in the unqualified admiration of all naturalists who may follow in the lines of his unique studies."

MORTIMER D. LEONARD
WALTER H. LARRIMER

BOOK REVIEW

SEUCHEN IM MENSCHEN (MENSCH, TIER UND PFLANZE IM KAMPF UND AUSGLEICH MIT IHREN PARASITEN), by Erich Martini. The Ferdinand Enke Press, Stuttgart, Germany. 1959.

This is a compilation of the significant known facts, interspersed with some philosophical speculation, pertaining to epidemic human diseases for which parasites are responsible. The author attempts to review the whole field of parasitism, even touching upon parasitic plants, and emphasizing viruses, protozoa, bacteria, fungi, nematodes and arthropods (25 per cent of the known German insect species are said to be parasitic). There is speculation concerning the origin of endoparasitism, and there is some consideration of morphological adaptations of parasites to hosts. For each group of organisms the place of entrance and the seat and development of infection are considered; but much of the discussion is historical review of epidemics. It is a somewhat rambling treatment of the subject, including discussion of situations that have only a very indirect bearing, or none at all, upon the main theme. The book does not seem to fill any particular need and is therefore disappointing.—C. F. W. MUESEBECK, *U. S. National Museum, Washington, D. C.*

SOCIETY MEETING

698th Meeting, April 6, 1961

The 698th regular meeting of the Society was called to order by the President, J. F. Gates Clarke, on April 6, 1961, at 8:00 p.m. in Room 43 of the U. S. National Museum. Forty-three members and 11 visitors signed the register. The minutes were approved as read.

Five new members were accepted: *Philip B. Dowden, Oliver S. Flint, Jr., Preston E. Hunter, Arthur D. Moore, and Arlo M. Vance.* *Howard R. Bullock* was presented as a candidate for membership. New members present were introduced.

Helen Sollers announced that the annual picnic will be held at Log Lodge, ARS, on June 7, 4:00—8:00 p.m.

W. E. Bickley notified the Society of the next meeting of the Washington Academy of Sciences and urged the members to attend.

W. H. Anderson invited the Society to attend the Prince Georges County Science Fair which is being held in the Cole Field House of the University of Maryland on April 15—16. An exhibit of space vehicles is to be available in addition to the student projects.

F. L. Campbell represented the Society, substituting for W. E. Bickley, at the recent meeting of the Board of Managers of WAS.

J. C. Jones reported his finding 4 or 5 sterile males of *Aedes aegypti* in his laboratory colonies. These males were without germ cells in the testes.

Three newly published books were exhibited by J. F. Gates Clarke: *How to Know the Butterflies* by Ehrlich and Ehrlich; *Monograph of Immature Stages of Neotropical Timber Beetles* by Duffie; and *Handbook of Insects (Japanese) in Colour*.

The speakers for the evening were both entertaining and authoritative in their presentations. Major R. M. Altman, Walter Reed Army Institute of Research and the University of Maryland, discussed the Army program of insect control in Panama and illustrated his comments with Kodachromes. A. M. Heimpel, Entomology Research Division, ARS, USDA, described the use of microorganisms in the control of forest insects. Both talks were followed by a great deal of lively discussion.

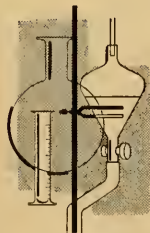
Among the visitors present were R. E. Wheeler of the University of Massachusetts, and R. L. Cowden.

The meeting was adjourned at 10:00 p.m.— ERNESTINE B. THURMAN, *Recording Secretary*.

PUBLICATION DATE

The date of publication of Vol. 63, No. 2, of the *Proceedings* is 20 June 1961. The date of publication of Vol. 63, No. 3, will be found in Vol. 63, No. 4.

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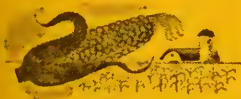
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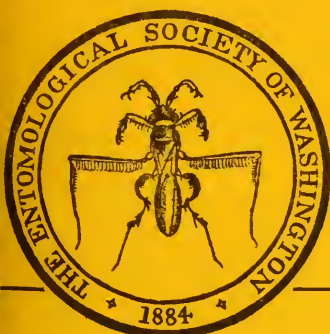
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insects

PROCEEDINGS

of the

ENTOMOLOGICAL SOCIETY
of WASHINGTONU. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

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Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are \$5.00; initiation fee is \$1.00 (U. S. currency).

PROCEEDINGS

Published quarterly beginning with March of the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are \$6.00 per year, both domestic and foreign (U. S. currency) payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

The Society does not exchange its publications for those of other societies.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 63

DECEMBER, 1961

No. 4

PROSIMULIUM DOVERI, A NEW SPECIES FROM ALASKA,
WITH KEYS TO RELATED SPECIES
(DIPTERA: SIMULIIDAE)

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The bionomics and morphology of the larvae, pupae, and adults led me to consider this a distinct species of the *Prosimulium hirtipes* complex. In addition, the patterns of the salivary gland chromosomes of mature larvae are different from those of all other members of the *hirtipes* complex that have been analyzed to date (July, 1958) by Dr. Rothfels and his colleagues. In the literature this species was previously referred to as *hirtipes E* by Sommerman (1958), and under the name of *P. travisi* Stone, Sommerman (1953) illustrated the head capsule of the larvae and gave the distinguishing larval characters in the key. Likewise the bionomic notes, which were based solely on larval observations appearing in Sommerman *et al* (1955) under the name of *travisi*, refer to this species.

The other Alaskan member of the *hirtipes* complex has been referred to as *hirtipes 2* by Sommerman (1958). Syme and Davies (1958) discussed its relationship with the Canadian species in the complex, *mixtum* S. & D., *fuscum* S. & D., and *fontanum* S. & D. Comparison with only a very few specimens of Canadian *mixtum* suggests to me that this common Alaskan species is distinct. But knowing the variation that occurs in the species treated herein, comparison with less than a half dozen specimens may not give a true picture. To avoid later confusion in the literature this common Alaskan species will still be referred to as *hirtipes 2* in this paper.¹

I am indebted to Dr. K. H. Rothfels and Mrs. Parvathi K. Basrur of the Botany Department at the University of Toronto for information concerning the chromosome patterns of the mature larvae. I am also grateful to Dr. D. Davies for kindly sending specimens of *mixtum* and *fuscum* for examination.

All the following descriptive comments refer to alcoholic specimens. It might be well to point out here that reared adults allowed to live only a day or two are not darkened completely so pigmentation of the

¹Dr. Rothfels informed me by personal correspondence that a restudy of the chromosome patterns of the Alaskan *hirtipes 2* indicates that it is distinct from *mixtum*, so a formal description is in preparation.

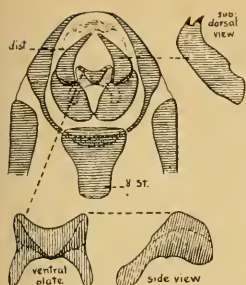
integument can be misleading. The "young" adults of *hirtipes* 2 and *travisi* have pale brown, almost beige, basal antennal segments, femora and tibiae, instead of dark brown as in the older specimens. Regardless of age, the terminal antennal segments have fine pile which the basal two-and-a-half segments lack. This pile makes the segments appear lighter. Color comments refer to the apparent color, pile included. The direction of the light is important in determining the color of the overall vestiture, so the head is directed toward the light source for all color comments except those referring to the terminalia, ventral view, which are also directed toward the light source. The drawings were made from terminalia cleared in warm NaOH, rinsed and propped in position on a gob of vaseline submerged in alcohol in a Syracuse dish. A stereoscopic microscope was used with a "squared" ocular. The male ventral plates, ventral view, were placed in position so that the tip of the lip coincided with the arch of the anterior internal fork and the separate dististyle was placed so that its condyles were superimposed, resulting in a sub-dorsal view. The larval and pupal drawings were made from uncleared specimens in alcohol.

Prosimulium doveri, new species

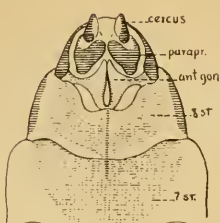
Prosimulium doveri is named in honor of Lewis Howard Dover, whose keen observations and enthusiastic and painstaking collecting, while assisting the author during the summer of 1948, contributed immensely to the success of the biological studies conducted by the Alaska Insect Project. It was during those studies that this species first came to the author's attention.

All the following type specimens were individually reared from pupae and each is accompanied by the pupal exuviae and case. The larval head capsule also accompanies the holotype. The pupae of these type specimens were collected by the author on July 10, 15, 21 and 25, 1958, from tiny spring-fed streams close to the margin of Eklutna Lake, elevation 875 feet and 40 miles northeast of Anchorage, Alaska. The male types emerged between July 11 and 30 and the females between July 27 and 31. *Holotype*: Female, collected at trickle 11-B, July 21, 1958, emerged July 29, killed Aug. 7. *Allotype*: Male, collected at trickle 11-B, July 25, 1958, emerged July 30, killed Aug. 2. *Paratypes*: 15 males, 15 females. The holotype, allotype and 4 paratypes of each sex are deposited in the collection at the United States National Museum; 5 paratypes of each sex are deposited at the Illinois Natural History Survey, and 5 of each in the Canadian National Collection; 1 of each sex at the Arctic Health Research Center. Larvae, pupae, and additional reared adults, as well as wild adults, are also deposited in the above-mentioned collections.

Female.—General color golden (yellow-orange) and brown, so also the vestiture. Wing length 4.4-5.0 mm. Head golden brown mostly, but with dark brown band immediately behind eyes; setae mostly yellowish, a few dark; frons and clypeus golden brown; frons distinctly widened above. Antennae with 11 chunky



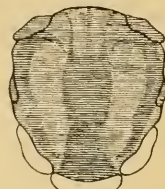
DOVERI
1. ♂ TERMINALIA



DOVERI
2. ♀ TERMINALIA



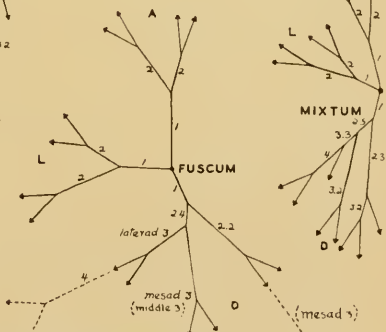
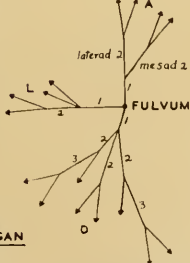
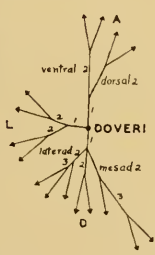
5. ♂ 8TH STERNITES



6. ♂ THORACIC PATTERN

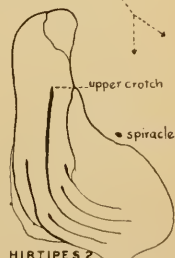
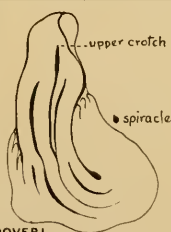
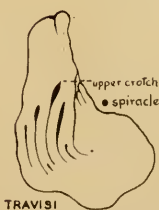
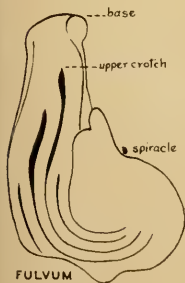


4. ♀ ANTENNAE



7. BASAL PART OF LEFT PUPAL RESPIRATORY ORGAN DORSAL VIEW

8. DIAGRAMS OF LEFT PUPAL RESPIRATORY ORGANS DORSAL VIEW, SEGMENTS TO SCALE



9. LARVAL HISTOBLASTS TO SCALE

segments,—the first and second usually lighter and more yellowish than the clypeus, proximal half of third segment usually more nearly the same shade as clypeus, the remaining segments darker but covered with dense silvery pubescence; third segment almost as long as second, fig. 4. Sensory segment of palps darkest, same shade as mesosternum. Sensory organ knotty and gnarled in addition to tubercles, occupying most of the basal half (length) of segment, with the opening rather large, almost as wide as the organ, fig. 3. Mandible serrate; maxilla with retrorse teeth. Pronotum, humeri of scutum, and usually depression before scutellum, yellowish brown like scape and pedicel; scutum darker brown, like tarsi, but with a light strip along sides, and with recumbent yellow hairs. Scutellum yellowish-beige like femora and tibiae, with erect yellow hairs. Post-scutellum usually brown like scutum. Pleuron for the most part various shades of beige to brown, with hairs of pleural tuft fine and yellow; sternopleural hairs absent; mesosternum dark brown, fading to yellow near pleural membrane. Hairs on base of costa mixed, brown and yellow, on stem vein yellow. Legs yellowish beige with some brown as follows: forecoxae with brown along base, sides and distally, and a small brown area posteriorly; the remaining coxae and all trochanters with both yellowish orange and very light brown areas, with posterior surface of middlecoxae dark brown; very faint distal brown band on femora and proximally on tibiae, the distal band on tibiae darker brown and all segments of tarsi dark brown. Claws without teeth. Abdomen pale, becoming more fumose posteriorly, with sclerotized parts yellowish brown, tergites flecked, fourth tergite noticeably narrower than scutellum; the whole abdomen covered with fine yellowish pubescence. No sclerotized sternal plates cephalad of the seventh sternite. Anterior gonapophyses slightly tapered with rounded apex, fig. 2, very pale, almost white, mesal sclerotization usually yellow-brown. Paraprocts and cerci dark, contrasting with pale yellowish seventh and eighth sternites.

Though characters vary somewhat, the following key helps to distinguish the females of these closely related Alaskan species, *P. fulvum* (Coq.) included.

1. Thorax almost entirely yellow; sensory organ cylindrical and densely tuberculate, fig. 3 **fulvum**
 Thorax predominantly brown or blackish brown; sensory organ not cylindrical, but gnarled and knotty, fig. 3, *doveri*, *hirtipes* 2, *travisi* 2
2. Femora and tibiae yellowish and tibiae usually without proximal brown band, or with an inconspicuous one; mesad sclerotized margin of gonapophyses usually yellow-brown; seventh and eighth sternites pale yellowish, sharply contrasting with brown cerci and paraprocts; fourth abdominal tergite conspicuously narrower than width of scutellum **doveri**
 Femora and tibiae beige to brown and tibiae with conspicuous proximal brown band; mesad sclerotized margin of gonapophyses brown to black and seventh or eighth sternites brown, much like cerci and paraprocts; fourth abdominal tergite about as wide as scutellum 3
3. Ventral view, third antennal segment almost as long and wide as second, fig. 4; opening of sensory organ small, about one-half width of organ; distance from base of segment to organ less than length of organ, fig. 3; gonapophyses tapering and twice dorso-ventral length of cerci, with

- sclerotized pigmented area along mesad margin extending more than half way to tip **travisi**
- Ventral view, third antennal segment shorter and narrower than second, fig. 4; opening of sensory organ large, about equal to width of organ; distance from base of segment to organ, greater than length of organ, fig. 3; gonapophyses generally rounded and less than twice dorso-ventral length of cerci, with sclerotized pigmented area along mesad margin usually not more than half way to tip **hirtipes 2**

Male.—General color dark brown, the vestiture being blond and blackish brown, with only that of the scutum, scutellum and stem vein yellowish, while that on base of costa is dark. Wing length 4.0 to 4.5 mm. Legs, light brown to dark brown, with the bare ventral strip of middle and hind femora yellowish. The following leg segments are densely clothed with erect hairs longer than width of respective segment: fore and hind femora, hind tibiae and first three hind tarsal segments. Abdominal sternites sclerotized, dark and clothed with blond and dark brown hairs. Terminalia, fig. 1, with eighth sternite bluntly rounded at anterior end; lip of ventral plate broad, rounded and deeply concave dorsally; dististyles with two stout teeth at apex.

The following key helps to distinguish the males of these closely related Alaskan species.

1. Mesad area cephalad of scutellum darker than adjacent lateral area, fig. 6; hind femora (dorsal view) beige with contrasting distal brown band **fulvum**
- Mesad area cephalad of scutellum concolorous with adjacent lateral area, exclusive of structural sheen; hind femora (dorsal view) brown, almost obscuring distal brown band **2**
2. Dorsally, hind femora and first tarsal segment with dense erect hairs longer than width of segment; bare ventral strip of middle and hind femora yellowish; setae on stem vein yellow, on base of costa dark **doveri**
- Dorsally, hind femora and first tarsal segment with few or no erect hairs longer than width of segment; bare ventral strip of middle and hind femora beige or brown; setae on stem vein pale or yellowish, on base of costa mostly pale **3**
3. Eighth sternite almost as wide as long, fig. 5; lip of ventral plate wide, but pointed, the whole tapering gently from arch of anterior internal fork; opening of sensory organ small as in female and about one-half width of organ; distance from basal end of segment to sensory organ about equal to length of organ **travisi**
- Eighth sternite, fig. 5, almost twice as long as wide; lip of ventral plate narrow and rounded, arising abruptly from arch of anterior internal fork; opening of sensory organ large, as in female, and about equal to width of organ; distance from basal end of segment to sensory organ considerably more than length of organ **hirtipes 2**

The following terms are defined to facilitate use of the distinguishing characters of the pupal respiratory organ: *trunk*, the solitary basal segment of the organ; *filaments*, the terminal filamentous processes; *branch*, a structure arising from the trunk, which subsequently terminates in filaments. The branches are composed of *segments* delimited by furcations, or by bases of filaments. The segments are counted from the trunk distally. The branches are designated mesad, laterad, anterior, posterior, dorsal, antero-dorsal, etc. with reference to the location of their bases on the trunk with respect to the general body directions.

It is often desirable to refer to particular segments of a branch, especially those relatively near the trunk. An abbreviated system of nomenclature has been adopted consisting of a capital letter followed by one digit, and if necessary a second digit separated from the first by a dot. The letter is the first letter of the branch name. If the branch name is a compound word the first letter of each word is used. The first digit is the segment number. Often more than one segment on a branch will turn up with the same letter-digit combination, in which case if they arise from the same segment they can be distinguished by using the terms mesad, dorsal, etc. preceding the name, eg. dorsal and ventral A2 or lateral, middle, and mesad D2. The second digit (number following the dot) is the total number of filaments supported directly and indirectly by that particular segment. It is used only when synonymy necessitates further distinction. However, sometimes use of the second digit may be less cumbersome and more distinctive than use of the preceding adjective. In more complicated branches where double-digit synonymy occurs in remote segments, further distinction can often be made simply by reference to the segment which precedes the one in question, eg. each D3.2 of *hirtipes* 2 is supported by a D2 with a different digit following the dot.

For examples and clarification see fig. 8. The diagrams are all to the same scale and represent the left respiratory organ as seen from above, but with the branches straightened and as if flattened (two-dimensional), hence the angles are not true but are suggestive. The diagrams were made by turning the pupa in alcohol and measuring the length of the segments and jotting the measurements on a rough diagram which was made as the measurements were taken. Then the diagram was redrawn making the segments the correct length with a ruler. The specimen was left intact. Anterior is toward the top of the page, laterad to the left, mesad to the right, and posterior toward the bottom. The central dot indicates the trunk and the uniform arrows represent filaments of varying lengths. The first letter of the branch name appears at the distal end of the branch. All segments are labeled to illustrate the system of numbering even though only a few are referred to. "Laterad" and "mesad" are shown on only a few of the segments in synonymy.

Pupa.—The preserved pupa is approximately 4mm. long, exclusive of the respiratory organ, which is approximately 2 mm. long. The exuviae is pale brown

with dorsum of thorax just slightly darker. The trunk of the respiratory organ supports three widely divergent branches, the anterior and laterad branches each with 4 filaments and the dorsal branch with 8, making a total of 16 respiratory filaments per organ, figs. 7 and 8. The first segments of all three branches are short but that of the anterior branch is longest. Both the anterior and laterad branches are dichotomous. Segments A2 are dorsal and ventral. D1 directly supports three D2 segments; the mesad and laterad D2 each indirectly supports a total of three filaments, while the posterior (middle) D2 supports only two filaments. Dorsal trichomes 6, rather long and fine, directed anteriorly. Abdominal segments III and IV dorsally each with 8 stout hooks on posterior margin, and segment II with 8 small, delicate hooks; segments V to VIII dorsally with anterior row of many fine spines; terminal hooks long; slender, almost straight; segments V to VII ventrally each with 4 long slender retrorse hooks on posterior margin. The females can be distinguished from the males by the smaller eyes, antennae reaching the rear margin of the eyes, and by the slight median emargination ventrally on the posterior margin of abdominal segment VIII, which has a distinct, short, median thickening. The pupal case is very loosely woven, covering all, or all but the respiratory organ. It often contains pebbles and bits of organic matter as well as entrapped diatoms and algae, so is well camouflaged.

The following key distinguishes the pupae of these closely related Alaskan species.

1. Dorsum of thorax strongly rugose and deeply pigmented; branches of respiratory organ closely clumped, unidirectional; trunk directly supporting only two branches, a laterad and antero-dorsal, fig. 8 **travisi**
 Dorsum of thorax not rugose; some branches of respiratory organ divergent; trunk directly supporting three branches 2
2. D1 and L1 somewhat unidirectional, so from side view L1 tends to obscure D1; D1 directly supporting only two segments; laterad branch dichotomous; L1 longer than D1 or A1, fig. 8 **hirtipes** 2²
 D1, L1 and A1 diverging so from side view each is almost entirely visible; D1 directly supporting three segments 3
3. Laterad branch dichotomous; A1 longer than D1 or L1; A2, dorsal and ventral, figs. 7 and 8 **doveri**
 Laterad branch rarely strictly dichotomous; L1 longer than D1 or A1; A2, laterad and mesad, figs. 7 and 8 **fulvum**

At pupation the respiratory organ swings up and slightly backward, therefore the dorsal branch of the pupal organ was the anterior branch

² The few *mixtum* specimens available for examination differ in the following gross respects from *hirtipes* 2: A1 and L1 somewhat unidirectional, so from side view L1 tends to obscure A1; A1 longer than L1 or D1, fig. 8. The few *fuscum* specimens examined have the first segment of all three branches diverging so from side view each is almost entirely visible; A1 longer than L1 or D1, fig. 8. In addition *mixtum* and *fuscum* appear to differ from each other in that on *fuscum* the mesad D2 (2.2) may or may not support a D3, but if the D3 is present it is longer than its proximal D2. Also on the laterad D3, a D4 may be present or absent, but if present it is longer than its distal filaments. On *mixtum* the mesad D2 supports a D3 which is much shorter than its proximal D2. Also the laterad D3 supports a D4 which is shorter than its filaments.

of the larval histoblast, and the laterad and anterior branches of the pupal organ were the posterior and inner branches respectively of the larval histoblast.

Larva.—The mature preserved larvae are 7 to 8 mm. long, with a light brown head capsule, and light body which is faintly smoky-brown dorsally. The head capsule of the larva is illustrated by Sommerman (1953) fig. 15. The dorsal head pattern consists of two long, narrow, median dark spots with two dark lateral spots on each side and a distinct dark horizontal band posteriorly. There are 24 to 27 rays in the mouth fan. Ventrally, the throat cleft is shallow and rounded or almost truncate, and there usually are two elongate dark spots near each side. The median submental tooth is longest with the tips of its secondary teeth about half way up. Usually there is a tiny tooth on each side at the base of the median tooth. The tips of the last lateral teeth are almost as high as the tip of the median tooth, and the tips of the two inner teeth are about as high as the tips of the secondaries on the median tooth. The inconspicuous innermost lateral tooth is the shortest, appearing like a tiny secondary tooth about half way up the second innermost lateral tooth.

At various stages of development sometimes individual larvae of *doveri* may be confused with larvae of *hirtipes* 2, *fulvum* or *travisi* depending upon variation in particular characters, but the mature larvae are distinct, as indicated in the following key.

1. At least two crotches distinctly above level of spiracle, the uppermost being about 2/3 distance from level of spiracle to base of respiratory organ, fig. 9, *fulvum* and *doveri* 2
 Only one crotch much above level of spiracle, it being about half way or less from level of spiracle to base of respiratory organ, fig. 9, *hirtipes* 2 and *travisi* 3
2. Head capsule straw-colored, almost uniform dorsally; 17 to 19 rays in mouth fan; throat cleft subtriangular *fulvum*
 Head capsule light brown, dorsal pattern usually distinct; 24 to 27 rays in mouth fan; throat cleft rounded to truncate *doveri*
3. Head capsule yellow-brown, dorsum usually with at most three darker spots, the middle one anterior to the lateral ones; throat cleft rounded to truncate *hirtipes* 2
 Head capsule dark brown, dorsum usually with two darker median spots and two darker lateral spots on each side, as well as a spotted horizontal band posteriorly, and a pale crescent on each side at suture bend; throat cleft subtriangular *travisi*

Prosimulium doveri has been taken from spring-fed streams in the Anchorage area, to the northeast about 40 miles to Eklutna Lake and to the southeast for about the same distance to the old abandoned Girdwood Mine. The preferred habitat is tiny spring-fed streams, exposed or shaded, ranging from the foothills to above timber-line. It seems quite probable that some of the stream are temporary and do not flow in winter. Most of the streams were less than an inch deep,

but three ranged to two inches in the deepest flowing water. The widths varied from 3 inches to 3 feet, the wide ones being extremely shallow. The stream speeds were estimated to be from less than 1 to 2.5 feet per second. The water was almost always clear although in some streams a considerable amount of organic matter became evident when a white cup was filled at little falls. The stream bottoms consisted of just about any combination of moss, fine sand and tiny pebbles, small stones, dead leaves, roots and pieces of dead wood. In some of the more gravelly exposed places the tiny streams were shaded with a dense growth of horsetails.

At many of its habitats *doveri* was the dominant species of black fly and in some habitats the only species. Occasionally *Simulium* (E.) *bicornis* D., R. and V., and *P. trivisi* were relatively abundant, and sometimes sparse populations of one or more of the following were also present: *P. frohnci* Somm., *fulvum*, *hirtipes* 2 and a species of *Gymnopaia*. Though the populations of immature *bicornis*, *trivisi* and *doveri* were in direct association, the development of *doveri* slightly succeeded that of *bicornis* and *trivisi*.

P. doveri has one generation a year, with winter being passed in the egg stage. In some streams the hatching period must begin as early as late April because small and medium larvae were present the first week of May (the earliest visits of the year) when the stream temperatures ranged from 34° to 45°F. At that period some of the habitats were exposed to bright sunshine so warmed considerably during the day. Throughout the season in exposed trickles the larvae were found directly in the current attached to the undersides of loose stones and sticks, but in shaded places they were also found on the upper surface of stones, sticks and leaves. Larval development required about eight weeks, the first mature larvae being found the last few days of June with the majority maturing in July and August and a few stray ones being present right up until freeze-up in early October. The larvae feed on detritus, judging from the gut contents of a few maturing and mature larvae examined from several streams. Occasionally small larval exuviae were included with the detritus, obviously ingested as cast skins because the gut was not present as it is when complete larvae are eaten by predaceous species like *frohnci*. The pupae were attached to stones, sticks and leaves, often at their line of contact with the sand and pebbles, and somewhat removed from the direct current. This seeming retreat to quieter waters may have been the result of a subsequent decrease in the depth of the water and not a definite choice of the larva. Pupae were present from early July until freeze-up. Most of the adults emerged during the last three weeks of July and first two of August. As usual the males started to emerge before the females. Mating and oviposition were not observed.

Only wild-caught females were taken, in flight or while probing and biting, from early August until mid-October. In the Anheorage area *doveri* is one of the vicious human biters, particularly troublesome in alder thickets and spruce forests near its larval habitats.

Females were biting when the sky was cloudy, overcast, during drizzle or light rain, and even in bright sunshine on cooler days. The air temperatures at the time of biting were usually in the fifties, Fahrenheit. Biting occurred during the entire over-all daytime observation period, 11:00 AM to 4:30 PM; sometimes it was fierce and at other times caused little or no trouble. The females were attracted to my hair, dark brown, often alighting on it under the visor of my cap, or along the hair line, then crawling down into the hair to bite. They also favored the areas around my eyes, eyebrows, ears and in my ears. Generally the initial stab could be felt but the rest of the actual biting was painless. A drop or more of oozing blood or a tiny dark speck indicated a fresh bite. Immediately thereafter the area reddened and a welt developed. Bites close-by resulted in a constantly red, hot, swollen area that itched or burned maddeningly at times for about a week, as did the individual welts.

The lab-emerged males and females had access to water from the cotton-filled tubes supporting the pupa (Sommerman, 1956), upon emergence and thereafter. The day after emergence a small drop of maple syrup was put on the lid of the individual's cage, and the adults discovered it quickly and fed. The adults have survived as long as three weeks in captivity, with or without blood meals, one individual or one of each sex, per tiny emergence cage with maple syrup on the lid. Survival was longest when the cages were kept in a shaded, screened window-box on the north side of the lab where the temperature approached that of the out-of-doors, since the afternoon sun raised the temperature above 80°F. in the lab. The adults sometimes became stuck to a drop of excrement and died shortly thereafter.

For biting, the females were transferred from the individual emergence cages to $\frac{3}{4}$ x 2 inch shell vials, which were held open-end against my arm. They usually fed readily the third day after emergence, which often was their first opportunity to bite. They were usually given only one chance to feed per day, and generally just on alternate days. They fed individually on me at any hour from seven in the morning to eleven at night in subdued light in the lab. It usually required about three to five minutes for them to fill up, but occasionally took as long as ten to twelve minutes of continuous biting. If they succeeded in drawing blood on the first try they normally bit only once at a feeding. However, several times they appeared to be feeding properly when the blood welled up around their mouthparts, which they quickly withdrew, moved over a few millimeters and inserted again. Sometimes a tiny drop of excrement was forcefully ejected during feeding. The drying, oozing blood from prior bites did seem to induce others to bite when they happened to probe over it, especially if they had been reluctant to bite. The lab-emerged females took several blood meals, often as many as five, with seven being the maximum. The blood meals were taken from the second day of adult life through the sixteenth, suggesting a probable two week feeding period in nature.

According to laboratory evidence mating is not necessary for the development of what appear to be mature eggs, but blood meals are necessary, and scant evidence suggests that the more blood meals taken the greater the number of mature eggs produced. Females having no blood meals but with access to maple syrup throughout adult life showed slight egg development, the eggs having finally reached approximately 0.1 mm in length when the females were three weeks old. With only one blood meal, eggs had developed to 0.2 mm by the time the adults were 10 to 15 days old. With two blood meals the maximum egg size was 2.5 mm at 11 to 14 days. With five or more blood meals the maximum egg length was almost 0.4 mm at 14 to 21 days.

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**KEY TO THE CULICOIDES OF OKINAWA AND THE DESCRIPTION OF
TWO NEW SPECIES**

(DIPTERA, CERATOPOGONIDAE)

ALEXANDER A. HUBERT¹ and WILLIS W. WIRTH²

Examination of extensive light trap collections made by Captain Carlyle Nibley, Jr., from March through September 1959, has resulted in the discovery of three species of *Culicoides* not previously known to occur in Okinawa. *Culicoides mihensis* Arnaud is reported from the island for the first time, and *C. nibleyi* and *C. arnaudi* are described as new. Arnaud (1956) provided descriptions and figures for nine species from Okinawa in his excellent paper on Japanese *Culicoides*.

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Two of these species, *balius* Arnaud and *longidens* Arnaud, were not collected in 1959.

We are indebted to Miss Thelma Ford of Walter Reed Army Institute of Research for preparing the illustrations. We also wish to thank Rogarciano Yecla of U.S. Army Medical Service Group, Ryukyu Islands, for his work of separating the ceratopogonids from the other material in the numerous light trap collections.

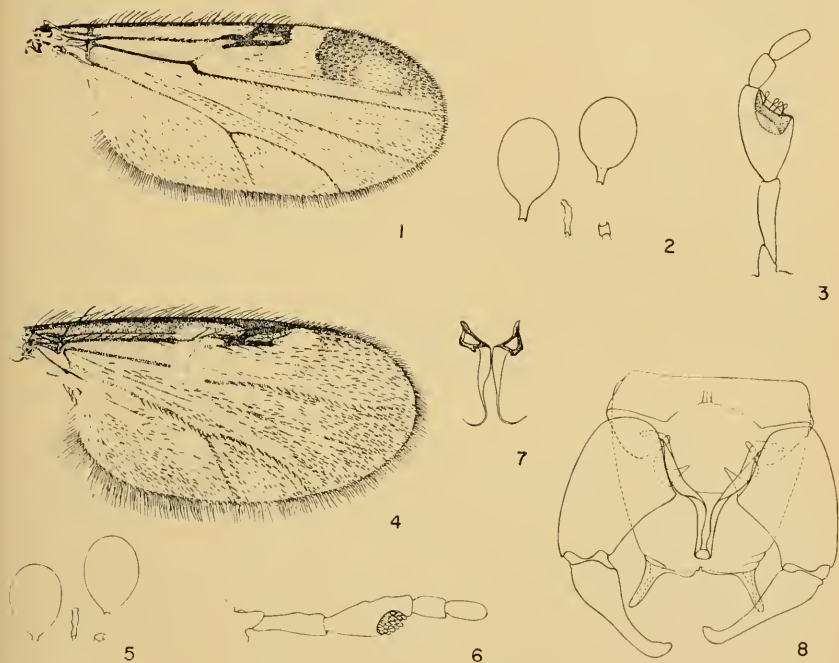
KEY TO THE CULICOIDES OF OKINAWA
(Females)

1. Wing without pale spots..... **balius** Arnaud
Wing with two or more pale spots2
2. Wing with lumen of cell R5 at least partly in pale spot3
Wing with lumen of cell R5 completely dark4
3. Hind femur dark to apex; wing with two pale spots in distal part of anal cell, pale spot in cell M4 not touching vein M3+4 ... **amamiensis** Tokunaga
Hind femur with subapical pale band; wing with only one pale spot in distal part of anal cell, pale spot in cell M4 touching vein M3+4 (syn. *kitaokai* Tokunaga, vide Wirth and Hubert, 1961).....**jacobsoni** Macfie
4. Wing with pale spot at extreme apex of cell R5 5
Wing without pale spot at extreme apex of cell R57
5. Wing usually with small pale spot in cell R5 posterior to second radial cell; one spermatheca **arakawai** (Arakawa)
Wing without pale spot in cell R5 posterior to second radial cell; two spermathecae 6
6. Wing with small pale spot only on distal side of crossvein, pale spots in cell R5 small **mihensis** Arnaud
Wing with large pale spot over R-M crossvein, pale spots in cell R5 very large **okumensis** Arnaud
7. Wing with one or more pale spots in cell R5 distal to poststigmatic pale spot 8
Wing without any pale spots in cell R5 distal to poststigmatic spot9
8. Wing with small round pale spot in cell R5 posterior and slightly distal to poststigmatic pale spot, apical spot in cell R5 more or less double (syn: *oxystoma* Kieffer)..... **schultzei** (Enderlein)
Wing without pale spot in cell R5 posterior to poststigmatic pale spot, apical spot in cell R5 round..... **nibleyi**, n. sp.
9. Wing with very large pale spots at base and over R-M crossvein.
..... **longidens** Arnaud
Wing without pale spot at base, spot over R-M crossvein small or moderate in size10
10. Legs with pale rings at bases of all tibiae and at apex of front femur; wing usually with faint pale spots in cell M4 and in distal part of anal cell..... **arnaudi**, n. sp.
Legs without pale rings; wing without pale spots in cell M4 and anal cell **okinawensis** Arnaud

Culicoides (Oecacta) nibleyi Hubert and Wirth, n. sp.

(Figures 1-3)

Female.—Length of wing 1.22 mm. **Head**: Eyes separated dorsally by the width of one facet. Antenna not measurable; multiple, prominent, distal sensory tufts present on segments III, VII-X. Palpal segments (fig. 3) with lengths in proportion of 13-31-40-13-20; third segment almost triangular in profile, very broad, widest near middle, 1.7 times as long as greatest breadth, with an extremely large



Culicoides nibleyi, n. sp., figs. 1-3, and *C. arnaudi* n. sp., figs. 4-8. Figs. 1, 4, female spermathecae; 3, 6, female palpi, male parameres; 8, male genitalia, parameres removed.

open pit extending from just beyond middle of segment to the apex. Mandible with 16 small, even teeth. **Thorax**: Scutum dark brown, pleuron brown above becoming darker brown on lower half. Legs brown; all legs with dark knees, an indistinct narrow, sub-basal, pale ring on each tibia; fore femur slightly paler at distal fourth; hind tibial comb with four spines, the one closest to the spur longest. **Wing** (fig. 1): as figured; single dark brown spot on costal margin covering second radial cell and apex of first radial cell; pale spot over R-M crossvein small; cell R5 with two pale spots, the first reaching costa narrowly, immediately beyond second radial cell and becoming considerably

broader posteriorly forming an "L" or an inverted "T," second spot oval, half-way from first spot to apex of wing; cell M_1 with elongated pale spot in basal half and small irregular spot near apex; cell M_2 with elongated pale spot proximal to medial fork, narrow pale streak down middle of cell, and small oval spot near wing margin; cell M_4 with large pale spot reaching wing margin; anal cell with oval plate spot proximal to medio-cubital fork, base of cell pale; macrotrichia rather dense at wing tip, sparse over most of wing, few or no macrotrichia proximad of R-M crossvein and anal angle. Costa extending to 0.54 of distance to wing tip. Halter pale. **Abdomen:** Brown. Two spermatheca (fig. 2), subequal, each measuring 0.055 by 0.033 mm., oval, with rather long, slender necks.

Male.—Unknown.

Holotype, female, Yaka, Okinawa, June 1959, C. Nibley, light trap (type no. 64895, USNM).

Of the Japanese and Okinawan *Culicoides*, this species is most closely related to *schultzei* (Enderlein) from which it can readily be separated by the characters given in the accompanying key. This species is named in honor of Captain Carlyle Nibley, Jr., U.S. Army Medical Service Group, Ryukyu Islands, whose extensive collections have added greatly to our knowledge of the Ceratopogonidae of Okinawa.

(Figures 4-8)

Culicoides (Oecacta) arnaudi Hubert and Wirth, n. sp.

Female.—Length of wing 1.22 (1.06-1.32, $n=9$) mm. **Head:** Eyes very narrowly separated. Antenna with lengths of flagellar segments in proportion of 19-12-12-12-13-13-13-13-30-32-34-35-49, antennal ratio 1.69 (1.57-1.81, $n=6$); distal sensory tufts present on segments III, V, VII, IX, XI-XV. Palpal segments (fig. 6) with lengths in proportion of 10-21-31-12-15; third segment 2.5 times as long as greatest breadth, with a broad, shallow sensory pit. Mandible with 15 (13-16, $n=15$) small, even teeth. **Thorax:** Scutum dark brown, scutellum medium brown, post-scutellum and pleuron dark brown. Legs brown; fore and mid femora with indistinct subapical pale rings, that on mid femur particularly faint; knees blackish; all tibiae with narrow sub-basal pale rings; hind tibial comb with 4 slender spines, the two nearest the spur equal in length and longer than the other two. **Wing** (fig. 4): As figured; one dark spot over second radial cell; two pale spots along costal part of wing, a rather large one covering R-M crossvein and most of first radial cell, second spot small and round, located in cell R5 just distal to second radial cell and covering vein R5 at apex of cell; faint round pale spot in distal part of anal cell adjacent to M-Cu fork; faint pale spot in cell M_4 ; very indistinct pale area at extreme base of anal cell; macrotrichia moderately dense in distal half of wing, extending proximad to near bases of cell M_2 and anal cell. Costa extending to 0.62 (0.61-0.63, $n=9$) of distance to wing tip. Halter infuscated. **Abdomen:** Brown. Two spermathecae (fig. 5), subequal, measuring 0.060 by 0.040 mm., ovate, widest at apical third, entrances to ducts very narrow, unsclerotized. **Male**

genitalia (figs. 7, 8). Sternum 9 with very deep caudomedian excavation; tergum 9 tapering to rather narrow apex, apicolateral processes long and tapering to tips, distomedian margin between them with a small median notch. Basistyle with ventral root narrowly triangular, dorsal root long and slender; dististyle almost straight except for curved, pointed tip. Aedeagus with basal arms slender, divergent, basal arch to one-half of total length, distal portion broad with a square tip. Parameres with angular basal knob bent laterad, stem tapering to very slender tip curving laterad.

Holotype, female, Chibana, Okinawa, March 1959, C. Nibley, light trap (type no. 65055, USNM). Allotype, male, 1 mi. W. Shimabuku, Okinawa, August 1959, C. Nibley, light trap. Paratypes, 2 males, 9 females: 1 female, same data as holotype except Aug. 1959; 2 males, same data as allotype except September 1959; 4 females, Yaka, Okinawa, April and May 1959, C. Nibley, light trap; 3 females, Shirahama, Japan, 24 April, 19 May, and 26 May, 1955, P. Arnaud; 1 female, Shinhama, Chiba, Japan, 16 May 1955, P. Arnaud.

This species is most closely related to the Japanese *ponkikivi* Kono and Takahashi, which differs in having distal sensory tufts on antennal segments III-XV and has pale halteres. *Culicoides kibunensis* Tokunaga from Japan has a smaller antennal ratio of 1.3-1.4, and the pit on the third palpal segment has a small opening. We are naming this species after Paul Arnaud of the California Academy of Sciences in recognition of his important work on the *Culicoides* of Japan, Okinawa, and Korea.

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PHLEBOTOMUS SANDFLIES FROM ANIMAL BURROWS IN EASTERN WASHINGTON (DIPTERA: PSYCHODIDAE).¹

G. B. FAIRCHILD² and ROBERT F. HARWOOD³

The most northern known occurrence of *Phlebotomus* in North America has hitherto been Modoc County in northern California

¹ This study was supported by grants E-2253 and E-1251 from the National Institutes of Health, U. S. Public Health Service.

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(Fairchild and Hertig, 1957). The discovery by Harwood of four species in eastern Washington is thus quite unexpected. The purpose of this paper is to record the species discovered, to describe one of them as new, and to give notes on the ecological conditions under which the various species were found. It has seemed useful also to present short keys to both sexes of the four species. The present additions bring to ten the total of species and subspecies known from the United States.

The species discussed were collected within the Columbia Wildlife Refuge, U. S. Fish and Wildlife Service, near Othello in Adams County, Washington. They were trapped in mammalian burrows during a study of such locations as summer resting sites for mosquitoes. The trap employed has been previously described (Harwood and Halfhill, 1960).

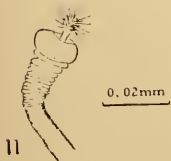
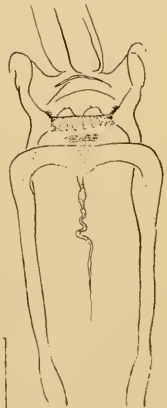
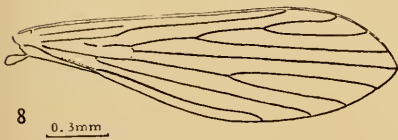
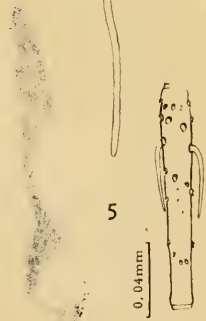
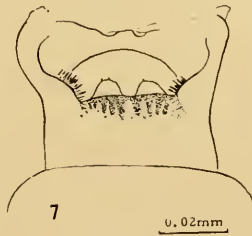
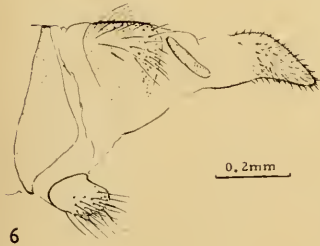
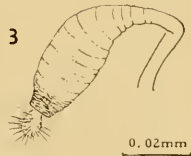
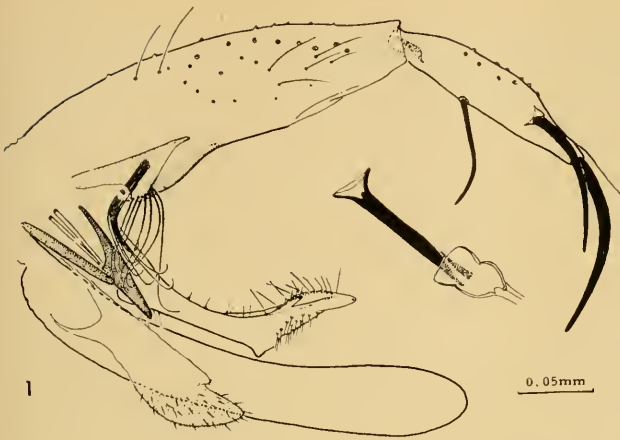
Most of the burrows trapped were constructed by the yellow-bellied marmot, *Marmota flaviventris avara* (Bangs). However, a variety of other vertebrates invariably use such burrow sites; the droppings of bushy-tailed woodrats (*Neotoma cinerea occidentalis* Baird) and deer mice (*Peromyscus* sp.) were particularly in evidence. On one occasion a skunk was observed in one of the burrows trapped, and Oregon prairie rattle-snakes, bull snakes, and garter snakes have been obtained in summer, and hibernating in such locations.

Phlebotomus were by no means rare in burrows within the study area. Twenty-two burrows were more or less routinely trapped once a week during the summer of 1960. Of these, eighteen produced adult sandflies. Actual numbers obtained on a given night were generally low, averaging 4.57 adults per night of trapping in a total of 65 collections. A maximum of 52 were obtained from a single location in one night of trapping.

The seasonal span of adult activity has not been completely determined. The earliest collection consisted of two females of *P. oppidanus* obtained on 12 June 1960. Routine trapping ended 23 August, but four traps on 3 October yielded seven males, five of which were identified as *vexator occidentis*. Peak numbers for all sites were obtained on 12 July, and nearly as many the two succeeding weeks. *P. oppidanus* was the earliest species, followed the next week by *vexator occidentis* and *californicus*. Only four specimens of the new species were obtained in 1960, spanning the period of 26 July to 9 August. One specimen of the new species was obtained on 21 August 1959.

The association of sandflies with animal burrows in this area is obviously close, and suggests that all the local species of *Phlebotomus* as

Figs. 1-10, *Phlebotomus aquilonius* n. sp. Fig. 1, male genitalia and sperm pump, slide 6894. Fig. 2, paramere, slide 6742. Fig. 3, spermatheca, drawn in phenol, slide 6727. Fig. 4, female head and appendages, slide 6864. Fig. 5, male, antennal segment IV, slide 6742. Fig. 6, female terminal abdominal segments, slide 6864. Fig. 7, female cibarium, enlarged, paratype, unnumbered slide. Fig. 8, female wing, slide 6864. Fig. 9, male first three sternites, slide 6742. Fig. 10, female cibarium, slide 6864. Fig. 11, *P. oppidanus*, spermatheca, slide 6813. Fig. 12, *P. vexator occidentis*, spermatheca, slide 6784.



well as a variety of local vertebrates find in these burrows a suitable habitat. Whether the sandflies are attracted to the burrows by the presence of a preferred host, by conditions suitable for breeding, or merely as daytime resting places in an otherwise harsh environment, remains to be determined. The finding of replete and gravid females, and of all four species in a single burrow suggests that all three factors may be involved. The capture of a single female of *vexator occidentis* is a timed-interval trap (Harwood, 1961) baited with a chicken also suggests that blood meals may be sought outside the burrows.

Since, according to Adler and Theodor (1957), the larvae of sandflies require free water as well as atmospheric humidity close to 100%, burrows, especially those situated near lakes and streams, would seem the only available breeding sites in the area. The occurrence of numerous adults in burrows in a relatively dry situation at the base of basalt cliffs indicates that the adults may utilize sites as daytime resting places which appear unsuitable as breeding sites.

Adler and Theodor (1957) have reviewed the importance of mammalian burrows as sandfly habitats wherever harsh environmental conditions obtain, such as in the Sudan, North Africa, Arabia, and Turkestan. They also discussed the importance of burrow-inhabiting vertebrates in maintaining *Leishmania*, which suggests such an inquiry should be made in the area under study.

KEY TO FEMALES

1. Cibarium with a comb of 18-20 fine teeth, a broad pigment patch and weak chitinous arch. Pharynx armed with flattened erect spines. Spermatheca with large rounded head and finely annulate body, the individual ducts about 3 times as long as the spermathecae, opening by a short common duct into vagina **californicus**
- Cibarium without a comb of numerous fine teeth. Pharynx with at most fine spinules at apex 2
2. Cibarium with a pair of heavily sclerotized rounded bosses, each surmounted by a short spine; erect teeth about 8, strong ridge-like, the central pair largest, and with scattered fine teeth distally. There are also a number of long slender inwardly-pointing lateral teeth. Pharynx broad, well sclerotized, the apex with minutely spinulose ridges. Chitinous arch strong and flat. Spermathecae ovoid, wrinkled, with long terminal knob and long individual ducts **aquilonius**
- Cibarium with 4 horizontal teeth, erect teeth weak or absent, lateral teeth lacking. No chitinous arch. Spermathecae otherwise 3
3. Spermathecae slender, tubular, the finely annulate body more slender than the ducts, which they join imperceptibly. Head small, oblate, wider than long. Ducts separate nearly their whole length. Pharynx slender, ridged at apex. Ascoids clearly exceeding ends of their respective segments **vexator occidentis**

Spermathecae as above, but head as long as wide. The more coarsely annulate body as wide as the wider and longer ducts. Pharynx and cibarium as above. Aseoids clearly shorter than their respective segments

..... oppidanus

KEY TO MALES

1. Style with three spines and a subterminal seta. Coxite with two separate groups of setae at base. Parameres with a small dorsal finger-like projection and a ventral triangular process. Lateral lobes moderately inflated. Eyes relatively small, cibarium with strong small pigment patch and strong chitinous arch
 aquilonius
- Style with 5 spines, the apical two paired; no subterminal seta 2
2. Most proximal spines of style paired, at same level. Tuft on base of coxite of about 10 subequal setae not in a row. Parameres evenly tapered. Lateral lobes clearly shorter than coxites. Third antennal segment short, about two-thirds length of proboscis on intact head
 californicus
- Proximal spines not paired. Tuft on base of coxite of fewer unequal setae set in a row. Parameres clubbed. Lateral lobes clearly longer than coxites. Third antennal segment longer 3
3. Ventral outline of parameres an even curve from base to apex, the enlargement of tip of paramere only on dorsal side. Aedeagus not over half length of paramere. Tips of genital filaments slenderly spear-shaped. Genital pump with deep narrow plunger. Aseoids short, not nearly reaching ends of their respective segments
 oppidanus
- Ventral outline of parameres not an even curve, sharply reversed before apex so that enlargement of tip of paramere is largely on ventral side. Aedeagus exceedingly slender, over half length of paramere. Genital filaments more slender, the preapical widening less pronounced. Genital pump with shallow cup-like plunger. Aseoids longer, nearly reaching ends of segments.
 vexator occidentis

Phlebotomus californicus Fairchild and Hertig

1957, Ann. Ent. Soc. America, 50(4):328, figs. 20-23. (♂, ♀; Ft. Yuma, Imperial Co., Calif.)

Othello, Adams Co., Wash. 20 ♂, 10 ♀, Harwood, from 5 burrows.

Phlebotomus oppidanus Dampf

(Fig. 11)

1944, Rev. Soc. Mexicana Hist. Nat., 5(3-4):247-248, figs. 1-8, 14 (♀; San Jacinto, Mexico, D.F.). Barretto, 1947, Arq. Zool. Est. S. Paulo, 5(4):215. Vargas and Diaz Najera, 1953, Rev. Inst. Salub. Enf. Trop. Mexico, 13(4):312. Fairchild and Hertig, 1957, Ann. Ent. Soc. America, 50(4):330, figs. 26-29 (♂; Nuevo Leon, Mexico); 1959, *op. cit.*, 52(2):124.

Othello, Adams Co., Wash. 14 ♂, 44 ♀, Harwood, from 7 burrows.

This material represents a new record for the United States and a very considerable extension of range for the species. The Washington specimens differ slightly from Mexican examples, the males having the parameres slightly more clubbed, the females with spermathecae slightly larger, though the differences seem insufficient to warrant formal recognition of a named segregate. The type was taken at light, the specimens reported by Fairchild and Hertig (1957) in a cave.

***Phlebotomus vexator occidentis* Fairchild and Hertig**

(Fig. 12)

1957, Ann. Ent. Soc. America, 50(4):334, figs. 12-13 (♂, ♀: California, taken in light traps and *Citellus* burrows).

Othello, Adams Co., Wash. 36 ♂, 45 ♀, Harwood, from 9 burrows.

The nominate subspecies has been reported from various localities in the eastern United States (Fairchild and Hertig, 1957). Dampf (1944, p. 238) reported it also from Sonora, Mexico, a reference overlooked by us in 1957, but whether his specimens were *v. occidentis* or *v. vexator* is unknown. Several reports indicate that the eastern subspecies is primarily a reptile feeder, so it will be interesting to determine the host preferences of the western form.

***Phlebotomus aquilonius*, n. sp.**

(Figs. 1-10)

Male.—Wing length 1.6-1.8 mm, venation as figured. Whole insect pale, mesonotum but little darker than pleura. Abdominal setae erect, sparse, denser on hind margins of tergites. Upper anepisternal setae 3 to 5, lower mesanepisternals 2 to 4. Head and its appendages similar to female, but proboscis shorter and third antennal segment longer, the latter reaching well beyond end of second palpal segment. Ascoids simple, short, as figured, paired on all but last two segments, the terminal three segments but slightly shorter than last preceding. Palpal formula 1-(2-4)-3-5, the fifth longer than any two preceding segments but less than 2+3+4. Pharynx slender with rather strong transverse denticulate ridges at apex. Cibarium with minute lateral denticles, the chitinous arch strong laterally, obsolete in middle, lower and more rounded than in female. Genitalia as figured, the filaments about 3.5 times length of pump, their tips unmodified. First three sternites as figured. Legs short, the femora, tibiae and basitarsi of slide 6894 measuring, in millimeters, as follows: fore leg, 0.75, 0.8 and 0.45; mid leg, 0.7, 0.95 and 0.5; hind leg, 0.8, 1.15 and 0.7.

Female.—Wing length 1.9 mm, venation as in male. Color and vestiture as in male. Upper anepisternal setae 6 to 7, lower mesanepisternals 4 to 5. No setae on sides of eighth abdominal segment. Head and appendages as figured. Ascoids as in male, though slightly longer, paired on all but last segment, the terminal three segments much shortened. Pharynx broad and well sclerotized, with finely denticulate transverse ridges at apex. Cibarium as figured, the two rounded eminences in place of the usual horizontal teeth apparently with one or two short fine teeth at apex. Lateral teeth numerous, slender. Vertical teeth difficult to see

in the preparations, but seeming to be formed of about 8 transverse rows of 2 to 4 blunt overlapping heavily sclerotized teeth, shown as single stippled vertical bars in the figure. Spermathecae as figured, though in none of the preparations are the ducts clearly visible throughout. From what can be made out, the ducts appear to be several times as long as spermathecae, slender, and joining in a short common duct. Cerci as figured. Sternites as in male. Legs apparently as in male, though no specimen has a complete set.

Holotype male, slide 6894, Columbia Wildlife Refuge, Othello, Washington, Site 42, 26 July 1960, R. Harwood coll. This specimen has an extra small spine on one style basad of the median spine, not shown in figure.

Allotype female, slide 6727, Columbia Wildlife Refuge, Othello, Washington, Site 42a, 9 Aug. 1960, R. Harwood coll. This specimen is the only one that shows the spermathecae at all well.

Paratypes, same locality and collector, 3 males, 21 Aug. 1959, 26 July and 9 Aug. 1960; 2 females, 21 Aug. 1959 and 26 July 1960.

Holotype, allotype to be deposited in the U.S.N.M. Paratypes are in the authors' collections.

This species seems most nearly related to the *vespertilionis* group and the male will key out to *P. vesiciferus* F. & H. in Fairchild and Hertig (1958). This sex differs from *vesiciferus* in the presence of a small dorsal lobe on the paramere and a double tuft of setae on the base of the coxite, as well as in other details. The female of the present species comes nearest *P. viriosus* F. & H., but differs considerably in the shape of spermathecae and especially in the very different cibarium. It differs from all other members of the *vespertilionis* group in the shorter third antennal segment, smaller eyes and relatively longer fourth palpal segment, but shares with them the inflated lateral lobes, similar wing venation, and generally similar genitalia.

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A CORRECTION IN MOSQUITO NOMENCLATURE

(DIPTERA: CULICIDAE)

Roth (Proc. Ent. Soc. Washington 47: 13, 1945) described the species *Psorophora longipalpis* from Arkansas and other midwestern states. Unfortunately he divulged the name before publication and it was validated by description with a different spelling in *The Mosquitoes of Texas* (Texas State Health Department, p. 88, 1944). The description accompanying "*Psorophora longipalpus* Roth" was based on a "paratype" of Roth's species.

Two questions arise. 1. What is the authorship for the prior name? 2. What should be considered the type and type-locality of the valid species?

1. *The Mosquitoes of Texas* was compiled by the Division of Medical Entomology, Bureau of Laboratories, Texas State Health Department, George W. Cox being the State Health Officer and S. W. Bohls the Director of Laboratories. In his preface, Dr. Bohls stated that Neal M. Randolph and Kellie O'Neill, "are chiefly responsible for the completion and appearance of this publication." I think it reasonable to suppose that they did the major work of writing the publication and can legitimately be considered the authors. That only one of them actually wrote the description is probable, but this method is true of most joint papers. Although they credited the name to Roth, he did not write the description and the name was not "published" by him in 1944. For these reasons I feel that the species should be known as *Psorophora longipalpus* Randolph and O'Neill.

2. Through the kindness of J. S. Wiseman of the Texas State Department of Health, I have seen 23 pinned specimens of *Psorophora longipalpus* from his laboratory. Of these, 9 bear data agreeing with paratypes of *P. longipalpis* Roth. None of these specimens bear paratype labels and since Roth claimed to have returned only 8 specimens to the Texas Laboratory, then 1 of the 9 might not be a paratype. It is not possible to determine with certainty which "paratype" was used in describing *P. longipalpus*, but I feel justified in selecting one of the 8 female specimens as lectotype. The best specimen, agreeing perfectly with the original description and possessing all of the differentiating characters for the female separating it from *P. horrida* (Dyar and Knab), is labeled, "Harris Co., Tex. 11-1-39"; I have labeled this specimen as lectotype. Through the kindness of Dr. Wiseman this lectotype has been deposited in the U. S. National Museum.

The synonymy for the species then is:

Psorophora longipalpus Randolph and O'Neill, 1944.

Type-locality, Harris Co., Texas.

syn. *Psorophora longipalpis* Roth, 1945. Type-locality,
Fayetteville, Arkansas.

—ALAN STONE, *Entomology Research Division, A.R.S., U.S. Department of Agriculture, Washington 25, D.C.*

THE VERNON L. KELLOGG MALLOPHAGA TYPE MATERIAL
IN THE UNITED STATES NATIONAL MUSEUM

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Only in a few instances did Kellogg indicate the disposition of type material listed in his taxonomic papers. In 1896, he stated "Types of the new species described will be placed in the collections of this University (Stanford), in the collections of the California Academy of Sciences, and in those of the University of Kansas." The Kellogg type material in the Snow Entomological Museum of the University of Kansas was reported by the author in 1958. During a visit to San Francisco, California, during the summer of 1958, Dr. Edward S. Ross stated that all Kellogg type material deposited in that institution was destroyed during the earthquake of 1906. Even though Kellogg did not publish information to the effect that some of his type material was deposited in the USNM, more is in that collection than in the Snow Entomological Museum.

Kellogg did not designate a holotype or type, but considered all material examined as cotypes. In some instances, the series he examined contained material from several hosts and are known to contain more than one species of Mallophaga. During the last few years, several workers have selected as lectotype the specimen which Kellogg used in illustrating his descriptions; thereby doing much to clarify the status of these species. Much remains to be done before this task is completed.

In this paper, all specimens conspecific with the lectotype are accepted as syntypes. Specimens not conspecific with the lectotype are regarded as no longer being syntypes. If a lectotype has not been designated, all specimens listed by Kellogg are considered to still be syntypes. In some instances, cotype labels were placed on material not examined at the time of the description. This material is listed in subsequent publications, and is not accepted by the author as part of the type material.

In the last twenty years, I have examined most of the Kellogg type material, and have found that errors on his labels are not uncommon. The percentage found in the U. S. National Museum Collection is not excessive.

I am indebted to the staff of the U. S. National Museum for permission to study this material, and especially to C. F. W. Muesebeck for his assistance and suggestions.

Colpocephalum osborni Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 521, pl. 71, figs. 2 and 3.

Type slide USNM 64940. Two male syntypes with label "*Colpocephalum osborni* Kellogg, From *Elanus glaucus*, Palo Alto, Cal., V. L. Kellogg, Stanford."

Present status: Colpocephalum osborni Kellogg, 1896.

Docophorus atlanticus Kellogg, 1914. Sci. Bull. Brooklyn Inst., 2: 81, pl. 16, fig. 1.

Type slide USNM 42752. Five female syntypes with label "Stercorarius erpidatus, North Tropical Atlantic, Robert C. Murphy, Coll., S. Ga. Isl. Exped. 1912-13, RCM 1279". The male syntypes could not be located, so designation of a lectotype is postponed at this time.

Present status: A synonym of *Saemundssonina cephalus* (Denny, 1842).

Docophorus atricolor Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 93, pl. 3, fig. 9.

One male and one female syntypes with label "Docophorus atricolor Kellogg, From Synthliborhampus antiquus, Monterey Bay, Cal., V. L. Kellogg, Stanford." The host could be *Gavia arctica pacifica*, see Emerson (1955). Lectotype, designated by Carriker (1957), is on slide 63a at Stanford University.

Present status: A synonym of *Craspedonirmus colymbinus* (Denny, 1842).

Docophorus californiensis Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 483, pl. 66, fig. 6.

Two female syntypes with label "Docophorus californiensis Kell., From Melanerpes formicivorus bairdi, Palo Alto, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 361a at Stanford University.

Present status: *Penenirmus auritus californiensis* (Kellogg, 1896).

Docophorus calvus Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 79, pl. 3, fig. 1.

Type slide USNM 64968. One female syntype with label "Docophorus calvus Kellogg, From Uria troile californica, Bay of Monterey, V. L. Kellogg, Stanford." In the description, Kellogg listed only one female as the type series. This specimen is therefore considered the type.

Present status: *Saemundssonina calva* (Kellogg, 1896).

Docophorus domesticus Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 475, pl. 65, fig. 4.

One male syntype with label "Docophorus domesticus Kellogg, From Progne subis, Lawrence, Kansas, V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 319a at Stanford University.

Present status: *Phlopterus excisus domesticus* (Kellogg, 1896).

Docophorus excisus major Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 490.

One female syntype with label "Docophorus excisus var. major Kellogg, From Petrochelidon lunifrons, Palo Alto, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 372a at Sanford University.

Present status: *Phlopterus excisus major* (Kellogg, 1896).

Docophorus graviceps Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 82, pl. 3, fig. 3.

One male and one female syntypes with label "Docophorus graviceps Kell., From Urinator pacificus, Bay of Monterey, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 125b at Stanford University.

Present status: A synonym of *Craspedonirmus colymbinus* (Denny, 1842).

Docophorus insolitus Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 94, pl. 4, fig. 5.

Two female syntypes with label "Docophorus insolitus Kellogg, From Ptychoramphus aleuticus, Monterey Bay, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957) is on slide 163c at Stanford University.

Present status: *Saemundssonina insolita* (Kellogg, 1896).

Docophorus latifrons occidentalis Kellogg, 1899. Oec. Pap. Calif. Acad. Sci., 6: 6, pl. 1, figs. 5 and 8.

One male and one female syntypes with label "Docophorus latifrons occidentalis Kellogg, Coccygus californicus occidentalis, Baja California, V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957) is on slide 428a at Stanford University.

Present status: A synonym of *Cuculoecus coccygii* (Osborn, 1896).

Docophorus montereyi Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 87, pl. 3, fig. 6.

One male and one female syntypes and one immature specimen with label "Docophorus montereyi Kellogg, From Synthliboramphus antiquus, Monterey Bay, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957) is on slide 151b at Stanford University.

Present status: *Saemundssonina montereyi* (Kellogg, 1896).

Docophorus occidentalis Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 89, pl. 3, fig. 7.

Type slide USNM 64941. Two female syntypes with label "Docophorus occidentalis Kellogg, From Fulmarus glacialis pacificus, Bay of Monterey, Calif., V. L. Kellogg, Stanford University."

Present status: *Saemundssonina occidentalis* (Kellogg, 1896).

Docophorus procax Kellogg and Chapman, 1899. Oec. Pap. Calif. Acad. Sci., 6: 54, pl. 5, fig. 1.

Two female syntypes with label "Docophorus procax Kellogg and Chapman, From Cepphus columba, Bay of Monterey, Calif., V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 468a at Stanford University.

Present status: *Saemundssonina procax* (Kellogg and Chapman, 1899).

Docophorus rufus Kellogg, 1899. Occ. Pap. Calif. Acad. Sci., 6: 7, pl. 1, figs. 6 and 9.

Type slide USNM 64942. One male and one female syntypes with label "Docophorus rufus Kellogg, From Myiarchus cinerascens nuttingi, Baja California, V. L. Kellogg, Stanford University."

Present status: Philopterus rufus Kellogg, 1899).

Eurometopus murphyi Kellogg, 1914. Sci. Bull. Brooklyn Inst., 2: 87, pl. 16, figs. 4 and 5.

Type slide USNM 64969. Kellogg listed type material from *Ossifraga gigantea* (RCM 1383), *Diomedea melanophrys* (RCM 1406), and *Thalassogeron chlororhynchus* (RCM 1405). The male on slide labeled "Ossifraga gigantea, South Atlantic, Robert C. Murphy Coll., S. Ga. Isl. Exped. 1912-13, RCM 1383." is designated lectotype. Also on this slide are two female syntypes. The two females on a slide from *Thalassogeron chlororhynchus* (RCM 1405) and the two immature specimens on a slide from *Diomedea melanophrys* (RCM 1406) are not conspecific with the lectotype, and are no longer considered syntypes. By this action, *Docophoroides hunteri* Harrison, 1937 becomes a synonym.

Present status: Docophoroides murphyi (Kellogg, 1914).

Eurymetopus pacificus Kellogg, 1914. Sci. Bull. Brooklyn Inst., 2: 87. *Nomen novum* for "Eurymetopus taurus" *sensu* Kellogg, 1896 (nec Nitzsch, 1866).

Type slide USNM 64970. One male syntype with label "Eurymetopus taurus Nitzsch, From Diomedea albatrus, Monterey Bay, Cal., V. L. Kellogg, Stanford." This slide also contains a specimen of *Saemundssonina* sp. One male syntype and one immature specimen with label "Nirmus giganticola Kellogg, From Diomedea albatrus, Monterey Bay, Cal., V. L. Kellogg, Stanford." This slide has obviously been mislabeled. I have examined other slides of this series, and none were relabeled by Kellogg following his action in 1914.

Present status: Docophoroides pacificus (Kellogg, 1914).

Giebelia mirabilis Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 138, pl. II, figs. 7 and 8.

Type slide USNM 64971. Two female syntypes with label "Giebelia mirabilis Kellogg, From Puffinus opisthomelas, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status: Trabeculus mirabilis (Kellogg, 1896).

Goniocotes creber Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 510, pl. 69, fig. 3.

Type slide USNM 64972. Three female syntypes and one immature specimen with label "Goniodes creber Kellogg, From Phasianus nychthemerus, San Francisco Bird Store, V. L. Kellogg, Stanford." Such minor errors on slide labels by Kellogg are rather common.

Present status: Probably a synonym of Goniocotes albidus Giebel, 1874.

Lipeurus celer Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 117, pl. 7, figs. 5 and 6.

Type slide USNM 64973. One male and one female syntypes with label "Lipeurus celer Kellogg, From Fulmarus glacialis, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status: A synonym of *Perineus nigrolimbatus* (Giebel, 1874).

Lipeurus diversus Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 123, pl. 8, figs. 3 and 4.

Type slide USNM 64974. One male syntype with label "Lipeurus diversus, From Puffinus opisthomelas, Monterey Bay, Cal., V. L. Kellogg, Stanford." Hopkins and Clay (1952) report this host is *Puffinus griseus*.

Present status: *Halipeurus diversus* (Kellogg, 1896).

Lipeurus fuliginosus major Kellogg and Chapman, 1899 (*nec* Piaget, 1880). Occ. Pap. Calif. Acad. Sci., 6: 101, pl. 7, fig. 3.

One male and one female syntypes with label "Lipeurus fuliginosus major Kellogg, Puffinus opisthomelas, Pacific Grove, Calif., Oct. '96." These specimens were remounted by Ewing, and in doing so, he destroyed the original Kellogg labels. The lectotype, designated by Carriker (1957) is on slide 494 at Stanford University. *Lipeurus fuliginosus major* Kellogg and Chapman, 1899 is a homonym of *Lipeurus major* Piaget, 1880. R. L. Edwards has a paper in press in which the status of this form will be clarified.

Lipeurus gracilicornis major Kellogg, 1899 (*nec* Piaget, 1880). Occ. Pap. Calif. Acad. Sci., 6: 30, pl. 3, fig. 3.

Epifregata fregatiphagus Eichler, 1943. Zool. Anz., 141: 59.

Nomen novum for *Lipeurus gracilicornis major* Kellogg, 1899.

One male and one female syntypes with label "Lipeurus gracilicornis P. var. major Kellogg, From Fregata aquila, Panama, V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 401a at Stanford University.

Present status: A synonym of *Pectinopygus fregatiphagus* (Eichler, 1943).

Lipeurus limitatus Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 124, pl. 8, figs. 5 and 6.

Type slide USNM 64975. Two immature female syntypes with label "Lipeurus limitatus Kellogg, From Puffinus griseus, Bay of Monterey, Calif., V. L. Kellogg, Stanford University."

Present status: A synonym of *Halipeurus diversus* (Kellogg, 1896).

Lipeurus macgregori Kellogg, 1899. Occ. Pap. Calif. Acad. Sci., 6: 33, pl. 3, figs. 5 and 6.

Type slide USNM 64976. One male and one female syntypes with label "Lipeurus macgregori Kellogg, From Crotophaga sulcirostris,

Panama, V. L. Kellogg, Stanford University.

Present status: Vernoniella macgregori (Kellogg, 1899).

Lipeurus macrocephalus Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 504, pl. 68, fig. 3.

Two male syntypes with label "Lipeurus macrocephalus Kell., From Chordeiles virginianus henryi, Palo Alto, Cal., V. L. Kellogg, Stanford." Lectotype, designated by Carriker (1957), is on slide 370a at Stanford University.

Present status: Multicola macrocephalus (Kellogg, 1896).

Lipeurus protervus Kellogg, 1899. Occ. Pap. Calif. Acad. Sci., 6: 31, pl. 3, fig. 4.

Two female syntypes and one immature specimen with label "Lipeurus protervus Kellogg, From Lagopus lagopus, Kodiak Island, Alaska, V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 447b at Stanford University.

Present status: A synonym of Lagopoecus affinis (Children, 1836).

Menopon incertum Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 533, pl. 73, fig. 2.

One male and one female syntypes with label "Menopon incertum Kell., From Turdus ustulatus, Palo Alto, Cal., V. L. Kellogg, Stanford." Kellogg listed as type material specimens from *Turdus ustulatus* and *Spinus tristis*. The species of *Myrsidea* found on these two hosts are not conspecific. The correct host for this species cannot be determined until a lectotype can be designated from the syntypes at Stanford University.

Menopon infrequens Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 161, pl. 15, fig. 5.

One female syntype and one immature specimen with label "Menopon infrequens Kell., From Larus glaucescens, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status: A synonym of Austromenopon transversum (Denny, 1842).

Mesopon numerosum Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 159, pl. 15, fig. 1.

Type slide USNM 64977. One male syntype and one immature specimen with label "Menopon numerosum Kell., From Fulmarus glacialis, Monterey Bay, Cal., V. L. Kellogg, Stanford." Two female syntypes with label "Lipeurus varius Kellogg, From Fulmarus glacialis, Monterey Bay, Cal., V. L. Kellogg, Stanford." The label on the latter mentioned slide is an obvious error which is not uncommon among Kellogg material.

Present status: A synonym of Procellariphaga brevifimbriata (Piaget, 1880). Dr. Clay (*in litt.*) informs me that she does not consider the genus *Procellariphaga* separable from *Austromenopon*.

Menopon praecursor Kellogg, 1899. Occ. Pap. Calif. Acad. Sci., 6:46, pl. 4, fig. 8.

Type slide USNM 64978. Two female syntypes with label "Menopon

praecursor Kellogg, From *Melanerpes uropygialis*, Baja California, V. L. Kellogg, Stanford Univ.'

Present status: Menacanthus praecursor (Kellogg, 1899).

Menopon titan impar Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 165.

Type slide USNM 64979. One male syntype with label "Menopon titan Piaget var. impar Kellogg, From *Pelecanus erythrorhynchos*, Lawrence, Kansas, V. L. Kellogg, Stanford."

Present status: A synonym of Piagetiella peralis (Leidy, 1878).

Menopon titan linearis Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 165, pl. 15, fig. 2.

Type slide USNM 64980. One male syntype and one immature specimen with label "Menopon titan Piaget var. linearis Kell., From *Pelecanus californicus*, Monterey Bay, Cal., V. L. Kellogg, Stanford."

Present status: A synonym of Piagetiella bursaepelecani (Perry, 1876).

Menopon tridens insolens Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 166, pl. 15, figs. 3 and 4.

Type slide USNM 64981. Two female syntypes with label "Menopon tridens N. var. insolens Kellogg, From *Colymbus nigricollis californicus*, Bay of Monterey, Calif., V. L. Kellogg, Stanford University."

Present status: Pseudomenopon insolens (Kellogg, 1896).

Menopon tridens pacificum Kellogg, 1896. Proc. Calif. Acad. Sci., 6: 166.

Type slide USNM 64982. Two female syntypes with label "Menopon tridens Nitzsch var. pacificum Kell., From *Urinator pacificus*, Monterey Bay, Cal., V. L. Kellogg, Stanford." The correct host is *Fulica americana*.

Present status: Pseudomenopon pacificum (Kellogg, 1896).

Nirmus actophilus Kellogg and Chapman, 1899. Occ. Pap. Calif. Acad. Sci., 6: 78, pl. 6, fig. 4.

One female syntype with label "Nirmus actophilus Kellogg and Chapman, From *Calidris arenaria*, Bay of Monterey, Calif., V. L. Kellogg, Stanford University." The slide also has a female *Quadriceps* sp. Lectotype, designated by Carriker (1957), is on slide 494 at Stanford University.

Present status: Lunaceps holophacus actophilus (Kellogg and Chapman, 1899).

Nirmus complexivus Kellogg and Chapman, 1899. Occ. Pap. Calif. Acad. Sci., 6: 75, pl. 6, fig. 3.

One male and one female syntypes with label "Nirmus complexivus Kellogg and Chapman, From *Calidris arenaria*, Bay of Monterey, Calif., V. L. Kellogg, Stanford University." Lectotype, designated by

Carriker (1957), is on slide 472b at Stanford University.

Present status: Carduceps zonarius complexivus (Kellogg and Chapman, 1899).

Nirmus fusco-marginatus americanus Kellogg and Chapman, 1899. *Oec. Pap. Calif. Acad. Sci.*, 6: 69, pl. 5, fig. 9.

Two female syntypes and one immature specimen with label "Nirmus fusco-marginatus var. americanus Kellogg and Chapman, From *Colymbus nigricollis californicus*, Bay of Monterey, Calif., V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 460a at Stanford University.

Present status: Aquanirmus americanus (Kellogg and Chapman, 1899).

Nirmus pacificus Kellogg and Chapman, 1899. *Oec. Pap. Calif. Acad. Sci.*, 6: 70, pl. 5, fig. 8.

One male and one female syntypes with label "Nirmus pacificus Kellogg and Chapman, From *Cepphus columba*, Bay of Monterey, Calif., V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 468b at Stanford University.

Present status: Quadriceps pacificus (Kellogg and Chapman, 1899).

Nirmus peninsularis Kellogg, 1899. *Oec. Pap. Calif. Acad. Sci.*, 6: 21, pl. 2, fig. 9.

One male and one female syntypes with label "Nirmus peninsularis Kellogg, From *Phainopepla nitens*, Baja California, V. L. Kellogg, Stanford University." Lectotype, designated by Carriker (1957), is on slide 441a at Stanford University.

Present status: Brüelia peninsularis (Kellogg, 1899).

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A KEY TO THE GENERA OF KNOWN NYMPHS OF THE
OLIGONEURIIDAE
(EPHEMEROPTERA)

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Demoulin (1952: 2-3) has given a useful key to the adults of the family Oligoneuriidae. The present key will serve to determine the nymphs of this family, except those of the genera *Oligoneuria* Pictet and *Oligoneuriodes* Demoulin of South America, which remain unknown. This key is not intended as a guide to the relationships among the genera. Our present knowledge of the family does not permit a clear evaluation of these relationships, although some of the possible ones are outlined below.

Edmunds and Traver (1954) believed the genus *Pseudoligoneuria* to be the most primitive member of the family, and placed it in a separate subfamily. The dorsal position of the gills on segment one is shared with the related Isonychiinae (Siphonuridae) in which the living members of the genus *Isonychia* of this subfamily possess traits similar to those which would be expected in the ancestors of the Oligoneuriidae. *Pseudoligoneuria* has a peculiar combination of isonychiine, oligoneuriine, and intermediate characters. Demoulin (1958) placed *Pseudoligoneuria* in the family Paedephemeridae, superfamily Oligoneurioidea; *Isonychia* was placed in the Isonychiinae of the same superfamily, but the remaining Siphonuridae are placed in a different superfamily.

Within the Oligoneuriinae the nymphs of *Oligoneurisca* and *Homocoenuria* are very similar in their adaptations of legs and gills to a sand habitat. The adult of *Oligoneurisca*, when known, may prove the two genera to be closely related. However, the incipient adult wing venation seen in the wing pads of *Oligoneurisca* nymphs suggests a closer relationship to *Oligoneuriella*. The adult wing venation of the genus *Elassoneuria* suggests it may be related to *Homocoenuria*, but the nymph is not specialized for a sandy habitat.

The genera *Oligoneuriella* and *Oligoneuriopsis* appear to be very closely related, but because they may be distinguished readily in both nymphal and adult stages, it seems advisable to keep them as full genera. Eventually the two might be ranked as subgenera of a single genus.

The genus *Lachlania* is a clearly delimited genus of widespread occurrence in the Americas. Of the several generic and subgeneric names listed as synonyms by Edmunds and Traver (1954: 237) one or more might be retained as subgenera, but current evidence does not favor such a view. The genus *Lachlania* is probably most closely re-

¹The research on which this paper is based was supported by a grant-in-aid from the National Science Foundation.

**A REVIEW OF THE GENUS *Kurtomathrips* WITH THE
DESCRIPTION OF A NEW SPECIES**

(THYSANOPTERA: THRIPIDAE)

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Up to this time the genus *Kurtomathrips* Moulton has been monotypic. In 1927, at the time of the description of *K. morrilli*, it was reported injuring cotton in Arizona. On several occasions since it has been collected on cotton in western Arizona. As a result, the writer had thought this wingless thrips was an inhabitant of the arid southwestern United States and was associated with typical desert plants (Bailey, 1957). However, as specimens have accumulated, it is known today from Laredo, Texas, to Monterey County of coastal California and, surprisingly, from tropical Honolulu and Jamaica. Also, collecting has added specimens of a second species. Therefore, it appears timely to present a short review of the genus.

Kurtomathrips* MoultonKurtomathrips* Moulton, 1927, Bull. Brooklyn Ent. Soc. 22(4): 187-188.

Body variously ornamented with sinuate thickenings or ridges. Head much smaller than prothorax. Vertex of head with cleft or emargination forming lobes. Eyes protruding. Ocelli wanting. Cheeks with ridges and indistinct tubercles. Antennae eight-segmented; second segment with two broad curved setae on dorsum arising from tubercles. Sense cones on segments three to five absent. Mouthcone long and pointed. Maxillary palpi long, slender and three-segmented. Labial palpi two-segmented. Setae broad, curved. Wings wanting. Abdomen broad, setae on segments nine and ten slender and pointed. Ovipositor downcurved. Male smaller and without ocelli or wings. Annature or other external sexual differences absent.

Type of the genus: *Kurtomathrips morrilli* Moulton, 1927.

This genus, in general appearance, reminds one of *Prosopothrips* and the wingless *Anaphothrips* species, such as *scticornis* Trybom. *Prosopothrips* lacks the prominent curved setae, having microsetae only on the head and pronotum, and the mouthcone is shorter and rounded. *Anaphothrips scticornis*, for example, has prominent trichomes on the antenna and segment VI exhibits cleavage. Also, the vertex is not emarginate. *Aptinothrips rufus*, form *stylifera*, Trybom can be distinguished from *Kurtomathrips* by the short, rounded mouthcone, normal setae, the prothorax being shorter than the head and abdominal segment X being sharply pointed.

***Kurtomathrips morrilli* Moulton**

Some refinement of the original description is in order since an additional species is described below.

Color of body light brownish yellow, antennal segments VI-VIII brown, I-II, and IV-V yellow to light brown, III light brown with pedicel yellowish white,

abdominal segments I-VIII with a brown spot on each side. Similar spots on thorax. Tips of tarsi brown. Femora and tibia with brown patches near center.

Head slightly wider than long, vertex emarginate with major setae set on tubercles. Four such setae, curved and enlarged at tip, on vertex and two behind them. Four smaller setae between eyes. Ocelli absent. Eyes prominent, not pilose. Checks slightly swollen and rough with one small seta behind each eye laterally. Dorsum slightly reticulate in center. Antennae arise beneath vertex and are eight-segmented. Segment II is swollen dorsally and supports two short curved setae. Remainder of setae are very minute, only one small simple trichome present on inner face near tip of segment VI. Segment III small, constricted in basal third and with slender pedicel. Style two-segmented. Mouthcone long and pointed nearly reaching mesothorax. Maxillary palpi three-segmented, basal segment longest. Labial palpi two-segmented.

Pronotum wider than long, about one-third wider at posterior than anterior. Posterior margin with minute and irregularly spaced teeth. Two curved setae at each posterior outer angle, the outer one longer. Dorsum with irregular thickenings and with several irregular rows of short curved setae arising from small tubercles. Wings absent. Legs short, unarmed.

Abdomen ovate. Segments II-VIII with four large curved setae about equally spaced on dorsum, one such seta mid-lateral and one at each side at outer posterior angle (fig. 5). Posterior margin of segments I-VIII with comb. Irregular thickenings horizontal not forming polygons. Tube short and faintly reticulated dorsally. Setae on segments IX and X slender and pointed (fig. 4). Ovipositor downcurved.

Male much smaller. Without external sexual differences.

The measurements of the holotype, made by Moulton, are as follows: "Total body length .66 mm. Head length .066 mm., width across eyes .087 mm., across at cheeks .075 mm.; prothorax length .105 mm., width at anterior end .075 mm., across posterior end .150 mm. Antenna length (width) segment I, 9 m. (18 m.); II, 27 (24); III, 21 (15); IV, 24 (18); V, 30 (18); VI, 33 (15); VII, 9; VIII, 9; total .165 m." Homotypes we have measured show the average female to be somewhat larger.

The holotype (No. 896) and 3 paratype slides are in the Moulton collection deposited in the California Academy of Sciences, San Francisco. The type locality is Gila Bend, Arizona. All specimens were collected by A. W. Morrill, July 19, 1926, on cotton.

The host plants of *K. morrilli* now include a wide variety of plants: bean, cotton, chrysanthemum, Jimson weed, lantana, *Lotus*, *Malva rotundifolia*, snapdragon, sugar beet, *Wedelia*, and *Wyethia ovata*.

The distribution of the species at present as known to me is as follows: Texas, Nevada, Arizona, central and southern California, Honolulu, Hawaiian Is., and Jamaica, B.W.I.

***Kurtomathrips unicolor* Bailey, new species**

Female.—Body color brown. Antennal segments I-II and VI-VIII dark brown, fore tarsi and tip of tibiae lighter. General appearance broad and somewhat flattened dorso-ventrally. Setae without pigment.

Head, very small, wider than long, vertex deeply emarginate, with curved, stout setae set on protruding tubercles. A row of four such tubercles on vertex with two posteriorly and between eyes (fig. 2). Four smaller setae between eyes posterior to an imaginary horizontal line through center. Ocelli wanting. One short seta behind each eye laterally on cheek. Eyes protruding, not pilose. Cheeks rough. Dorsum of head deeply reticulate in center near posterior margin. Anten-

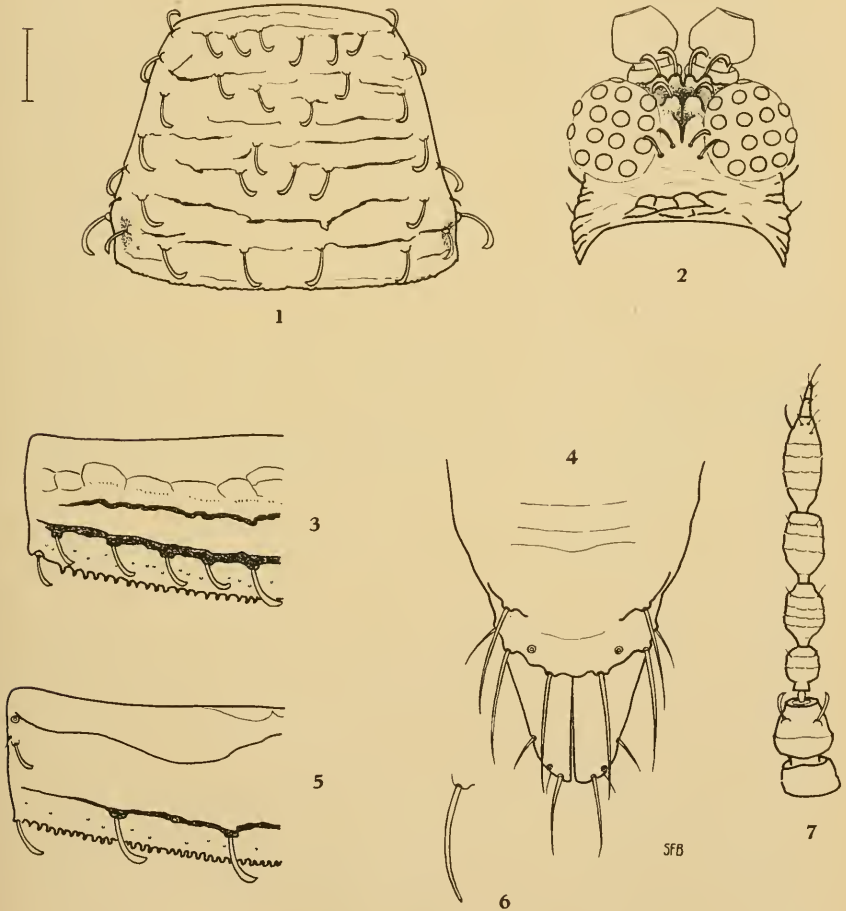


Fig. 1, *Kurtomathrips unicolor* Bailey, new species, dorsum of pronotum; fig. 2, *Kurtomathrips unicolor* Bailey, new species, dorsum of head; fig. 3, *Kurtomathrips unicolor* Bailey, new species, left half of dorsum of abdominal segment VI; fig. 4, *Kurtomathrips morrilli* Moulton, dorsum of abdominal segments IX and X; fig. 5, *Kurtomathrips morrilli* Moulton, left half of dorsum of abdominal segment VI; fig. 6, *Kurtomathrips unicolor* Bailey, new species, major seta on posterior margin of abdominal segment IX; fig. 7, *Kurtomathrips unicolor* Bailey, new species, right antenna. Scale—all figures, line equals 0.032 mm.

nae (fig. 7) arising beneath vertex, eight-segmented. Dorsum of antennal segment II swollen with two short curved setae on dorsum. Segment III constricted in basal third and with slender pedicel. Style two-segmented. All other setae minute. One small simple trichome visible on VI. Mouthcone long and pointed, reaching to posterior margin of pronotum. Maxillary palpi three-segmented. Labial palpi two-segmented.

Pronotum (fig. 1) wider than long, posterior angles bluntly rounded. Posterior margin and lateral margin beneath with minute blunt teeth. One large curved seta on outer margin near posterior and a smaller seta posterior and inward, arising from an indentation. Dorsum with irregular, sinuate, heavy thickenings, principally horizontal and more or less in parallel rows. Surface with irregularly spaced curved setae. Wings absent. Legs short, unarmed, faintly reticulated.

Abdomen broad, somewhat flattened. Segments I-VIII with complete comb of blunt teeth on posterior margins. A row of large curved setae arise from tubercles set on a heavy, undulating chitinous band. The band extends across the segments posterior to the center (fig. 3). Anterior to it is a similar band without setae and a reticulated area extending in the center nearly to anterior margin. Tube short, blunt, faintly reticulated, and split dorsally. Setae on segment IX slender, slightly curved and blunt at tip (fig. 6). Ovipositor downcurved.

Measurements (in mm.) of female holotype: total body length .769; head, length .064, width at center of cheeks .076; pronotum, length at center .112, anterior width .096, posterior width .160; abdominal segment X, length .048, width at base .048. Antennal segments: I, .009; II, .028; III, .025; IV, .027; V, .028; VI, .035; VII, .007; VIII, .006; total length, .169.

Male.—Smaller than female. Ocelli wanting. Legs short, without armature. No claspers or terminal or dorsally enlarged setae. Pronotum much smoother than that of female.

Holotype female and male allotype carry the following data: 2100 ft., Big Bend National Park, Castolon, Texas, August 25, 1954, yellow flowers, R. M. Bohart. The description is based on an additional ten female and two male paratypes. Dr. Bohart also collected additional specimens at Sierra Blanca, Hudspeth County, Texas, August 27, 1954 on blue flowers of an unknown shrub. Three specimens are known also from New Mexico, taken on greasewood and on rabbit brush roots.

Again the fine spirit of cooperation among thysanopterists has made the preparation of this contribution a pleasure. Miss Kellie O'Neill, L. J. Stannard and E. S. Ross have kindly made specimens under their cognizance available for study. Dr. A. N. Tissot of the University of Florida states there are no *Kurtomathrips* in the Watson collection.

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A NOTE ON THE SYSTEMATIC PLACEMENT OF
BOALDA GYONA SCHAUS
 (LEPIDOPTERA: NOCTUIDAE)

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In 1929 (Proc. Ent. Soc. Washington, 31(3): 49), Schaus described the genus *Boalda* and cited as type *Boalda gyona*, n. sp., the sole species included. This species was described from a unique male, U. S. N. M. Type Number 33557, from "Santa Catharina" [Santa Catarina], Brazil. The specimen was figured on plate 4 [Schaus' plate "II", explanation of figures p. 61], figure 27. In this paper Schaus merely included the genus in the family Noctuidae without comment as to subfamily placement or to relationship with any previously described genera. Until recently the species has been in the Acronyctinae (*sensu* Hampson, 1908) in the collection of the U. S. National Museum.



Fig. 1. Male genitalia (caudal view) of *Boalda gyona* Schaus, type, aedeagus removed and placed to the side (lateral view).

The type specimen has well-developed hair on the eyes and should therefore be placed in the subfamily Hadeninae. Schaus did not mention the hair on the eyes in either his generic or specific descriptions. This oversight probably resulted in the incorrect subfamily placement of the species and may also have influenced Biezanko, Ruffinelli and Carbonell (1957, "Lepidoptera del Uruguay," Revista de la Facultad de Agronomía, Universidad de la República Uruguay, No. 46: 62) to place it in the Acronyctinae. Those authors reported *gyona* from Quebr. de los Cuervos, Treinta y Tres, Uruguay.

The correct systematic position within the subfamily Hadeninae is unknown and must of necessity await a generic revision of the neotropical members of the subfamily. However, an illustration of the genitalia of the male type of *Boalda gyona* Schaus is provided here for those who may wish to compare it with similar structures of other hadenine genera.

**NEW SPECIES OF BANDAKIA, WETTINA, AND ATHIENEMANNIA
FROM MICHIGAN**(ACARINA: HYDRACARINA)¹DAVID R. COOK, *Wayne State University, Detroit*

During the summer of 1959 the author began a study² on the psammophilic water mites of Michigan. In addition to collections from sand and gravel deposits of streams, routine samplings were also made in associated surface waters. Collections from surface waters of springs and streams in Barry and Alger Counties, in the Lower and Upper Peninsulas of Michigan respectively, contained the following three species.

Holotypes and allotypes will be deposited in the Chicago Natural History Museum; paratypes in the U.S. National Museum, Washington D. C.

***Bandakia vietsi*, new species**

(Figs. 1, 2, 3, 4, 6, 7)

Male.—Length of ventral shield 436μ , width 384μ ; ventral shield oval, with numerous, small pores; first coxae touching medially but with a distinct suture line; second coxae separated medially; capitular bay relatively wide and shallow; median margins of third coxae rounded and almost touching; fourth coxae separated by the genital bay; lateral margins of fourth coxae indistinct; genital field with two genital flaps covering three pairs of acetabula; over one-half of genital field lying posterior to genital bay; length of genital field 114μ , width 102μ ; a few setae located along medial and lateral edges of genital flaps; genital acetabula relatively short and wide, not taking up most of space along median margins of genital flaps (fig. 3); length of the individual acetabula 22μ - 24μ , width 16μ - 17μ ; dorsum with a large, oval dorsal shield 419μ in length, 314μ in width; with four pairs of small, plate-like glandularia in the integument posterolateral to the dorsal shield (fig. 2).

Dorsal lengths of the palpal segments: P-I, 22μ ; P-II, 78μ ; P-III, 28μ ; P-IV, 38μ ; P-V, 28μ ; length of seta on ventral side of P-II 27μ - 30μ ; anteroventral portion of P-II with a bluntly-pointed, distally-directed projection; P-IV with a ventral projection; dorsal lengths of the distal segments of the first leg: I-Leg-4, 64μ ; I-Leg-5, 71μ ; I-Leg-6, 106μ ; dorsal lengths of the distal segments of the fourth leg: IV-Leg-4, 78μ ; IV-Leg-5, 86μ ; IV-Leg-6, 88μ ; IV-Leg-6 with two ventral setae and claws at the tip (fig. 6).

Female.—Length of ventral shield 506μ , width 445μ ; ventral shield oval, with numerous pores as in male; first coxae touching medially but with a distinct suture; second coxae separated; capitular bay relatively wide and shallow; median margin of third coxae rounded, much narrower than in male and slightly

¹Contribution No. 53 from the Department of Biology, Wayne State University.

²Supported by a Research Fellowship and a Grant-in-aid from the Graduate Division, Wayne State University.

separated (fig. 1); fourth coxae separated by genital bay; lateral margins of fourth coxae indistinct; genital field with two genital flaps covering three pairs of acetabula; well over one-half of genital field projecting posterior to genital bay; genital field proportionally, as well as actually, longer than in male, length 170μ , width 128μ ; a few setae located on lateral and median margins of genital flaps; length of individual genital acetabula 28μ - 32μ , width 17μ - 19μ ; genital acetabula taking up only a relatively small amount of space along the median margins of the genital flaps; dorsum with a dorsal shield and smaller plate-like glandularia as in male, length of dorsal shield 497μ , width 384μ .

Dorsal lengths of the palpal segments: P-I, 22μ ; P-II, 82μ ; P-III, 26μ ; P-IV, 44μ ; P-V, 34μ ; length of seta on ventral side of P-II 34μ ; anteroventral portion of P-II with a bluntly-pointed, anteriorly-directed projection (fig. 4); ventral side of P-IV with a well developed, seta-bearing projection; dorsal lengths of the distal segments of the first leg: I-Leg-4, 68μ ; I-Leg-5, 73μ ; I-Leg-6, 96μ ; figure 7 illustrates the chaetotaxy of these segments.

Types: Holotype, adult male, collected in the Miner River above Miner's Falls, Alger County, Michigan (T47N/R18W/S15), August 27, 1959; allotype, adult female, taken in Glass Creek, Barry County, Michigan (T2N/R9W/S7), June 18, 1959.

Bandakia vietsi is the first representative of its genus (and the family Mameropsidae) reported from the New World. *B. vietsi* is most closely related to the European *B. concreta* Thor and its subspecies but differs as follows: The genital acetabula of *vietsi* are shorter and broader and take up much less of the area along the median edge of the genital flaps, especially in the female. There is a bluntly-pointed, anteriorly-directed projection on the ventral side of P-II anterior to the ventral seta in *B. vietsi*, the comparable structure in *concreta* is a rounded, ventrally-pointing hump. The new species may be separated from *B. orientalis*, described by Viets (1935) from Java, in that the latter has much larger plate-like glandularia flanking the posterolateral edges of the dorsal shield and lacks a ventral projection on P-IV. Two species of *Bandakia* have been described from the subterranean waters of Europe, *B. speciosa* from Germany by Viets (1953) and *B. corsica* from Corsica by Angelier (1951). These latter two species are closely related and differ from *B. vietsi* as follows: The subterranean species are proportionally much longer and the plate-like glandularia associated with the dorsal shield are smaller. Also the palps of *speciosa* and *corsica* lack the seta and projection on the ventral side of P-II and do not have a projection of the ventral side of P-IV.

***Wettina octopora*, new species**

(Figs. 5, 8, 14, 16)

Male.—Length between anterior end of first coxae and posterior end of the genital field 384μ ; anterior end of first coxae rounded, projecting well beyond capitulum; first coxae separated medially; anterior end of second coxae somewhat

rounded; apodemes from first coxae long; both first and second coxae directed more or less posteriorly; median margin of third coxae wide; median margin of fourth coxae reduced to a median angle; genital field somewhat heart-shaped, narrower anteriorly; width of genital field 128μ ; genital opening large, four genital acetabula on each side (fig. 8); edges of genital field appearing irregular due to associated secondary sclerotization; dorsum soft, with a pair of small, elongate plates located slightly posterior and lateral to the postocularia (setae without associated glands); antennaform setae at anterior end very long.

Dorsal lengths of the palpal segments: P-I, 26μ ; P-II, 60μ ; P-III, 40μ ; P-IV, 73μ ; P-V, 32μ ; structure and chaetotaxy of palp similar to that of female; dorsal lengths of the segments of the first leg: I-Leg-1, 48μ ; I-Leg-2, 36μ ; I-Leg-3, 41μ ; I-Leg-4, 54μ ; I-Leg-5, 56μ ; I-Leg-6, 84μ ; figure 5 illustrates the chaetotaxy of the first leg; other legs with long, thin setae, some of which can be classified as swimming hairs; II-Leg-5 with 5-7 swimming hairs; III-Leg-5 with 6 swimming hairs; IV-Leg-5 with 3 swimming hairs.

Female.—Length between anterior end of the first coxae and posterior end of the genital field 428μ - 454μ ; coxae of female resembling those of male except that they average slightly larger; acetabular plates somewhat triangular in shape and lying considerably posterior to the enlarged pregenital sclerite (fig. 16); each acetabular plate bears four acetabula; dorsum similar to that of male.

Dorsal lengths of the palpal segments: P-I, 29μ - 30μ ; P-II, 68μ - 70μ ; P-III, 49μ - 50μ ; P-IV, 82μ - 84μ ; P-V, 36μ - 37μ ; figure 14 illustrates the chaetotaxy of the palp; dorsal lengths of the segments of the first leg: I-Leg-1, 56μ - 57μ ; I-Leg-2, 40μ - 42μ ; I-Leg-3, 46μ - 49μ ; I-Leg-4, 60μ - 64μ ; I-Leg-5, 58μ - 60μ ; I-Leg-6, 92μ - 96μ ; chaetotaxy of first leg similar to that of male; II-Leg-5 with 5-7 swimming hairs; III-Leg-5 with 5-6 swimming hairs; IV-Leg-5 with 1-4 swimming hairs.

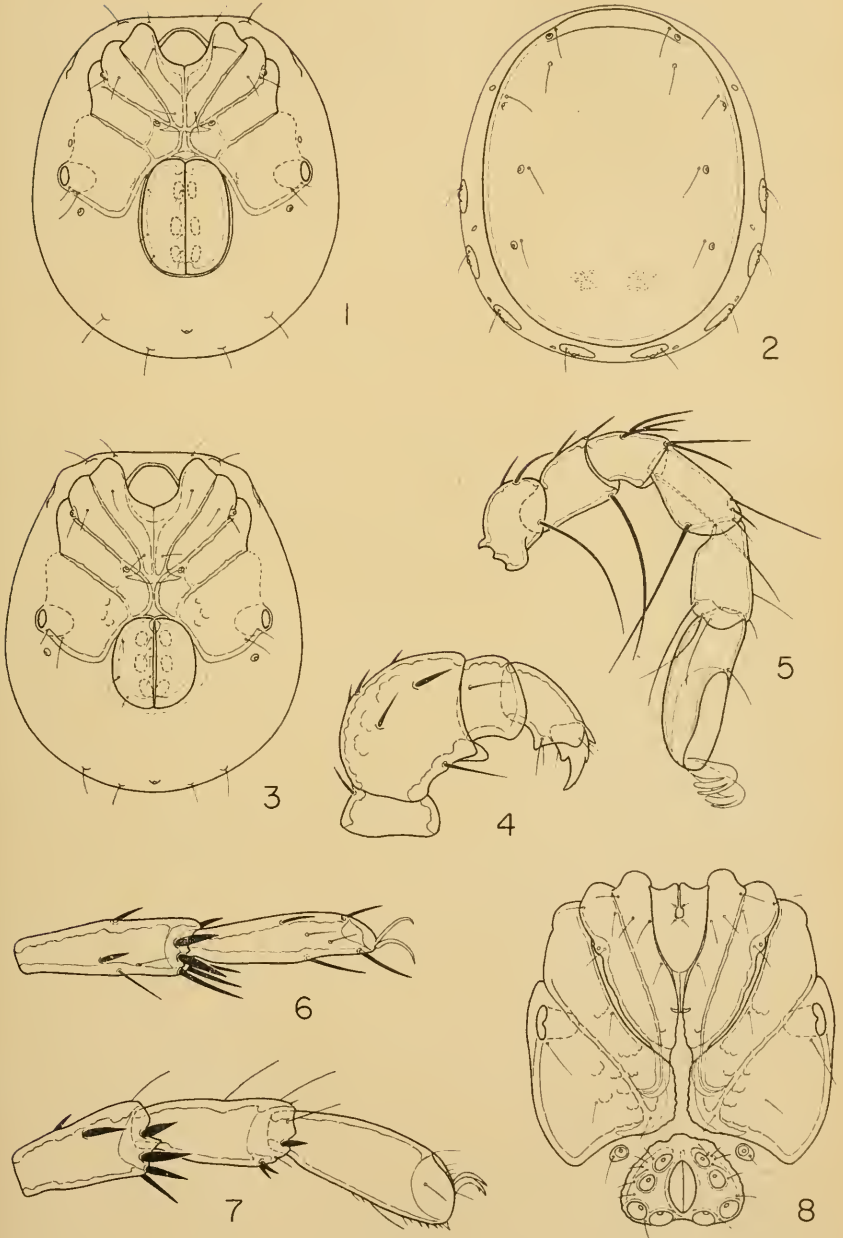
Types: Holotype, adult male, taken in Power's Creek (actually a large reocrene spring), Barry County, Michigan (T4N/R9W/S32), September 26, 1959; allotype, adult female, same data as holotype; one paratype female, collected in the headwaters of a small stream leaving the Yankee Springs, Barry County, Michigan (T3N/R10W/S26), June 18, 1959.

Both localities in which this species was collected are the headwaters of very cold streams fed by extensive areas of springs. The new species is closely related to the holarctic species, *W. podagrica* (Koch), the most obvious difference being the possession of four pairs of genital acetabula by *W. octopora* rather than three. In addition, *W. podagrica* is larger and the acetabular plates, especially in the male, are proportionally, as well as actually, larger.

Wettina octopora is the second known member of the subfamily Tiphysinae in which there are more than the characteristic three pairs

Bandakia vietsi, n.sp. Fig. 1, ventral view, female; fig. 2, dorsal view, male; fig. 3, ventral view, male; fig. 4, palp, female; fig. 6, distal segments of fourth leg, male; fig. 7, distal segments of first leg, female.

Wettina octopora, n.sp. Fig. 5, first leg, male; fig. 8, ventral view, male.



of genital acetabula. In *Tiphys mitchelli*, described by Cook (1956), the number of acetabula varied from four to six on each side. There has been a tendency in water mite classification to use number of acetabula as a criterion for the establishment of subgenera. On this basis, a new subgenus would need to be erected to receive *W. octopora*. However, for reasons given in the "remarks" section under *Tiphys mitchelli* Cook 1956, the author feels that a small change in acetabula numbers (for example, three pairs to four pairs) is not sufficient, in the absence of other differences, to warrant the establishment of a separate subgenus. Because the differences between *octopora* and *podagrica* are very small, except that of the acetabula number, the erection of a new subgenus does not seem to be justified.

Athienemannia schermeri besselingi, new subspecies

(Figs. 9, 10, 11, 12, 13, 15)

Male.—Length of ventral shield 558μ - 672μ , width 523μ - 576μ ; ventral shield oval, with numerous pores; median margins of first, third and fourth coxae well developed, second coxae not touching medially; a pair of glandularia located at posterior edge of fourth coxae; genital field oval in outline, longer than wide, with 36-41 acetabula on each side; acetabula lying free in the integument of the genital opening; width of acetabular region 66μ - 72μ ; four pairs of setae flanking the acetabular region (fig. 12); dorsum with large dorsal shield 541μ - 620μ in length, 488μ - 541μ in width.

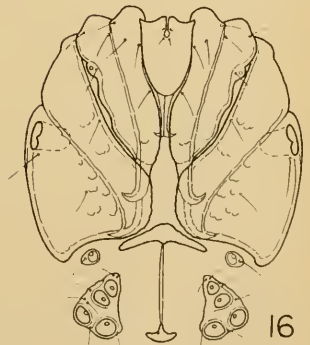
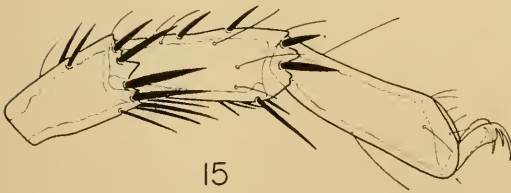
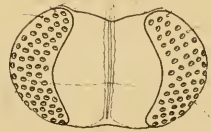
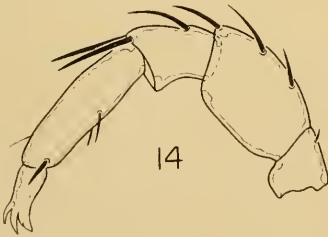
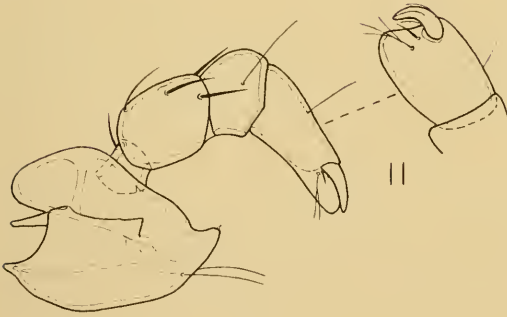
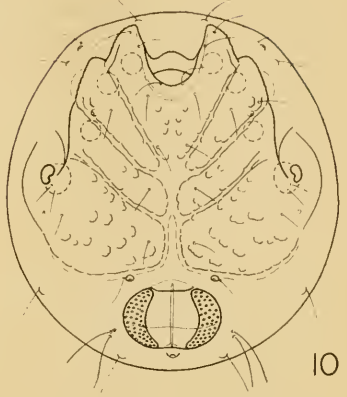
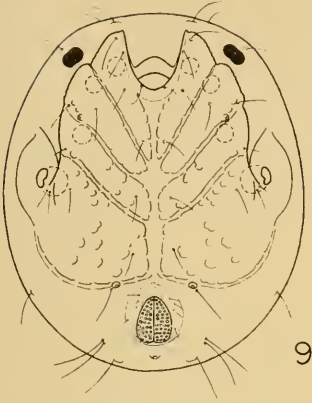
Dorsal lengths of the palpal segments: P-I, 24μ - 30μ ; P-II, 64μ - 72μ ; P-III, 40μ - 47μ ; P-IV, 72μ - 76μ ; P-V, 32μ - 35μ ; P-IV with a short heavy seta and a long, thin, 2-3 branched seta near insertion of P-V; structure and chaetotaxy of palp similar to that of female; dorsal lengths of distal segments of first leg: I-Leg-4, 66μ - 72μ ; I-Leg-5, 84μ - 98μ ; I-Leg-6, 100μ - 120μ .

Female.—Length of ventral shield 690μ - 786μ , width 646μ - 715μ ; ventral shield oval, coxae similar to those of male (fig. 10); genital field oval, wider than long; with 48-59 acetabula on each side, these located on acetabular plates (fig. 13); dorsum with a large dorsal shield 663μ - 750μ in length, 567μ - 628μ in width.

Dorsal lengths of the palpal segments: P-I, 34μ - 40μ ; P-II, 76μ - 82μ ; P-III, 50μ - 56μ ; P-IV, 86μ - 96μ ; P-V, 37μ - 40μ ; P-IV with a short, heavy seta and a long, thin, 2-3 branched seta near insertion of P-V (fig. 11); P-IV wider than thick, and oriented at right angles to the long axis of the body; in figure 11 the small figure at right shows P-IV and P-V shifted approximately 90° to that on the left; tip of capitulum drawn out into a small, slightly upturned rostrum (fig. 11); dorsal lengths and greatest height of distal segments of first leg (height given in parentheses following length measurement): I-Leg-4, 72μ - 76μ (40μ - 44μ); I-Leg-5, 96μ - 104μ (36μ - 40μ); I-Leg-6, 112μ - 122μ (34μ - 36μ); figure 15 illustrates the distal segments of the first leg.

Athienemannia schermeri besselingi, n.sp. Fig. 9, ventral view, male; fig. 10, ventral view, female; fig. 11, palp and capitulum, female; fig. 12, genital field, male; fig. 13, genital field, female; fig. 15, distal segments of first leg, female.

Wettina octopora, n.sp. Fig. 14, palp, male; fig. 16, ventral view, female.



Types: Holotype, adult male, collected in the Yankee Springs, Barry County, Michigan (T3N/R10W/S35), July 19, 1959; allotype, adult female, same data; paratypes, 1 male, 10 females, same area, between June 18 and July 28, 1959; 1 male, taken in a small spring near Hastings, Barry County, Michigan (T3N/R9W/S24), July 28, 1959; 1 male, collected in Power's Creek (a large reocrene spring), Barry County, Michigan (T4N/R9W/S32), September 26, 1959.

Athienemannia schermeri besselingi is the second species of its genus reported from North America. *A. brunsoni*, described by Cook (1955) from Montana, differs from *besselingi* in being larger, possessing proportionally longer legs, and III-Leg-5 of the male exhibiting a slight sexual dimorphism. The mites from Michigan are closely related to the European subspecies, *A. schermeri schermeri* described by Viets (1920) from Germany. *Athienemannia schermeri besselingi*, with a length varying from 690 μ -786 μ in the female, is somewhat larger than the European subspecies. Viets (1923) reports a variation in body length of 615 μ -685 μ . Also, the leg segments of *besselingi* are noticeably longer and thinner than in *schermeri*. Besseling (1951) described what appeared to be a second European species of *Athienemannia*, *A. fluvicola*, but Kurt O. Viets (1960) has shown it to be the female of *Mundamella germanica* Viets.

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**A MITE, ALLOTHROMBIUM MITCHELLI, NEW TO SCIENCE,
PREDATOR ON THE BALSAM WOOLLY APHID¹**

(ACARINA: TROMBIDIIDAE)

ROBERT DAVIS, *Entomology Department, University of Georgia, Athens*

The balsam woolly aphid, *Chermes piceae* Ratz., was probably introduced into this country from Europe around the turn of the century. In 1908 it was found damaging fir forests in Maine. Since then it has spread throughout the northeast and into the Pacific northwest attacking all true firs, *Abies* spp.

In 1956 the balsam woolly aphid was first collected from Fraser fir at Skyland, Virginia, where it was causing top dieback and some tree mortality. In 1957, it was collected on Fraser fir from Mt. Mitchell, North Carolina. Surveys by the U. S. Forest Service personnel showed that in 1958 over eleven thousand fir were dead and over twenty-one thousand additional fir died in 1959, (Nagel, 1959).

In May of 1959 in the red spruce-Fraser fir stands of Mt. Mitchell, an unusually large population of Trombidiid mites was found by Mr. Gene D. Amman and myself. It was observed that these mites were predaceous on all stages of the balsam woolly aphid and specimens of the mite were submitted to the U. S. National Museum for determination. A determination of *Allothrombium* sp. was made by Dr. E. W. Baker.

This species of *Allothrombium* is described here as new since a search of the literature has revealed that it is not possible to associate this mite with any described species.

***Allothrombium mitchelli*, new species**

Female.—Idiosoma 4650 μ long to anterior tip of scutum, 2400 μ wide at widest part (Fig. A.) Scutum (Fig. B.) widest just anterior to the insertion of the sensillae. The ratio of length to width of scutum is 850 μ /1190 μ . The anterolateral lobes of the scutum extend 15 μ anterior to the scutum proper and posteriorly to the point of insertion of the sensillae. Each lobe is well developed and bears from 100-120 setae, most of which are concentrated on the posterior half of the lobes. Scutum proper gradually widening posteriorly to a point lateral to the sensillae insertions, then widens abruptly to its greatest width at a point lateral of the sensilligera posterior to the sensillae insertions, then rounded to the posterior of the sensilligera. Posteriorly the scutum is reduced to the size of the crista metopica where the latter is superimposed on the scutum. The crista metopica is small, widest at point of attachment to sensilligera, one third longer than wide, and lacks setae. Setae of scutum (Fig. D.) long, except immediately anteriorly and laterally to sensillae insertions where they are only slightly more than one third the length of the other setae, peripectinate and borne on subconical papil-

¹ This research was supported, in part, by National Science Foundation Grant G-13939. Journal Paper No. 145 of the College Experiment Station of the University of Georgia College of Agriculture Experiment Stations. Accepted for publication.

lae. This variance in setal length gives the unmounted specimens a tufted appearance on the anterior portion of the idiosoma. Ocular plates and eyes are present. Anterior margin of hysterosoma projecting slightly beyond the posterior margin of the propodosoma so that the posterior portion of the scutum containing the metopica crista and the posterior sensilligera are hidden in dorsal view in unmounted specimens. Anterior dorsal setae of hysterosoma slenderer and less heavily barbed than remaining body setae. Setae of hysterosoma are heavily barbed, peripectinate and situated on subconical papillae (Fig. C.). Sensillae (Fig. E.) very long, slender, only slightly barbed and peripectinate their entire length.

Setae of coxae and legs similar (Fig. D.), long, slender, peripectinate, and less heavily barbed than hysterosomal setae, borne on subconical papillae. Setae becoming progressively shorter and less heavily barbed toward distal end of legs. Claws of all legs normal, smaller on leg I, pulvilli split, each with a ventral row of dendritic fringe. The relative length of legs I-IV are illustrated in Fig. G.

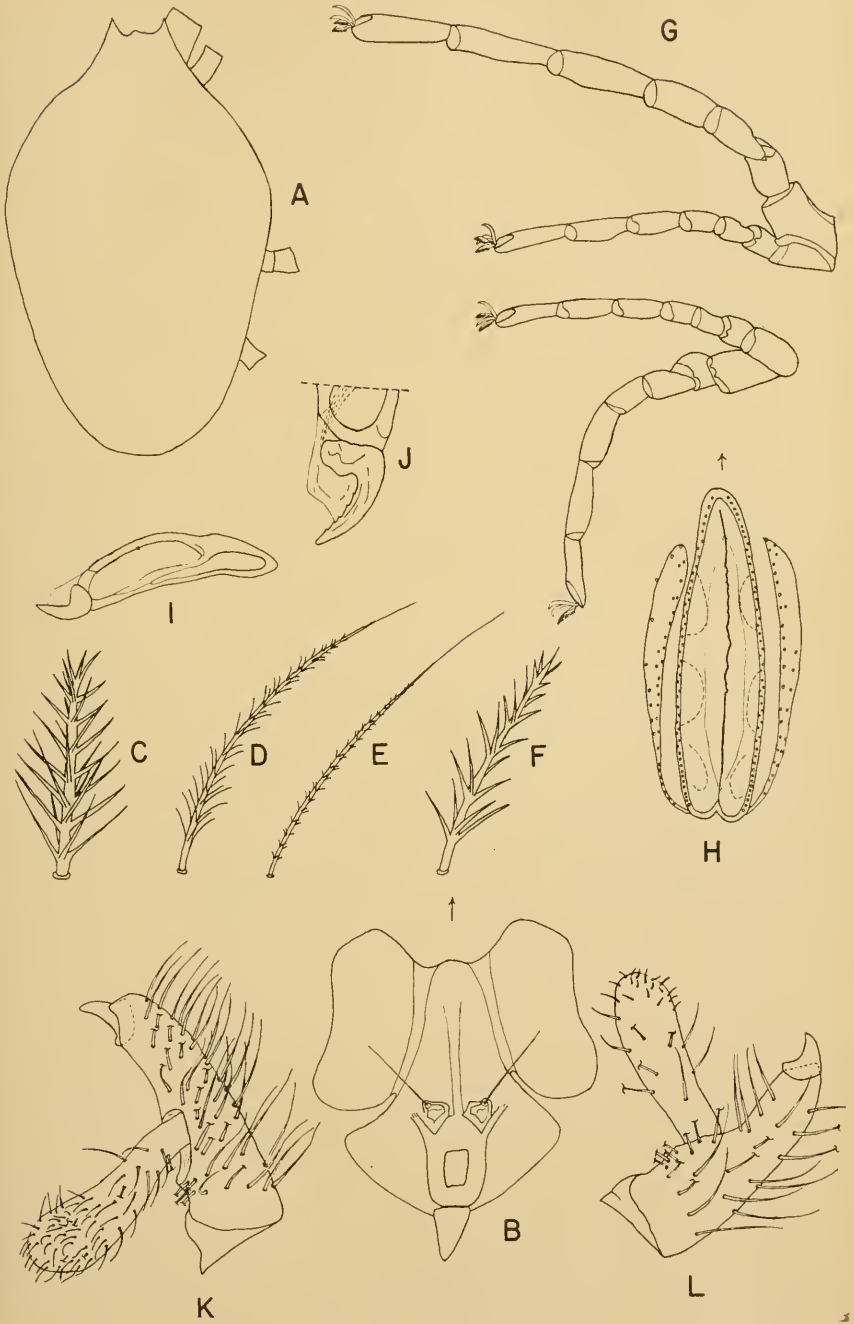
Genital and paragenital sclerites well developed (Fig. H.); genital sclerites each with 45 to 60 peripectinate setae. The insertion of the setae are indicated in Fig. H. Anterior setae of the genital sclerite long, gradually shortening posteriorly for two-thirds the length of the sclerite then abruptly becoming very long on the remainder of the sclerite. The paragenitals with 25-30 peripectinate setae similar to those of the anterior portion of the genital sclerite. Three pairs of genital acetabula of nearly equal size are placed well back in the genital opening. Anal sclerites present, each with 3 to 5 heavily barbed, peripectinate setae.

Base of gnathosoma with posterior ventral margin broadly concave. Base and rostrum with numerous slender, long, peripectinate setae becoming less pectinate toward distal end of rostrum. Velum relatively large and simple containing central, converging fimbriae. Twenty-two to twenty-four smooth long rostral setae encircle the velum posteriorly.

Chelicerae (Fig. I.) arched dorsally, fairly straight along the ventral margin except for the posterior one-third where the chelicera narrows and the ventral margin becomes subparallel with the dorsal. Dorsal membrane well developed and tapered slightly to its ventral margin. Tarsus of chelicerae (Fig. J.) with a row of 6-to-8 dorsal teeth, slightly diminishing in size posteriorly, on the distal two-thirds.

Trochanter of palp with many very long, slender, peripectinate setae on the posterior surface. The anterior surface has three long, slender, peripectinate setae in a row on its distiventral portion and a moderately long similar setae on the distidorsal portion. Setae of the femur and genu are long, slender, flexible, and peripectinate; longer on the ventral margins than the dorsal, and more

Allothrombium mitchelli n. sp., female. Fig. A, dorsum; fig. B, scutum (50x); fig. C, seta of hysterosoma; fig. D, seta of type found on coxa, leg and scutum; fig. E, sensillae; fig. F, setae of genital sclerite; fig. G, legs I-IV (17x); fig. H, genital opening (100x); fig. I, chelicera (50x); fig. J, cheliceral detail (100x); fig. K, anterior of tibia and tarsus of right palp (100x); fig. L, posterior of tibia and tarsus of left palpi (100x).



numerous on the posterior surface than the anterior. Palpal tibia (Fig. K, L) with long slender setae more numerous on posterior surface than anterior surface, with heavy pointed claw. Tarsus inserted midway of tibia. Tibial setae becoming smooth distal to tarsus insertion.

Male.—Unknown.

This description was based on the female holotype (dissected) and seven undissected paratypes from Mt. Mitchell, North Carolina. The specimens were collected May 15, 1959 on the bark of Fraser fir trees where they were feeding on the balsam woolly aphid, *Chermes piceae* Ratz. Collectors, Robert Davis and Gene D. Amman.

The holotype and two paratypes will be deposited in the U. S. National Museum. Five paratypes will be placed in the collection of the University of Georgia.

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IXODES BAKERI, A NEW SPECIES OF TICK FROM NYASALAND

(ACARINA: IXODIDAE)

DON R. ARTHUR¹ and CARLETON M. CLIFFORD²

The new species of *Ixodes* here described was found among several lots of unidentified African ticks on loan from the Museum of Comparative Zoology, Harvard University, Cambridge, Mass. This species is named for Dr. Edward W. Baker, Acarologist in the Entomology Research Division, U.S. Department of Agriculture.

Ixodes bakeri, new species

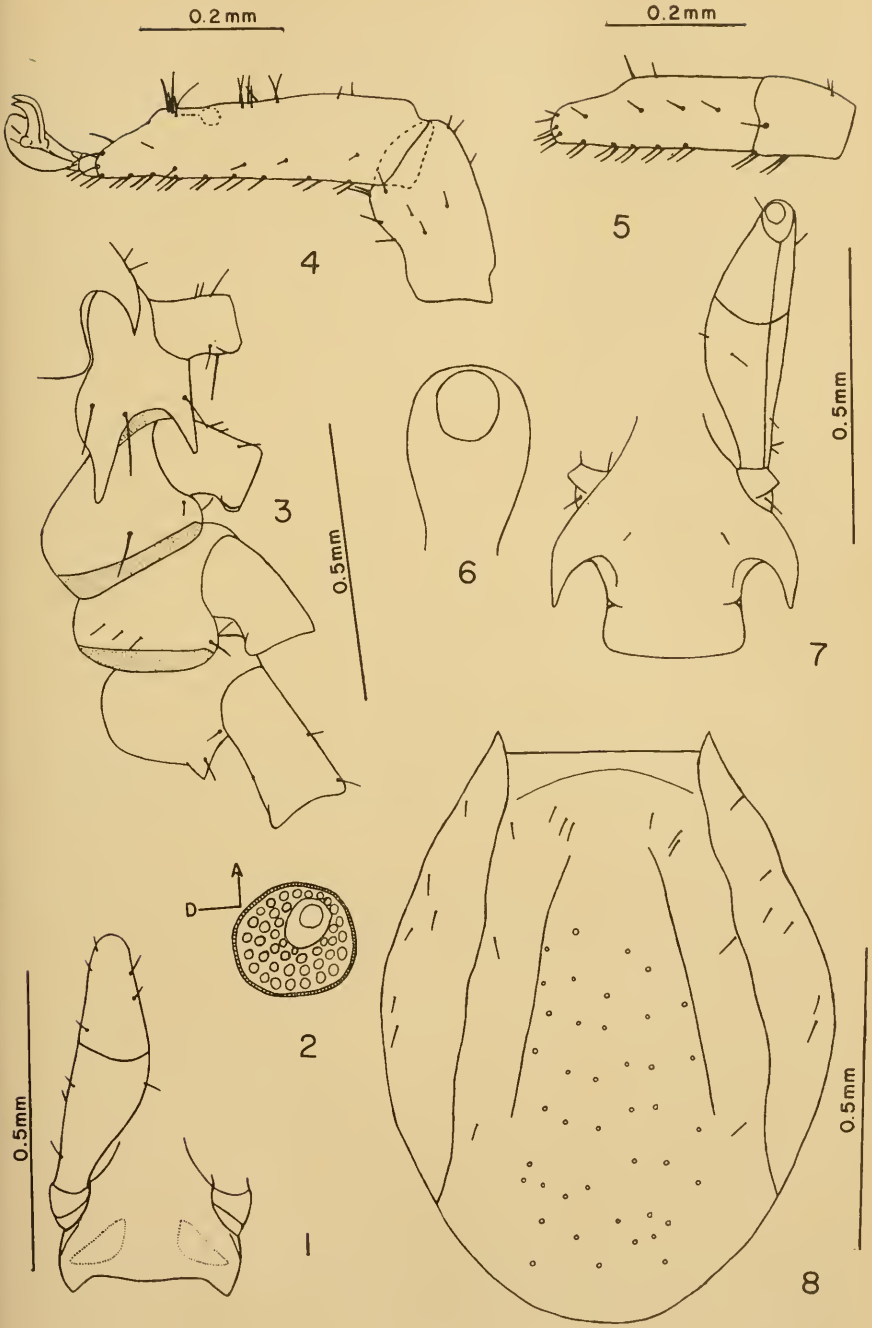
(Figs. 1-8)

Holotype.—Female, from *Otomys* species, Nyika plateau, 7000 ft., Nyasaland. A. Loveridge *leg.* Deposited in the Museum of Compara-

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Ixodes bakeri, new species, female. Fig. 1, dorsal view of capitulum; fig. 2, spiracle; fig. 3, coxae I-IX; fig. 4, tarsus I and metatarsus I; fig. 5, tarsus IV; fig. 6, anal groove; fig. 7, ventral view of capitulum; fig. 8, scutum.



tive Zoology, Harvard University, Cambridge, Mass., U.S.A.

Female.—Partially fed. Oval, widest about mid-length. Capitulum, scutum and legs yellow brown. Body with numerous fine pale hairs dorsally and ventrally.

Capitulum.—Length, tips of palpi to tips of cornua, 0.61 mm.: width of basis across cornua 0.31 mm. Basis capituli broad, lateral margins posterior to insertion of palpi short and convex, posterior margin almost straight; cornua strong, broad, tapered. Porose areas small, pyriform, slightly depressed and separated by an interval exceeding the length of one of them. Palpi long, rounded apically, broadest at distal third of segment 2. Palpal segment 1 a simple ring when seen dorsally, but produced into a spine-like process ventrally. Length of segment 2, 0.24 mm., segment 3, 0.21 mm. Ventrally, basis widest across auriculae; slightly constricted behind auriculae; surface smooth, almost flat, and straight posteriorly; transverse suture line lacking. Auriculae present as long, sharply pointed posteriorly directed projections. Hypostome damaged, but median and lateral teeth long and sharply pointed.

Scutum.—Length 0.99 mm., greatest width of 0.77 mm. just behind mid-length. Shape as figured. Surface smooth shining. Scapulae of moderate length, pointed. Emargination broad, shallow. Cervical grooves as shallow depressions, divergent and extending beyond mid-length. Lateral carinae run close to, and parallel with, cervical grooves, but extend back to posterolateral margins. Punctations small, fairly widely and uniformly dispersed in the central field. Hairs sparse, but where they occur are fine and of moderate length; arranged as in the figure. Hairs on the alloseutum longer and thicker.

Legs.—Of moderate length and thickness. Coxae I-III with narrow syncoxae; coxa I with external and internal spurs long and of approximately equal length; coxae II and III both lack spurs, whilst coxa IV has a very short, broadly pointed external spur. Trochantal spurs short, very broad and rounded apically. Hairs on legs tend to be short.

Tarsi.—Tarsus I with dorsal surface converging slightly to Haller's organ, subapical hump moderate, tarsus IV with subapical hump less well defined; length of tarsus I, 0.47 mm., metatarsus I, 0.22 mm.; tarsus IV, 0.41 mm., metatarsus IV, 0.27 mm.

Genital orifice.—On level with coxae III.

Anal aperture.—Placed near posterior edge of body. Anal groove roughly horseshoe shaped.

Spiracular Plate.—Ovoid, macula anterior of center. Goblets large, not numerous. Dimensions in holotype, 0.18 x 0.17 mm.

RELATED SPECIES

This species has apparent affinities with *Irodex colasblecouri* Arthur 1957, in the capitular features, in the form of the anal groove, in the scutal characters and in being a parasite of small rodents. Its sepa-

ration from *I. colasbelcourii* rests on the spurs of the coxae and of the trochanters. Thus in the species presently described the external and internal spurs on coxa I are long and almost equal in length; in *I. colasbelcourii* the external spur is very short and the internal spur is very short and the internal spur very long. Similarly the external spur of coxa IV in *I. colasbelcourii* is very long and pointed whilst in this species it is short and broad. The trochantal spurs on legs II-IV also, in *I. colasbelcourii*, are attenuated and sharp, but in *Ixodes bakerei* they are very short and broadly rounded.

Ixodes lunatus and *I. colasbelcourii* are, as far as we know, endemic in Madagascar and *I. bakerei* is the first species of this doubtless complex of species to be found on the African mainland.

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BOOK NOTICES

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- THE BIOCHEMISTRY OF INSECTS.** Darcy Gilmour. Academic Press, Inc., New York. 343 pp. \$8.00.
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- THE MITES OF STORED FOOD.** A.M. Hughes. Ministry of Agriculture, Fisheries and Food, Tech. Bull. No. 9. Order from British Information Services, 45 Rockefeller Plaza, New York 20, N. Y. 287 pp., illus. \$3.30.

AN UNDESCRIBED SPECIES OF *METEORUS* FROM WISCONSIN
(HYMENOPTERA: BRACONIDAE, EUPHORINAE)¹

R. D. SHENEFELT, *Department of Entomology, College of Agriculture, University, of Wisconsin, Madison.*

During the study of insects associated with pulp logs stored in yards in central Wisconsin numerous specimens of an undescribed species of *Meteorus* were collected in light traps, bait traps and in tanglefoot on yellow trap boards. This species runs to couplet 13 in Muesebeck's key (1923) and to *fumipennis*. The author wishes to express his appreciation to Mr. Muesebeck for the loan of specimens of *M. fumipennis*.

Meteorus clinophthalmicus,² n. sp.

Holotype ♀.—Length, exclusive of ovipositor, 2.8 mm.; antenna 2.5 mm.; abdomen 1.4 mm.; ovipositor 1 mm.

Head.—Transverse, 1.2 x width of thorax between tegulae, width 39³, greatest length 24, strongly receding behind eyes, maximum width across occipital carina 27; eyes large, bulging, ovoid (20 by 5), sparsely hairy; as seen from side temple 8, eye width 14; malar space 0.1 eye height; breadth of face measured across lower margins of antennal fossae 17, at narrowest point between eyes 14; distance from lower margin of antennal fossae to anterior tentorial pits 11; face minutely transversely rugoso-punctate with pale, short hairs which are denser laterally and below; clypeus convex, twice as wide as high; vertex and temples smooth and polished, with sparse short pale hairs; ocell-ocular line 3 x and postocellar line 2.67 x the greatest diameter of a lateral ocellus, the ocelli being relatively small and widely spaced; a groove extending from the median ocellus forward 0.3 the distance to the antennal fossae; flagellum 25-segmented, the length of basal segment 9, second 10 (3 x as long as broad), third 8, fourth 7, the remaining segments becoming gradually shorter and relatively broader; pedicel 0.5 as long as first flagellar segment.

Thorax.—Slender, 2.5 x as long as wide between tegulae, notaulices sharply impressed to a depth of about half their width, crenulate, joining behind to form an impressed, rugose, V-shaped area before the broad prescutellar furrow, the latter divided by three ridges into four foveae, short pale scattered hairs near notaulices and on sides of lateral mesonotal lobes; scutellum relatively small (width 7, length 7) and strongly arched, smooth and shining, with a few scattered hairs; propodeum irregularly rugoso-reticulate, with larger areolae indistinctly formed due to some ridges being higher than others, slightly excavated centrally

¹Results of a cooperative project of the Wisconsin Agricultural Experiment Station, College of Agriculture, University of Wisconsin, supported in part by the Nepeo Foundation and the Wisconsin Conservation Department. Approved for publication by the Director of the Wisconsin Agricultural Experiment Station.

²From κλίω—slope and ὄφθαλμός—the eye. In reference to the inwardly slanting eyes.

³60 = 1 mm. in the measurements as given in the description.

at apex; sides of pronotum rugoso-punctate except along lower margin; mesopleurae mostly smooth above, with a broadly-impressed, coarsely roughened sternaulus; metapleurae rugose; venter of pro- and mesothorax smooth.

Legs.—Relatively long and slender.

Fore: coxa length 10; trochanter 15 (proximal segment 10 and distal 5, measured along ventral aspect of leg); femur 32 (width 7); tibia 36; tarsal segments 15, 8, 6, 5, 6; claws 3.

Middle: coxa length 11; trochanter 15 (proximal segment 9 and distal 6); femur 36 (width 7); tibia 43; tarsal segments 21, 9, 7, 5, 6.

Hind: coxa length 18; trochanter 17 (proximal segment 9 and distal 8); femur 44 (width 10); tibia 65; tarsal segments 25, 12, 9, 6, 7. Length of inner spur 8, width of tibia at apex 6.

Wings.—Fore: very lightly and evenly infuscated, veins brown; length 140, maximum width 44; stigma brown, paler at base, length 28, width 9, inner side 18, outer side 13; radial cell ending 9 before wing tip; first abscissa of radius 2.5, second 3.5, third 4.3; second abscissa of cubitus 9; first intercubitus 12; second intercubitus 8; recurrent entering first cubital cell 2 before junction of first intercubitus; nervulus postfureal for about its width.

Hind: nervellus 7, lower abscissa of basella 7, upper abscissa of basella 12.

Abdomen.—2.7 x as long as wide across apex of second segment; first segment 7 wide at base, 30 long and 18 wide at apex, spiracles at 12 from base and basal edge of dorsal fossae at 7, the ridge between the fossae extending posteriorly beyond spiracles, plate beyond spiracles with irregular wrinkles and elongate depressions which tend to follow an arched path, diverging outwardly at base and converging posteriorly near apex; segment two 21 wide at base, 32 wide at apex and 17 long, smooth, polished; suturiform articulation a weakly impressed straight line, indistinct; ovipositor slightly decurved and with a small dorsal notch at 4 from the apex (total length 60).

Color: head very dark chocolate brown, face Burmese gold (3-C-11)⁴; apical third of clypeus, basal two-thirds of mandibles, scape and pedicel apricot (10-G-7); first flagellar segment slightly browner than scape and the flagellar segments gradually becoming browner as apex is approached; eyes approximately Mohawk brown (7-H-12); palpi Polar Bear (9-B-2).

Thorax mostly Andorra brown (8-L-4), propectus testaceous (4-B-11); fore and middle coxae and trochanters and posterior trochanters close to Capucine Buff (9-E-4); posterior coxae, all femora, tibiae and tarsi tawny (13-D-10); tegulae, sclerites at base of forewing and leading edge of costa testaceous.

Abdomen testaceous to terra cotta (4-D-12) above in center, becoming darker brown apically and much more so on sides, first tergite also more infuscated on apical half; ovipositor clear golden wheat (11-D-7), ovipositor sheaths concolorous with propodeum.

Type locality and data on pin: Wood Co., Nekoosa, Wisconsin. IX-3-1948 R. D. Shenefelt. Bd. Type in collection of University of Wisconsin.

⁴Color names from Maerz, A. and M. R. Paul. 1950. A Dictionary of Color. Ed. 2. McGraw-Hill. Numbers within parentheses refer to plate number, column and row.

Allotype ♂.—length 3.25 mm. Antenna 31-segmented, 3.9 mm. long. Similar to ♀ but with relatively longer antennae; propodeum more sharply angled between dorsal and posterior faces, the dorsal face relatively longer, the central impression of the posterior face deeper; lower abscissa of basella equal to nervellus but only half as long as upper abscissa; face nearly twice as broad as deep between anterior tentorial pits and lower edge of antennal fossae (21 wide, 11 deep); first abdominal tergite relatively broader at apex (width 25, length 37). General coloration same as in holotype.

Wood Co., Nekoosa, Wisconsin. VIII-6-1948. R. D. Shenefelt. Bd. In collection of University of Wisconsin.

Paratypes.—To be deposited in the University of Wisconsin Collection, the U. S. National Museum, the Canadian National Collection, the Naturhistorisches Museum, Wien, Austria and the author's collection.

A total of 109 ♂♂ and 88 ♀♀ were taken in the Nekoosa yard during 1948 between July 7 and September 9 by W. W. Barrett or R. D. Shenefelt. A single specimen was captured June 16, 1949. The time of greatest abundance of adults is the latter part of August and early September.

This species varies considerably in size, ranging from 3.4 to 2.5 mm. in the ♀♀ and from 4 to 2.5 mm. in the ♂♂. Color is variable as to degree of darkness but the pattern seems to be consistent. The relative size of the eyes, the extent to which they bulge and the degree of slant inward also varies to a considerable extent. In some specimens the face appears relatively narrow as compared to others due to the difference in eye slant. The proportions of the first tergite are subject to change. In four specimens (3 ♂♂ and 1 ♀) the second intereubitus is totally wanting, and in one ♂ the second intereubitus is fully developed in the left but absent in the right forewing.

Differs from *hypophloci* Cushman in the narrower, less robust thorax, much narrower face, more protuberant and more sloping eyes, shorter malar space and less strongly decurved ovipositor.

Clinophthalmicus can be separated from *fumipennis* Muesebeck by the relatively narrower head as compared to the width of the thorax between the tegulae. In *fumipennis*, the head width is 1.50 x that of the thorax while in *clinophthalmicus* it is 1.2 x. The relatively shorter lower abscissa of the basella and longer malar space will separate *clinophthalmicus* from *angustipennis* Muesebeck.

REFERENCE

- Muesebeck, C. F. W., 1923. A revision of the North American species of Ichneumon-flies belonging to the genus *Metcorus* Haliday. Proc. U. S. Nat. Mus. 63(2470): 1-44.

NEW SYNONYMY IN CYNIPOIDEA
(HYMENOPTERA)

LEWIS H. WELD, *Arlington 13, Va.*

MESOCYNIPINAE

Baviana Barbotin, 1954. Bull. Ent. Soc. France 59(7-8): 125-7, figs. 1-3. *Baviana ferruginea*, n. g., n. sp. ♀ Monob. Oberthurellinae. Indochina. The figure of the abdomen with no mention of a tooth on the hind femur or of the scutellum ending in a spine suggested that the species belongs in the Mesocynipinae in the genus *Paramblynotus*. When this was called to his attention he agreed in letter of August 31, 1955 that it is a *Paramblynotus* and intends to publish a note to that effect. Apparently he has not done so. *Baviana* is a synonym of *Paramblynotus* Cameron (syn. n.) and the species is *Paramblynotus ferrugineus* (Barbotin) (comb. n.).

Decellea Benoit, 1956. Rev. Zool. Bot. Afr. 53(1-2): 51, fig. 1. *Decellea yangambicola*, n.g., n.sp. ♀. Belgian Congo. Said to be related to *Paramblynotus* Cameron, a "genus of mostly Asiatic species." With no spur on any hind tarsal segment, with a distinct and sulcate petiole, the parapsidal grooves pereurrent in the coarse sculpture, tergite V largest in the female and cubitus arising at middle of basal it is a *Paramblynotus* and this was called to his attention in May 1957. *Decellea* is a synonymy of *Paramblynotus* Cameron (syn. n.) and the species is *Paramblynotus yangambicola* (Benoit) (comb. n.). The median dorsal tooth on the truncation of the pronotum suggests it is related to *Paramblynotus ruficollis* (Cameron).

ASPICERINAE

Heteraspidia Belizin, 1952. Ent. Oboz. 32: 299. *Heteraspidia foreata* n.g., n.sp. ♂. Monob. Aspicerinae. Turkmenia. The parallel longitudinal ridges on the scutellum which ends in a blunt point, the radial cell partly open at base as well as on margin, the pereurrent parapsidal grooves with a median forked behind indicate that this is a *Paraspicera*, genus 15, p. 93 in CYNIPOIDEA (1952). *Heteraspidia* is a synonym of *Paraspicera* Kieffer (syn. n.) and *foreata* is *Paraspicera foreata* (Belizin) (comb. n.). This was called to his attention in October 1960 and a specimen of a *Paraspicera* was sent to him to see if *foreata* is not congeneric but there has been no comment.

EUCOILINAE

Trichoplasta Benoit, 1956. Ann. Mus. Congo Belge Tervuren Zool. 51: 537. *Trichoplasta Basilewskyi*, n. g., n. sp. figs. 2, 8, 11, 12, 21. ♀. Monob. Eucoilinae. Belgian Congo. The large cup on scutellum, the disk drawn out into a blunt cone behind, the open radial cell, antennae with a 7 segmented club, tergite II pubescent at the base indicate that it is a *Conucoela*. So *Trichoplasta* becomes a synonym of *Conucoela* Kieffer (syn. n.) and the species is *Conucoela basilewskyi* (Benoit) (comb. n.).

Conucoela striatissima Benoit, 1956. *idem*, p. 533, fig. 1. ♀ ♂. Eucoilinae. Belgian Congo. The figure of mesoscutum and scutellum shows it is not a *Conucoela* but represents a new genus near *Trissoodontaspis* Ashmead, differing in having an open radial cell, the sides of pronotum, the mesoscutum and lateral bars striate, the 3rd segment of antenna of female only half of 1 plus 2 and the

flagellum stouter distally. For this the name of *Afrodontaspis* is here proposed (genus n.) with *Afrodontaspis striatissima* (Benoit) as the type (comb. n.). Monobasic.

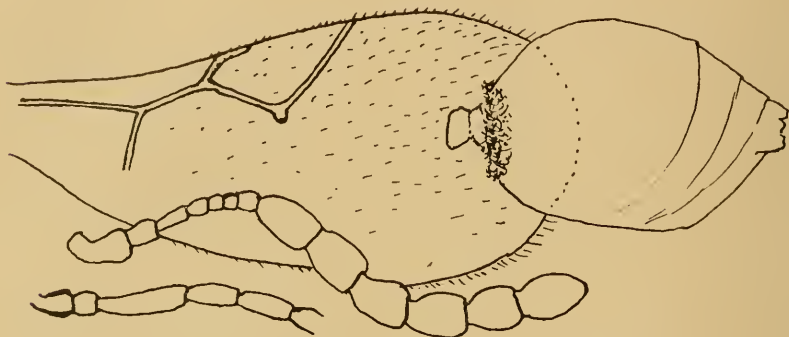


Fig. 1. *Didietyum zigzag* Riley (from paratype).

Hexaplasta Foerster, 1869. Type: *Cothonaspis hexatoma* Hartig. Reexamination of the type (Kerrich & Quinlan, Opusc. Ent. 25(3): 191 (1960)) showed that the disk is striate and hence congeneric with *Eucoela picicrus* Giraud, genotype of *Hexacola* Foerster. This reverses Weld's erroneous statement in CYNIPOIDEA (1952), p. 221, and confirms Rohwer & Fagan in making *Hexaplasta* a synonym of *Hexacola* in 1917. Thus *Hexaplasta* of authors and as a subgenus of *Trybliographa* in CYNIPOIDEA is left without a name. The oldest name available is *Didietyum* Riley (1879, in Comstock, Rept. on Cotton Ins., p. 214,500 (misspelled on p. 197) and Amer. Ent. 3: 52 (1880)) with *Didietyum zigzag* Riley as the type. Types are in the U.S. Natl. Mus. Host: *Megaselia aetiae* (Comstock), a scavenger on decaying pupae of *Aletia*, Florida. The disk is punctate, the veins of radial cell almost colorless. Fig. 1 (projected).

When **Ganaspis fuscipes** Kieffer, 1907, was transferred to *Hexacola* in 1952 it should have been given a new name. *Hexacola fuscicola* is here proposed (name n.).

ANNOUNCEMENT

The new **INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE** has been published and is available for \$3.00 postpaid from the Publications Officer, International Trust for Zoological Nomenclature, 19 Belgrave Square, London, S.W.1, England. Checks and money orders should be made payable to the Trust.

NOTES ON THE LARVAL HABITAT AND DEVELOPMENTAL
PECULIARITIES OF *NALLACHIUS AMERICANUS* (McLACHLAN)
(NEUROPTERA: DILARIDAE)¹

ELLIS G. MACLEOD² and PAUL E. SPIEGLER³

INTRODUCTION

The Dilaridae comprise an interesting but poorly known group of planipennian Neuroptera, which, with the exception of the Australian Region, occur in at least a part of all of the major zoogeographic regions of the world. The family is a small one and although several of the species appear to be wide-spread, nearly all of the known species are represented by only one or at most a few specimens.

Species of the genus *Nallachius* Navas occur in both the Neartic and Neotropical Regions. In North America, two species are known: *N. pulchellus* (Banks) and *N. americanus* (McLachlan). The first of these is represented by a single male specimen from Arizona and by a male and a female specimen from Cuba (Carpenter, 1947). *N. americanus* was redescribed by Carpenter in 1940, who, although over half a century had elapsed since the time of its original description, was still able to gather only five specimens for study (three males, two females), including the holotype. Since then, Steyskal (1944) and Gurney (1947) have provided additional records for twenty-seven males and ten females and the species is now known for six somewhat scattered locales in the eastern United States from Michigan to Georgia. Carpenter (1947) has given the record of an additional male of this species from Puerto Rico.

For many years knowledge of the biology of the Dilaridae remained almost completely unknown, being confined to the collection data accompanying captured specimens. In particular, the appearance and habitat of the immature stages have, until very recently, remained in doubt. Takahashi (1942) described a neuropterous larva from an aquatic habitat on Taiwan, which he felt might belong to the Dilaridae; however, direct proof of this suggestion is lacking. Although species of the related genus *Dilar* Rambur are known from Taiwan (Nakahara, 1955), what is now known of the ecology and morphology of the larva of *N. americanus* seems to make it questionable whether Takahashi's larva is a dilarid.

The first published description of the immature stages of this family which is not open to question was provided by Gurney (*op. cit.*), who

¹ The authors are deeply grateful to W. H. Anderson, M. R. Smith and W. W. Wirth for the determinations of the immature insects found associated with or used as experimental food by the *Nallachius* larvae. In addition, we would like to express our thanks to A. B. Gurney for his helpful comments during the preparation of this manuscript.

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described the larva, pupa and cocoon of an unidentified species of *Nallachius* (in all probability *N. americanus*). He had at his disposal eight larvae and two pupae which had been collected over the years in the vicinity of Washington, D. C. Both of the pupae were identified to genus by comparing them with adults and one pupa had with it a cast larval skin which was compared to the larval series. Gurney was also able to give a short description of the egg of *N. americanus*, based on a single dried example found at the tip of the ovipositor of a pinned adult female. All of the larvae and pupae had been collected incidental to the breaking up of dead trees in the search for coleopterous larvae. An additional larval specimen belonging to this genus was reported by Peterson (1953) from a similar dead-wood habitat in Ohio.

Because of the ecological situations in which larvae and pupae had been found and in view of the well-developed ovipositor of the female, Gurney (*op. cit.*) concluded that the eggs of *Nallachius* are probably inserted into crevices in the wood of dead trees and that the larvae are probably predators of soft-bodied insects living within the galleries of the dead wood. This contention was considered to be strengthened by the fact that a majority of the adults of *N. americanus* which had been captured had been taken on or in close proximity to dead trees. The findings of the present writers substantiate these views.

PRELIMINARY RESULTS OF STUDIES

The additional knowledge which is reported in this paper has been made possible by clues supplied by Dr. J. G. Rozen, who in the spring of 1958 collected a short series of neuropterous larvae from dead trees. All but one of these larvae belonged to the genus *Lomamyia* of the Berothidae, a family related to the Dilaridae, while the remaining larva, collected from a similar situation, belonged to *Nallachius*. Dr. Rozen was kind enough to show the present writers the locale and microhabitat from which his *Lomamyia* larvae had been collected. Although subsequent collecting at a different locale did not immediately result in the discovery of any larvae of *Lomamyia*, it did produce numerous larvae of *Nallachius* from a slightly different microhabitat. There is no doubt that the accurate observations of Dr. Rozen have provided the needed key to a better understanding of the biology of both of these groups of Neuroptera.

Many subsequent collections by the authors during the months of April through June of 1958 and 1959 have yielded a total of thirty-nine larvae and two adult females of *Nallachius americanus*. One of these females was induced to lay fertile eggs in the laboratory. Twenty of the field-collected larvae were preserved for study and the remaining nineteen larvae were placed in 20 x 20 mm. and 20 x 50 mm. glass vials for rearing. These vials were cotton-stoppered and were filled to a depth of about one cm. with a mixture of plaster of paris and charcoal and this was kept moist in order to maintain the humidity. (See Rhode, 1956, for details as to the use of this mixture.) The vials were

kept inverted and the larvae stayed on or burrowed into the cotton. Eggs, disabled larvae and pupae of several different insects were provided as food and all were utilized by the *Nallachius* larvae. Eleven of the nineteen larvae spun cocoons and from these a total of six females and two males eclosed. Determinations were made from a study of these adults by the senior author using the key of Carpenter (1940). Although, so far as is known, the wing venation of *N. americanus* allows specific determinations, the genitalia of the two male specimens were removed and examined as a further check.

The material which has been collected and reared has made possible more-extensive studies on the morphology and ecology of *Nallachius*. These studies are now in progress and although knowledge of the details of the life cycle of this insect is still far from complete, certain of the more interesting features will be presented here.

Habitat.—The locale from which all of our collections were made is an extensive mixed deciduous woods in Washington, D. C., which, as near as can be determined, is at least seventy years old. The trees of the forest consist of a rich mixture of several species of oaks and hickories, tuliptrees (*Liriodendron tulipifera* L.), a few beech (*Fagus grandifolia* Ehrh.), and an occasional grey birch (*Betula lutea* Michx.). A few very tall and for the most part dead virginia pines (*Pinus virginiana* Mill.) are also present near the edges of the forest. The trees are very tall and straight with little in the way of branches for the first twenty-five to thirty feet. A well-developed understory of seedlings is present along with some large examples of flowering dogwood (*Cornus florida* L.) and, in the more open areas, clumps of mountain laurel (*Kalmia latifolia* L.). The composition of the floor of the forest is quite variable. During the season in which our collecting was done, many areas were covered with thick stands of may-apple (*Podophyllum peltatum* L.) while other areas were devoid of any herbaceous component. Still other areas supported luxuriant growths of poison ivy (*Toxicodendron radicans* (L.)).

The microhabitat from which all but two of the larvae have been taken is beneath the tightly adherent bark of erect, recently dead trees. In almost all cases it was found necessary to pry off the bark in small sections by means of a screwdriver. Larvae were usually found on the surface of the outer wood exposed by the removal of the bark and only very rarely would a larva be found on the piece of removed bark. The wood during the spring was frequently slightly moist from rain, but it was never soggy. The wood of these trees was quite sound with only a few superficial galleries of cerambycid larvae visible. The decay of the wood had not progressed to the stage where the first indication of termite damage was visible. Larvae were found most frequently in dead tuliptrees and in several species of oaks, red oaks (*Quercus rubra* L.) and black oaks (*Q. velutina* Lam.) being the most productive.

That the larvae are not confined exclusively to reasonably sound wood in the first stages of decay is evidenced by the microhabitat from which the remaining two larvae were taken. Both of these were taken from wood in a much advanced stage of decay, the first from the exposed outer wood of a tuliptree after the loosely hanging bark had been removed by hand, while the second was found on the wood under the loose bark of the stump of an unidentified species of oak. In both cases, the wood from which the larva was taken showed extensive damage from beetle larvae and termites.

Additional evidence that the larvae also occur in dead trees of advanced decay is provided by the circumstances of capture of the two adult females. In both cases, these were first observed walking about on a stump of much-decayed, crumbling virginia pine and in one case the female was seen to probe into various parts of the dead wood with her ovipositor for several minutes before she was captured.

Oviposition.—The presumably ovipositing female which was collected in the field was confined in a quart jar with several thin strips of dead wood from a tuliptree and overnight laid a minimum of fifty-eight eggs. The ovipositor of this species is quite flexible, its pliant movements reminding one somewhat of the freedom of motion of an elephant's trunk. With her ovipositor, the female would probe several mm. into the wood and upon locating a small space within the wood, would fill this cavity with up to fourteen closely packed eggs. A favorite site for oviposition seemed to be the small crevices which form between the annual rings during decay. The eggs are pale greyish-white with a very thin, unmarked chorion. At the anterior end, the snow-white micropyle forms a conspicuously rounded knob. The embryos seem to be rather resistant to the effects of distortion as many eggs were considerably deformed as they were forced into the spaces within the wood, with no apparent ill effects, since larvae hatched from nearly 100% of these eggs. The eggs required fifteen and one-third days to hatch at 80°F. As Gurney (*op. cit.*) suspected, the eggs are not stalked.

Feeding of the larvae.—Although numerous larvae of Cerambycidae (*Elaphidion* sp.), Curculionidae (*Herarthrum* sp. or near), Buprestidae (*Chrysobothris* sp.) and Xylophagidae (*Erinna* sp.) were taken in the vicinity of the *Nallachius* larvae collected in the field, in only one case was a *Nallachius* larva taken in close association with any insect on which it may have been feeding. In this case, as a piece of bark of a tuliptree was pried off, a large *Nallachius* larva was seen with its mouthparts adjacent to a large dead larva of *Elaphidion* sp. Both larvae were in a small chamber between the bark and the outer wood of the tree, this chamber being surrounded by compacted insect frass. In the laboratory, *Nallachius* larvae were seen to attack and feed on disabled larvae of the cerambycid *Elaphidion* sp. and the eucujid *Cucujus clavipes* Fabricius and in addition readily fed on eggs, larvae, and pupae of the ant *Camponotus castaneus* (Latreille). While

feeding, the larvae used the jaw on only one side of the head at a time, working the head from side to side until the jaw had penetrated the integument of the prey. The tips of the jaws are rather blunt and, judging from the difficulty which the larvae seem to experience in forcing their jaws into prey, their normal food must be either disabled, unable to move about, or must have a rather thin integument.

Ecdysis.—Larval ecdysis in this insect is accomplished by a transverse rent which extends all of the way around the body between the prothorax and the mesothorax. Thus when ecdysis is completed, the old integument of the head and prothorax is in one piece and the integument of the remainder of the body is in another piece. This mode of ecdysis is correlated with the lack of an ecdysial cleavage line on the rather well-sclerotized head and prothorax which contrast sharply with the more membranous nature of the integument of the rest of the body.

In this pattern of ecdysis, *Nallachius* differs from all other Neuroptera known to the writers, although it approaches the condition observed by us in many larvae of the Chrysopidae, which, also lacking an ecdysial cleavage line on the head, split the old cuticle transversely immediately behind the old head capsule. In the Chrysopidae, however, the transverse split occurs at the anterior end of a median dorsal rent which runs longitudinally over the thorax. In addition, the transverse portion of the split in larval chrysopids ends latero-ventrally, so that the head capsule of the exuviae remains attached ventrally to the remainder of the old integument.

Development of the Larva.—Judging from the fact that in our rearings larvae were observed to feed rather intermittently and to increase in size and weight quite slowly, the complete life cycle of this insect must occupy at least one year. The number of larval instars in *Nallachius* is definitely puzzling. In the majority of the families of Neuroptera there seem to be consistently two moults separating three larval instars. The only published exceptions occur in *Ithona fusca* Newman of the Ithonidae, which is reported to have five larval instars (Tillyard, 1922); and in *Conwentzia hageni* Banks (Quayle, 1912) and *Spilocoelis picticornis* Banks (Badgley, *et al.*, 1955) of the Coniopterygidae, for which four larval instars have been reported. Several large larvae of *Nallachius* were collected which moulted one and two times subsequent to their capture. In addition, one larva moulted three times, two larvae moulted four times, one larva moulted five times, one larva moulted nine times, and one larva moulted twelve times. These moults occurred regularly at intervals of from fifteen to thirty days. What is perhaps even more surprising is the fact that in several of these cases a series of regularly spaced moults occurred with no feeding having taken place during the intervening stadia. Thus, for example, the larva mentioned above which moulted twelve times was collected April 19, 1959, and was regularly provided with food until June 7 during which period it gained weight and moulted twice.

From this date until January 18, 1960, it was given no food at all, yet, although it continually lost weight, it moulted nine more times and died during the ecdysis following the tenth moult.

It should be noted that none of the larvae which showed a large number of moults ever spun a cocoon, although the significance of this fact is difficult to evaluate since, once the ability to moult without feeding was discovered, many larvae were consistently underfed in order to study this peculiarity. Of the eleven larvae which did spin cocoons, ten did so without any moulting after they were collected, the time elapsing between collection and spinning ranging from three to thirteen days (mean = 8.1 days). The eleventh larva moulted once twenty-five days after collection and spun its cocoon seventeen days after this. Most of these larvae were observed to feed to some extent prior to spinning.

It is possible that the abnormally high number of moults is an artifact arising from the conditions under which the larvae were reared and that under more natural conditions the number is lower. The meager data at hand do, however, suggest the hypothesis that under normal circumstances the moulting rhythm is independent of feeding, moults occurring periodically, and that the final number of instars through which any given larva passes is facultatively determined by the availability of food.

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SOME SPECIES DESCRIBED AS ICHNEUMONIDS BUT BELONGING
TO OTHER FAMILIES

(HYMENOPTERA)

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Prior to the publication of Gravenhorst's "Ichneumonologica Europaea" in 1829, the limits of the Ichneumonidae were vague, and older authors described a number of braconids, wasps, etc., as species of *Ichneumon*, *Ophion*, *Pimpla*, and other genera which now include only Ichneumonidae. Errors of this sort have fortunately been rare since the time of Gravenhorst.

The majority of the species erroneously referred to the Ichneumonidae have long since been placed in their correct families. A small residue, however, is still out of place, and some already taken out of the Ichneumonidae had this action in little known publications. I have recently had an opportunity to study ichneumonid types in Europe and to find the identity of some of these masqueraders. Below are taxonomic notes on these, which may be useful to other taxonomists. There is a smaller number of cases where species described in other families are actually ichneumonids. These are not discussed below, but some of them will appear in a forthcoming catalogue on the Ichneumonidae of the Oriental and Australian regions.

In 1792 Olivier described six Neotropic species of "*Ichneumon*" and in 1796 Lichtenstein described ten species in the same genus. Nine of Lichtenstein's species were from Surinam, the other without locality. Some of these sixteen are probably braconids, as the descriptions were published before braconids and ichneumonids were distinguished. The types of all of them are probably destroyed and none have been identified by later authors. The Olivier species involved are: *Ichneumon bellatorius*, *I. indagator*, *I. inquisitor* (a preoccupied name), *I. muncrator*, *I. scrutator*, and *I. suspicator*. The Lichtenstein species are: *Ichneumon constuprator*, *I. bidentator*, *I. fuliginator*, *I. cocculcator*, *I. formicator*, *I. acolorator*, *I. humeralis*, *I. annularis*, and *I. aethalurus*. About *Ichneumon suspicator*, Schulz states (1906, *Spolia hymenopterologica*, p. 129): "Es ist dies irgend eine winzige Braconide," but does not give his reason for thinking so. At present, nothing further can be stated about these.

While studying the Fabrician types in the Sehestedt and Lund collections in Copenhagen, I found that specimens from South America, collected by Schmidt, were often labeled "Essequibo" [British Guiana]. It appeared probable that all species described as South American by Fabricius and collected by Schmidt came from Essequibo, whether or not the types were actually labeled "Essequibo." So far as I recognized the species they were all from that part of South America and there seems no reason to doubt that the Schmidt material came all from one place. Although only the type locality "South America" as given by Fabricius is cited below, plus the actual

label on the type, one can assume that the correct locality is Essequibo, British Guiana.

The locations of the type specimens are indicated, in parentheses, by the names of the cities in which they are found.

Financial support for this work is from the Dow Chemical Company and the National Science Foundation.

Bassus spectator Fabricius, 1804. *Systema piezatorum* p. 100. [♂] Described from South America. Type: ♂, labeled "ex Am. mer. Schmidt" (Copenhagen). As far as known, all the Schmidt specimens came from Essequibo, British Guiana.

The type is a diapriid, subfamily Belytinae.

Ichneumon annulatus Fabricius, 1793. *Entomologia systematica* . . . 2: 179. [♂]. Described from "India Orientali." Type: ♂, without data, labeled "*B. annulatus*" in Fabricius' handwriting (Copenhagen).

This is a psammocharid of the subfamily Psammocharinae. Schulz (1912. *Berlin Ent. Ztschr.* 57: 73) calls attention to its proper family and synonymizes *Pompilus multipictus* Smith, 1879, with *annulatus* Fabricius.

Ichneumon assimilator Swederus, 1787. *Svenska Vetensk.-Akad. Handl.* 8: 280. ♂. Described from "America Septentr. Mus. D. Banks." Type: ♂, without data (London).

This is a braconid, as has already been stated by Morley (1909. *Entomologist* 42: 137). Mr. G. E. J. Nixon has looked at the type for me and states that it is probably an *Iphiaulax*.

Ichneumon dubitorius Fabricius, 1775. *Systema entomologiae* p. 331. ♀ Described from "nova Hollandia" [= Australia]. Type: ♀, without data (London).

The type is a braconid. Morley (1909. *Entomologist* 42: 134) has already stated that it is a braconid. Mr. G. E. J. Nixon has looked at the type for me and placed it near *Iprobracon*.

Ichneumon fulvus Fabricius, 1775. *Systema entomologiae* p. 341. [sex?]. Described from "America." Type: Lost, presumably destroyed.

The type was in the Drury collection and appears never to have been seen again after Fabricius first described it. The combination of characters given by Fabricius does not fit any ichneumonid that I can recall, but would agree moderately well with several braconids of the subfamily Agathidinae. Someone studying the Agathidinae may be able to decide what species should bear the name.

Ichneumon sericeus Fabricius, 1793. *Entomologia systematica* . . . 2: 189. [♂, ♀]. Described from "Insula Guadeloupe." Types: Eleven specimens of both sexes, all the same species, glued on a paper rectangle, without data but labeled "*sericeus*" in Fabricius' handwriting (Kiel, but on deposit in Copenhagen).

The types are a braconid of the genus *Apanteles*. Trentopohl (1829. *Isis, von Oken* p. 966) referred this species to the genus *Bracon* and redescribed the types,

but later authors seem to have overlooked his publication. Three different species of later authors with the name "*sericeus*" have been placed in *Apanteles*, which means that some name shifting is in order. Without knowledge of all the synonymy involved, and suspecting that the genus *Apanteles* must be subdivided, it seems best to leave the nomenclatural rectification to authors having greater familiarity with the braconids.

Lissonota semistriata Walker, 1874. *Cistula* Ent. 1: 305. ♀. Described from Japan. Type: ♀, labeled "Japan" (London).

This is a braconid of the subfamily Agathidinae. Morley (1913. *Entomologist* 46: 133) has referred it to the genus *Earinus*. Mr. G. E. J. Nixon has looked at the type for me and places it in the genus *Agathis*.

Ophion generator Fabricius, 1804. *Systema piezatorum* p. 135. [♂]. Described from "India orientali." Type: ♂, labeled "ex Ind. or. Daldorff" (Copenhagen).

The type is a braconid of the subfamily Agathidinae.

Ophion nigrator Fabricius, 1804. *Systema piezatorum* p. 140. "♀" = ♂. Described from South America. Type: ♂, labeled "ex Am. mer. Schmidt" (Copenhagen). This specimen is probably from Essequibo, British Guiana, which is the known origin of most of the Neotropical material collected by Schmidt.

The type is a braconid, genus *Aridelus*.

Ophion pennator Fabricius, 1804. *Systema piezatorum* p. 135. ♀. Described from South America. Type: ♀, labeled "Am. mer. Schmidt" (Copenhagen). This specimen came probably from Essequibo, British Guiana, which is the origin of most of the other Neotropical specimens collected by Schmidt.

The type is a braconid of the subfamily Agathidinae.

Ophion quaestor Fabricius, 1804. *Systema piezatorum* p. 132. ♀. Described from South America. Type: ♀, without locality label (Copenhagen). This specimen came probably from Essequibo, British Guiana, which is the origin of most of the other Neotropical specimens in the Schmidt collection.

The type is a braconid of the subfamily Macrocentrinae.

Pimpla meliorator Fabricius, 1804. *Systema piezatorum* p. 118. ♀. Described from South America. Type: ♀, labeled "Am. mer. Schmidt" (Copenhagen). This specimen came probably from Essequibo, British Guiana, which is the origin of most of the other Neotropical specimens collected by Schmidt.

The type is a braconid of the subfamily Spathiinae. Schulz (1912. *Berlin Ent. Ztschr.* 57: 72) also places this in the Spathiinae.

Pimpla necator Fabricius, 1804. *Systema piezatorum* p. 117. ♀. Described from South America. Type: ♀, labeled "Am. mer. Schmidt" (Copenhagen). This specimen came probably from Essequibo, British Guiana, which is the origin of most of the other Neotropical specimens collected by Schmidt.

The type is a braconid of the subfamily Spathiinae. Schulz (1912. *Berlin Ent. Ztschr.* 57: 72) also places this in the Spathiinae.

A NEW SPECIES OF WASP OF THE GENUS *DOLICHURUS* FROM
SOUTHERN MEXICO

(HYMENOPTERA: AMPULICIDAE)

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In February 1960, Howard E. Evans kindly sent me for study twenty-two males and one female of a species of *Dolichurus* that he had collected in the State of Morelos, Mexico, in 1959. These proved to belong to my recently described subgenus *Paradolichurus* and to be closely related to its type, *Dolichurus (Paradolichurus) californicus* Williams (1960), from Julian, San Diego County, California.

Dolichurus (Paradolichurus) morelensis Williams, n. sp.

(Figures 1-3)

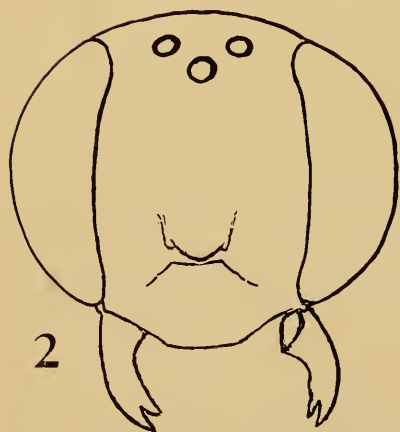
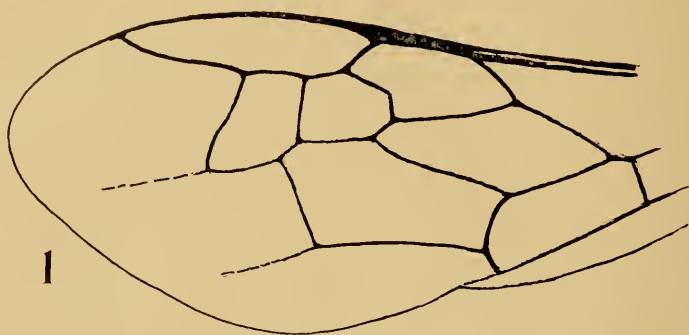
Female (holotype).—Length 6.25 mm. Shining. Head and thorax black, abdomen red; very pale creamy yellow markings as follows: on clypeus, base of mandibles, margining anterior portion of frontal platform, two narrow bands nearly meeting mesad on posterior part of pronotum, an area outwardly on coxae 2 and 3, and a large subdorsal spot on each side of tergite 1; terminal segments of legs dark brownish; venation dark testaceous to nearly black. Interocular space at clypeus wider than at vertex; mandibles apparently tridentate (mandibles closed); clypeus drawn out subtruncate mesad, shining, rather sparsely punctate; frontal platform shorter than wide, smooth on the white marking; antennae with segment 3 about $\frac{1}{5}$ longer than 4; frons almost uniformly sculptured up to the fore ocellus, the area with very fine chiefly parallel though irregular longitudinal carinulae, thus giving the sculpture a longitudinal flow or trend; there are some punctures in this reticulum of chiefly elongate cells. This longitudinal flow is also continued on the vertex to the occiput but here the sculpture is rather reticulate punctate. Ocellar triangle practically equilateral, the posterior ocelli being about $1\frac{3}{4}$ their diameter from the compound eyes. Pronotum rather finely and transversely carinate punctate and slightly depressed mesad posteriorly. Mesonotum shining, with about 30 longitudinal carinulae or fine ridges often forking, the intervening sulcae with a few punctures; there are no nautaulices and no definable parapsidal grooves. Metanotum sculptured about as in mesonotum, but with a narrow smooth median strip. Propodeum with the discal shield of well separated parallel carinulae, thence rugose and well rounded to the rather flattish long posterior face and with some coarse transverse carinae. Laterally, the thorax is largely horizontally striate, the mesopleurae irregularly striato-punctate, the mesoternum with heavy punctures. Tarsal claws small. Wings with the stigma small, sum of abeissae 1, 2 and 3 along the marginal cell very little exceeding the fourth abeissa to where it ends within the marginal cell; third submarginal only moderately narrowed anteriorly; first abeissa of basal vein about half as long as transverse median vein; anal lobe of secondaries very small and strap-like. Vestiture of wings of tiny dot-like setae. Abdomen smooth and polished, tergites 3-5 with fine punctures; a notch beneath between sternites 1 and 2. White pile chiefly on thorax.

Male (allotype).—Length 6 mm. Head, thorax and abdomen black, pale markings as in the holotype except that the mandibular spot is nearly obsolete, there is a transverse spot anteriorly on the metanotum, and the tibial spurs are whitish. Interocular space at clypeus and at vertex approximately equal; mandibles bidentate at apex; clypeus drawn out almost truncate mesad, the convex disc with strong punctures, especially at its dark base; antennae long, scape slightly shorter than article 3, articles 3 and 4 subequal; frons rather opaque, finely reticulate with a slightly transverse trend, on the more shining vertex and occiput the sculpture is more open and consists of separate punctures. Ocellar triangle slightly less than a right angle, posterior ocelli about their diameter distant from the compound eyes. Pronotum transversely reticulate-punctate, depressed mesad between the wide creamy spots and slightly anteriorly. Mesonotum without parapsidal furrows or notaulices, strongly punctured, but when viewed in lateral illumination the sculpture resolves itself largely into longitudinal fossulae or reticulations containing punctures, this furrowed effect however, being less close and distinct than in the holotype. Metanotum sculptured much as in the female. Propodeum in profile as in the holotype, the discal shield of well-spaced longitudinal carinulae, the slope transversely carinulate-reticulate, sides of the thoracic mass generally strongly punctured and with some horizontal carinulae, mesosternum with strong punctures. Wings as in the holotype, but their vestiture longer and hair-like. Body vestiture: Silvery pile rather long and dense on clypeus, face, genae, sides of thorax and posterior portion of propodeum.

Holotype, allotype, and 3 male paratypes, Huajintlan, Morelos, Mexico, IV-11-1959, 2800' (H. E. Evans); other paratypes, 1 male, S end of Cuernavaca, Morelos, Mexico, V-11-1959, 4500' (H. E. Evans). 2 males, 3 mi. N. Alpuyeca, Morelos, Mexico, 111-9, 1959, 3400', (H. E. Evans and D. M. Anderson), and 15 males, Lake Tequesquitengo, Morelos, Mexico, 111-16-1959, 2800', (H. E. Evans). Additional data (correspondence from Dr. Evans) are: "The series from Lake Tequesquitengo and from Huajintlan were both taken on dried leaves beneath large trees (live oaks?) which were dripping honeydew. Many other wasps were taken in both situations, especially larrids." Holotype and allotype deposited in the U.S. National Museum. (U.S.N.M. Type No. 65080).

Discussion:—There is some variation among the 22 males. Eleven of these lack the pale metanotal spot as described in the allotype, the first abscissa of the basal vein varies from about $\frac{1}{2}$ the length of the transverse-median vein to disappearing in being interstitial with it. There is some variability, not readily describable, in the sculpture. The males vary from approximately 4 to 6 mm. long. The unique female of *Dolichurus* (*Paradolichurus*) *morelensis* and of *californicus* are readily separable, one from the other. While the conformation of the clypeus and the frontal platform are similar in both species, *D. morelensis* has; a) much more developed creamy markings, there being none at all on the abdomen of *D. californicus*; b) in *D. morelensis* the third

submarginal cell is only moderately narrowed at the marginal cell, whereas it is strongly narrowed there in *D. californicus*; c) the sculpture of the frons and vertex of *D. morelensis* is finer than in *D. californicus*, the delicate generally parallel carinulations being arranged



Dolichurus (Paradolichurus) morelensis, n. sp., holotype (female). Fig. 1, forewing. *Dolichurus (Paradolichurus) morelensis*, n.sp., allotype (male). Fig. 2, head from in front; fig. 3, genitalia (camera lucida drawing).

in a longitudinal and obliquely longitudinal trend and enclosing usually long cells, the sculpture of *D. californicus* on the other hand, consists mainly punctate reticulations, the enclosures being more or less roundish, with the longitudinal trend being much less marked, and the vertex with discrete punctures; d) the sculpture of the meso- and metanotum is rather compactly longitudinally striate or carinate in *D. morelensis*, in *D. californicus* it consists of more widely spaced punctate foveae.

LITERATURE CITED

Williams, F. X., 1960. Wasmann Jour. Biol. 17(2): 229-303; figs. 1, 2, and 4.

**THE IDENTITY OF LYGAEUS SIDAE FABRICIUS, TYPE SPECIES
OF THE GENUS NIESTHREA
(HEMIPTERA: COREIDAE)**

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The classification of the genus *Niesthrea* is in a chaotic state and will remain so until type specimens of many species described by Signoret, Stål and others can be seen and the characters of the male and female genitalia described. However, thanks to the cooperation of S. L. Tuxen and Mrs. Ella Zimsen of the Universitetets Zoologiske Museum at Copenhagen, Denmark, I have been able to examine two of the four specimens that comprise the type series of *Lygaeus sidae* Fabricius. As a result it is now possible to establish the identity of *sidae* and describe as new a common United States species that has been erroneously placed under this name. The synonymy listed below for *sidae* is intended to show only the combinations in which the name has been used.

***Niesthrea sidae* (Fabricius)**

- Lygaeus sidae* Fabricius, 1794. Entomologia Systematica, Tom. 4, p. 169.
Coreus sidae Fabricius, 1803. Systema Rhyngotorum, p. 201.
Coryna sidae, Wolff, 1811. Icones Cineum descriptionibus illustratae, fasc. 5, p. IV. [*Coryna* Wolff, 1811 is a homonym of *Coryna* LeBosc, 1802—see Harris, 1942. Jour. Kans. Ent. Soc. 15: 63-64.]
Rhopalus sidae, Dallas, 1852. List of Hemipterous Insects in . . . British Museum, Pt. 2, p. 152.
Niesthrea sidae, Spinola, 1837. Essai Insectes Hémiptères, p. 245.
Corizus sidae, Signoret, 1859. Ann. Soc. Ent. France [III]7: 95.
Corizus (Niesthrea) sidae, Stål, 1870. Kongl. Svenska Vetensk.-Akad. Handl. 9: 223.
Niesthrea sidae, Harris 1943. Iowa State Coll. Jour. Sci. 17: 201-202.

Length including membrane.—Males: Average, 5.5 mm., range 4.8 to 5.0 mm. Females: Average, 6.5 mm, range 6.0 to 7.0 mm.

Width across humeral angles.—Males 1.8 to 2.2 mm.; females 2.1 to 2.5 mm.

Shape, elongate oval; body a little more than twice as long as greatest width across abdominal segments IV and V.

Head triangular, a little broader across eyes than long, ratio 19:17; bucculae elevated, tapered posteriorly, reaching anterior margin of eyes. Antenniferous tubercles scarcely visible from above and but slightly flared before anterior margins of eyes, apex of each tubercle not swollen (see fig. 1). Tylus reaching or slightly exceeding apex of first antennal segment, declivent and a little bulbous before apices of jugs. Jugs about half as long as tylus. Ocelli on elevated prominences, each of which is separated by a shallow groove from a similar prominence located behind inner hind angle of eye. Ratio of antennal segments 5:14:14:16. Rostrum almost reaching second abdominal conjunctiva; ratio of segments 10:11:9:13.

Pronotum with cicatrices impressed, smooth, widened laterally and curved anteriorly, margined in front by a low transverse ridge. Lateral margin carinate, impressed behind each cicatrix. Median longitudinal line raised. Humeral angles rounded laterally, elevated discally. Scutellum a little broader than long, apical third constricted, depressed and moderately excavated before acute apex. Hind angle of metapleurite rounded, disc convex; both meso- and meta-pleurites expanded beyond costal margin of hemelytron. Hemelytra with costal margins almost parallel, veins raised, opaque, enclosed cells hyaline; embolium opaque and widened apically, reaching anterior margin of abdominal segment VI; membrane hyaline, extending beyond apex of abdomen.

Abdomen with connexiva expanded, broadly exposed, widest at the fourth conjunctiva. Tergum of last abdominal segment produced, with apex broadly rounded, more narrowly so in males.

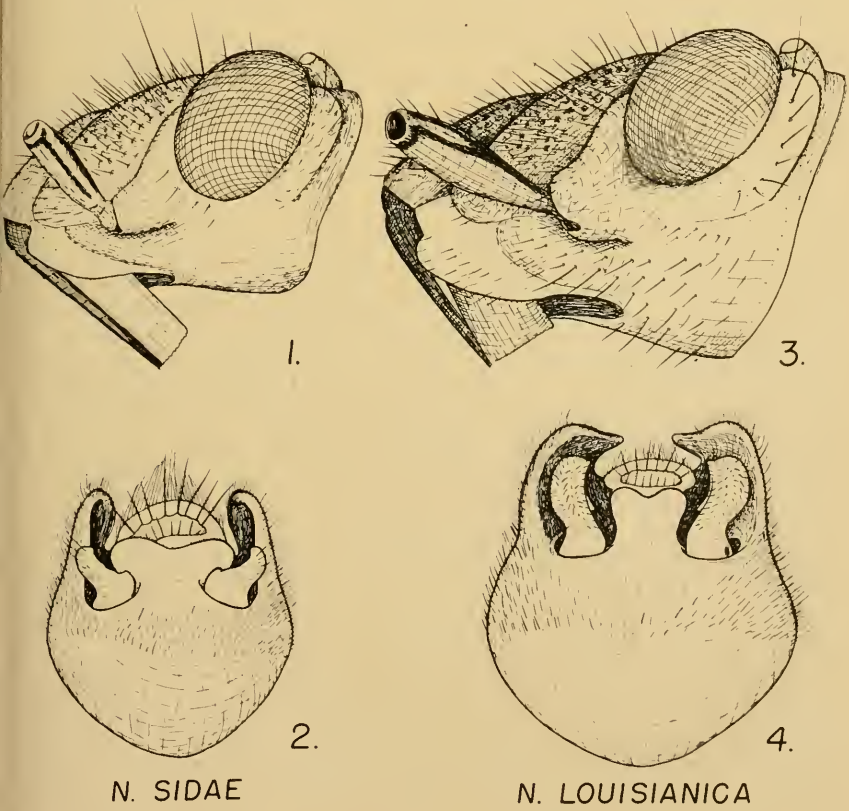
Male pygofer as shown in figure 2, median lobe of the posterior margin broad and noticeably constricted basally. The proportionately larger size of this lobe and its more broadly flared apex are perhaps the best characters for distinguishing *Niesthrea* from *Arhyssus*.

Color variable, ranging from gray through yellow to reddish yellow, usually with flecks to spots of brown or red scattered over pronotum, scutellum, pleura and venter of abdomen. Similar spots on veins of corium. In some specimens red spots on venter are concentrated into solid patches of color laterally, surrounding the pale margined spiracles. Lateral margins of segments IV, V, and VI often marked with fuscous, a darkened spot on each side of the median line of the head just behind the ocellus continued on the pronotum to the cicatrices. Dorsum of abdomen, typically with segment II darkened or even black, III pale except at middle, IV and V dark with median line tending to be paler, VI with broad median basal area and hind margin pale, VII pale except for dark median basal spot that in males tends to be attenuated toward and may attain apex of segment. Connexivum, with segments II and III, pale usually marked with red medially, IV, V, and VI fuscous to black, each with a transverse median spot and the anterior and posterior margins pale; VII pale, suffused with red medially. Legs pale with red, brown, or fuscous spots, which on the femora tend to form concentric rings with the apical pair on each hind femur usually continuous and sometimes fused to form a band.

Antenna generally pale with two narrow dark lines on dorsal surface of first segment diverging toward apex, each continuing as a narrow lateral line along sides of second and third segments; fourth segment fuscous or black, except for pale base and apex.

Head, pronotum, scutellum, and pleurites except broad hind margins of metapleura, deeply and closely punctured; tergites of abdomen with smaller but more closely spaced punctures. Connexiva and venter of abdomen smooth. Body generally, except for hyaline cells and membrane of hemelytra and tergum of abdomen, moderately clothed with pale pubescence.

Distribution.—Throughout the West Indies, the northern coastal regions of Venezuela and Columbia, Central America, and Mexico. In the United States the species seems to be restricted to Florida and



N. SIDAE

N. LOUISIANICA

Niesthrea sidae (F), Baracoa, Cuba. Fig. 1, lateral view of head; fig. 2, male pygofer. *Niesthrea louisianica* n. sp., Baton Rouge, La. Fig. 3, lateral view of head; fig. 4, male pygofer.

southeastern Georgia as far north as Sapelo Island, and to the area around Brownsville, Texas.

Type material.—According to information kindly provided by Dr. Tuxen, the ‘real type is in Fabricius’ own collection in Kiel which at present we have borrowed—besides this [type specimen] we possess three specimens belonging to the type material (originating from a collection which two of his [Fabricius’] pupils formed, and from which he described a lot of species marked in his books as originating from ‘Mus. D. Lund’ or ‘Mus. D. de Schestedt’.” Mrs. Zimsen wrote that the abdomen of the specimen in the Fabrician collection is missing. For my study she sent two specimens from the “Schester & Tønder Lund” collection which bore the label “Amer. Insul. Pflug, Mus. S. & T. Lünd, *Coreus sidae* Fab.” Both these specimens are females and appear to represent different species. One specimen is intact and the other lacks its head. The intact specimen is here designated as *lectotype*. It is paler and pigmented areas are fewer and smaller than is characteristic for the species. However, specimens in the U.S. National Museum from Cuba and Jamaica are similar, and one specimen collected “Near Santiago, Cuba, August 31, 1917, by Harold Morrison” has pigmentation identical with the *Lectotype*. This specimen has been labeled “Compared with *lectotype*.”

It is possible that the type material labeled “Amer. Insul.” originated in Cuba; however, Pflug spent the later years of his life on St. Croix, Virgin Islands, and died there in 1789. It is difficult to reconcile the data on the type material with that given by Fabricius in his description, where he records the species from “America meridionalis.” Perhaps this is an example of Fabricius’ tendency to indicate locality data in the most inclusive sense when he had material from several countries. If so, he may have had, or seen, specimens which he considered to be *sidae*, from continental areas of South or Central America. The name *Lygaeus sidae* may have been removed from the type material and replaced with *Coreus sidae* when Fabricius moved *sidae* to the latter genus in 1803.

The second specimen is almost devoid of pigmentation and agrees in all observable details with an example in the U.S. National Museum, collected Arreyo Arenas, Cuba, July 8, 1923, by S. C. Bruner. In addition to the difference in color, there are differences in the female genitalia which indicate that this second Fabrician specimen and the one collected by Bruner are not conspecific with the *lectotype*, but are a different and probably unnamed species. Although the two specimens from Fabricius’ collection belong in different species, the fact that the one selected as *lectotype* of *sidae* represents a species common in Cuba and the second is similar to an undescribed species known from a single specimen collected in Cuba suggests that both came from Cuba.

Discussion.—The literature concerning the species is much confused. Many of the synonyms listed under the name *sidae* unquestionably refer to different species, while many of the references to *pictipes*

Stål, 1859, should be referred to *sidac* as represented by the lectotype. The name *pictipes* was established for specimens reported to have come from "Insula Taiti, Buenos Ayeres et Rio Jaueiro." The Tahiti record is certainly erroneous, for there is no evidence that the genus *Niesthrea* occurs outside the Western Hemisphere. Since *sidac*, as recognized here, does not appear to occur south of the northern coastal regions of Venezuela and Columbia, *pictipes* is probably a name that should apply to one of the several species common in Brazil and Argentina.

Niesthrea louisianica, n. sp.

Similar to *sidac* in general habitus, but a little larger and the pigmentation generally darker, with color pattern showing more contrast and greater individual variation and the antennal tubercules more inflated. Males easily distinguished from those of *sidac* by the more elongate, blade-shaped parameres and the smaller, basally less constricted lobe on the posterior margin of the pygofer. The following description is concerned principally with the characters that differ from those of *sidac*.

Length, including membrane.—Males: Average 6.8 mm., range 6.0 to 8.0 mm. Females: Average 7.5 mm., range 7.0 to 8.5 mm.

Width at humeral angles.—Males 2.2 to 2.5 mm.; females 2.5 to 2.9 mm.

Head slightly broader than long (21:19); proportion of antennal segments as 6:16:16:17, antenniferous tubercule convex and slightly inflated along dorso-apical surface (fig. 3); rostrum with ratio of segments as 11:14:12:16, apex reaching to or beyond the second abdominal conjunctiva. Anterior lobe of pronotum convex almost nodulose laterad of the cecitricies, lateral margin raised, continuing around the posterior margin as a pale calloused line.

Male pygofer as shown by figure 4, the median lobe of the posterior margin shorter than the parameres, and with the sides straight or only slightly constricted toward the base.

Color yellowish to reddish testaceous, speckled with pigmented areas that may be reddish brown, sanguineous, or almost black. In some individuals the pronotum is suffused with sanguineous, leaving testaceous spots interspersed with fuscous spots involving one or several punctures. Each ocellar prominence bounded medially by a smooth fuscous or black band that is continued on the anterior lobe of the pronotum as a vitta-like spot. Pale median line of pronotum continued to apex of scutellum. Spots on veins of corium fuscous or black; embolium and apex of corium opaque, usually suffused with red. Underside of body with reddish flecks that often fuse to form spots or even bands of solid red. Spots on legs fuscous or black, usually fused to form 5 continuous rings around each femur and 7 around each tibia, the two apical rings on each femur usually connected along dorsal surface by a longitudinal line. Antenna with dark lateral lines as wide as the intervening pale areas. Rostrum with dark line from base to apex on lower side. Abdomen with tergite I black, II black with posterior margin pale, III pale, except for spot near posterolateral angle, IV black with pale anterior margin, V and VI black with pale longitudinal line across middle of V extended laterally along the fifth and sixth conjunctive, VII with black spot on disc, in males often extended to the base and sometimes to the apex. Connexivum pale with broad

dark bands across base and middle of segments IV, V and VI, these bands connected along inner and lateral margins, often fused to form 3 instead of 6 bands across each connexivum.

Head, pronotum and thoracic pleurites deeply punctured, the posterior lobe of metapleurite smooth. Dorsum of abdomen, except smooth seventh tergite, with smaller more closely spaced punctures. Most of the body surface, except hyaline cells of corium and membrane of hemelytra and the dorsum of the abdomen, with pale erect pubescence.

Distribution.—Found in association with malvaceous plants from Long Island, New York south along the eastern coast to Florida, and westward cross the Cotton Belt to the Huachuca Mts. of Arizona. In the Mississippi Valley the most northern record is Iowa City, Iowa.

Type material.—Holotype: ♂ Baton Rouge, Louisiana, Sept. 17, 1919, T. H. Jones, on okra pods. U.S. National Museum Cat. No. 64936 Allotype: ♀ same data. Paratypes:—ALABAMA: 1, Auburn, Aug. 4, 1896, C. F. Baker. ARIZONA: 4, Huachuca Mts., July, G. Beyer; 1, "Ariz." Uhler Collection; 2, July 9, Brooklyn Museum Collection: 54, July 8-29, 1905, H. G. Barber. ARKANSAS: 1, Ashdown, Sept. 21, 1904 W. D. Pierce; 4, Little Rock, Sept. 12, 1938, W. F. Turner, on *Hibiscus syriacus*. FLORIDA: 1, Pinellas Co., Dec. 16, 1929, B. P. Moora. GEORGIA: 1, Atlanta, Oct. 4, 1934, P. W. Fattig; 2, Sapelo Isl., Sept. 8, 1944, on okra, Special Survey No. 19860; 7, Savannah, Sept. 22, 1943, on white *Hibiscus*, Special Survey No. 4113; 11, Dec. 8, 1944, Special Survey No. 21716; 2, same data, on *Nerium* sp.; 1, Waverly, Sept. 28, 1943, on rose of Sharon, Special Survey No. 4262. IOWA: 1, Iowa City, Oct. 30, 1915, D. Stoner. KANSAS: 2, Riley Co., Oct. 18, F. Marlatt; 2, Aug. 25, Popenoe; 2, Sept. 7, Popenoe. LOUISIANA: 1, Baton Rouge, Sept. 17, 1919, on okra pod, T. H. Jones; 7, Sept. 3, 1919, on *Hibiscus lasiocarpus*, T. H. Jones; 3, Sept. 22, 1924, on okra, C. E. Smith; 16, New Orleans, May 10, 1922; 60, Opelousa, collected by C. R. Pilate in 1897 during the months of April, May and June; 1, Palmetto, July 2, 1897, G. R. Pilate. MARYLAND: 1, "Md." Uhler Collection. MISSISSIPPI: 1, "Miss.", W. H. Ashmead; 5, Natchez, May 16-22, 1909, E. S. Tucker. NEW MEXICO: 1, Dona Ana Co., July 27, 1954, R. E. Fye, swept from cotton; 2, Anthony, Aug. 18, 1944, on blackeyed pea, Special Survey No. 18711; 1, Tularosa, T. D. A. Cockerell. NEW YORK: 1, Riverhead, Long Island, May 17, 1954, Roy Latham. NORTH CAROLINA: 1, Wilmington, Oct. 1, 1919; 1, April 15, 1916, H. B. Barber; 5, Winston-Salem, Oct. 20, 1933, R. J. Campbell, on *Althea*; 2, New Bern, Nov. 3, 1944, on *Hibiscus*; 1, Ashville, Sept. 26, 1939, B. H. Wilford, on *Hibiscus*. OKLAHOMA: 1, Ardmore, Nov. 10, F. C. Bishopp; 1, Ponca City, Nov. 4, 1907. SOUTH CAROLINA: 11, York, Nov. 21, 1927, Mrs. J. Barron; 1, Charleston, Sept. 26, 1944, on okra, Special Survey No. 19054; 2, Pritchardville, Oct. 12, 1944, on okra, Special Survey. TEXAS: 1, Anahuac, Oct. 28, 1918, H. S. Barber; 1, Oct. 31, 1918, H. S. Barber, on okra; 1, July 24, 1918, E. L. Diven; 1, Aug. 1918, H. C. Hanson; 1, Brownsville, Jan. 22, 1936, P. A. Glick, on cotton; 5, March 20, 1908, W. D. Pierce on *Sphaeralcea angustifolia*; 1, Sept. 20, McMillan; 1, Feb. 25, 1942, *Abutilon hypoleucum*; 1, Jan. 16, 1942, *A. hypoleucum*; 1, March, 26, 1942, *A. hypoleucum*;

5, Oct. 2, 1939, L. C. Fife, on *Wissidula amplissima*; 2, May 11, 1939, O. D. Deputy; 1, Oct. 7, 1939, L. C. Fife on *Anodo pentachista*; 1, Mar. 27, 1942, on hollyhock; 3, June 1903, Brooklyn Museum Colln.; 3, June 1904, H. S. Barber; 1, Jan. 16, 1923, T. C. Barber; 8, collected by Townsend; 4, Esperanza Ranch; 3, Boerne, Oct. 6, 1905, F. C. Pratt; 1, Dallas, Aug. 27, 1908, E. S. Tucker, on *Abutilon*; 2, May 17, 1906, W. D. Pierce on *Callirrhoe involucrata*; 1, May 9, 1906, F. C. Bishopp, on *Amorpha fruticosa*; 1, Concan, June 4, 1933, P. W. Oman; 1, San Diego, Sept. 26, E. A. Schwarz; 1, Paris, Nov. 20, 1905, F. C. Bishopp; 1, Kerrville, May 30, 1906, F. C. Pratt; 1, Corsicana, July 24, 1906, F. C. Bishopp; 1, Columbus, April 6; 1, Sabinal, June 3, 1910, Pierce and Pratt; 1, Del Rio, May 1, 1907, F. C. Bishopp, on *Ratibida columaris*; 1, San Benito, Nov. 24, 1944, on potato, Special Survey No. 11770; 1, Corpus Christi, April 19, 1907, C. S. Spooner; 1, San Antonio, May 14, 1906, F. C. Pratt; 1, June 1, 1910, W. D. Pierce, on *Abutilon* sp.; 1, San Angelo, Sept. 27, J. C. Crawford, on cotton; 2, Smith Point, July 29, 1918, E. L. Diven, on *Hibiscus incanus*; 1, Kirbyville, March 21, 1908, E. S. Tucker; 1, Terrill, Sept. 12, 1904; 1, Alvin, April 6, 1905, A. W. Morrill, on strawberry; 10, Plano, Aug. 5, 1908, E. S. Tucker, on *Abutilon*; 1, Devils River, May 7, 1909, F. C. Bishopp, on *Sphaeralcea angustifolia*. VIRGINIA: 5, Norfolk, Oct. 28, 1937, L. D. Anderson, on rose of Sharon; 2, Sept. 27-28, 1933, L. D. Anderson, on rose of Sharon; 3, Oct. 10, 1933, L. D. Anderson, on rose of Sharon.

Discussion.—In both taxonomic and economic literature this species has usually been called *sidac* or *pictipes* Stål. Most records for *sidac* from Florida are probably correct, since *louisianica* seems to be rare in that state. Texas records for *sidac* from the Brownsville area may also be correct; however, *louisianica* is also common there, and unless specimens are rechecked such records must be treated as referring to both species. Readio (1928) published observations on the life cycle, as well as excellent illustrations of the adult and life stages of *louisianica* under the name of *Corizus sidac*. His specimens were collected near Lawrence, Kansas where he found nymphs and adults feeding on the seed pods of velvet weed, *Abutilon theophrasti* Medic.

The name *louisianica* has been applied to the species because C. F. Baker recognized that the long series collected by G. R. Pilate at Opelousa, Louisiana, was different from the "forms of the species abundant in West Indies, Mexico and South America," which he referred to as the "specific group, *pictipes* of Stål" (1908, Can. Ent. 40: 244), and in his collection he used the manuscript name *Nicsthrea pictipes* var. *louisianicus* Baker.

REFERENCES

- Baker, C. F., 1908. Preliminary remarks on American Corizini.—Canad. Ent. 40: 241-244.
- Readio, P. A., 1928. Studies on the biology of the genus *Corizus* (Coreidae, Hemiptera).—Ann. Ent. Soc. America 21: 189-201.

**STUDIES ON IDIOCERINAE LEAFHOPPERS: I. IDIOCERINUS BAKER,
1915, SYNONYM OF BALOCHA DISTANT, 1908, AND NOTES ON THE
SPECIES OF BALOCHA**
(HOMOPTERA: CICADELLIDAE)

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Through the kindness of Reece I. Sailer and J. P. Kramer of the Entomology Research Division, U. S. Department of Agriculture, a large collection of idiocerine leafhoppers has been made available to the author. This paper is the first of a series in which this material will be treated. In this paper *Idiocerinus* Baker has been reduced to a synonym of *Balocha* Distant. The genitalia of one of the two species described by Baker in *Idiocerinus* are illustrated. The second species is known only from females but is also transferred to *Balocha*. A new species of this genus from West Pakistan and another from Sarawak are described. *Balocha busonioides* Baker is removed from the genus and placed in *Pedioscopus* Kirkaldy.

In addition to the previously mentioned entomologists the author wishes to thank W. E. China of the British Museum (Natural History) for notes on the genotype of *Balocha* and for the loan of the Sarawak specimens here discussed.

Balocha Distant, 1908

Balocha Distant, 1908, Fauna of British India, Rhynchota—Vol. IV, Homoptera: 189.

Idiocerinus Baker, 1915, Studies in Philippine Jassoidea, IV. The Philippine Journal of Science X(6): 341.

Redescription of the genus:

Vertex short, about one third as long as pronotum; finely or very finely transversely rugose; anteriorly convexly rounded, hind margin parallel to anterior margin. Eyes close to hind margin of head. Head slightly or definitely wider than pronotum. Filament of antenna short, hair-like. Frons somewhat roundly inflated. Upper extremities of clypeus short and usually not very well defined, strongly bent mesad, in some species directed toward ocellus of opposite side thus giving the impression that the clypeus is broader than long, with clear or obsolete striae. Ocelli on face, closer to eyes than to each other. Clypellus as long as wide or slightly longer than wide, bell-shaped, slightly emarginate at tip. Lora reaching to about midway of lateral margins of clypeus. Pronotum with anterior margin convexly rounded; sides moderately long; hind margin concave; shorter than scutellum (40:30). Scutellum subtriangular, slightly broader than long (50:40). Legs of moderate length, strongly spinulose on the four edges. Mesothoracic wings much longer than abdomen, abdomen reaching to apex of clavus or slightly beyond; wing venation as in figure 1; appendix broad, reaching to third apical cell; costal margin convex; with four apical cells, the third pedunculate in the known species.

External female genitalia.—Seventh segment slightly longer than sixth, caudal margin slightly concave or slightly produced and concave medianly; valves slightly longer than abdominal sterna together; with a few setae or fine spines near apex; ovipositor slightly longer than valves, narrow, upcurved apically, glabrous.

Male genitalia.—Valves upcurved on lateral aspect, spatulate, upper margin on apical half with very long hairs, hairs longer than depth of valve; with a small globular elevation on upper margin near base (fig. 21). Aedeagus with basal half or two thirds consisting of a more or less cylindrical shaft; apical portion flattened laterally and expanding apically along the median line, with a spine on each side of the anterior and posterior upper angles, the spines on the posterior angle usually longer than those on the anterior, both pairs of spines pointing to base of aedeagus. Gonopore opening apically, slit-like (fig. 18). With an upwardly bent, short, shelf-like structure on each side where the apical and basal portions meet (figs. 6 and 20). The tenth tergum with a ventrally produced lobe each side of the median line (fig. 14), the lobes reaching down to the shelf-like lateral projections of the aedeagus. Connective V or Y-shaped (figs. 11 and 17), caudal end slightly bent upward, aedeagus not fused to caudal end, freely movable. Pygofer shorter than deep; caudal margin convex, undulate or notched. Styles: anterior end flattened laterally, fin-like; posterior end with a hooked process on inner margin extending dorsad and caudad, its apex curved lateroventrad, with a row of spiny or conical elevations pointing ventrad or mesad; the outer side of the posterior end produced as an outer shelf; lower on the shaft than the inner process. This is the common or usual form in the *Idioerinae*.

Type of genus: *Balocha tricolor* Distant 1908. Described from India and Malaya; Tenasserim and Myitta (India).

The known species of *Balocha*, on external appearance, seem closer to the group of species of *Pedioscopus* Kirkaldy having the third apical cell pedunculate. The upper extremities of the clypeus of *Balocha* are short, not well defined, strongly bent mesad, and in some species directed toward the ocellus of the opposite side. In *Pedioscopus* the upper extremities of the clypeus are directed toward the inner margin of the ocellus of the same side. The aedeagi of these two genera are different as can be seen from figures 10 and 22. The absence of subapical cells and the shape of the aedeagus will separate *Balocha* from other genera.

Balocha tricolor Distant, 1908

Balocha tricolor Distant, 1908, Fauna of British India, Rhynchota, Vol. IV, Homoptera: 189.

I have not been able to see the type material. For this reason Distant's description is quoted verbatim: "Vertex and face orange-yellow (with a pale yellow inverted semicircular band on face including ocelli), base of vertex between eyes virescent; pronotum with the anterior area bright testaceous, the posterior area and lateral margins virescent; scutellum bright testaceous; body beneath and legs pale ochraceous; tegmina with the apical pale fuliginous with a black apical spot, the costal area to a little beyond middle broadly orange-yellow,

claval area testaceous red, its inner margin virescent and again outwardly margined with testaceous red; eyes piceous."

Dr. W. E. China kindly examined the type material (all females) and furnished the following additional information: "There is a bright vermilion stripe down the anal margin of the clavus and along the claval suture. Between these stripes, that is, on the sutural half of the clavus, is a clear pale yellow stripe. The costal half of the tegmen is bright translucent orange becoming paler towards the apex of the tegmen. Black apical spot of the tegmen is larger than in (*Balocha pallida* n. sp. described below). The anterior half of the pronotum is bright vermilion and there is a vermilion crescent on the vertex."

Length including tegmen 4 mm. Described from Tenasserim; Myitta (Doherty collector).

Type of the genus. Described from female material. Deposited in the British Museum (Natural History).

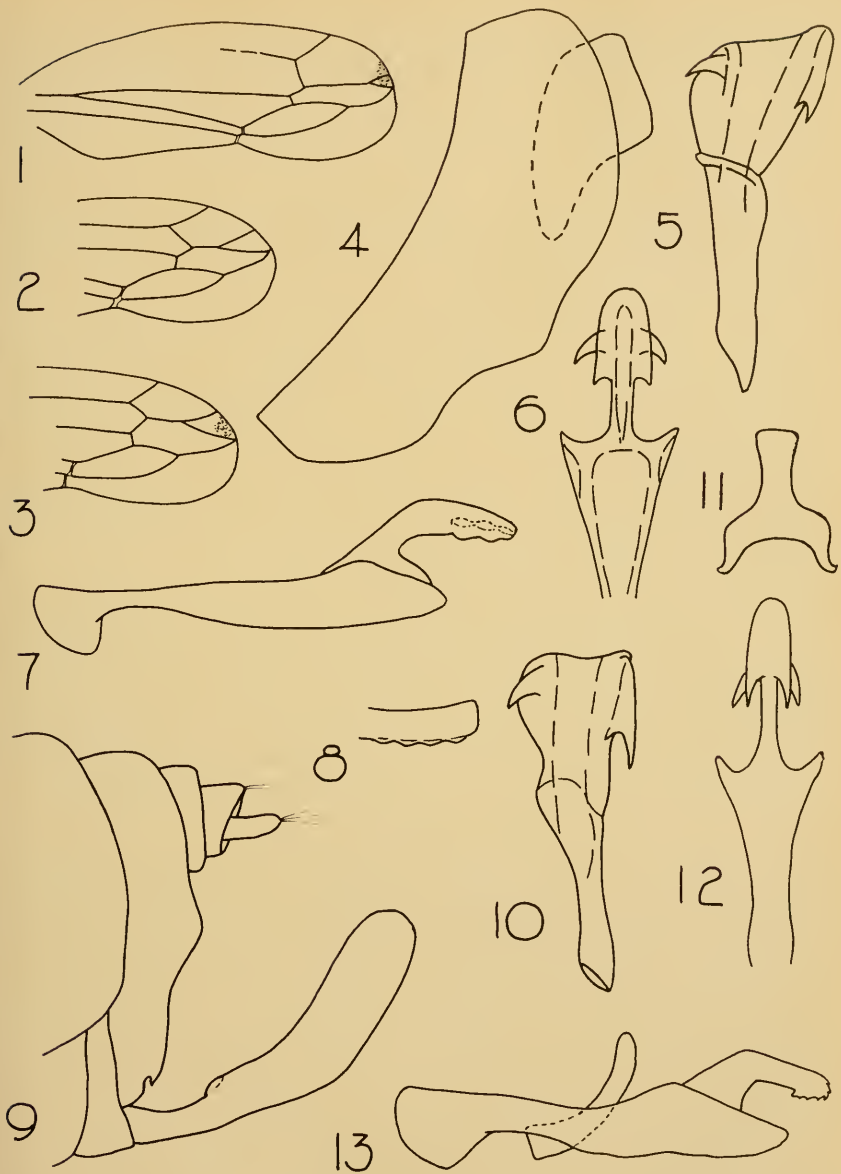
Belongs in the same group with *Balocha lucida* n. sp. and *B. pallida* n. sp. Very similar in coloration to the first from which it can be separated by the yellow inverted semicircular band on face.

Balocha lucida, sp. nov.

This species is being described for the purpose of giving a name to some material from Sarawak belonging to the British Museum (Natural History). Male specimens from India or the type locality of *Balocha tricolor* Distant may prove this species to be identical with *B. lucida* sp. nov.

Female.—Vertex short, about one third as long as pronotum; finely transversely corrugated, anterior margin convexly round, anterior and posterior margins parallel; eyes extending slightly beyond lateral margins of pronotum. Face near crown transversely corrugate, remaining portion of face shagreen. Upper extremities of clypeus short, pointing to slightly above ocelli on opposite side; clypeus inconspicuously obliquely striate; the clypeus octagonal in appearance. Clypellus bell-shaped, as long as wide. Lora reaching to about middle of lateral margins of clypeus, slightly elevated. Head across eyes wider than from crown to apex of clypellus. Pronotum almost two and one half times as broad as long (61:25), hind margin broadly and shallowly concave. Scutellum triangular, slightly broader than long. Wing venation as in figure 1; tip of abdomen reaching to near base of apical cells; third apical cell pedunculate, peduncle one and three fourths times longer than cell. Vertex anteriorly with transverse bright orange-red band, posteriorly straw or yellow colored. Face straw colored, excepting

Balocha lucida, n. sp. Fig. 1, forewing venation; fig. 4, lateral view of pygofer; fig. 5, lateral view of aedeagus; fig. 6, rear view of aedeagus; fig. 7, lateral view of left style; fig. 8, ventral view of apex of left style. *B. nacreatus* (Baker). Fig. 2, venation of apical half of forewing. *B. pallida* n. sp. Fig. 3, venation of apical half of forewing; Fig. 9, lateral view of male genital capsule; fig. 10, lateral view of aedeagus; fig. 11, ventral view of connective; fig. 12, rear view of aedeagus; fig. 13, lateral view of left style and connective in place.



a bright orange-red narrow semicircular band close to upper margin. Anterior half of pronotum, except on lateral margins, bright orange-red; posterior half and lateral margins straw or yellowish colored. Scutellum bright orange-red. Thorax ventrally and laterally, legs, and abdomen ventrally yellowish. Forewing mainly translucent; with inner longitudinal half of clavus bright orange-red, outer half of clavus pearly white; membrane area adjacent to claval suture bright orange-red to near apex of clavus; costal margin narrowly golden yellow; other portions of corium translucent. Veins on basal half of wing inconspicuous and concolorous with membrane; on apical half sharply defined and brownish; pedunculate cell totally covered by a black spot that extends into the fourth apical cell. Ovipositor shiny brown.

Female genitalia.—Hind margin of seventh abdominal sternum slightly convex.

Male genitalia.—Pygofer with caudal margin undulate. Aedeagus with caudal spines of apical portion as long as apical portion; spines on opposite side shorter than apical spines. Spiny portion on apical inner projection of style pointing mesad. Figures 4 to 8.

Balocha lucida, n. sp., is closer to *B. tricolor* than to the other known species. The absence of a yellow inverted arc across face and the presence of a bright or pale reddish arc on face above ocelli in *B. lucida* suffices to separate it *B. tricolor*.

Holotype male: deposited in the British Museum (Natural History). From Sarawak, collected at the foot of Mt. Dulit, near the junctions of river Tinjar and Lejak; 31. viii. 1932, Oxford University Expedition, B. M. Hubby and A. W. Moore collectors. B. M. 1933-254.

Allotype female: same locality and collectors. 29. viii. 1932. Also in the BM(NH). Paratypes: four specimens in the BM(NH).

Balocha pallida, sp. nov.

Male.—Head mainly orange-yellow; hind margin of head, gena, clypeus, and clypellus pale yellow. Eyes black; ocelli orange yellow, inconspicuous. Pronotum orange yellow, hind margin pale yellow. Scutellum orange yellow, slightly paler toward apex. Thorax ventrally and legs pale yellow; legs with last few spines on all rows on tibiae and all on tarsi brown. Abdomen ventrally yellowish, dorsally orange, genital segments pale yellow, tip of aedeagus brown. Wing with costal area to base of outer apical cell and inner margin of clavus yellow, remaining portions translucent; veins concolorous on basal half of wing, on apex light brown, with a round dark brown spot on third or pedunculate cell. A very small brown spot on base of appendix. Vertex one third as long as pronotum, very finely transversely corrugate; eyes extending slightly beyond lateral margin of pronotum; upper lateral margin of clypeus obsolete, pointing to slightly above ocellus of opposite side, inconspicuously obliquely striate. Face shagreen. Clypellus slightly longer than wide, lateral and apical margins concave. Lora with lateral margin elevated and well defined to about middle of lateral margin of clypeus. Scutellum slightly broader than long. Wing venation as in figure 3; with third apical cell pedunculate, the peduncle nearly a third as long as the cell.

Male genitalia.—Aedeagus similar to that of *Balocha lucida* n. sp.; style with spiny area of inner caudal projection pointing ventrad. Pygofer with a rounded projection pointing mesoventrad near base. Connective Y-shaped. Figures 9 to 14. Length, 4 mm. to 14.

Female.—Coloration and proportions as in the male; ovipositor brown; external genitalia as in figure 15. Length, 4.2 mm.

Balocha pallida, n. sp., is in the same group as *B. tricolor* Distant and *B. lucida* n. sp. but contrary to the last two species the stripes and bands are not in contrasting colors but more or less blended. The peduncle of the third apical cell is shorter than the cell in *B. pallida* n. sp. and longer than the cell in *B. lucida* n. sp.

Holotype: male, deposited in the USNM, Cat. No. 64923. Collected in Lahore, West Pakistan, March-September 1958, J. Maldonado-Capriles collector.

Allotype: female in the USNM, same collecting data as for holotype. Paratypes: eleven specimens of both sexes; two in the BM(NH), two in the USNM, and the remaining in the author's collection; same data as for types.

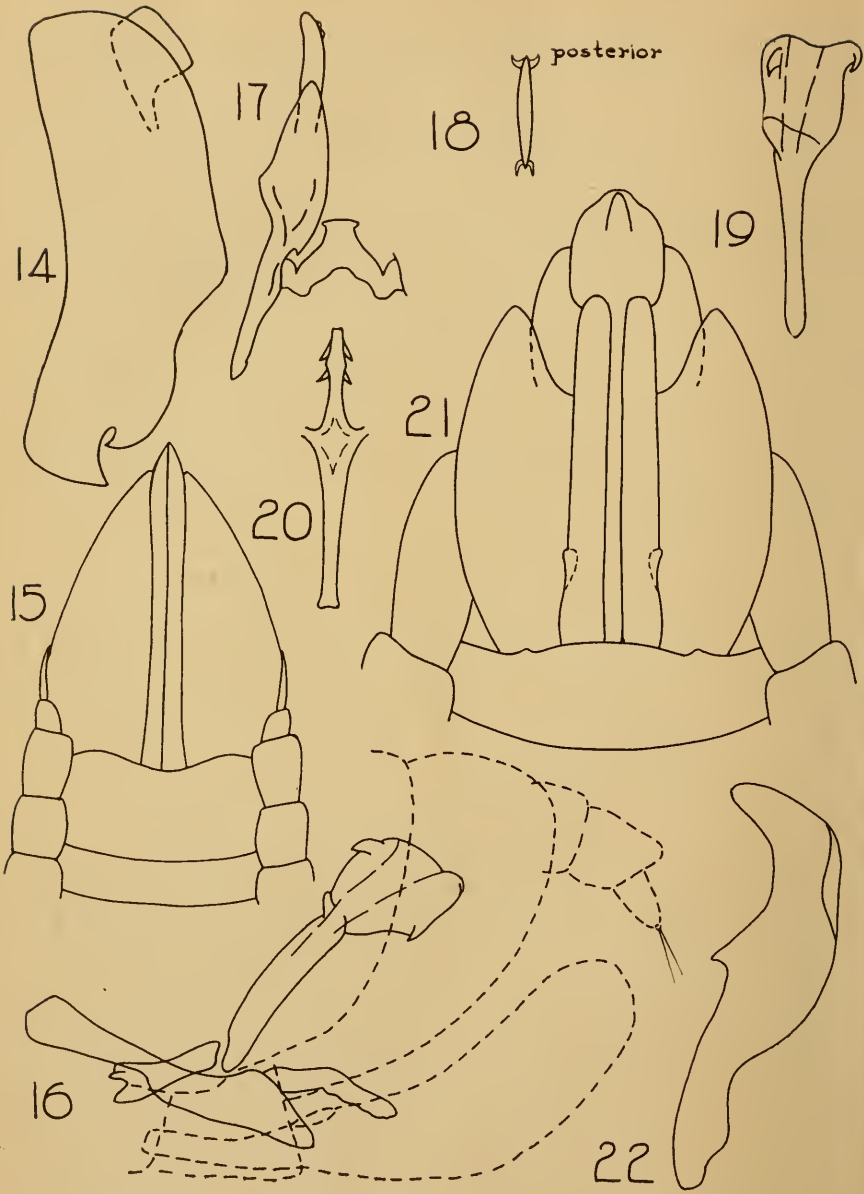
***Balocha melichari* (Baker, 1915), n. comb.**

Idiocerinus melichari Baker, 1915, Philippine Journ. Sci. X (6): p. 341.

Baker's description copied verbatim is as follows: "Length 4 mm.; width of head 1.3 mm. Ochraceous, tinted with reddish brown on pronotum and scutellum. Tegmina semitransparent; corium very slightly tinted with pale brownish, only the inner veins distinct, the median vein broadly blackened throughout its length; clavus opaque golden brown; punctures obsolete.

Vertex, and face to near ocelli, sharply and strongly cross striate, the striae on face strikingly oblique (a rare condition in the Idiocerini); length of vertex into width between eyes about five times, the length at middle very slightly greater than that at eyes. Face about as broad as long; distance between ocelli once and a half the distance between ocelli and eyes and about once and a half width of clypeus at base, clypeus very short, broadened toward tip, where it is slightly emarginate; lora as long as clypeus, about two thirds as wide, and with outer margin incurved. Width of pronotum two times the length, the length three and a half times that of the vertex; surface very finely shagreened. Scutellum very finely shagreened, the impressed line very inconspicuous and nearly straight; the length equaling that

B. pallida n. sp. fig. 14, lateral view of pygofer; fig. 15, ventral view of abdomen of female allotype. *B. melichari* (Baker). Fig. 16, lateral view of male genital capsule and internal genitalia; fig. 17, ventral view of left style and connective; fig. 18, gonopore as seen from above of aedeagus; fig. 19, lateral view of aedeagus of another specimen from the type locality; fig. 20, rear view of same aedeagus; fig. 21, ventral view of male genital capsule. *Pedioscopus busonioides* (Baker). Fig. 22, lateral view of aedeagus of holotype.



of pronotum; corium with second apical cell pedunculate. Hind margin of anal segment of female truncate. Pygofer of male with slender bases, gradually narrowed apically where the tip is upturned.

LUZON, Mount Maquiling (Coll. Baker)."

The type of this species is a female. Males were found in the type series and the male genitalia are described herein: hind margin of pygofer almost evenly semicircular. Aedeagus similar to that of *Balocha pallida*, n. sp., and *B. lucida*, n. sp. Two externally very similar specimens show great variation in the aedeagus as can be seen from figures 16, 19, and 20. Inner caudal projection of style slightly longer and more extensively spined than in the latter species. Other details of the genitalia as in figures 16 to 20.

The two known Philippine species, *Balocha melichari* (Baker) and *B. nacreatus* (Baker), are characterized by having gray or smoky forewings instead of hyaline and clear as in *B. tricolor* Distant, *B. pallida* n. sp., and *B. lucida*, n. sp. These two species can be separated by the characters given in the key.

The seven specimens at hand of *Balocha melichari* show striking variation in coloration. The most constant color character seems to be the "median vein broadly blackened throughout" but even this is lacking in one of the specimens. Another good pretty constant character, not mentioned in Baker's description, is the whitish scutellum that contrasts with the dark forewings. One of the female specimens is totally different in lacking the blackened vein and in being colored much like *Balocha tricolor*. All these specimens come from the type locality.

***Balocha nacreatus* (Baker, 1915), n. comb.**

Idiocerinus nacreatus Baker, 1915, Philippine Journ. Sci. X(6):342.

Baker's description follows: "Length, 4 mm.; width of head, 1.3 mm. Head, thorax, and legs pearl white, tegmina semitransparent, with basal third washed with orange, postnodal veins orange.

Head sculptured as in *I. melichari*; length of vertex into width between eyes about three and one third times, length at middle distinctly greater than at eyes. Face about as broad as long, distance between ocelli once and a half the distance between ocelli and eyes and once and a half the width of clypeus at base, clypeus as in *I. melichari*; lorae as long as clypeus and about two thirds the width, the outer margins not incurved. Width of pronotum two and a fourth times the length, the length two and a half times that of vertex, surface finely shagreened. Scutellum as long as pronotum and one half of vertex together, sculptured as in *melichari*. Corium with second apical cell pedunculate. Genitalia of female as in *melichari*, but side plates strongly, discally carinate.

Luzon, Mount Maquiling (Coll. Baker)."

Specimens of this species have not been examined. Baker separates *I. melichari* from *I. nacreatus* as follows:

- "a¹. Head and pronotum shining ochraceous, the latter and scutellum tinted with reddish brown; tegmina smoky, the veins concolorous; hind margin of anal segment of female truncate, the side plates not carinate
.....*melichari* sp. nov.
- a². Head and pronotum shining pearly; tegmina subhyaline, the veins basally orange; hind margin of anal segment of female medially produced and emarginate, the side plates strongly carinate*nacreatus* sp. nov."

***Pedioscopus busonioides* (Baker, 1915), n. comb.**

Balocha busonioides Baker, 1915, Philippine Journ. Sci. X(6): 330.

The male genitalia of the holotype shows that this is a *Pedioscopus* species and not a *Balocha*. Figure 22 illustrates the aedeagus of this species.

KEY TO THE SPECIES OF *BALOCHA* DISTANT, 1908

1. Wings smoky and with a median longitudinal vein broadly blackened throughout. Pronotum uniformly reddish or orange reddish (Philippines) ***Balocha melichari*** (Baker, 1915)
Wings hyaline or subhyaline, not smoky; only with a small blackish spot on pedunculate apical cell. Pronotum if reddish or orange reddish then with caudal margin yellow 2
2. Species conspicuously banded with red or orange-red and yellow 3
Pale species, pearly or pale yellow 4
3. With an inverted yellow arc across face including ocelli (India)
..... ***Balocha tricolor*** Distant, 1908
With a pale or bright reddish arc on face above ocelli (Sarawak)
..... ***Balocha lucida***, n. sp.
4. Shining pearly; forewings hyaline, veins basally orange, pedunculate cell with peduncle much shorter than cell; hind margin of anal segment of female medianly produced and emarginate; (Philippines)
..... ***Balocha nacreatus*** (Baker, 1915)
Pale straw colored; veins of forewing concolorous with wing, pedunculate apical cell with peduncle slightly shorter than cell; hind margin of anal segment of female emarginate; (West Pakistan)
..... ***Balocha pallida***, n. sp.

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SOCIETY MEETINGS

699th Regular Meeting, May 4, 1961—The 699th regular meeting of the Society was called to order by the President, J. F. Gates Clarke, on May 4, 1961, at 8:00 p.m. in Room 43 of the U. S. National Museum. Thirty-four members and 28 guests signed the register. The minutes were approved with one change.

Harold G. Alford, *Homer V. Autry*, and *Jane Carr* were presented as candidates for membership. *Howard R. Bullock* was accepted as a member.

Helen Sollers called attention to the annual picnic which will be held at Log Lodge, ARC, June 7, at 5:00 p.m. William E. Bickley announced the next meetings of the Washington Academy of Sciences on May 18 and June 11 and urged ESW members to attend.

William E. Bickley reported the occurrence of *Aedes thibaulti* (Dyar & Knab) as a new record for Maryland. Larvae were collected in Dublin Swamp, Somerset County on April 27, 1961, by Stanley R. Joseph, who reared two males from the larvae.

Karl Krombein exhibited a "picture" formed by an arrangement of detached wings of butterflies. The picture had been presented by a Japanese friend.

Four area students presented and discussed their science projects: *Gwynne Helene Lourie*—"Insect Eradication through Sterilization by Irradiation"; *Donna Hughes*—"Collecting Night-flying Insects"; *Delman J. Edwards*, "Are You Attracting Roaches?"; and *Kenneth Frank*—"What Promotes Changes in Color within a Single Species of Butterfly?"

The speaker for the evening, Captain John E. Scanlon of the Walter Reed Army Institute of Research, reported on his studies on *Culicoides* in Maryland. Of the 33 species of *Culicoides* found in Maryland, 6 were new. The discussion was well organized, clearly presented, and well received.

Among the visitors introduced were *Dr. Robert J. Byrne* and the parents of the Science Fair Exhibitors: *Mr. and Mrs. Edward J. Edwards, Jr.*, *Mr. and Mrs. Irvin M. Lourie*, *Mr. and Mrs. Isaiah Frank*, and *Dr. and Mrs. John Hughes*.

The meeting was adjourned at 10:00 p.m. In the absence of the Recording Secretary, the minutes were taken by the Corresponding Secretary, Dr. Paul A. Woke.—ERNESTINE B. THURMAN, *Recording Secretary*.

700th Meeting, June 7, 1961—The annual picnic was held jointly with the Insecticide Society of Washington at the Log Lodge, Agricultural Research Center, Beltsville, Maryland, on June 7 from 5:30 to 9:00 p.m. Contests and games, followed by a smorgasbord, were enjoyed by the members of the societies and their guests.—ERNESTINE B. THURMAN, *Recording Secretary*.

701st Regular Meeting, October 5, 1961—

The 701st regular meeting of the Society was called to order by the President-elect, Harold H. Shepard, on October 5, 1961, at 8:00 p.m. in Room 43 of the U. S. National Museum. Thirty-eight members and 31 guests were present. The minutes were approved as read.

Three new members were: *Jane Carr*, *Homer V. Autry*, and *Harold G. Alford*. Names of five candidates for membership were read: *Thomas J. Henneberry*, *Herbert E. Wave*, *Robert J. Lyon*, *Donald E. Ullrich*, and *John E. Lane*.

Curtis Sabrosky in reporting on the Tenth Pacific Science Congress brought greetings from Paul W. Oman, Past President of the Society. Mr. Sabrosky showed a Kodachrome slide of Dr. Oman in a typical Hawaiian setting.

Thomas E. Snyder commented on the Fourth Congress of the International Union for the Study of Social Insects which was convened at Pavia, Italy, September 9-14, 1961.

Harry D. Pratt, CDC, Atlanta, Georgia, showed pictures of the new buildings of the Communicable Disease Center which were dedicated in 1960.

Ashley B. Gurney exhibited specimens of a bark louse (Psocoptera, genus *Paramphictomum*), a rock-inhabiting species found in Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia. Its nearest relatives are found in Ceylon and Japan.

Kellie O'Neill exhibited two species of thrips "bathing," an activity which she found could be provoked by introducing water into the vial holding the thrips after the specimens had been kept under conditions drier than optimum.

Helen Sollers announced the pending meeting of the American Society of Tropical Medicine & Hygiene which will be held at the Willard Hotel, Washington, D.C., November 1-4, 1961.

The guest speakers presented interesting lectures well illustrated with Kodachromes. Ross H. Arnett, Jr., Department of Biology, Catholic University, discussed the ecology of the tarnished beetles of the genus *Oxaxis*. David C. M. Manson, New Zealand Department of Agriculture, Levin, New Zealand, selected "Some New Zealand Insects" as his title.

A number of visitors and new members were introduced. The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary*.

PUBLICATION DATE

The date of publication of Vol. 63, No. 3, of the *Proceedings* is 22 Nov. 1961. The date of publication of Vol. 63, No. 4, will be found in Vol. 64, No. 1.

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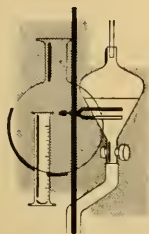
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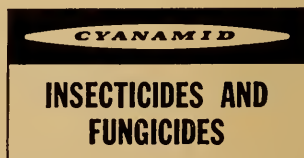
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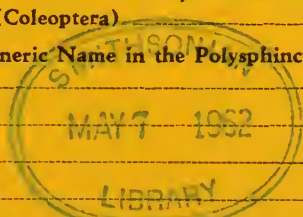


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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 64

MARCH, 1962

No. 1

SOME ACARIDAE FROM BEES AND WASPS

(ACARINA)

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While studying the biology of various species of bees and wasps, K. V. Krombein of the U. S. Department of Agriculture collected many mites living in association with these insects. Most of the mites belonged to the family Saprogllyphidae, and have been described in another paper. Those described in this paper, however, are members of the family Acaridae, even though they may superficially appear to belong to the Saprogllyphidae. Adults, as well as hypopial nymphs, were obtained in three of the four species studied. The hypopial nymphs are quite distinct generically, but the adults are more or less nondescript. Consequently, the genera and species are based upon the hypopial forms. The biological notes on these mites and their hosts are discussed by K. V. Krombein in the following paper; rearing nest numbers are given here for correlation with his studies. I wish to take this opportunity to thank A. M. Hughes of London for her help.

Genus *Horstia* Oudemans, 1905

Zakhvatkin (1941) stated that the adult of *Horstia* was known from only one species, *Horstia trifilis* (Canestrini), and that it was superficially described. The female lacked genital discs, but this statement is considered doubtful since these discs are typical for the Acaridae, and the male and female here studied possess these organs. The hypopus has a distinctive dorsal reticulate pattern, the gnathosoma consists of two setal bearing tubercles; and the generalized adults possess bifurcate pseudostigmata.

Previously, the genus had been placed in the Chaetodactylinae (Glycyphagidae) (Zakhvatkin, 1941), and later in the Saprogllyphidae (= Ensliniellidae) (Baker and Wharton, 1952). The presence of the empodial rods, however, necessitates placing these mites in the Acaridae.

SATURNIUM INSTITUTE MAY 2 1962

Horstia virginica, new species

(Figs. 1-11)

Hypopus.—Propodosoma lightly reticulate, setae strong, anterior propodosomals long, strong. Hysterosoma longitudinally marked dorsomedially, tuberculate latero-posteriorly; dorsomedial setae strong, marginal setae weaker. Ventrally, coxal apodemes enclosed as figured; suctorial plate simple, with three pairs of large discs; gnathosoma consisting of two tubercles with setae. All tarsi with empodial claws well set into tarsi; empodial rods present although not conspicuous; tarsi of legs I, II, and III with 4 lanceolate setae each; tarsus IV with 4 long whiplike setae; legs strongly sclerotized. Total length 350 μ ; width 178 μ .

Adults.—Male and female similar. Tarsus I sensory rod tapering to point. Male with distinct propodosomal shield; female shield indistinct. Setal pattern of both sexes as figured; dorsal setae of male weak, short, except for the long outer propodosomals; setae of female weak, but longer than in male, the propodosomals subequal. Pseudostigmatic organ of both sexes similar, a strong, bifurcate organ (in one female it is trifurcate). Tarsus I of both sexes as figured; tarsus IV of male with discs located on distal and proximal ends of segment. Genitalia of male between coxae IV; anal discs present, as figured. Genital opening of female lying anterior to coxae III and extending posteriorly to coxae IV; setal pattern of anal area as figured. Male body 350 μ long by 190 μ wide; female body 478 μ long by 248 μ wide.

Holotype.—Hypopial nymph, U. S. National Museum No. 2729 taken from nest of the xylocopid bee, *Xylocopa virginica krombeini* Hurd, Lake Placid, Florida, June 2, 1960 (at Washington, D. C.), by K. V. Krombein, collector.

Paratypes.—Four hypopial nymphs, nine males, and thirteen females with the above data.

The mites are from nest numbers B-66, B-106, and B-189.

Genus **Tortonia** Oudemans, 1911

Tortonia was known only from the hypopial nymphs, but now both sexes of adults have been found. Adults are unique in having a pebbled skin dorsally, and in that the male lacks anal discs. The hypopus lacks the gnathosoma. As with *Horstia*, these mites have been variously placed, but they belong in the family Acaridae.

Tortonia quadridens, new species

(Figs. 12-19)

Hypopus.—Propodosoma and hysterosoma lightly reticulate, the pattern on the propodosoma more or less transverse; that on the hysterosoma longitudinal, the pattern composed of broken striae laterally and posteriorly as figured. Outer propodosomal setae longer than other body setae, strong, not serrate; inner propodosomals fine, about $\frac{1}{2}$ as long as outer. Humeral setae of hysterosoma longer and stronger than others; the first two pairs of dorso-median setae strong, about $\frac{1}{3}$ as long as humerals; other hysterosomal setae shorter, as figured. Gnathosoma lacking, only aristae present. Ventral apodemes of coxae free, curving, as figured. Suctorial plate small, round, on posterior of body. Legs as

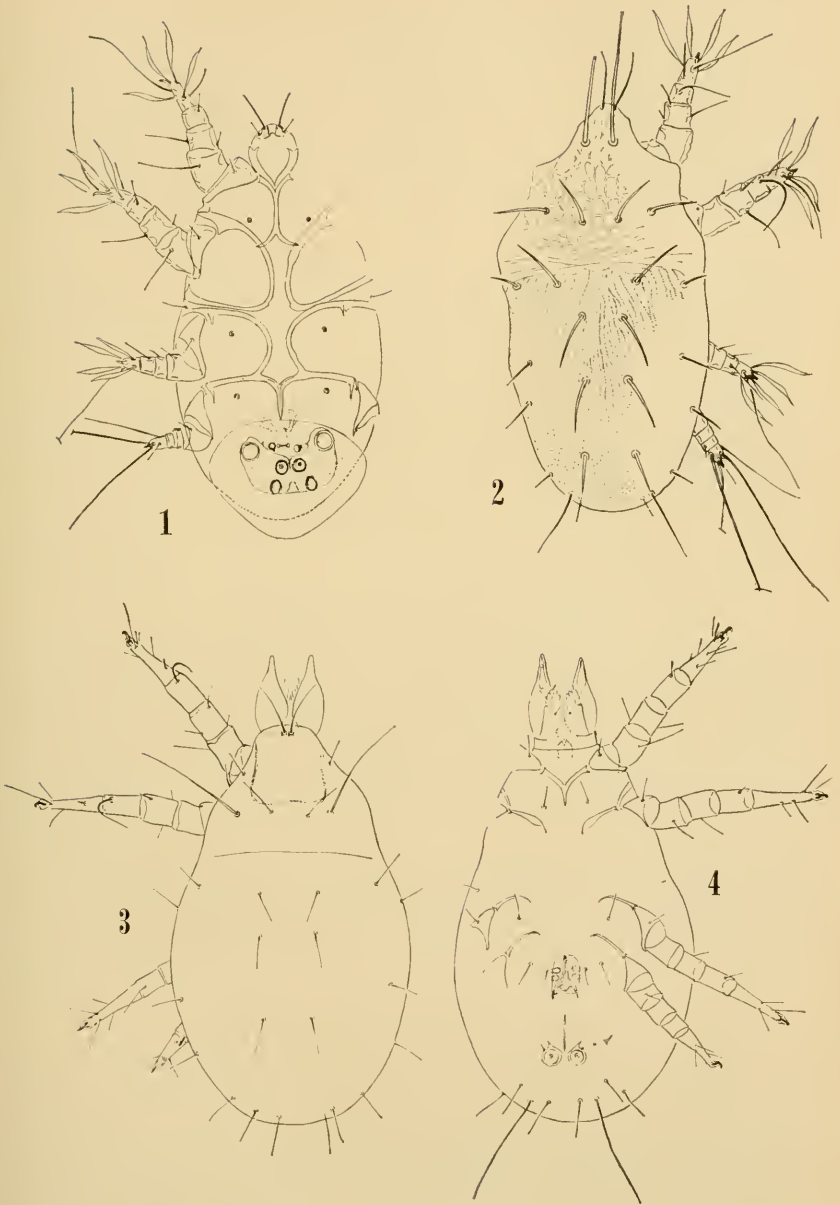


Plate I. *Horstia virginica*, new species. Fig. 1, venter of hypopus; fig. 2, dorsum of hypopus; fig. 3, dorsum of male; fig. 4, venter of male.

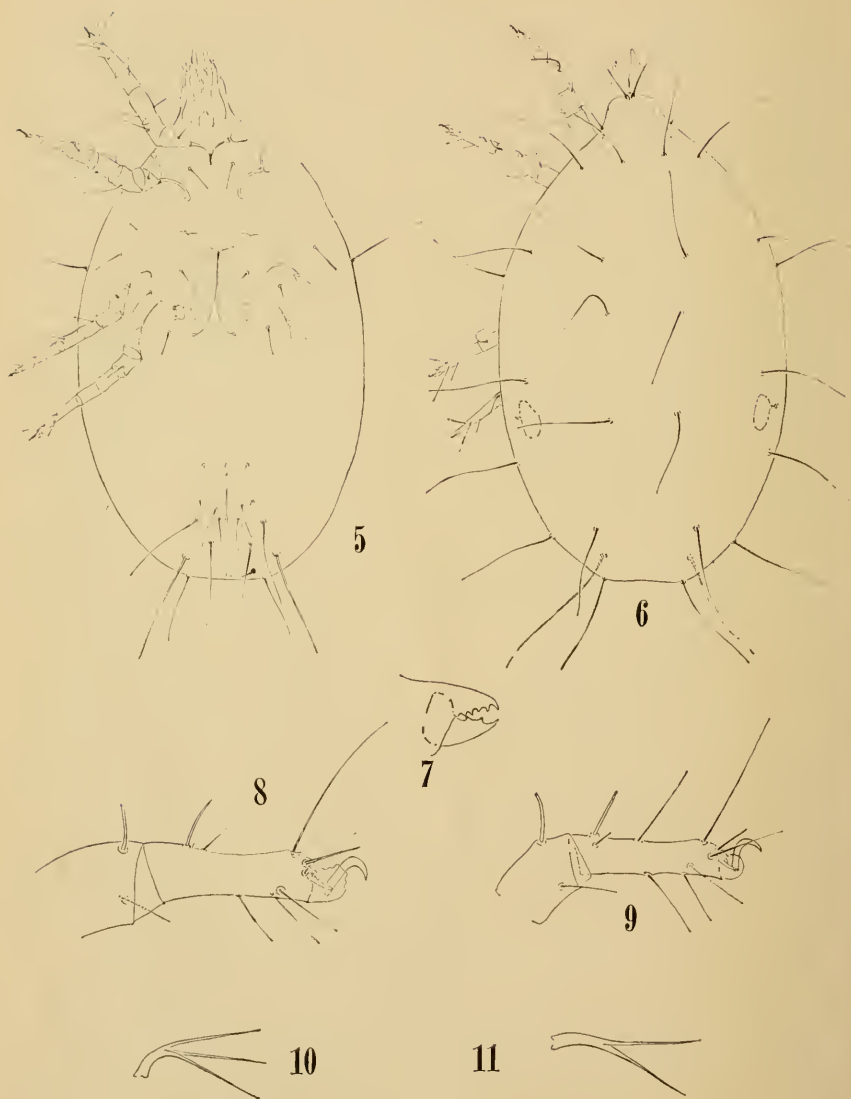


Plate II. *Horstia virginica*, new species. Fig. 5, venter of female; fig. 6, dorsum of female; fig. 7, chelae of female; fig. 8, tarsus I of male; fig. 9, tarsus I of female; figs. 10 and 11, pseudostigmatic organs of female.

figured; setal pattern normal for genus; leg IV without empodial claw, ending in three long, whiplike setae. Total length 191 μ ; width 140 μ .

Male and female.—Both sexes similar, characterized by the tuberculate skin and strong, spinelike dorsal body setae, those of the male being shorter than those of the female. Propodosomal shield present in both sexes. Pseudostigmatic organ similar in both sexes, simple, with six to seven branches. Male genitalia between coxae IV; female genitalia between coxae III and IV; genital and anal setae as figured; no anal discs in male, but discs present on tarsus IV of male; these discs small, closely set distally. Male body 306 μ long by 178 μ wide; female body 319 μ long by 153 μ wide.

Holotype.—Hypopial nymph, U. S. National Museum No. 2730, taken on venter of abdomen of the vespid wasp, *Monobia quadridens* (L.), Kill Devil Hills, North Carolina (at Washington, D. C.), by K. V. Krombein, July 4, 1956.

Paratypes.—Three hypopial nymphs with the above data. One male and two females taken on cell wall of nest of *Monobia quadridens* (L.), Kill Devil Hills, North Carolina (at Washington, D. C.), by K. V. Krombein, October 11, 1956. One female paratype with same data but collected September 19, 1956.

One female and five nymphs from nest number C-727, and one male from nest number C-706.

Genus *Lackerbaueria* Zakhvatkin, 1941

The mites discussed here are intermediate between *Forcellinia* and *Lackerbaueria* in the hypopial state, but the adults are not typical of *Forcellinia*, differing principally in the type of dorsal setae. The adults are also similar to *Kuzinia*, but the legs lack the longitudinal ridge, and the position and length of the dorsal setae differ. At present the species are being included in the genus *Lackerbaueria*, even though there are some differences in the suctorial plates of the hypopial nymphs.

The hypopi possess strong dorsal body setae, and strongly sclerotized coxae; the gnathosoma is prominent. The adults are generalized acarids, the male is distinctive in having an almost straight, simple aedeagus; both male and female possess a heavily pectinate pseudostigmatic organ.

Lackerbaueria krombeini, new species

(Figs. 17-28)

Hypopus.—Propodosomal setae thin, short. Hysterosomal setae strong, heavily serrate. Dorsum of hysterosoma punctate, forming pattern as figured; propodosoma without pattern. Gnathosoma distinct, longer than broad, extending past anterior margin of propodosoma. Ventral apodemes as figured; sternum almost reaching posterior margin of sternal plate; apodemes I and II open, III and IV enclosed. Coxal I seta dislike; coxal III seta also dislike, situated on sclerotized margin of coxa. Suctorial plate as figured, outer disc anterior to inner disc. Tarsi I and II as figured, sensory rod on tarsus I less than $\frac{1}{2}$ as long as

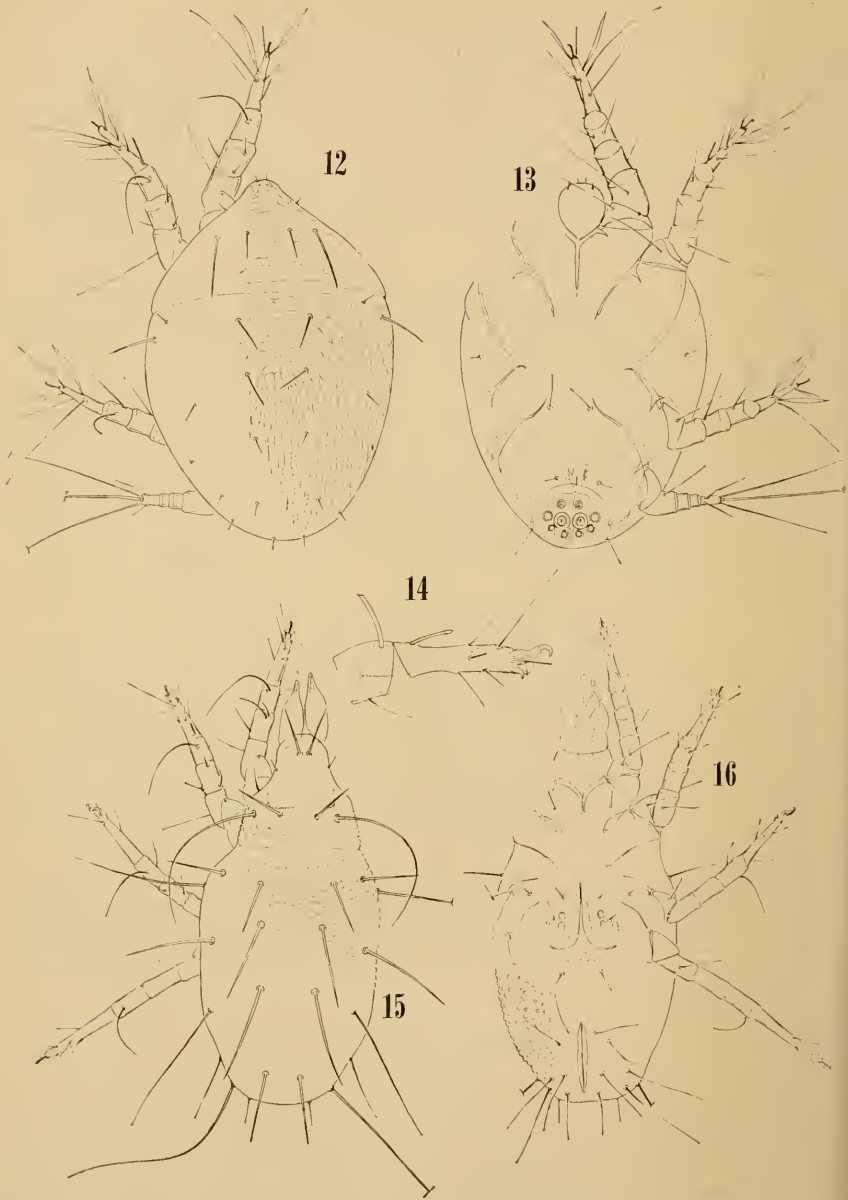


Plate III. *Tortonia quadridens*, new species. Fig. 12, dorsum of hypopus; fig. 13, venter of hypopus; fig. 14, tarsus I of female; fig. 15, dorsum of female; fig. 16, venter of female.

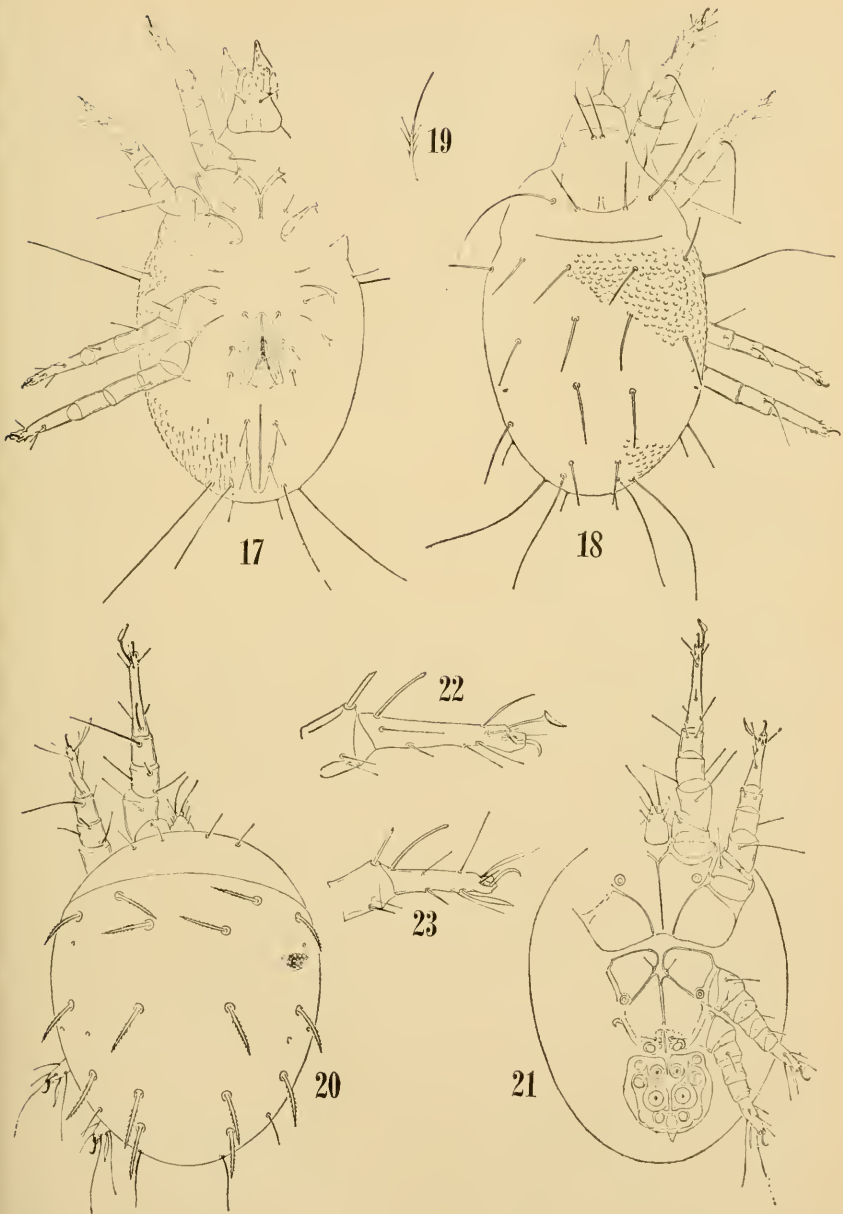


Plate IV. *Tortonia quadridens*, new species. Fig. 17, venter of female; fig. 18, dorsum of female; fig. 19, pseudostigmatic organ of female. *Lackerbaueria krombeini*, new species. Fig. 20, dorsum of hypopus; fig. 21, venter of hypopus; fig. 22, tarsus I of hypopus; fig. 23, tarsus II of hypopus.

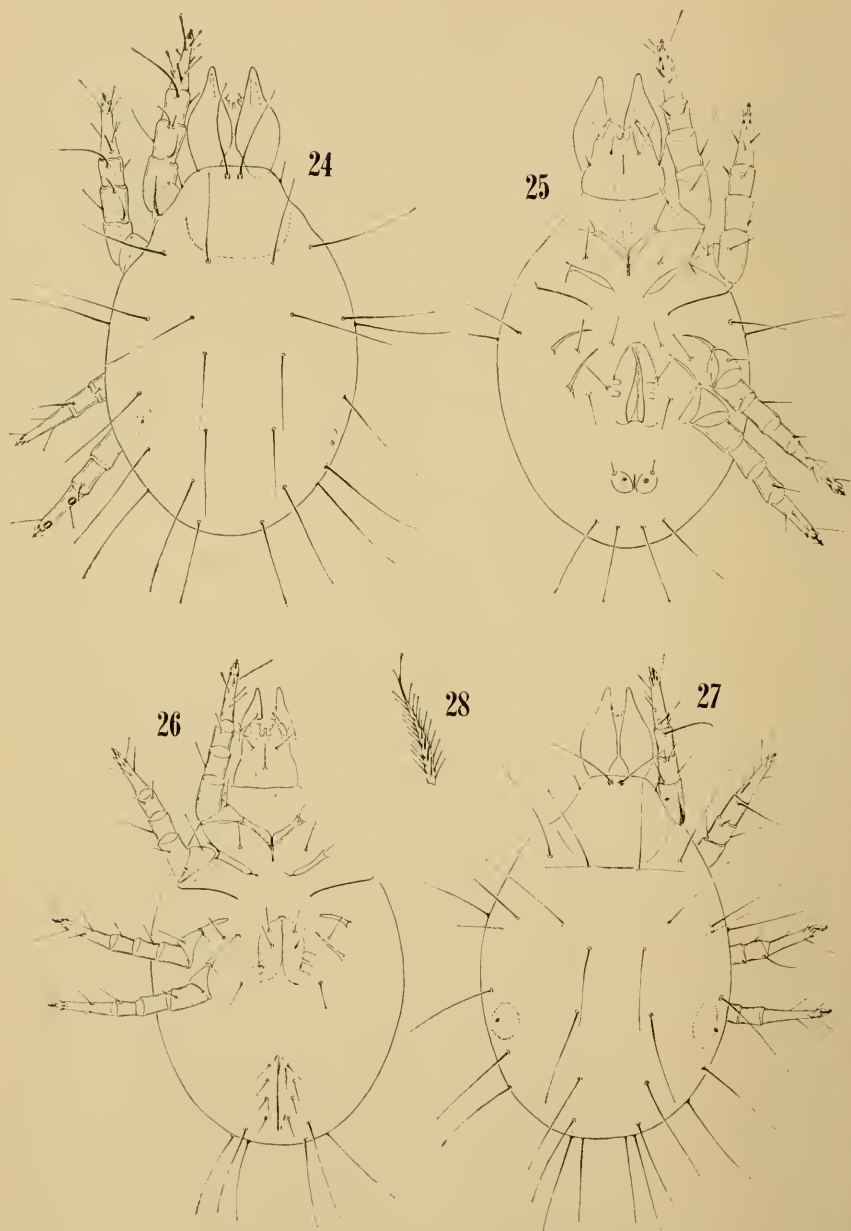


Plate V. *Lackerbaueria krombeini*, new species. Fig. 24, dorsum of male; fig. 25, venter of male; fig. 26, venter of female; fig. 27, dorsum of female; fig. 28, pseudostigmatic organ of female.

tarsus; that on tarsus II slightly longer than $\frac{1}{2}$ length of tarsus; ventral setae of tarsi I and II sharp, spinelike. Total length of body 255 μ ; width 185 μ .

Adults.—Male and female similar, with long, simple body setae. Both sexes with propodosomal shield. Pseudostigmatic organ heavily pectinate, similar in both sexes. Male aedeagus very slightly s-shaped; anal discs egg-shaped; posterior anal setae long, of equal length, in transverse row; tarsal IV discs large, situated proximally and distally on tarsus. Male body 427 μ long by 261 μ wide; female body 574 μ long by 350 μ wide.

Holotype.—Hypopial nymph, U. S. National Museum No. 2731, taken from adult female of pemphredonine wasp, *Diodontus atratus parenosus* Pate, Arlington, Virginia, July 4, 1952, by K. V. Krombein.

Paratypes.—One paratype hypopus with the above data. Five paratype hypopi taken on adult male of pemphredonine wasp, *Passaloeccus annulatus* (Say), Arlington, Virginia, May 21, 1955, by K. V. Krom-

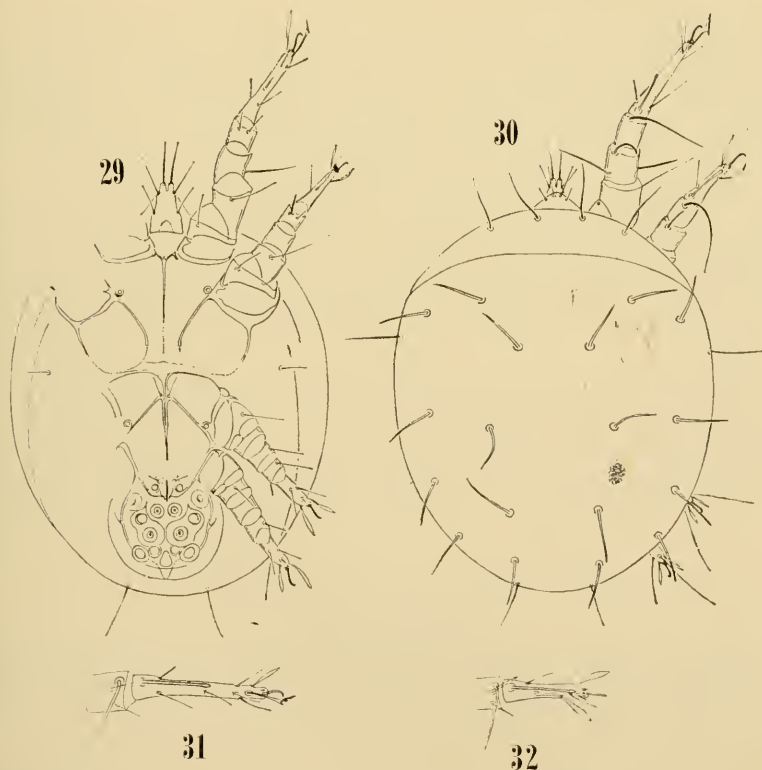


Plate VI. *Lackerbaueria americana*, new species. Fig. 29, venter of hypopus; fig. 30, dorsum of hypopus; fig. 31, tarsus I of hypopus; fig. 32, tarsus II of hypopus.

bein. Six males and three female paratypes taken in nest number A-5 of *Diodontus atratus parcinosus* Pate, Arlington, Virginia, June 26, 1959, by K. V. Krombein. Two paratype males taken in the same nest, June 29, 1959, by K. V. Krombein.

***Lackerbaueria americana*, new species**

(Figs. 29-32)

Hypopus.—Similar to *Lackerbaueria krombeini*. Dorsal setal pattern similar, but propodosomal setae longer; hysterosomal setae of same length but more slender, whiplike, and nude. Venter similar, although sternum not as long; differences in the suctorial plate may be due to mounting. Gnathosoma distinct, longer than broad, extending past anterior margin of propodosoma. Leg setae as figured; inner ventral tibia II seta spinelike, others setiform. Sensory setae of tarsus I slightly more than $\frac{1}{2}$ as long as tarsus; sensory seta of tarsus II about as long as tarsus; ventral seta of tarsus I setal-like, but ventral seta of tarsus II blunt, spinelike. Tarsi I and II each about $\frac{2}{3}$ as long as in *L. krombeini*. Total length 204 μ ; width 153 μ .

Adults.—Not known.

Holotype.—Hypopial nymph, U. S. National Museum No. 2732, taken on female of the pemphredonine wasp, *Stigmus americanus* Packard, Arlington, Virginia, May 21, 1955, by K. V. Krombein.

Paratypes.—Five hypopi with the above data.

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**BIOLOGICAL NOTES ON ACARID MITES ASSOCIATED WITH
SOLITARY WOOD-NESTING WASPS AND BEES**

(ACARINA: ACARIDAE)

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During field studies of the wasps and bees that nest in borings in wood I found a few adult insects or nests infested with acarid mites. The brief notes which follow summarize my limited observations on the biology of the mites and their relationship with the host wasps and bees. I am indebted to my colleague, E. W. Baker, for making the indispensable taxonomic study on the preceding pages which has made names available for the several mites discussed here. I have presented in separate papers biological notes on the saprogllyphid mites associated with solitary vespid wasps (Krombein, 1961), and on the chaetodactylid mites associated with solitary megachilid bees (Krombein, 1962).

BIOLOGY OF THE HOST WASPS AND BEES

The aculeate Hymenoptera involved in these associations are all solitary species. They are the vespid wasp, *Monobia quadridens* (L.); the sphecid wasps, *Diodontus atratus parcnosus* Pate, *Passalococcus annulatus* (Say), *P. mandibularis* (Cr.), *P. relativus* Fox, and *Stigmus americanus* Pack.; and the carpenter bee, *Xylocopa virginica krombeini* Hurd. In nature these wasps usually nest in the abandoned borings of coleopterous or other insect larvae in dead trees or structural timber. At my home in Arlington, Va., I have found *Diodontus*, *Passalococcus* and *Stigmus*, all of which are small species, nesting in abandoned borings of anobiid larvae. *Monobia*, a larger wasp, nests in abandoned borings of carpenter bees or other large insects. *Xylocopa* excavates its burrows in sound wood or reuses old *Xylocopa* borings.

Some of the species (*Xylocopa*, *Monobia*, and *Diodontus*) can be induced to nest in drilled borings of appropriate diameter in sticks of straight-grained wood. These traps may be set out where the wasps and bees are likely to search for nesting sites. When the nests are completed, they may be split open to study the nest architecture and development of the occupants. Most of my notes are on mites found in such nests.

The nest architecture of each of these species is essentially the same. The wasp or bee constructs a series of linear cells divided by partitions of various substances—clay in *Monobia* and *Stigmus*, resin in *Passalococcus*, and small bits of wood fiber cemented together in *Diodontus* and *Xylocopa*. Each cell is provided with a store of food for the larva—paralyzed lepidopterous larvae by *Monobia*, paralyzed aphids by *Diodontus*, *Passalococcus* and *Stigmus*, and a pollen-nectar mixture by *Xylocopa*. *Monobia* lays its egg in the cell before bringing in the store of food, but the other species provision the cell first and lay the eggs just before that cell is capped. The eggs hatch in a few days and the larvae complete their development in a week or more depend-

ing upon the species. After prepupal periods of variable duration the insects pupate. Adults eclose 2 to 4 weeks later, and leave their cells several days afterward. All five species have two or more generations a year; adults of *Xylocopa* hibernate, but all the wasps pass the winter as resting larvae.

BIOLOGY OF THE MITES

The acarid mites associated with the Hymenoptera discussed above are *Tortonia quadridens* Baker on *Monobia quadridens* (L.), *Lackerbaueria americana* Baker on *Stigmus americanus* Paek., *L. krombeini* Baker on *Diodontus atratus parenosus* Pate, *Passaloecus annulatus* (Say), *P. mandibularis* (Cr.), *P. relativus* Fox, and *Stigmus americanus* Paek., and *Horstia virginica* Baker on *Xylocopa virginica krombeini* Hurd. I obtained nests containing each of these mite species except *L. americana*, which is known only from the hypopial stage taken from adult wasps.

The hypopus (deutonymph) of the mite is associated with the adult wasps and bees. These acarid hypopi usually do not congregate in a special acarinarium on the body of the host as do saprogylyphid hypopi that have a very intimate symbiotic relationship with their host wasps (Krombein, 1961). The acarid hypopi of the genus *Lackerbaueria* are dispersed in random fashion on the body surface of the host; hypopi of *Tortonia* have been found in the acarinarium at the base of the second tergum of *Monobia* as well as on the surface of the abdomen; hypopi of *Horstia* have not been found on the host bee. Usually most of them are scattered on the anterior abdominal terga, but occasionally some are found on the abdominal sterna, thorax, wings or head. The hypopi adhere to the host body by means of the anal suckers.

The accompanying Table 1 presents data on the infestation of adult sphecid wasps by hypopi of *L. krombeini*. These wasps nested in deserted anobiid borings in the wooden walls of an old cowshed at my home in Arlington, Va. They were collected on the surface of the walls from 1949 to 1955. I made a determined effort to collect all specimens of *Xysma* and the several species of *Spilomena*. No such effort was made to collect the other wasps listed in this table, so the figures in column 1 do not reflect the relative abundance of the species except for those numbered 9 to 12. Species 1 to 3 belong to the subfamily Trypoxyloninae, and species 4 to 12 to the subfamily Pemphredoninae. Species 1 to 8 are considerably larger (4-8 mm. long) than species 9 to 12 (2-3 mm.). Species 1 to 3 store small paralyzed spiders in their nests, species 4 to 8 store paralyzed aphids, and species 9 to 12 store tiny paralyzed thrips.

In addition to these 12 sphecid wasps two other aculeates nested commonly in these anobiid borings, the vespid wasp *Symmorphus canadensis* (Sauss.) and the megachilid bee *Prochelostoma philadelphia* Robt. I preserved only four specimens of the former and three of the latter. None of these individuals bore acarid hypopi.

Table 1. Infestation of sphecoid wasps by hypopi of *Lackerbaueria krombeini* Baker in Arlington, Va.

	(1) Number of wasps examined	(2) Number of wasps with mites	(3) Number of mites per infested wasp	(4) Mean number mites per infested wasp	(5) Percent wasps infested
TRYPOXYLONINAE					
Prey on spiders					
1. <i>Trypoxylon</i> <i>backi</i> Sandh.	28 ♀♀				2.2
	17 ♂♂	1 ♂	1	1	
2. <i>Trypoxylon</i> <i>carinatum</i> Say	4 ♀♀	0	--	--	0
3. <i>Trypoxylon</i> <i>frigidum</i> Sm.	1 ♀	0	--	--	0
	3 ♂♂				
PEMPHREDONINAE					
Prey on aphids					
4. <i>Diodontus</i> <i>atratus</i> <i>parenosus</i> Pate	24 ♀♀	7 ♀♀	1,1,1,1,7,9,29	7	
	4 ♂♂				25.0
5. <i>Stigma</i> <i>americanus</i> Paek.	46 ♀♀	1 ♀	1		3.8 ¹
	7 ♂♂	1 ♂	7	4	
6. <i>Passaloecus</i> <i>annulatus</i> (Say)	20 ♀♀	5 ♀♀	1,2,8,17,26	10	21.5
	8 ♂♂	1 ♂	5		
7. <i>Passaloecus</i> <i>mandibularis</i> (Cr.)	7 ♀♀	1 ♀	5	5	14.3
8. <i>Passaloecus</i> <i>relativus</i> Fox	11 ♀♀	2 ♀♀	1,9	5	16.7
	1 ♂				
PEMPHREDONINAE					
Prey on thrips					
9. <i>Spilomena</i> <i>alboclypeata</i> Brad.	11 ♀♀	0	--	--	0
	1 ♂				
10. <i>Spilomena</i> <i>pusilla</i> (Say)	259 ♀♀	1 ♀	1	1	0.35
	24 ♂♂				
11. <i>Spilomena</i> <i>barberi</i> Krom.	74 ♀♀	1 ♀	1	1	0.96
	30 ♂♂				
12. <i>Xysma</i> <i>ceanothae</i> (Vier.)	31 ♀♀	0	--	--	0
	3 ♂♂				

¹Infestation by *Lackerbaueria* hypopi was actually 7.5% because two females bore hypopi of *L. americana* Baker.

I believe that the presence of only one hypopus on a wasp may represent a chance infestation, and does not indicate that that species of wasp has any meaningful relationship with the mite. This contention is substantiated by the extremely low percentage of infestation in two of the species of *Spilomena* of which many individuals were examined. If this contention is accepted, we should then rule out the possibility that *Trypoxylon backi* is a true host of the mite; only one specimen was found infested and that individual bore only one mite.

If this argument is valid, we are then faced with the remarkable fact that *L. krombeini* is inextricably associated with wasps which provision their nests with paralyzed aphids. We might conjecture from this that perhaps the ancestral species of *Lackerbaueria* were in some way associated with aphids or their habitat. Such species as *L. americana* and *L. krombeini* then might have evolved when the appropriate wasps happened to store their nests with infested aphids.

The acarid hypopi do not enter the genital chamber of the host, as do some saproglyphid hypopi, so there is no venereal transmission as in that family (Cooper, 1955). Presumably several hypopi drop off an infested female wasp or bee in each cell as it is being provisioned.

I was unable to observe the activities of the hypopi immediately after they gained access to the host cell. However, the finding of *L. krombeini* and *H. virginica* mites in some cells in which the host eggs or larvae failed to develop, suggests that tritonymphs and adults of these genera occasionally may feed first on the host egg or young larva, as do tritonymphs and adults of some chaetodactylid mites belonging to the genus *Chaetodactylus* (van Lith, 1957; Krombein, 1962). However, this behavior is apparently not essential, because all *T. quadridens* mites and some of *H. virginica* developed in cells in which the wasp and bee occupants also developed to maturity.

If the developmental cycle is the same as in most other acarid mites, the hypopi transform almost immediately into tritonymphs after entering the host cell. These tritonymphs may feed either on the host egg or young larva as in *L. krombeini* and some individuals of *Horstia*, or on provisions stored for the host larva as in *Tortonia* and some individuals of *Horstia*. The tritonymphs then transform into adults which deposit eggs either on the cell walls as in *Tortonia*, or on the provisions stored for the host larva as in *L. krombeini* and *Horstia*. When there is an abundance of food, the mite may go through several generations without producing hypopial nymphs as happens in occasional infestations of *Horstia*. Where the food supply is limited, particularly in cells where the host insect is able to develop normally, hypopi are probably produced in the first generation. These hypopi attach to the newly eclosed teneral host before it leaves the cell.

The partitions capping the cells are of considerable importance to the mite. They prevent migration of mites from one completed cell to another and egress from the nest. If the host bee or wasp matures successfully in a cell containing some mites, the hypopi can attach to

the mature host during the few days that it remains in the cell as a teneral individual. If the mites destroy the host egg or larva, they can produce large numbers of descendants destined to die unless the partition capping that cell is breached in some manner. This situation could happen in a nest in which the host insect matures successfully in some of the innermost cells in a linear series while only mites develop in the outermost cells. Under these conditions when the adult insects in the inner cells cut through all the partitions to leave the nest, the mites in the outer cells could then get on the body of the host as it passes through an infested cell. However, normally one would expect that the hypopi on the body of the mother wasp or bee would drop off as the first cells were provisioned, as did happen in most of the nests infested by *L. krombeini*, and that the outermost cells, if any, would be free of mite infestation.

One is left with the general impression that these mites act primarily and usually as scavengers, and that when they inadvertently (?) destroy the host egg or larva they are practicing involuntary auto-acaricide. Since they apparently are not associated with the host insects in a symbiotic relationship, we can probably expect that they are not at all host specific, as has already been demonstrated for *L. krombeini*, but may be expected to infest a number of closely related aculeate Hymenoptera that nest in borings in wood.

Tortonia quadridens Baker

Dead hypopi were obtained in October 1956 from the body of a male *Monobia quadridens* collected at Kill Devil Hills, N. C., on August 4, 1956. One hypopus of *Tortonia* was found on the surface of the second abdominal tergum, and three hypopi of the same species were found in the acarinarium at the base of the second tergum. This wasp also was infested by 10 hypopi of the saproglyphid mite *Monobiacarus quadridens* Baker and Cunliffe which occurred in the genital chamber and on the genitalia. It is believed that this latter mite is ordinarily the species that would be found in the acarinarium as well as in the genital chambers; the occurrence of *Tortonia* in that specialized mite chamber is unexpected and perhaps fortuitous.

Tortonia mites were found also in two nests (C 706, C 727) of *Monobia* at Kill Devil Hills in 1956. Both had been suspended from limbs of pond pine growing on the sandy barrens between the ocean and dunes. The two nests, stored between August 10 and early September, were at stations about 150 meters apart and undoubtedly were provisioned by two different female wasps. The nests were picked up on September 9 and examined on September 11. Each of the four cells of one nest contained a wasp prepupa infested with active, adult *Tortonia*. The three-celled nest contained a mature wasp larva in the innermost cell and successively smaller larvae in the others; the cell walls of this nest were infested with adult *Tortonia* on September 18. On October 11 there were active nymphs and adult mites in all cells of both nests. The mites died during the winter, but adult wasps developed in all but two of the cells. There was no evidence that the wasp mortality had been caused by the activity of the mites, which appeared to act purely as scavengers in their nests.

Two males and one female of a species of *Tortonia* were recovered July 31, 1961, from a small infestation in cells 1 and 2 of a four-celled nest (K 129) of *Monobia quadridens* from Plummers Island, Md. This nest contained active, mature wasp larvae in the infested cells on that date. This mite is very closely related to, if not identical with, *Tortonia quadridens*, and differs only in the comparative length of several of the body setae in both the hypopi and adults. This difference was noted as being constant by Dr. Baker in a series of larvae, nymphs and hypopi obtained from the bodies of several adults of *Monobia* collected at Plummers Island during the past 55 years. The significance of this setal difference cannot be ascertained until additional mites are examined from *Monobia* from other localities. The mites found on the bodies of the *Monobia* from Plummers Island came from a number of areas: A few occurred in the acarinarium at the base of the second abdominal tergum; others were on the surface of the abdomen or thorax; and still others were in a small pocket posteriorly on the lateral surface of the propodeum. From three to a dozen or so mites were obtained from each of seven wasps.

Lackerbaueria krombeini Baker

This species was first known from dead hypopi found in 1955 on the bodies of a female *Diodontus atratus parenosas* captured July 4, 1952, and a male *Passaloecus annulatus* taken May 21, 1955. Both wasps were collected at my home in Arlington, Va., where they were nesting in deserted anobiid borings in the wall of a wooden cowshed. There were 29 hypopi on the *Diodontus*, located mostly on the first and second abdominal terga; only 5 hypopi were found on the *Passaloecus*, three on the head, one on the mesopleuron, and one on the side of the second abdominal tergum.

During the subsequent examination in 1960 of more than 600 wasps taken on this cowshed wall between 1949 and 1955 I found the following specimens infested with *krombeini* hypopi:

- ♀ *Diodontus atratus parenosas*, June 7, 1952, with seven hypopi
- 2 ♀♀ *Diodontus atratus parenosas*, July 12, 1952, each with one hypopus
- ♀ *Diodontus atratus parenosas*, July 13, 1952, with one hypopus
- ♀ *Diodontus atratus parenosas*, August 31, 1952, with one hypopus
- ♀ *Diodontus atratus parenosas*, May 22, 1954, with nine hypopi
- ♂ *Stigmus americanus*, May 29, 1949, with seven hypopi
- ♀ *Stigmus americanus*, May 23, 1954, with one hypopus
- ♀ *Passaloecus annulatus*, September 22, 1951, with one hypopus
- ♀ *Passaloecus annulatus*, May 23, 1953, with 26 hypopi
- ♀ *Passaloecus annulatus*, May 16, 1954, with 17 hypopi
- ♀ *Passaloecus annulatus*, May 22, 1954, with 8 hypopi
- ♀ *Passaloecus annulatus*, September 21, 1954, with two hypopi
- ♀ *Passaloecus mandibularis*, May 22, 1955, with five hypopi
- 2 ♀♀ *Passaloecus relativus*, May 22, 1955, one with one hypopus, the other with nine hypopi
- ♀ *Spilomena pusilla*, July 18, 1953, with one hypopus
- ♀ *Spilomena barberi*, July 28, 1953, with one hypopus
- ♂ *Trypoxylon backi*, August 31, 1953, with one hypopus

I believe that only those species that bear two or more hypopi serve as actual hosts of this mite. If this is so, then only the species of *Diodontus*, *Stigmus* and

Passalococcus listed above are the actual hosts of *L. krombeini*. The infestation of single individuals of species of *Trypoxylon* and *Spilomena* with a single hypopus represents only a chance association.

In 1960 I discovered an infestation of *L. krombeini* in a trap nest (A 5) of *Diodontus* placed on this cowshed wall in Arlington. This nest was split open on June 23; it contained nine cells separated by partitions of tiny bits of wood fiber cemented together. A nest of this size would take about a week to complete, and the relative development of the occupant of the outermost cell indicated that the nest must have been completed about June 18. Cells 1, 2, 3, 4, and 6² each contained several adult *krombeini* mites, a store of paralyzed aphids, and a dead wasp egg on one of the outermost aphids; the presumption is that the eggs were destroyed by the developing mites. Cells 5, 7 and 8 each contained a wasp prepupa in its cocoon, and cell 9 held a mature wasp larva spinning its cocoon. On the next day, June 24, some of the mites had deposited eggs on the aphids; concurrently the wasp in cell 5 pupated. The mite eggs were oval in shape, 143-160 μ long by 110-118 μ across the middle; one live adult female mite was 531 μ long and 363 μ wide, and a live male measured 337 μ by 186 μ . None of the mite eggs hatched on June 25, but the wasps in cells 7 and 8 pupated. On June 26 some of the mite eggs hatched into six-legged larvae. On June 27 the wasp in cell 9 pupated. By June 28 some of the mite larvae had transformed to eight-legged nymphs; the nymphs were wandering around in the cell. On July 1 an adult wasp eelosed in cell 5; two male wasps left the nest on July 5 and 6, and I found two dead male wasps in the nest on July 7. I expected that the wasp in cell 5 would be infested by mites when it passed through cell 6, but none of these wasps bore hypopi.

In 1961 I obtained four more nests (J 1, 4, 5 and 11) of *Diodontus atratus parenosus* infested by *L. krombeini* from this same station. The nests were completed early in June because the wasps were in the prepupal or early pupal stages when I picked up the nests on June 12 and 16. Nest J 1 contained nine cells of which cells 1, 2, 4 and 7 were infested by mites; J 4 contained ten cells of which cells 1, 5, 8 and 10 were infested; J 5 contained ten cells of which cells 5 and 7 were infested; and J 11 had eight cells of which cells 1-5 were infested. This gives an infestation rate of 40%. A fifth nest (J 6) of this same wasp contained seven cells, none of which was infested by mites. The wasp eggs were dead in all cells infested by the mites and healthy wasps were present in the other cells, so it seems highly improbable that the mortality could have been caused by any factor other than attack by the mites. Three of the nests contained both adult mites and mite eggs in the infested cells on June 12, and some of the eggs hatched on the 14th. The fourth nest contained adult mites, eggs, larvae and nymphs in the infested cells on June 16. The mites in the infested cells died about a week later, probably because of desiccation occurring from my daily examination of the nests. However, one adult mite gained access to a previously uninfested cell in nest J 4 due to rupture of the partition dividing two cells and laid some eggs on the wasp prepupa. I did not follow development in this cell, but one of the wasps that emerged on June 26 bore one hypopus on its abdomen, so the mites can develop successfully on a more mature stage of the host without injuring or killing it.

²Cells are numbered beginning with the innermost.

Lackerbaueria americana Baker

This species was described from a series of six hypopial nymphs. These were part of a larger infestation found on an adult female *Stigmus americanus* captured at my home in Arlington, Va., on May 21, 1955. This female was nesting in an old anobiid boring in the wall of a wooden cowshed. Most of the hypopi were disposed in random fashion on the first and second abdominal terga, but a few were present also on the abdominal sterna.

During the subsequent examination of more than 600 wasps collected on this cowshed wall from 1949 to 1955 I found an infestation of eight hypopi on a second female of *Stigmus americanus* collected on May 14, 1952. These hypopi were distributed as follows: four on the first tergum, two on the second, one on the scutellum and one on the right temple. The other 51 specimens of *Stigmus americanus* were free of *americana* hypopi, but two of them bore hypopi of *L. krombeini*.

Presumably the biology of this species is very similar to that of *L. krombeini*.

Horstia virginica Baker

Mites belonging to this species were found in three trap nests (B 66, B 106, B 189) of the carpenter bee *Xylocopa virginica krombeini* sent to me in May and June, 1960, by Mr. Richard Archbold, from the Archbold Biological Station, Lake Placid, Fla. These nests were not completely stored, and the mother bee was trapped inside each one when it was picked up. Two of the nests contained six stored cells each and one five cells. All cells except one contained some live *Horstia* mites. There was a dead *Xylocopa* egg in one of the infested cells, and there was a small dead bee larva in each of eleven of the infested cells; presumably these larvae and the egg had been killed by the mites. I was able to rear two adult bees from two of the infested cells, but the mite infestation in each of the two cells died out; the bees from these cells were mature larvae when I received that particular nest.

Presumably the mites gained access to these nests from the bodies of the mother bees; however, I was unable to find hypopi on any of the mothers. It is possible, though most unlikely, that active mite nymphs might have wandered into these nests by chance. However, the nests had been suspended beneath branches of three different trees. Furthermore, I have never found any *Horstia* mites in the several hundred other nests from the Archbold Biological Station. So it seems rather improbable that these infestations could have originated from wandering nymphs. It is more likely that all hypopi had left the mother bee's body during provisioning of the cells.

The pollen-nectar masses in these nests were quite moist, about 12 to 15 mm. long, flat on the top side, and about 6 mm. thick. I stored several of them in glass vials for subsequent pollen analysis. Four or five weeks later I found the vials teeming with mites in all stages from egg to adult, except hypopial nymphs. The eggs were oval in shape, 167 μ long and 84 μ wide across the middle. The mites apparently had fed on just the nectar in these masses, because the individual pollen grains were separated and dry; in this respect their feeding habits are similar to those of a species of *Chaetodaetylus* that I observed in nests of the megachilid bee *Osmia lignaria* Say (Krombein, 1962).

Horstia may have infested a fourth nest (B 190) of *Xylocopa* from a different station at the same locality, but I failed to preserve material for identification.

This one-celled nest contained a live female bee pupa when received. Many hypopi were clustered on the thoracic sternum, the middle of the mesonotum, and the wings. The pupa died 2 weeks later.

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A NEW CHELONUS FROM WESTERN UNITED STATES

(HYMENOPTERA: BRACONIDAE)¹C. W. McCOMB, *University of Maryland, College Park*

This paper is presented in order to provide a name for use in a paper being published by Dr. H. V. Daly, of the University of California, on thoracic musculature. The author examined material from Dr. Daly's collection, as well as numerous examples on hand in the U. S. National Museum collection and from the California State Department of Agriculture. It is unfortunate that there is no host record available for this common species.

Chelonus (Chelonus) muesebecki, n. sp.

This species resembles *sericeus* (Say) and *texanus* Cresson in general conformation and in the color of the legs. In size it is intermediate, averaging smaller than *sericeus* and larger than *texanus*. From *sericeus* it may be immediately distinguished by not having protruding maxillae (in *sericeus* the maxillae are very conspicuous, extending prominently below the clypeus) and by the much less slender female antennae, which are setaceous in *sericeus*, with nearly all segments more than twice as long as broad. The female antennae of *muesebecki* are very similar to those of *texanus*, but the face is more coarsely and not transversely rugose, and the ovipositor is conspicuously exerted and curved upward over the end of the carapace.

Female.—Length 5 to 7 mm. Antennae filiform in basal three-fourths, setaceous in apical fourth, 26-27 segmented, extending back to the middle of the carapace, 1st flagellar segment 0.7 as long as scape, diameter of each of the five basal flagellar segments less at mid point than at either end of each segment,

¹ Scientific article No. A957, Contribution No. 3325 of the Maryland Agricultural Experiment Station, Department of Entomology.

segments 13-17 in most specimens as wide as long, those beyond successively more slender, the terminal segment varying in length but always longer than the one basal to it; head transverse, 0.6 as long as wide; frons rugose; temples coarsely rugose, not receding from eye margin, width at mid eye point very slightly less than maximum eye width; face rugose, 0.6 as wide as high, clypeus shiny, closely punctate; malar space $1\frac{1}{2}$ times as long as basal width of mandibles; level of lower eye margins just above dorsal margin of clypeus.

Thorax 0.7 as long as carapae; mesoscutum rugose, lobes indistinctly defined; posterior median area behind middle lobe rugose reticulate; disc of scutellum flat, its lateral margins sharply defined, its surface rugose but usually with a small smooth area medially; lateral lobes at base of scutellum large; fovea at base of scutellar disk very coarsely foveolate; a conspicuous, but short median keel on dorsal surface of metathorax; propodeum coarsely rugose reticulate; caudal margin of its dorsal face indicated by an irregular raised line; the outer pair of projections large and prominent, the inner pair weak and indistinct.

Carapae rugose, 0.55 times as wide as long, gradually deepening apically, sometimes almost half as deep as long, reaching its point of maximum depth near apex; the lower half of the posterior face of the carapae slightly concave (the impression running dorso-ventrally); distance between the apex of the ventral opening and the apex of the carapae equal to $\frac{3}{4}$ the length of the posterior metatarsus; ovipositor and sheath exerted in all specimens examined, extending apically, then strongly curving dorsally.

Stigma three times as long as wide; radial cell on wing margin about $\frac{5}{6}$ as long as stigma, and longer than the combined lengths of the 1st and 2nd abscissae of the radius; the 1st and 2nd abscissae of radius in a straight line, the 2nd abscissa usually noticeably longer than the 1st; radiella sinuate.

Body black; carapae black but often with two lateral basal yellow spots, the area distal to the spots sometimes more or less ferruginous; coxae and trochanters black; femora and tibiae ranging from almost entirely black to almost wholly ferruginous but the femora nearly always at least black at extreme bases and the hind tibiae darkened apically; wings subhyaline basally, conspicuously infumated on apical thirds.

Male.—Similar to the female but the antennae filiform, extending back almost to the end of the carapae; the number of segments ranging from 29 to 31; and the lower posterior surface of the carapae rounded, not concave.

Type.—USNM No. 65951.

Type locality.—Bishop, Inyo County, California, U.S.A.

Described from 9 females (one the holotype) and 9 males collected at type locality by Dr. H. V. Daly sweeping on *Helianthus* sp, on 3 August 1961; also considerable material of this species from other parts of California was studied as well as specimens from Alaska, Oregon, Arizona, New Mexico, Nevada, Utah, Colorado, and South Dakota. Collections were made from June thru August, with the majority of the specimens being collected in July. The host is unknown.

The author is grateful to Mr. C. F. W. Muesebeck, of the U. S. National Museum, for his advice in the study of this species and in the writing of this paper.

A REVISION OF THE LARROPSIS SUBGENUS ANCISTROMMA FOX
(HYMENOPTERA: SPHECIDAE)

R. M. BOHART¹ and G. E. BOHART²

In his revisional work, "The North American Larridae," W. J. Fox (1893) set up the subgenus *Ancistromma* for 11 species of larrid wasps. This category, as used by Fox, was synonymous with *Larropsis* Patton described in the previous year. However, *Larropsis* divides logically into two subgenera and *Ancistromma* is available for one of these since the designation of *L. distincta* as its type by Rohwer (1911).

Of the 11 species considered by Fox, only 4, one of which is sub-specific, are in *Ancistromma* as now constituted. With several species added by later workers and 6 new ones described herein, the subgenus now contains 11. Generally speaking these are the forms of *Larropsis* with the interocular distance strongly narrowed toward the vertex.

Material of *Ancistromma* made available from institutions and individual collections has totaled about 500 specimens. We are grateful to the following for their cooperation: Y. U. Amrein (Pomona College), W. E. Barr (University of Idaho), W. L. Brown, Jr. (Museum of Comparative Zoology, Harvard: MCZ), G. W. Byers (Snow Museum, University of Kansas), R. R. Dreisbach, G. R. Ferguson, H. J. Grant, Jr. (Academy of Natural Sciences, Philadelphia: ANSP), T. H. Hubbell (Museum of Zoology, University of Michigan), P. D. Hurd, Jr. (California Insect Survey, University of California, Berkeley), G. P. Knowlton (Utah State University), K. V. Krombein (U. S. National Museum: USNM), W. M. Mason (Canadian National Collection), A. T. McClay (University of California, Davis), L. W. Quate (University of Nebraska: U. Nebr.), E. S. Ross (California Academy of Sciences: CAS), H. F. Schwarz (American Museum of Natural History), H. A. Scullen (Oregon State College), P. H. Timberlake (University of California, Riverside), and F. S. Truxal (Los Angeles County Museum).

Special mention should be made of F. X. Williams who furnished the nucleus of our collection in the interest of progress in classification of the Larrinae.

Holotypes are deposited as indicated in the descriptions. Paratypes will be distributed to the collections listed above, insofar as possible.

Subgenus *Ancistromma* Fox

Ancistromma Fox, 1893. Proc. Acad. Nat. Sci. Phila. 45:487. Type, *Larrada distincta* Smith, desig. Rohwer, 1911.

Subgeneric diagnosis.—With the generic characters of "comma-shaped" upper ocellar scars; face raised somewhat along inner eye margins, especially in females; fore-tarsal comb of female composed of thorn-like setae instead of flexible ones as in *Tachysphex*; pygidium of female with stiff, appressed, setose bristles, be-

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coming longer and heavier distally; male tergite VII with stiff bristles, not silvery-pubescent. Subgenerically, epipleural sinus not limited below by strong cross ridges which occur in *Larropsis* s.s. (compare figs. 1 and 2); eyes approaching toward vertex so that least interocular distance is usually less than length of flagellar segment I and pedicel taken together; female clypeus usually sharply declivous below discal prominence, with a well defined sublateral tooth, and a well-defined anterior flange.

A study of male genitalia has revealed few specific differences other than size. In general the species of *Ancistromma* have coarser teeth on the aedeagus. There appears to be a constant subgeneric difference in the cuspis, a boomerang-shaped structure with translucent distal blade and pigmented basal "handle." In *Ancistromma* the distal part is much shorter than the base, whereas in *Larropsis* the two sections are about equal in size and length.

Systematics.—The unridged upper mesepimeron and the strongly convergent eyes are both useful characters but the former is more diagnostic.

The 11 known species of the subgenus can be separated into groups A and B on the basis of "short" versus "long" first flagellar segment in the female (compare figs. 11 and 9). Group A divides into two subgroups, (1) with female fore-femur unpolished and the first flagellar segment shorter than second (*distincta*, *platynota*), and (2) with female fore-femur extensively polished on outer surface and first two flagellar segments about equal (*portiana*, *sericifrons*). Group B is divisible into three subgroups, (1) with female clypeus strongly bulging and fore-femur extensively polished (*bradleyi*, *capax*, *corrugata*), (2) with evenly convex female clypeus, unpolished fore-femur, and densely setose median cell of the forewing (*aurantia*, *shappirioi*), and (3) with evenly convex clypeus, reduced setosity of the median cell, and unusually finely sculptured propodeal enclosure (*granulosa*, *hurdi*).

A description of the larva of *distincta* has been given by Evans (1958a).

Biology.—Cave crickets of the genus *Ceuthophilus* are known to be prey of *aurantia* and *capax*, whereas the field cricket, *Nemobius*, is utilized by *distincta* according to Evans (1958b). In Evans' paper a description of hunting behavior and nesting habits is given. He postulated a rather primitive behavior since this species of *Ancistromma* used pre-existing cavities in the soil as nesting sites, paralyzed the prey lightly, and carried the prey over the ground with the mandibles. Two species of miltogrammine flies were acting as parasites.

Distribution.—The subgenus is essentially a northern one with habitats primarily in the Canadian and Transition life zones. A few species, such as *granulosa* and *sericifrons* seem to prefer the Upper Sonoran zone. The two captures of *shappirioi* indicate that it may be

a creature of the Carolinian zone. Our records for the subgenus are plotted in figures 27-32. It seems likely that the ranges of several species will be found extending into Mexico, at least in Baja California, Sonora and Chihuahua. The European species, *punctulatus* Kohl shows definite relationship to the *distincta* group.

KEY TO MALES OF LARROPSIS (ANCISTROMMA)

1. First flagellar segment with greatest breadth less than one-half the greatest length; least interocular distance nearly always equal to or shorter than length of first flagellar segment..... 2
 First flagellar segment at least one-half as broad as long; least interocular distance always greater than length of first flagellar segment... 5
2. Least interocular distance less than median length of clypeus and usually less than length of flagellar segment I; vertex area between ocellar scars and summit longer than broad (fig. 20); striae of propodeal side fine and even..... *bradleyi* G. & R. Bohart
 Least interocular distance subequal to median length of clypeus, or striae of propodeal side moderate to coarse..... 3
3. Propodeum laterally reticulate, scarcely striate..... *aurantia* (Fox)
 Propodeum laterally with distinct striae..... 4
4. Propodeum laterally with striae evenly graded from top to bottom; vertex area between ocellar scars and summit about as broad as long (fig. 16)..... *capax* (Fox)
 Propodeum laterally with coarse striae above and fine ones rather abruptly below; vertex area between ocellar scars and summit longer than broad (fig. 18)..... *corrugata* G. & R. Bohart
5. Propodeal enclosure with sculpture (reticulation, puncturation, or granulation) much finer than that of scutellum..... 6
 Propodeal enclosure with sculpture coarser than or about equal to that of scutellum..... 8
6. Least interocular distance much greater than first flagellar segment plus pedicel (fig. 6); abdomen black..... *granulosa* G. & R. Bohart
 Least interocular distance about equal to first flagellar segment plus pedicel (fig. 8); abdomen mostly or all red..... *hurdi* G. & R. Bohart
7. Propodeal enclosure with sculpture much coarser than that of scutellum..... 8
 Propodeal enclosure with sculpture not coarser than that of scutellum..... 9
8. First flagellar segment distinctly shorter than second (fig. 10); posterior face of propodeum not enclosed by a ridge..... *distincta* (Smith)
 First flagellar segment as long as second (fig. 14); posterior face of propodeum enclosed except at mid-dorsal point by a high, irregular ridge, the face itself with about 5 very strong transverse rugae and one or two oblique ones..... *shappirioi* G. & R. Bohart
9. Penultimate antennal segment more than twice as long as broad (fig. 12); last 4 abdominal segments black..... *aurantia* (Fox)
 Penultimate antennal segment less than twice as long as broad (figs. 22, 25); last 4 abdominal segments red or slightly darkened..... 10

10. Hind femur partly, fore and mid-tibiae red; silvery pubescence of mesonotum untarnished as viewed from above and in front.....
 *portiana* (Rohwer)
 Hind femur, fore and mid-tibiae dark; silvery pubescence of mesonotum somewhat tarnished as viewed from above and in front.....
 *sericifrons* (H. S. Smith)

KEY TO FEMALES OF THE GENUS LARROPSIS (ANCISTROMMA)

1. First flagellar segment at most twice as long as broad..... 2
 First flagellar segment $2\frac{1}{2}$ to 3 times as long as broad..... 5
2. Femora largely red *portiana* (Rohwer) 3
 Femora black 3
3. Propodeal enclosure coarsely granulate, or with close striae; outer surface of fore-femur highly polished; first two flagellar segments equal in length (fig. 34)..... *sericifrons* (H. S. Smith)
 Propodeal enclosure with distinct, well separated striae; outer surface of fore-femur rather evenly punctate, not highly polished; first flagellar segment shorter than second (figs. 11, 24)..... 4
4. Scutum with median punctures moderate in size and separated by less than a puncture diameter; abdomen partly or all black; pygidial setae dark coppery..... *distincta* (Smith)
 Scutum with median punctures fine, separated by more than a puncture diameter, in addition an even scattering of much stronger punctures *platynota* G. & R. Bohart
5. Front femur well punctured on outer surface for almost entire length; punctures toward middle of scutellum separated by less than a puncture diameter 6
 Front femur with outer surface polished and sparsely punctate for almost entire length; punctures toward middle of scutellum separated by more than a puncture diameter 8
6. Median cell with posterior portion much more sparsely setose than anterior portion; wings nearly hyaline (usually with milky reflection); hind femur and tibia red..... *hurdi* G. & R. Bohart
 Median cell rather uniformly setose; wings distinctly fumose (smoky); hind femur and tibia dark 7
7. Posterior face of propodeum with median sulcus extending to bottom of propodeum, dividing it into 2 coarsely, irregularly rugose areas, enclosed above by a high ridge *shappirioi* G. & R. Bohart
 Posterior face of propodeum with median sulcus extending about $\frac{2}{3}$ of the way to bottom of propodeum, posterior face with numerous rather fine transverse rugulae *aurantia* (Fox)
8. Hind femur largely red *bradleyi* G. & R. Bohart
 Hind femur largely black 9
9. Least interocular distance at least $1\frac{1}{2}$ times as great as length of first flagellar segment (fig. 7); mesopleural and scutal pubescence pale....
 *granulosa* G. & R. Bohart
 Least interocular distance less than $1\frac{1}{2}$ times as great as length of first flagellar segment (figs. 17, 19); mesopleural and scutal pubescence dark 10

10. Propodeum laterally with coarse striae above and fine ones rather abruptly below; abdomen red toward apex.....**corrugata** G. & R. Bohart
 Propodeum laterally with striae evenly graded from top to bottom; abdomen often black toward apex, or sometimes all black.....
**capax** (Fox)

Larropsis (Ancistromma) aurantia (Fox)
 (Figs. 12, 13, 28)

Larra aurantia Fox, 1891. Ent. News 2:194. Montana (lectotype female, ANSP).
Ancistromma aurulenta Fox, 1893. Proc. Acad. Nat. Sci. Phila. 45:388, lapsus.

Diagnosis. *Female*.—Body length about 12 mm. Abdomen all red (all black in specimen from Kansas); wings brown-stained. Pubescence brownish on head and thorax, golden on abdomen, median cell of forewing with dense microsetae. Punctuation of head and thorax fairly coarse and close, fore-femur with a shiny spot on distal one-half; abdomen punctuation obscure but more definite than usual; pygidial punctures close and fairly coarse. Clypeus moderately convex; flange with a median notch and 2 lateral ones. Least interocular distance about as long as flagellar segment I which is about 3 times its greatest breadth (fig. 13). Propodeal side and enclosure granulate and scarcely striate, posterior face weakly cross-striate, not enclosed by ridges, median sulcus incomplete below. Pygidial setae dense toward apex and golden.

Male.—Body length about 9 mm. Abdomen usually with last four segments black. Fore-femur well punctured. Clypeal flange convex, indented medially and laterally; flagellar segment I a trace longer than II, about 2.1 times as long as broad, a little shorter than least interocular distance (fig. 12).

Systematics.—Belonging in the long antenna group of *Ancistromma*, it seems to form a reasonable subgroup with *shappirioi* which also has dense notal punctuation and even more completely punctate fore-femur.

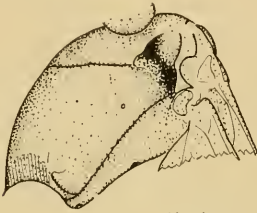
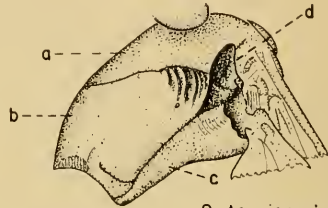
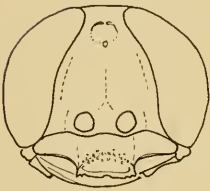
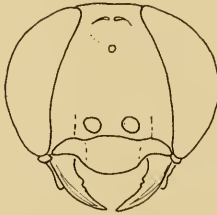
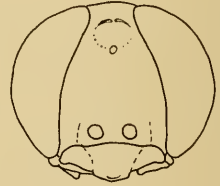
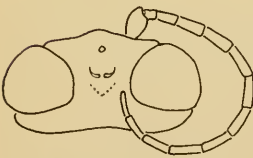
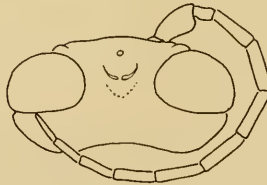
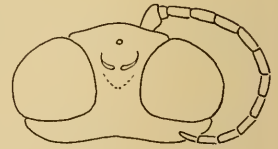
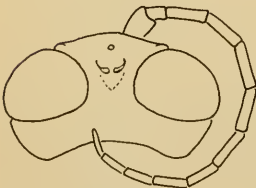
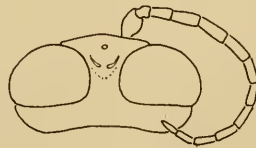
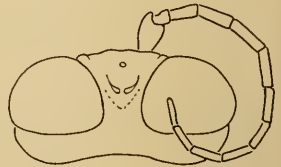
Biology.—A female from Yellowstone Co., Montana, was taken with a paralyzed *Ceuthophilus fusiformis* Scudder.

Distribution.—It ranges generally throughout the midwest as indicated in fig. 28.

Larropsis (Ancistromma) bradleyi G. and R. Bohart, new species
 (Figs. 20, 21, 31)

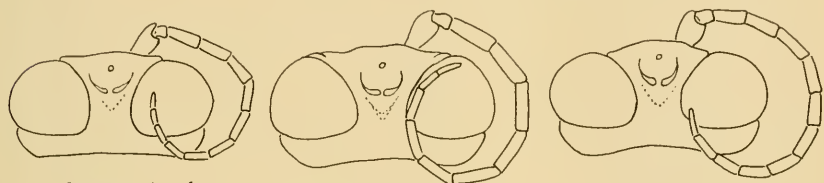
Female.—Length 10.0 mm., forewing length 7.5 mm. Head and thorax black, abdomen red; third and following flagellar segments, mandible tip, tegula, fore- and mid-legs, hind coxa and trochanter mahogany to black; rest of hind leg red; forewing dark stained, hind wing nearly clear. Pubescence pale, restricted, inconspicuous; microsetae of median cell of forewing moderately dense, thinner toward middle. Punctuation generally moderate to fine, coarse but well spaced on clypeus, moderate and close but distinct on frons, fine and very close on vertex and in addition a scattering of larger punctures, rather fine and 1-3 puncture widths apart on central area of scutum, finer and more widely separated on scutellum, fine and very close on postscutellum and propodeal enclosure,

moderately coarse and close on pleuron and propodeum laterally, widely scattered on shiny outer surface of fore-femur, extremely fine and well-spaced or obsolete on abdomen, large and widely spaced on pygidium. Clypeus strongly bulging, flange, with a median notch and a lateral one, proportions of flagellar segments

1. *distincta* ♀2. *tenuicornis* ♀3. *corrugata* ♀4. *granulosa* ♂5. *hurdi* ♂6. *granulosa* ♂7. *granulosa* ♀8. *hurdi* ♂9. *hurdi* ♀10. *distincta* ♂11. *distincta* ♀

Larropsis (*Ancistromma*) spp. Figs. 1 and 2, left pleural areas of female (a, mesepisternum; b, mesepimeron; c, metepisternum; d, epipleural sinus); figs. 3, 4 and 5, front view of head, minus antennae; figs. 6 through 11, top view of head and right antenna.

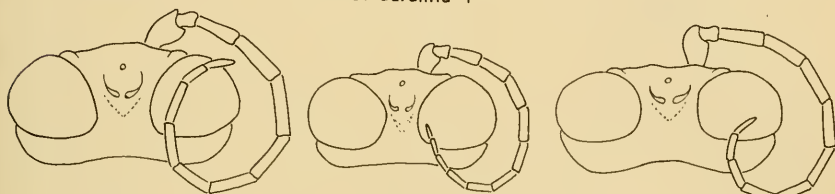
and least interocular distances as in fig. 21. Propodeum very distinctly, finely, and obliquely striate in enclosure which is hardly margined and has a faint median groove; striae of propodeum laterally a little coarser, even, distinct; posterior propodeal surface with indistinct but moderately coarse cross-striae,



12. *aurantia* ♂

13. *aurantia* ♀

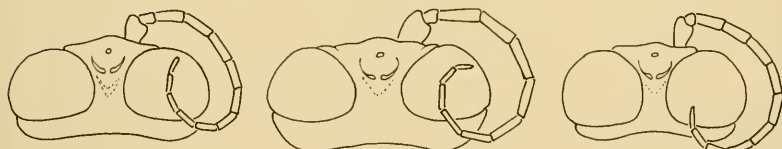
14. *shappirioi* ♂



15. *shappirioi* ♀

16. *capax* ♂

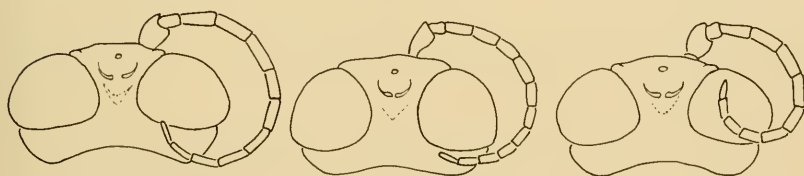
17. *capax* ♀



18. *corrugata* ♂

19. *corrugata* ♀

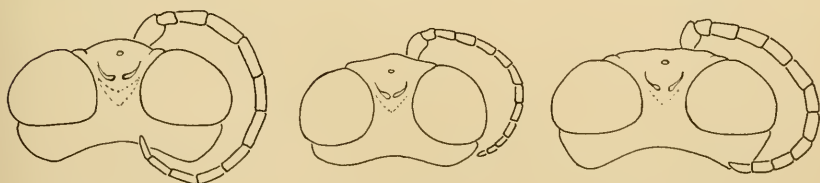
20. *bradleyi* ♂



21. *bradleyi* ♀

22. *sericifrons* ♂

23. *sericifrons* ♀



24. *platynota* ♀

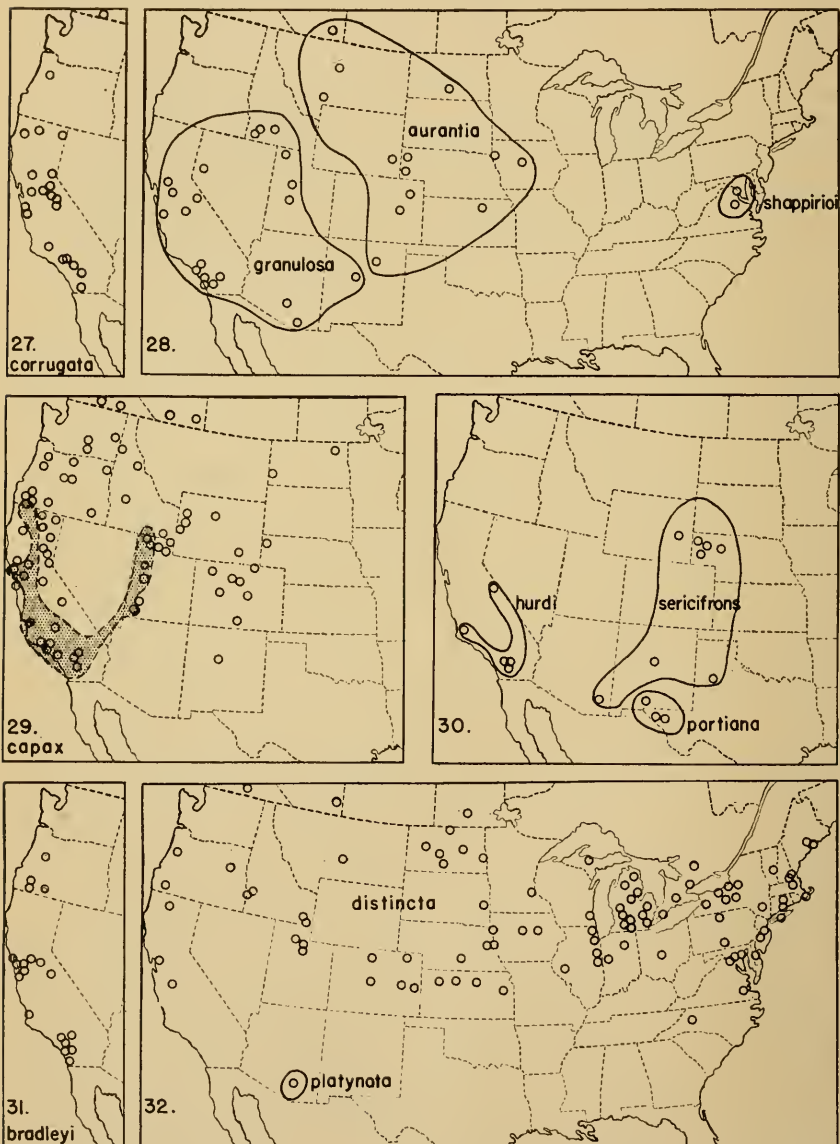
25. *portiana* ♂

26. *portiana* ♀

Larropsis (*Ancistromma*) spp. Figs. 12 through 26, top view of head and right antenna.

median sulcus fading below. Pygidium with sides converging at an angle of about 40 degrees, several rows of long golden setae near apex.

Male.—Differing from description of female primarily as follows: a little



Larropsis (Ancistromma) spp. Figs. 27 through 32, distribution of specimens studied; stippled area represents approximate range of *capax* with all-red abdomen.

smaller, antennae and legs except for tarsi, black. Sides of face and clypeus with appressed silvery pubescence. Punctuation in general coarser and closer, dorsum of thorax completely punctured and dull, abdominal tergites finely and closely punctured basally, a little less closely toward apex, punctures of sternites close laterally but becoming sparse medially; outer surface of fore-femur well punctate. Clypeal flange indented medially and sublaterally, antennal proportions as in fig. 20, least interocular distance less than length of flagellar segment I.

Holotype, female (CAS), San Rafael, Marin Co., California, July 16, 1922 (F. X. Williams). Paratypes, 25 males, 21 females, all from California, July to September as follows: San Rafael and Mill Valley, Marin Co. (F. X. Williams); Berkeley (J. C. Bridwell) and Livermore, 20 miles south (M. Wasbauer), Alameda Co.; Danville (F. X. Williams) and Orinda (M. Wasbauer), Contra Costa Co.; Davis, Yolo Co. (S. F. Bailey); Redwood City, San Mateo Co. (F. X. Williams); San Antonio Valley, Santa Clara Co. (P. D. Hurd); Santa Cruz, Santa Cruz Co. (S. M. Fidel); Mokelumne Hill, Calaveras Co. (F. E. Blaisdell); Yosemite Park, 5000 ft., Tuolumne Co. (A. L. Olson); Lone Pine, Inyo Co. (E. I. Schlinger); Black Lake Canyon, San Luis Obispo Co. (R. M. Bohart); Tanbark Flat, Los Angeles Co. (R. Schuster); Mountain Home, San Bernardino Co. (E. I. Schlinger); Peters Canyon, Orange Co. (R. M. Bohart); Temecula, Riverside Co. (J. W. MacSwain); San Diego, San Diego Co. (F. E. Blaisdell). Metatypes (all from Oregon); 1 female, Pinehurst (J. Schuh); 1 female, Klamath Falls (G. R. Ferguson); 1 female, Macdonald Forest near Corvallis (G. R. Ferguson).

Systematics.—The red hind legs of the female are distinctive among the *copax*-like species with moderately long flagellar segments and shiny front femur (see systematics under *corrugata*). The exceptionally narrow least interocular distance of the male combined with the regularly striate propodeal side are characteristics. It is known only from California and western Oregon (fig. 31). We take pleasure in naming the species for the well-known Hymenopterist, Professor J. C. Bradley.

Larropsis (Ancistromma) capax (Fox)

(Figs. 16, 17, 29)

Ancistromma capax Fox, 1893. Proc. Acad. Nat. Sci. Phila. 45:490, Colorado (lectotype female, ANSP).

Ancistromma dolosa Fox, 1893. Proc. Acad. Nat. Sci. Phila. 45:492, California (lectotype female, ANSP).

Larropsis dolosana Rohwer, 1915. Proc. U. S. Natl. Mus. 49:245, Washington (holotype female, USNM).

Larropsis picina Mickel, 1916. Trans. Amer. Ent. Soc. 42:418, Nebraska (holotype female, U. Nebr.).

Diagnosis. *Female.*—Body length about 14 mm. Abdomen often with last 3 segments black, sometimes all black or all red; wings dark brown. Median cell of forewing with dense microsetae. Punctuation of head and thorax mostly

moderate and close except on scutum and scutellum where punctures are rather widely spaced; outer surface of fore and mid-femur shiny for entire length; abdominal punctation obscure, pygidium with coarse punctures, dense distally. Clypeus strongly bulging, flange with median notch and 2 lateral ones. Least interocular distance a little more than length of flagellar segment I which is nearly three times its greatest breadth (fig. 17). Propodeal side coarsely striate, enclosure finely or obscurely, posterior face cross-striate, not enclosed by ridges, median sulcus incomplete below. Pygidial setae dense on distal one-half, reddish golden.

Male.—Body length about 10-12 mm. Abdominal coloration as in female. Femora fairly well punctate. Clypeal flange convex, indented medially and laterally. Flagellar segment I a trace longer than II, about 2.1 times as long as broad, about as long as least interocular distance (fig. 16).

Systematics.—The three color forms have given rise to a number of synonyms. The all-black variety, called *dolosana* by Fox and *picina* by Mickel is most common in the Rockies, the northwest and north central area. We have seen this form from Albany Co. and Worland, Wyoming; Colorado-Wyoming line on Highway 287; Steamboat Springs, Cascade, Fort Garland, and Boulder, Colorado; Wallace and Moscow, Idaho; Yakima, Washington; Okanagan Falls and Robson, British Columbia; Garden City, Utah; Beach, North Dakota; Harrison, Nebraska; and Crook Co., Enterprise, and Antelope Mt., Oregon. The typical red and black abdomen form frequents the Sierra and Rocky Mountain ranges, intermingling with the all-black variety to the north and at lower elevations in the mountains. The all-red abdomen form, called *dolosa* by Fox, is characteristic of the Upper Sonoran life zone in southern Oregon (Gold Hill), California (Davis, Antioch, Tomales Bay, Oso Flaco Lake, Oxnard, Saticoy, Claremont, Camp Baldy, Los Angeles, Walker Pass, Big Bear Lake, Idyllwild, Anza, Warner Springs) and Utah (Kelton, Park Valley, Iosepa, Delta, Topaz, Zion National Park). The approximate range of this form is indicated by the stippled area on figure 29. Because of the rather indefinite limits it does not seem advisable to recognize subspecies on the basis of color. Geographical variation is also expressed in scutal punctation, that of the Pacific States forms being relatively fine and sparse, whereas specimens from east of the Continental Divide have it coarser and denser. Material from the eastern Great Basin is generally intermediate in this respect. The separation of *capax* from *bradleyi* and *corrugata* is discussed under *corrugata*.

Biology.—A typically marked female from Clio, Plumas Co., California, was collected by R. C. Bechtel in possession of a nymphal *Ceuthophilus*.

Distribution.—As illustrated in figure 29, *capax* occurs generally from the Rocky Mountains westward. It favors the Transition and Canadian life zones but occurs also in the Upper Sonoran. To the east its range overlaps slightly that of *aurantia*, the dominant Great Plains species.

Larropsis (Ancistromma) corrugata G. and R. Bohart, new species

(Figs. 3, 18, 19, 27)

Female.—Length 16.0 mm., forewing length 13.0 mm. Head and thorax black, abdomen red; forewing dark-stained, hind wing nearly clear. Pubescence mostly pale, inconspicuous; microsetae of median cell of forewing moderately dense, thinner toward middle. Punctuation generally moderate to fine, coarse but well spaced on clypeus, moderate and close but distinct on frons, vertex punctures about a puncture width apart, large scattered punctures prominent here and on scutum and scutellum, scutal punctuation rather sparse, scutellum mostly polished, punctures fine and very close on postscutellum and propodeal enclosure, moderately coarse and close on pleuron and propodeum laterally, widely scattered on shiny outer surface of fore- and mid-femora, extremely fine and well-spaced or obsolete on abdomen, large as well as fairly thick and striatiform on pygidium. Clypeus strongly bulging, flange with a median notch and 2 lateral ones (fig. 3), proportions of flagellar segments and least interocular distance as in fig. 19. Propodeal enclosure finely but distinctly striate, propodeum laterally with fine close striae below but becoming much coarser and widely spaced in upper one-half, posterior surface with fairly coarse cross-striae, median sulcus fading to a carina below. Pygidium with sides converging at an angle of about 40 degrees, distal setae reddish to black.

Males.—About as in female but smaller (8-10 mm. long), tergites IV-VII and sternites V-VII black. Sides of face and clypeus silvery, scutal pubescence with bronzy reflections, narrow silvery apical bands on tergites II-III. General punctuation coarser and closer, notum closely punctate, outer surface of front femur a little more closely punctate but still shiny, abdomen with fine and rather close punctures, a little more widely spaced toward middle of venter. Clypeal flange indented medially and laterally, antennal proportions as in fig. 18, least interocular distance a little less than length of flagellar segment I.

Holotype, female (CAS), Strawberry, Tuolumne Co., California, July 17, 1951 (J. W. MacSwain). Paratypes, 11 males, 24 females, all from California, June to September, as follows: Lake City, Modoc Co. (C. L. Fox); McCloud, Siskiyou Co. (E. P. Van Duzee); Trinity Co. (G. E. Bohart); Sagehen Creek, Sierra Co. (R. M. Bohart); Lake Tahoe (R. M. Bohart) and Thompson's Creek (F. X. Williams), Placer Co.; Colusa, Colusa Co. (R. O. Schuster); China Flat and Pyramid Ranger Station, El Dorado Co. (J. W. MacSwain); Jackson, Amador Co. (R. and G. Bohart); Yosemite, Mariposa Co. (P. Hurd, J. MacSwain); Mt. Herman (W. E. Hazeltine) and Laurel (D. J. Burdick), Santa Cruz Co.; Rio Vista, Solano Co. (R. P. Allen); Jamesburg, Monterey Co. (R. I. Sailer); Paradise Valley (E. C. Van Dyke) and Huntington Lake (E. P. Van Duzee), Fresno Co.; Frazier Park, Kern Co. (F. A. Ehrenford); Tanbark Flat (D. E. Barcus) and Mt. San Antonio (W. E. Kelson), Los Angeles Co.; Snowcrest Camp, San Bernardino Co. (D. S. Thompson); Idyllwild, Riverside Co. (E. C. Van Dyke); Mt. Laguna, San Diego Co. (E. P. Van Duzee). Metatypes, 1 female, 5 miles west of Lewisburg, Benton

Co., Oregon (G. R. Ferguson); 4 females, Okanagan Falls, and 1 female Keremeos, British Columbia (Sladen).

Systematics.—The subgenus *Ancistromma* divides into 2 groups on the basis of the antennal length. The long antenna group contains 3 subdivisions, the *aurantia* subgroup, the *granulosa* subgroup, and the *capax* subgroup. The last-named group contains 3 closely related species, *bradleyi*, *capax*, and *corrugata*. These are characterized in the female by a bulging clypeus, extensively polished fore- and mid-femora, and well separated punctation on the scutum and scutellum. The females of the 3 species are not difficult to distinguish since *bradleyi* has red hind legs and *corrugata* has an all red abdomen in addition to its peculiar propodeal striation. The vertex is a little broader in *capax* than in the other two as seen by comparing figures 17, 19 and 21. Males are somewhat less distinctive and special attention must be paid to least interocular distance and propodeal striation as indicated in the key.

Distribution.—The known range covers much of California, north to southern British Columbia (fig. 27). Except for a few Upper Sonoran records, it is found mostly in the Transition and Canadian life zones.

Larropsis (*Ancistromma*) *distincta* (Smith)

(Figs. 1, 10, 11, 32)

Larrada distincta Smith, 1856. Cat. Hym. Brit. Mus. 4:292, New York (holotype female, Brit. Mus. Nat. Hist.).

Larropsis distincta semirufa Banks, 1921. Ann. Ent. Soc. Amer. 14:19, Massachusetts (syntype males and females, Mus. Comp. Zool.).

Diagnosis. *Female.*—Body length about 11 mm. Abdomen usually red with last 3 segments black, but sometimes all black (Michigan), wings lightly smoky. Median cell of forewing with dense microsetae. Punctation rather fine and close, including fore- and mid-femora; abdominal punctation very fine, mostly obscure, pygidium with large and fairly close punctures. Clypeus moderately convex, flange with a weak median notch and 2 lateral ones. Least interocular distance about 1.3 times length of flagellar segment I which is a little shorter than II and less than twice as long as broad (fig. 11). Propodeal side finely striato-granulose; enclosure with distinct and well separated striae; posterior face cross-striate, not enclosed by ridges, median sulcus fading to a line below. Pygidial setae dense on distal one third, dark coppery.

Male.—Body length about 9 mm. Abdomen with last 4 segments black or rarely all-black. Clypeal flange truncate medially, indented laterally. Flagellar segment I distinctly shorter than II, 1.3 to 1.5 times as long as broad, 0.6 to 0.8 times as long as least interocular distance (fig. 10).

Systematics.—Except for some all-black Michigan specimens, the color pattern is remarkably constant in the material before us. This species, the type of the subgenus, is one of the short antenna forms and is readily distinguished from its somewhat distant relatives by

the close punctation of both scutum and fore-femur. The rather coarse striation of the propodeal enclosure as well as the unusually short flagellar segment I in the male are additional recognition characters.

Biology.—Evans (1958) described the nesting habits and recorded *Nemobius faciatus* (DeGeer) as the prey. Nests were made from the bottoms of pre-existing depressions in the ground, particularly the caved-in parts of mole burrows. Cells were located 4 to 8 inches below the surface, and varied in number from 1 to 9, radiating from a common point. Most cells contained 2 crickets, the wasp egg located between the front and middle coxae of the first cricket in the cell. Miltogrammine parasites reared from the nests were *Mctopia argyrocephala* (Meigen) and *Senotainia trilineata* (Wulp).

Distribution.—As shown in fig. 32, *distincta* is well represented in North America between latitudes of 37° N. and 50° N.

Larropsis (Ancistromma) granulosa G. and R. Bohart, new species
(Figs. 4, 6, 7, 28)

Female.—Length 10.0 mm., forewing length 8.0 mm. Head and thorax black, variegated with reddish brown on mandible and legs, abdomen red. Forewing rather evenly smoky, hind wing nearly clear, pubescence mostly pale, inconspicuous; microsetae of median cell of forewing absent over most of basal two-thirds, small and irregular elsewhere. Punctation fine and close on head and thorax, microscopic on abdomen which has a satiny sheen; punctures of frons, vertex, scutum mostly less than a puncture width apart, those on scutellum somewhat more spaced, on propodeal enclosure very fine and granulate, on pleuron fine and dense, widely scattered on smooth but shagreened outer surface of fore- and mid-femora, large and widely spaced on pygidium. Clypeal flange practically entire medially, with a small sublateral notch, median clypeal area rather evenly convex, proportions of flagellar segments and least interocular distance as in fig. 7. Striae obsolescent on propodeal enclosure, fine and close on side of propodeum; posterior face not bounded by ridges, with fine, widely spaced cross-striae, median sulcus fading to a carina below. Pygidium with sides converging at an angle of about 40 degrees, distal setae reddish.

Male.—About as in female but smaller (6-8 mm. long), abdomen black. Sides of face and clypeus silvery, narrow silvery apical bands on tergites I-III. General punctation a little coarser, notum closely punctate throughout. Clypeal flange evenly convex (fig. 4). Antennal proportions as in fig. 6. Least interocular distance about 2.3 times length of flagellar segment I.

Holotype, female (CAS), Anza 2 miles east, Riverside Co., California, July 5, 1956 (R. M. Bohart). Paratypes, 64 males, 12 females, all from California, May to August, as follows: Riverside Co.: Anza 2 miles east, on *Eriogonum* and *Asclepias* (E. Linsley, M. Wasbauer, L. Stange, P. Hurd, R. Bechtel, R. Bohart), Temecula (J. W. MacSwain), Gavilan (P. H. Timberlake), Banning (S. Miyagawa); Los Angeles Co.: Huntington Park (A. Bauman), Claremont (C. F. Baker), Tanbark Flat (R. Bechtel, P. Hurd, H. Mathis), San Francisco Canyon (L. A. Stange); Yolo Co.: Davis (A. McClay, E. Shlin-

ger, R. Whitzel, R. Bohart); Inyo Co.: Mazourka Canyon and Antelope Springs (J. W. MacSwain); Lassen Co.: Hallelujah Junction (R. M. Bohart). Metatypes, 25 males, 2 females from CALIFORNIA: Beaumont, Perris, Warner Springs, Corona, La Jolla, Three Rivers, Paraiso Springs, Hospital Canyon (San Joaquin Co.); NEVADA: Sky Ranch near Reno; IDAHO: Bliss, Hot Creek Falls, Strike Dam Rock; UTAH: Delta, Skull Valley, Iosepa, Park Valley; ARIZONA: Toltec, Patagonia; NEW MEXICO. Albuquerque.

Systematics.—The unusually broad least interocular distance suggests the possibility that *granulosa* may be a link with the typical subgenus *Larropsis*. It seems to be related to *hurdi* on the basis of the long female antennae and shorter male antennae as well as the fine sculpture of the propodeal enclosure.

Distribution.—Its range over 6 western states is plotted in figure 28.

***Larropsis (Ancistromma) hurdi* G. and R. Bohart, new species**
(Figs. 5, 8, 9, 30)

Female.—Length 9.0 mm., forewing length 7.0 mm. Head and thorax mostly black, antenna, mouthparts, and legs partly reddish brown, hind leg red beyond base of femur, abdomen red, wings faintly yellowed. Pubescence silvery, conspicuous on face, gena, fore-femur, mesopleuron and side of propodeum; silvery apical bands on all but last tergite; microsetae of median cell of forewing present only around edge. Punctuation very fine and close on head and thorax, microscopic on rather satiny abdomen; outer surface of fore- and mid-femur closely punctate; punctures of pygidium fine and numerous basally, thicker and coarser distally. Clypeus moderately convex, flange with a weak broad emargination medially, lateral notches indistinct, proportions of flagellar segments and least interocular distance as in fig. 9. Striae of propodeum fine, close and inconspicuous on sides and rear, even finer and closer on satiny enclosure; posterior face finely and indistinctly cross-striate, median sulcus fading to a fine carina below. Pygidium with sides converging at an angle of about 40 degrees, distal setae pale golden.

Male.—About as in female but smaller (6-8 mm. long), hind femur mostly black except toward apex, hind tibia sometimes mostly dark. Face more densely silvery. Clypeal flange somewhat narrowly rounded or angled out (fig. 5). Antennal proportions as in fig. 8. Least interocular distance about 1.8 times length of flagellar segment I.

Holotype, female (CAS), Palm Springs, Riverside Co., California, May 22, 1917 (E. P. Van Duzee). Paratypes, 1 male, same data as type but collected May 23; 7 males, Borego, San Diego Co., Calif., April 24-27, 1954-55, on *Croton californicus* (P. D. Hurd, M. Wasbauer); 1 female, San Jacinto, Riverside Co., Calif.; 1 female, Santa Margarita, San Luis Obispo Co., Calif., June 10, 1958 (J. W. MacSwain); 2 males, 1 female, Fish Creek Mts., Imperial Co., April 20, 1955 (W. R. Richards). Metatype, 1 male (headless), Mazourka Canyon, Inyo Co., Calif., July 2, 1953 (J. W. MacSwain).

Systematics.—Because the female has rather long antennae and the

male has them fairly short, *hurdi* seems to bridge the two groups of *Ancistromma*. This condition occurs also in *granulosa* which, however, has a much broader least interocular distance.

Distribution.—The Upper and Lower Sonoran areas from which this species is known are plotted in figure 30.

Larropsis (Ancistromma) platynota G. and R. Bohart, new species

(Figs. 24, 32)

Female.—Length 10.0 mm., forewing length 8.0 mm. Head and thorax black (hind legs missing beyond coxae), abdomen red, wings lightly yellowed. Pubescence pale, inconspicuous; microsetae of median cell of forewing rather long, scattered, fewer toward middle. Punctuation very fine and fairly close on head and thorax except scutum and scutellum where fine punctures are several puncture widths apart and overlaid with a scattering of large punctures, abdomen with inconspicuous punctuation, satiny; outer surface of fore- and mid-femur completely covered with somewhat separated fine punctures; pygidium with dense and rather coarse, striatiform punctures. Clypeus moderately convex, flange broadly and weakly emarginate medially, lateral notches minute, proportions of flagellar segments and least interocular distance as in fig. 24. Scutum and scutellum unusually flattened; striae of propodeum coarse laterally, fine but distinct and well separated in enclosure, posterior area enclosed by carinae and weakly arcuate, median sulcus fading below. Pygidium with sides converging at an angle of about 40 degrees, densely covered with reddish golden setae, largest distally.

Male.—Unknown.

Holotype, female (CAS), Tucson, Arizona, October 10, 1939 (Richard Grant).

Systematics.—The flattened notum is an unusual feature in the subgenus. A relationship with *distincta* is indicated by the similar antennae, propodeal enclosure and punctate fore-femur.

Larropsis (Ancistromma) portiana Rohwer

(Figs. 25, 26, 30)

Larropsis portianus Rohwer, 1911. Proc. U. S. Natl. Mus. 40:583, New Mexico (holotype female, USNM).

Diagnosis. *Female*.—Body length about 9 mm. Abdomen red, legs mostly so, wings faintly yellowed. Median cell of forewing with uniform dense microsetae. Punctuation fine and mostly close on head, coarse and slightly separated on scutum and scutellum, coarse and close elsewhere on thorax; fore- and mid-femora extensively polished, abdomen with fine but distinct and well separated punctures, pygidial punctures scattered. Clypeus moderately convex, flange with a weak median emargination and 2 notches laterally. Least interocular distance about 1.6 times length of flagellar segment I which is equal to II and less than twice as long as broad (fig. 26). Propodeal side with moderate, close striae; enclosure with fine striae; posterior face cross-striate, not enclosed by ridges; median sulcus fading to a ridge below. Pygidium with sides converging at an angle of about 45 degrees, setae few, distal, pale reddish.

Male.—Body length about 7 mm. Face densely silvery, thorax a little less so. Tibiae and tarsi red, femora partly so, including distal one-half of hind femur. Fore-femur well punctate, silvery. Clypeal flange indented medially and laterally. Flagellar segment I about as long as II, about 1.6 times as long as broad, about 0.55 times as long as least interocular distance (fig. 25).

Systematics.—Its closest relative of the short antenna species is *sericifrons* from which it differs as discussed under that species. The red legs are striking in appearance, but the broad pygidium in both sexes, punctate abdomen, and densely setose median cell are more fundamental characters. As we have seen only 2 males and 4 females, the color pattern may be more variable than we have indicated.

Biology.—The type female was collected on *Croton neomexicanum* and one of the males on *Gutierrezia sarothrae* by T. D. A. Cockerell.

Distribution.—Known only from west Texas and New Mexico as indicated in fig. 30. The material we have seen is as follows: 1 male, Las Cruces, New Mexico, September 27 (T. D. Cockerell); 1 pair, Las Cruces, New Mexico (female holotype); 1 female, Barstow, Texas, October 12, 1905; 1 female, El Paso, Texas, October.

Larropsis (*Ancistromma*) *sericifrons* (H. S. Smith)

(Figs. 22, 23, 30)

Ancistromma sericifrons H. S. Smith, 1906. Ent. News 17:247, Nebraska (holotype male, U. Nebr.).

Larropsis rubens Mickel, 1917. Nebr. Univ. Studies 17:329, Nebraska (holotype female, U. Nebr.), **new synonymy**.

Diagnosis. Female.—Body length about 9 mm. Abdomen red, wings faintly smoky or yellowed. Median cell of forewing with dense microsetae. Punctuation fine to moderate on head and thorax, and very close; fore- and mid-femora extensively polished; abdominal punctuation fine, somewhat obscure, most evident on last few tergites and ventrally; pygidium with scattered punctures. Clypeus moderately convex, flange with a median notch and 2 lateral ones. Least interocular distance about 1.4 times length of flagellar segment I which is about as long as II, and about twice as long as broad (fig. 23). Propodeal side striatogranulose; enclosure usually granulose, sometimes with fine and close striae; posterior face cross-striate, not enclosed by ridges, median sulcus fading below. Pygidial setae thick distally, reddish coppery.

Male.—Body length 7 mm., last 3 or 4 segments sometimes black. Face extensively silvery. Abdomen with rather uniform, fine to moderate punctuation. Clypeal flange indented medially and laterally. Flagellar segment I about as long as II, about 1.4 times as long as broad, about 0.6 times as long as least interocular distance (fig. 22).

Systematics.—The short antennae and generally dense punctuation place *sericifrons* in the *distincta* group and evidently closest to *portiana*. The latter's red legs are distinctive as well as its female characters of separated scutal punctures and broad pygidium. The male of *sericifrons* has a much less silvery thorax.

Distribution.—As indicated in fig. 30, *sericifrons* appears to be primarily a Great Plains species. We have seen about 35 specimens from the following localities: NEBRASKA: Sioux Co. (P. R. Jones, H. S. Smith), Grant Co. (L. W. Quate), Mitchell (*rubens* type); WYOMING: Glendo (D. R. Tysdale); TEXAS: Buffalo Lakes, Lubbock Co.; NEW MEXICO: Moriarty (M. F. McClay); ARIZONA: Willcox, on *Eriogonum thomasi* (P. D. Hurd, D. D. Linsdale, R. M. Bohart). All specimens were taken in August and September.

Larropsis (Ancistromma) shappirioi G. and R. Bohart, new species
(Figs. 14, 15, 28)

Female.—Length 11.0 mm., forewing length 9.0 mm. Black, wings rather evenly brownish. Pubescence fulvous, light brownish on scutum, inconspicuous; microsetae of median cell of forewing small, numerous, a little sparser medially. Punctuation of head and thorax fine to moderate, very dense, even on scutellum and fore-femur, sparse and inconspicuous on satiny abdomen; pygidial punctures coarse, sparse basally. Clypeus moderately convex, flange with a weak median emargination and 2 small lateral notches, proportions of flagellar segments and least interocular distance as in fig. 15. Propodeum very coarsely and rather irregularly striate in well defined enclosure, striae well separated but ill-defined laterally, posterior surface outlined by ridges, coarsely areolate, median sulcus

Male.—About as in female but smaller (9 mm. long). Pubescence off-silvery, a little more conspicuous, especially on face, mesopleuron and propodeum, tergites I-III with obscure silvery apical bands. Clypeal flange convex in outline, indented medially and sublaterally. Antennal proportions as in fig. 14. Least interocular distance about 1.3 times length of flagellar segment I.

Holotype, female (USNM), Washington, D. C., July 22, 1944 (D. Shappirio). Paratype, 1 male, Dunn Loring, Virginia, July 24, 1949 (K. V. Krombein).

Systematics.—The long antennae, extensively punctate fore-femur, and thickly setose median cell are possessed in common with *aurantia*. However, the rugose propodeum of *shappirioi* is distinctive. The species is named in honor of the collector, David Shappirio.

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A NEW GENERIC NAME IN THE POLYSPHINCTINE ICHNEUMONIDS
(HYMENOPTERA)

It has been found that the ichneumonid generic name *Laufeia* (Tosquinet, 1903. Mém. Soc. Ent. Belgique 10:381) is preoccupied because of its earlier use for a genus of salticid spiders (Simon, 1889. Ann. Soc. Ent. France (6) 8:248), so the new name *Dreisbachia* is hereby proposed to replace *Laufeia* Tosquinet. The new name is in honor of Mr. R. R. Dreisbach, whose collecting work has done much to make the North American ichneumonids better known.

The specific names to be referred to *Dreisbachia* are *Laufeia mira* Tosquinet, 1903 (Oriental Region, the type-species of both *Dreisbachia* and *Laufeia* Tosquinet); *Polysphincta stigmata* Uchida, 1941 (Japan); *Pimpla pictifrons* Thomson, 1877 (Europe); *Polysphincta slossonae* Davis, 1898 (Nearctic Region); and *Laufeia navajo* Townes, 1960 (Arizona and Honduras).—HENRY TOWNES, *Museum of Zoology, The University of Michigan, Ann Arbor.*

BOOK REVIEW

INSECT SOUNDS. By P. T. Haskell. 22.7 cm. Quadrangle Books, 119 West Lake St., Chicago 1, Ill., 1961. viii+189 pp., 97 figs. Price: \$5.75.

Dr. P. T. Haskell is a Deputy Director of the Anti-Loeust Research Centre in London, and he has contributed importantly to the literature of insect sounds prior to this book, which is one of a series by British authors entitled *Aspects of Zoology*.

Insect sounds have been of general interest to people since ancient times, but knowledge of them has been placed on a scientific basis largely during the past 20 years. The 1948 book on the songs of insects by G. W. Pierce, a Harvard physics professor, has been followed by such other comprehensive works as the 1954 Colloquium on the acoustics of Orthoptera, edited by Busnel; a 1958 summary of insect sounds (Ann. Rev. Ent., vol. 3), a 1960 bibliography (published by the Pennsylvania State Univ. Press), by Hubert and Mable Frings; and a 1960 A.I.B.S. symposium volume on animal sounds and communication, edited by Lanyon and Tavalga.

This convenient-sized book of good construction contains 7 chapters, the first dealing with the recording and analysis of insect sounds. Equipment used by current students is discussed, but unhappily not pictured. Other chapters deal with sound-producing mechanisms, hearing, song patterns, behavior, and some physiological aspects of acoustic behavior. The final chapter is a brief consideration of some broad aspects of some research accomplishments and goals. The large number of times that the ability to produce sounds has independently evolved in certain insect groups, the survival value of stridulation, the "social reactions" correlated with songs, and the practical aspects of applying the growing wealth of basic information to ecological problems are among the subjects mentioned.

Each chapter has its own bibliography, with titles omitted. While all details of the subject naturally can not be encompassed by this small book, it is a useful, critical, and challenging summary.—ASHLEY B. GURNEY, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

A NEW SPECIES OF CERCONOTA FROM ECUADOR

(LEPIDOPTERA: STENOMIDAE)

W. DONALD DUCKWORTH, *North Carolina State College, Raleigh*

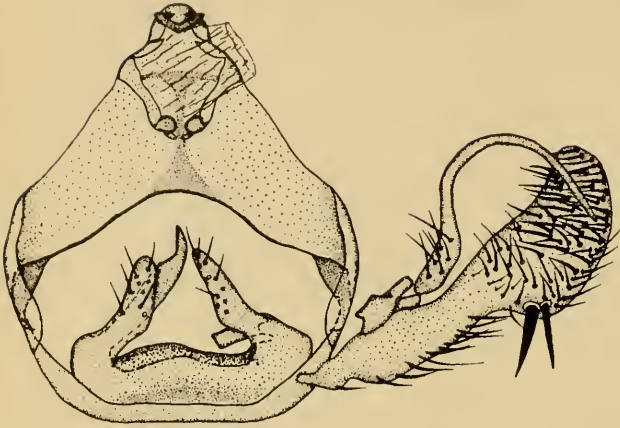
The following description is published in order to provide a name for an important insect pest of cacao in Ecuador. The specimens from which this species is described were received from Ing. Gualberto Merino M., of Quito, Ecuador. The species is a leaf-tier on cacao and is considered by Mr. Merino to be one of the principal insect pests on cacao foliage.

***Cerconota dimorpha*, n. sp.**

Alar expanse, 18-22 mm.

Antenna whitish basally, brown beyond. Face whitish medially, light brown with violaceous tinge laterally; second segment of palpus dark violaceous brown except whitish on inner side and at tip, the inner side with light violaceous brown shade anteriorly; apical segment white, tip brown. Legs whitish-ocherous; fore- and midlegs shaded heavily with violaceous brown, trochanters dull yellow-ocherous. In male, dorso-anterior portion of thorax and tegula ocherous, posterior portion black. In female, thorax mottled with violaceous brown and blackish scales dorsally. Abdomen of male greyish-fuscous dorsally, except 1st segment gray; female grayish-fuscous dorsally; both male and female ocherous ventrally. Forewing, in male, ocherous to argillaceous shaded with brown, with a large, dorsal area of black scales at inner angle; base of costa narrowly dark brown; three triangular dark brown costal spots, one at basal third, one near middle, and one at apical fourth; from the apex of latter extends an ill-defined, slender, lunate line to tornus; from the outer corner of this costal spot a row of dark brown dots extends from apex along termen to tornus; costa, except spots, edged with ocherous; a brown dot at end of cell; cilia violaceous brown basally, lighter beyond. In the female, forewing ocherous heavily shaded with brown, with three costal spots, basal one indistinct, small, others larger, more sharply defined; from apical costal spot extend two outwardly curving, indistinct parallel, dark, transverse lines to tornus; from middle costal spot extends an outwardly curving, indistinct, transverse line; costa narrowly dark brown basally, edged with ocherous beyond, except spots; a small faint dot at end of cell; cilia violaceous brown basally, lighter beyond. Hindwings grey with whitish costal margin; cilia ocherous faintly irrorate whitish and grey and with grey subbasal line.

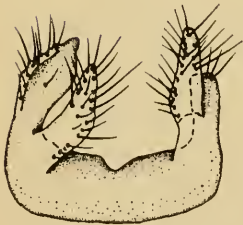
Male genitalia.—See figures (Slide WDD. No. 2035, type). Uncus small, curved ventrad; gnathos divided; harpe with costal arm sickle-shaped; neck of harpe narrow, cucullus subtriangular with two strong setae from ventral angle, apex bluntly rounded; anellus with four lateral lobes, ventral two approximately equal in size and shape, fingerlike; dorsal two unequal, one large, upright, tapering to slightly curved point, the other small, recurved, truncate; aedeagus blunt, with broad, flattened process near apex; cornuti consisting of an elongate cluster of heavy, straight spines.



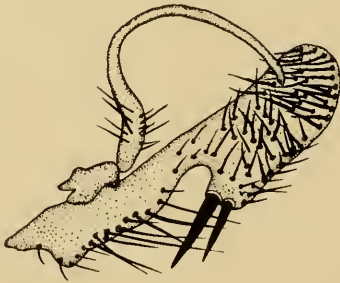
1a



1b



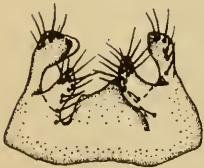
2a



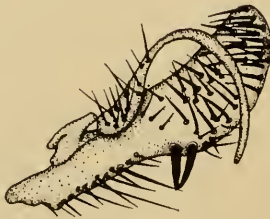
2b



2c



3a



3b



3c

Female genitalia.—See figures (Slide WDD, No. 2040, paratype). Lamella antevaginalis large, forming a flap over ostium; ostium bursae large, sclerotized; ductus bursae membranous, convoluted near corpus bursae; corpus bursae with large, dumbbell-shaped, dentate signum; inception of ductus seminalis well before ostium.

Type.—U. S. National Museum No. 65460.

Type locality.—"Eugenia" Farm, Kilometer 4, Canton Milagro, (Guayas Province), Ecuador (June 1, 1960, G. Merino).

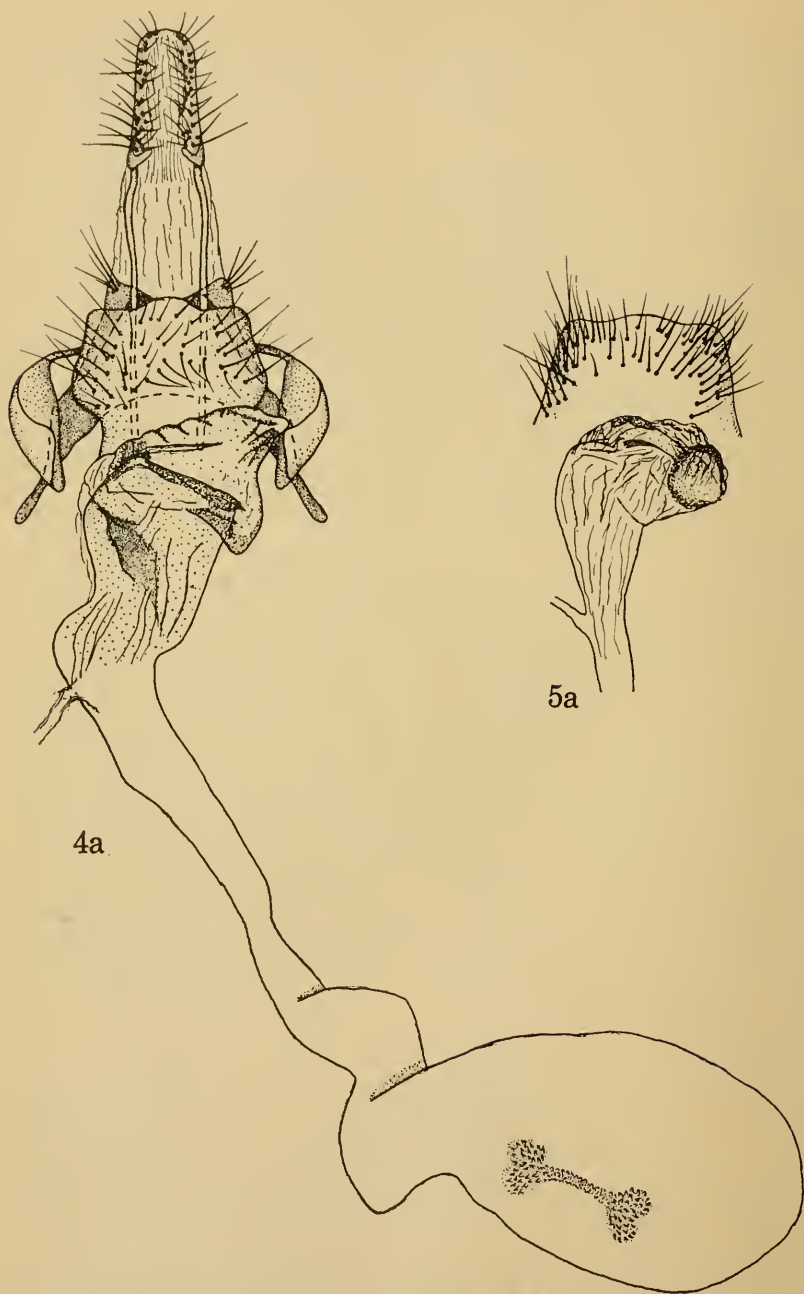
Described from the type male, four male and five female paratypes all with same data.

This species is very closely related to *Cerconota carbonifer* (Busek) (Figures 3a, 3b, 3c, 5a) and *C. palliata* (Walsingham) (Figures 2a, 2b, 2c). Both *palliata* and *carbonifer* possess a hair-pencil on the upper surface of the hind wing, along vein 8, which is lacking in *dimorpha*. This distinguishes the males of the latter readily from the males of the former two. No females of *palliata* are available for study and the single female of *carbonifer* is in poor condition so no reliable superficial characters for separating *carbonifer* from *dimorpha* are present.

The genitalia provide abundant distinguishing characters and the three species can be readily separated. The deep excavation of the neck of the harpe of *palliata* immediately distinguishes it from the other two and the tight group of spines at the distal end of the aedeagus of *carbonifer*, absent in both *dimorpha* and *palliata*, distinguishes it easily from them. A comparison of the figures of the three will show differences in the anellus of each which support the distinguishing features mentioned above. The rather strongly sclerotized and enlarged ostium bursae of *dimorpha* compared with that of *carbonifer* leave no doubt about the identities of these two.

The sexual dimorphism found in *dimorpha* also occurs in *carbonifer*. No female specimens of *palliata* are available for study but it is very likely that a similar condition of sexual dimorphism occurs in that species. There is a strong possibility that the sexually dimorphic condition found in these species occurs frequently in the genus *Cerconota* and many of the presently described species may ultimately prove to be synonyms.

Cerconota dimorpha n. sp. Fig. 1a, male genitalia with aedeagus removed; Fig. 1b, lateral view of aedeagus. *C. palliata* (Walsingham). Fig. 2a, anellus; Fig. 2b, harpe; Fig. 2c, lateral view of aedeagus. *C. carbonifer* (Busek). Fig. 3a, anellus; Fig. 3b, harpe; Fig. 3c, lateral view of aedeagus.



Cerconota dimorpha n. sp. Fig. 4a, female genitalia. *C. carbonifer* (Busck). Fig. 5a, genital plate.

4. Pronotum with 6 large, acute teeth on each side; disk of pronotum with 3 longitudinal ridges. General feeder on stored foods.....
Saw-toothed grain beetle, Oryzaephilus surinamensis (Linnaeus) complex
- Pronotum without teeth, or with only 1 or 2 teeth on each side; disk of pronotum without longitudinal ridges, or with 2 parallel longitudinal ridges 5
5. Elytron largely shiny blue or blue-green. *Ham beetles, Necrobia*..... 54
 Elytron largely brownish or blackish, occasionally with reddish markings... 6
6. Elytron completely or almost completely covering abdomen, rounded at apex 7
 Elytron not completely covering abdomen, truncate (cut off squarely) at apex 56
7. Antenna shorter than head and pronotum together, apical segments usually enlarged and club-like 8
 Antenna distinctly longer than head and pronotum together, without apical club 51
8. Prothorax hood-shaped, covered with tubercles which are rather coarse, especially in front. Infesting whole grain.....
 *Lesser grain borer, Rhyzopertha dominica* (Fabricius)
- Prothorax not hood-shaped, without tubercles or with few fine tubercles... 9
9. Dorsal surface of body without hairs or scales visible with hand lens of 15 powers 10
 Dorsal surface of body with scales or hairs visible against light with hand lens of 15 powers 31
10. Each elytron with 2 or 3 pale spots on dark background. General feeder on fungus and mold
 *Two-banded fungus beetle, Alphitophagus bifasciatus* (Say)
- Each elytron of uniform brownish or blackish color 11
11. Usually less than 4.5 mm. long; color usually brownish..... 12
 At least 4.5 mm. long (often longer); color usually blackish..... 23
12. Pronotum much longer than broad; body distinctly parallel-sided. Infesting whole grain
 *Square-necked grain beetle, Cathartus quadricollis* (Guerin-Meneville)
- Pronotum as wide as, or wider than long 13
13. Side margins of head projecting into and partially dividing eyes..... 14
 Eyes more or less rounded, not divided 19
14. Antenna shorter than head with distinct, compact, 5-segmented club; first segment of hind tarsus shorter than combined length of segments 2 and 3; 2.5-3 mm. long. Infesting broken grain.....
 *Long-headed flour beetle, Laetheticus oryzae* Waterhouse
- Antenna distinctly longer than head, with compact 3-segmented club or loose 4-segmented club, or gradually broadening from the base with no distinct club; first segment of hind tarsus as long as combined lengths of segments 2 and 3 15
15. Elytron without longitudinal ridges, sometimes punctate; males with two prominent tubercles on middle of head and each mandible with large conspicuous tooth curved upwards. Horned flour beetles, *Gnathocerus*.. 18

- Elytron with longitudinal ridges, at least at the sides; males without distinct tubercles on head and without large, upwardly curved teeth on mandibles (flour beetles) 16
16. 5-6 mm. long. Infesting broken grain.....
*False black flour beetle, Tribolium destructor* Uyttenboogaart
 Less than 5 mm. long 17
17. Antennal club gradually enlarged toward tip; eyes separated by more than width of either eye when seen from below; head expanded on each side in front of eye; a ridge above eye. Infesting broken grain.....
*Confused flour beetle, Tribolium confusum* Du Val
 Antennal club with last three segments abruptly enlarged; eyes separated by about width of each eye when seen from below; head not expanded beyond eyes at side; no ridge above eye. Infesting broken grain.....
*Red flour beetle, Tribolium castaneum* (Herbst)
18. About 4 mm. long; eye almost completely divided, only 1 or 2 facets connecting dorsal and ventral portions of eye; male mandible with a broad triangular tooth. Infesting broken grain.....
*Broad-horned flour beetle, Gnathocerus cornutus* (Fabricius)
 About 3 mm. long; eye less completely divided, 5 or 6 facets connecting dorsal and ventral portions of eye; male mandible with slender tooth. Infesting broken grain
*Slender-horned flour beetle, Gnathocerus maxillosus* (Fabricius)
19. Pronotum with angular or rounded protuberance on each front angle; middle of posterior margin of pronotum rather strongly convex. Infesting moldy foods.....*Foreign grain beetle, Ahasverus advena* (Walth)
 Pronotum without protuberance on front angles; posterior margin of pronotum convex from corner to corner or almost straight..... 20
20. 3-4 mm. long; apical antennal segments distinctly swollen..... 21
 Less than 3 mm. long; apical antennal segments slightly swollen..... 22
21. Second antennal segment inserted before tip of first; elytron with conspicuous raised lines. Infesting whole and broken grain.....
*Siamese grain beetle, Lophocateres pusillus* (Klug)
 Second antennal segment inserted at tip of first; elytron without conspicuous raised lines. Infesting whole and broken grain.....
*Mexican grain beetle, Pharaxonotha kirschi* Reitter
22. Protuberance above antenna separate from slight ridge above eye. Infesting broken grain
*Small-eyed flour beetle, Palorus ratzeburgi* Wissman
 Protuberance above antenna continuous with ridge over eye. Infesting broken grain.....*Depressed flour beetle, Palorus subdepressus* (Wollaston)
23. 10-25 mm. long 24
 4.5-10 mm. long 26
24. 20-25 mm. long*Churchyard beetle, Blaps mucronata* Latreille
 10-19 mm. long. Meal worms, **Tenebrio** 25
25. Body with abundant dense punctures; pronotum about as broad as long. Infesting broken grain.....*Dark meal worm, Tenebrio obscurus* Fabricius
 Body with less numerous punctures; pronotum broader than long. Infesting broken grain.....*Yellow meal worm, Tenebrio molitor* Linnaeus

26. Antenna swollen abruptly (last 3 to 5 segments)..... 27
 Antenna swollen gradually toward tip 28
27. 4 to 6 mm. long; sides of thorax almost parallel; last 3 segments of antenna swollen. Infesting broken grain
 *Black flour beetle, Tribolium madens* (Charpentier)
 8 to 10 mm. long; thorax strongly constricted at base; last 4-5 segments of antenna swollen. Infesting broken grain
 *Cadelle beetle, Tenebroides mauritanicus* (Linnaeus)
28. Body not twice as long as wide; clypeus ("forehead") not notched. Infesting damp and moldy grain
 *Red-horned grain beetle, Platydemus ruficornis* (Sturm)
 Body about twice as wide as long; clypeus ("forehead") notched at tip.... 29
29. Pronotum widest at base; glossy.....
 *Lesser mealworm, Alphitobius diaperinus* (Panzer)
 Pronotum widest slightly behind middle; dull shine or without shine..... 30
30. Eye divided or with only 1 facet at narrowest part; pronotum with posterior corner acutely-angled
 *Black fungus beetle, Alphitobius laevigatus* (Fabricius)
 Eye narrowed but not divided; with a number of facets at narrowest part; pronotum with posterior corner right-angled.....
 *Larger black flour beetle, Cynaenus angustus* Leconte
31. Body clothed with hairs 32
 Body clothed with scales 48
32. Head without median ocellus (simple eye) 33
 Head with median ocellus (simple eye) 45
33. 5-10 mm. long, densely covered with hair, *Dermestes* 39
 2-4 mm. long, densely covered with hair or not 34
34. Head essentially hidden beneath hood-like pronotum ... 35
 Head easily seen from above 37
35. Elytron smooth. General feeder on stored foods.....
 *Cigarette beetle, Lasioderma serricorne* (Fabricius)
 Elytron striate, with rows of punctures at least on sides 36
36. Elytron entirely striate; about 2 mm. long; brownish. General feeder on stored foods..... *Drug-store beetle, Stegobium paniceum* (Linnaeus)
 Elytron striate only on sides, about 3 mm. long; shining blackish. General feeder on stored foods *Catorama beetles, Catorama bibliothecarum* (Poey) and *Catorama herbarium* (Gorman)
37. 3-4 mm. long; each elytron with two paler areas; antennal club 4-segmented
 *Four-spotted fungus beetle, Mycetophagus quadriguttatus* Mueller
 2-3 mm. long; each elytron with two paler areas; antennal club 3-segmented 38
38. Side of thorax not toothed, narrowing anteriorly. Infesting broken grain
 *Hairy fungus beetle, Typhaea stercorea* (Linnaeus)
 Side of thorax with small tooth at middle front corner conspicuously angulate *Plaster beetle, Cryptophagus* spp.
39. Posterior margin of elytron with numerous small, sharp teeth; apex of each elytron extended posteriorly to form large spine. General feeder on stored foods and fabrics..... *Hide beetle, Dermestes maculatus* Degeer

	Posterior margin of elytron more or less smooth; apex of elytron not extended posteriorly	40
40.	Basal $\frac{2}{5}$ to $\frac{1}{2}$ of elytron clothed with pale hairs except for few small dark patches which may almost form row; apical half of elytron with only black hairs. General feeder on stored food and fabrics..... <i>Larder beetle, Dermestes lardarius</i> Linnaeus	
	Elytron not so	41
41.	Pronotum and elytron with dark or golden hairs, but no pale or whitish hairs. General feeder on stored foods and fabrics..... <i>Black larder beetle, Dermestes ater</i> Degeer	
	Pronotum with some (frequently conspicuous) whitish hairs; elytron with some whitish hairs as well as darker ones	42
42.	Pronotum with broad band on each side and much narrower band on the anterior margin consisting entirely or almost entirely of whitish hairs... 43 Pronotum with mixture of dark brown and yellowish hairs on sides and disk, without lateral or apical bands of whitish hairs..... 44	
43.	Elytron uniformly blackish..... <i>Dermestes frischii</i> Kugelann Elytron with red-brown band on basal $\frac{1}{3}$ to $\frac{1}{2}$ and with transverse patches of golden hairs..... <i>Dermestes carnivorus</i> Fabricius	
44.	10-12 mm. long; elytron with broad transverse band of white hairs which sometimes reaches midline. General feeder on stored food and fabrics	
 <i>Tallow beetle, Dermestes marmoratus</i> Say	
	8-9 mm. long; elytron without such band of whitish hairs. General feeder on stored foods and fabrics..... <i>Dermestes caninus</i> Germar	
45.	Hind tarsus with first segment half (or less than half) as long as second segment; dark brown or blackish, <i>Attagenus</i>	46
	Hind tarsus with first segment as long as (or longer than) second segment	47
46.	Each elytron with whitish or yellowish spot near the middle. General feeder on stored foods and fabrics..... <i>Attagenus pellic</i> (Linnaeus) Each elytron entirely blackish. General feeder on stored foods and fabrics..... <i>Black carpet beetle, Attagenus piceus</i> (Olivier)	
47.	Pronotum and elytron almost same color; eyes indented on inner side. General feeder on stored food and fabrics..... <i>Larger carpet beetle, Trogoderma inclusum</i> Lecote	
	Pronotum darker than elytron; eyes gently rounded on inner side. General feeder on stored food and fabrics	
 <i>Khapra beetle, Trogoderma granarium</i> Evert's	
48.	Antenna 8-segmented, with 2-segmented club; 2-2.9 mm. long. General feeder on stored food and fabrics..... <i>Museum beetle, Anthrenus museorum</i> (Linnaeus)	
	Antenna 11-segmented, with 3-segmented club; size varied	49
49.	Eyes smooth and rounded; antennal club with nearly parallel sides. General feeder on stored foods and fabrics..... <i>Varied carpet beetle, Anthrenus verbasci</i> (Linnaeus)	
	Eyes indented on inner side; antennal club oval	50
50.	Elytron dark and generally pale-sealed; brick-red scales present especially along midline of elytra; pronotum with dorsal rim of antennal cavity	

- moderately to strongly dilated and visible from above. General feeder on stored foods and fabrics.....
*Carpet beetle, Anthrenus scrophulariae* (Linnaeus)
- Elytron with dark, whitish, and golden-brownish scales, never any brick-red scales; pronotum with dorsal rim of antennal cavity not dilated or only slightly dilated. General feeder on stored food and fabrics.....
*Furniture carpet beetle, Anthrenus flavipes* Leconte
51. Body subcylindrical, head and thorax much narrower than elytron, antennae inserted between eyes. *Spider beetles*, Family Ptinidae..... 63
- Body flattened; sides subparallel; antennae inserted on sides of head before eyes, **Cryptolestes** 52
52. Male with antenna as long as, or longer than body. Infesting broken grain **Cryptolestes turcicus** (Grouvelle) 53
- Male with antenna shorter than body 53
53. Male with antenna $\frac{2}{3}$ as long as body. Infesting broken grain.....
*Flat grain beetle, Cryptolestes pusillus* (Schoenherr)
- Male with antenna $\frac{1}{2}$ as long as body. Infesting broken grain.....
*Rusty grain beetle, Cryptolestes ferrugineus* (Stephens)
54. Pronotum reddish, anterior portion of elytron reddish. Infesting meats and cheeses.....*Red-shouldered ham beetle, Necrobia ruficollis* (Fabricius)
- Pronotum and elytron entirely metallic blue or bluish-green..... 55
55. Legs reddish. Infesting meats and cheeses.....
*Red-legged ham beetle, Necrobia rufipes* (Degeer)
- Legs bluish-green to black. Infesting meats and cheeses.....
**Necrobia violacea** (Linnaeus)
56. Antennae clubbed; elytron not striate 57
- Antennae not clubbed or only indistinctly so; elytron deeply striate..... 58
57. Blackish with two pale reddish or amber spots on each elytron. Infesting whole grain and dried fruit
*Dried fruit beetle, Carpophilus hemipterus* (Linnaeus)
- Reddish-brown without pale spots on elytron. Infesting whole grain and dried fruit.....*Corn sap beetle, Carpophilus dimidiatus* (Fabricius)
58. Hind femur with 1 or more teeth; each eye with an indentation extending back from base of the antennae. *Pea and bean weevils* in Family.....
 Bruchidae 59
- Hind femur without teeth; each eye completely rounded.....
*Coffee bean weevil, Araecerus fasciculatus* (Degeer)
59. Hind femur with tooth on inner and outer side 60
- Hind femur with tooth on outer side only, or large tooth and tiny teeth on inner side 61
60. Median basal thoracic lobe elevated, whitish, ivory-like, often with whitish hairs; antenna of male comb-like. Infesting legumes.....
*Southern cowpea weevil, Bruchidius chinensis* (Thunberg)
- Median basal thoracic lobe not so strongly elevated and dark, clothed with whitish hairs; antenna of male not comb-like. Infesting legumes.....
*Cowpea weevil, Callosobruchus maculatus* (Fabricius)
61. Hind femur with single large sharp tooth on inner side followed by several tiny teeth; last antennal segment pale. Infesting legumes.....
*Bean weevil, Acanthoscelides obtectus* (Say)

- Hind femur with tooth on outer side, but no tiny teeth; last antennal segment dark 62
62. Front femur largely reddish; hind femur with rounded tooth and depression; last abdominal segment entirely blackish dorsally. Infesting legumes..... *Broadbean weevil*, **Bruchus rufimanus** (Boheman)
- First femur largely blackish; hind femur with sharp tooth; last abdominal segment with two blackish spots dorsally. Infesting legumes *Pea weevil*, **Bruchus pisorum** (Linnaeus)
63. Elytron shiny, smooth, not punctate 64
- Elytron hairy 66
64. Head and thorax entirely bare and shiny, brownish. Infesting broken grain..... *Shiny spider beetle*, **Gibbium psylloides** (Czempinski)
- Head and thorax covered with scales 65
65. Head and thorax with golden-yellow scales. Infesting broken grain..... *American spider beetle*, **Mezium americanum** (Laporte)
- Head and thorax with silvery white scales. Infesting broken grain..... *Northern spider beetle*, **Mezium affine** Boieldieu
66. Prothorax viewed from above subcircular, not constricted before the base; integument concealed by dense covering of hairs; front (between the antennae) flat and wide; triangular plate between the elytra not evident. Infesting broken grain **Trigonogenius globulum** Solier
- Prothorax strongly constricted before base 67
67. Integument entirely concealed by pale golden hairs; front (between the antennae) flat; posterior trochanter extending to elytron. Infesting broken grain..... *Golden spider beetle*, **Niptus hololeucus** (Falderman)
- Integument never entirely concealed by the covering of fine hairs..... 68
68. Front (between the antennae) flat; each space between sutures or lines on elytron with several rows of hairs; posterior trochanter reaching elytron; triangular plate between elytra not or scarcely evident. Infesting broken grain..... **Epauloecus unicolor** Piller
- Front (between the antennae) with ridges 69
69. Posterior trochanter not reaching elytron; triangular plate between elytra moderately large, very distinct, lying in same plane as elytra... 70
- Posterior trochanter reaching elytron; triangular plate small and indistinct, almost vertical, not extending between elytra. Infesting broken grain **Pseudeurostus alienus** Brown
70. Spaces between the lines on elytron with rather dense covering of prostrate hairs. Hairs covering triangular plate between elytra similar in color to those of elytra. Infesting broken grain..... **Pseudeurostus alienus** (Brown)
- Elytron without dense covering of hairs, usually with sub-basal and sub-apical patches of white scales, each space between lines on elytron with single row of hairs. Triangular plate between elytra conspicuous, with closely placed, prostrate, white or pale yellowish hairs..... 71
71. Pronotum with large, dense, strongly elevated brush of hairs sub-basally on each side of median line; median line between and before the brushes and small area on each side before each brush polished and without

- sculpture or covering of hairs. Infesting broken grain
 *Canadian spider beetle*, **Ptinus raptor** Sturm
- Pronotum usually with clusters of hairs but without strongly elevated
 brushes and without polished, unsculptured areas 72
72. Hairs in spaces between lines on elytron approximately equal in length,
 semi-erect in the female, strongly inclined in the male 73
- Hairs in spaces between lines on elytron alternately long and short, hairs
 of entire elytron suberect in both sexes. Infesting broken grain
 *Hairy spider beetle*, **Ptinus villiger** (Reitter)
73. Pronotum with elongate cluster of densely placed hairs sub-basally on
 each side of median line. Infesting broken grain
 *White-marked spider beetle*, **Ptinus fur** Linnaeus
- Pronotum with hairs regularly distributed and not more dense on any
 part *Brown spider beetle*, **Ptinus clavipes** Panzer complex

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CORRECTION

In a paper by T. W. Donnelly entitled "*Aeschna persephone*, new species of dragonfly from Arizona, with notes on *Aeschna arida* Kennedy," which starts on p. 193 of Vol. 63 of the *Proceedings*, the figures are numbered as follows:

- p. 195: Figs. 1-7 read from top to bottom.
- p. 197: Figs. 1-3 read from bottom to top (plate inverted).
- p. 199: Figs. 4-6 read from left to right.
- p. 200: Figs. 7-9 read from top to bottom.
- p. 201: Plate is turned on its side, so that Fig. 10 is at the top, Fig. 11 is at the lower right, and Fig. 12 is at the lower left.

NOTES AND DESCRIPTIONS OF AFRICAN LICE
(ANOPLURA)PHYLLIS T. JOHNSON, *Gorgas Memorial Laboratory, Panama*

Amongst African specimens submitted to me for identification by Dr. F. Zumpt of the South African Institute for Medical Research and Dr. R. L. Wenzel of the Chicago Natural History Museum, were representatives of two interesting anopluran species. One of them is new to science and the other was known previously only from the female. Descriptions and illustrations of these species follow.

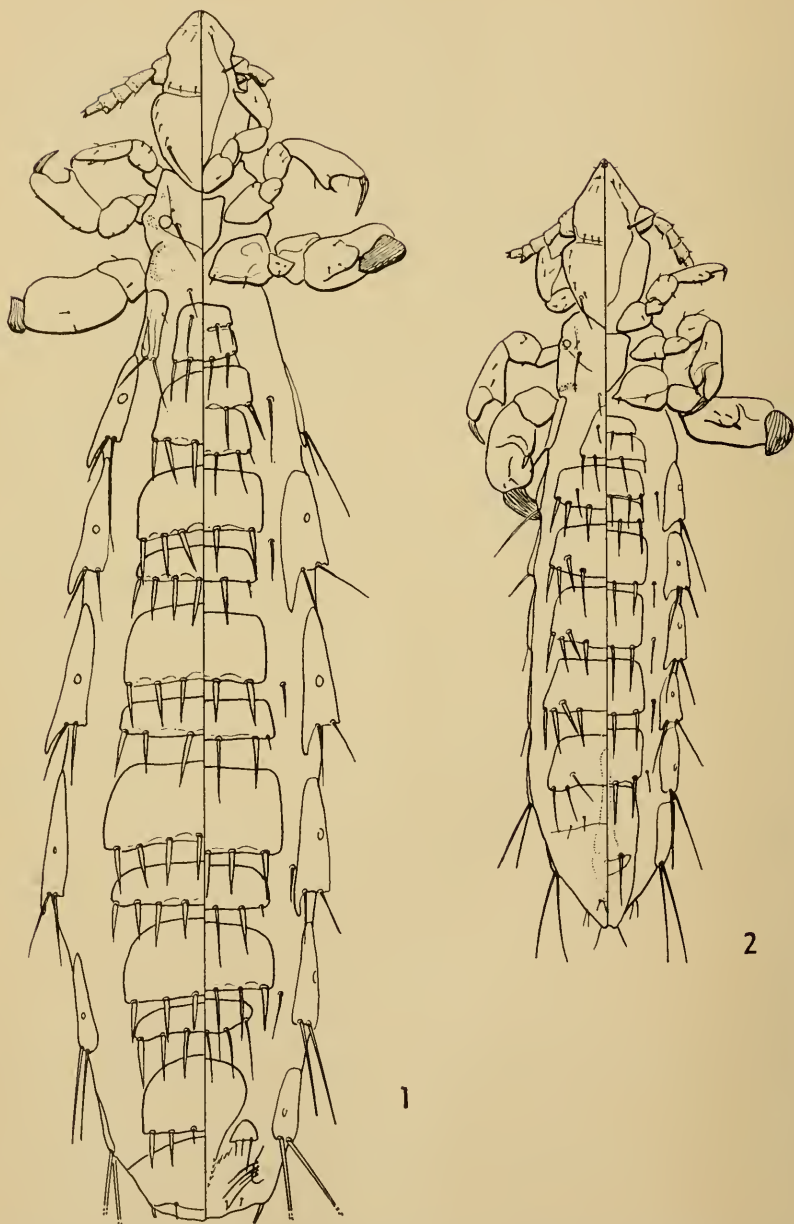
***Polyplax meridionalis*, new species**

(Figs. 1-3, 5, and 7)

Type data.—Male holotype and female allotype from *Acomys cahirinus* (Desmarest), Franciston, Bechuanaland Protectorate, 4 September 1958, BP2/58. Holotype and allotype deposited in the collections of the South African Institute for Medical Research, Johannesburg.

Diagnosis.—Close to *P. oxyrrhyncha* Cummings but differing in the male genitalia and the setation and shape of the abdominal paratergal plates of both sexes. Like *oxyrrhyncha*, *P. meridionalis*, new species, male has the third antennal segment unmodified and sterna 2 and 3 with two plates and two rows of setae. Both sexes of *meridionalis* approach *oxyrrhyncha* in their slender body form; the sensoria of antennal segments 4 and 5 are contiguous, the head is elongate and produced acutely before the antennal bases, and the postantennal angles are marked. *P. meridionalis* differs from *oxyrrhyncha* in that paratergal plates III-VI have the apical setae shorter than the corresponding plate except for paratergal plate III which has the dorsal apical seta longer than the plate in both sexes, and in the female the ventral apical angle of paratergal plates III-VI is about one-half the length of the apical setae and is scaly (compare figs. 3 and 4). The male genitalia have the parameres long, and with their lateral margins straight and convergent toward the acute apex, not convex laterally, so that the aedeagus is narrowly triangular (compare figs. 5 and 6).

Description.—**Male** (fig. 2). *Head* about twice as long as broad, produced acutely anterior to insertion of antennal bases; postantennal angles marked; margins of hind head converging posteriorly, somewhat convex. Antennae with sensoria of fourth and fifth segments contiguous; third segment unmodified. *Thorax*: longer than broad, sternal plate (fig. 7, ♀) weakly sclerotized, shield-shaped, anterior margin straight. *Legs*: as in genus. *Abdomen*: ventrally with two sternal plates on segments 2 and 3; one broad sternal plate on each of segments 4-8, these plates more than one-half as long (in longitudinal axis) as they are broad (in horizontal axis), the plates not emarginate between setal bases. Setation of venter as follows: segment 2, first plate—five short, slender setae; second plate—two stout, long setae medially, flanked by one shorter, slender seta on each side, plus one very small, oblique seta at each posteroapical angle; segment 3, first plate—five long, stout setae; second plate—four long, stout setae and one small seta at each posteroapical angle; plates of segments 4-6 as second plate of segment 3; segment 7 plate with four long, stout setae; segment 8 plate with two long, median setae. One seta laterally off plate on



Polyplax meridionalis, new species. Fig. 1, female allotype; fig. 2, male holotype.

both sides on segments 3-7. Dorsally segments 2-8 each with one tergal plate which occupies most of segment; plates not emarginate between setal bases. Typical segment with plate bearing seven to nine stout, long setae; third or fourth seta from lateral plate margin on each side submarginal and at angle to other setae. Paratergal plates III-VI with ventroapical angle produced into short, acute, scaly lobe. Pairs of apical setae not as long as plate bearing them except dorsal apical seta of plate III which is longer than plate. Spiracles not particularly large, plates VII and VIII with usual long setae. *Genitalia* (fig. 5): basal plate narrowed anteriorly, longer than aedeagus proper. Parameres with lateral margins straight, converging apically, pseudopenis enclosed by parameres, extending beyond their apices.

Female (fig. 1). *Head, thorax, and legs* as in male except for usual sexual differences. *Abdomen*: ventrally segments 2-7 each with two plates, anterior plate of segments 4-7 twice as long as posterior plate of these segments (measured in longitudinal axis), plates not posteriorly emarginate between setal bases though lines of heavier sclerotization suggest this condition. Typical sternal plates bearing five or six setae, more lateral setae short, stout, and sword-like. At times these setae flanked laterally by one small, slender seta on each side. One seta off plates laterally on each side on segments 4-7. Dorsally tergal plates and setae are similar but there are seven to nine stout, sword-like, apical setae on each plate and no setae occur off the plates. Paratergal plates (fig. 3) as in male except ventral apical angle of plates III-VI is produced into longer point. *Genitalia*: margin of vulva apically angled, fimbriate. Lateral setigerous lobes of eighth segment ("gonopods") triangular in outline, each bearing one long lateral seta and two short, more median, setae.

Lengths.—Male, 1.2 mm.; female, 2.0 mm.

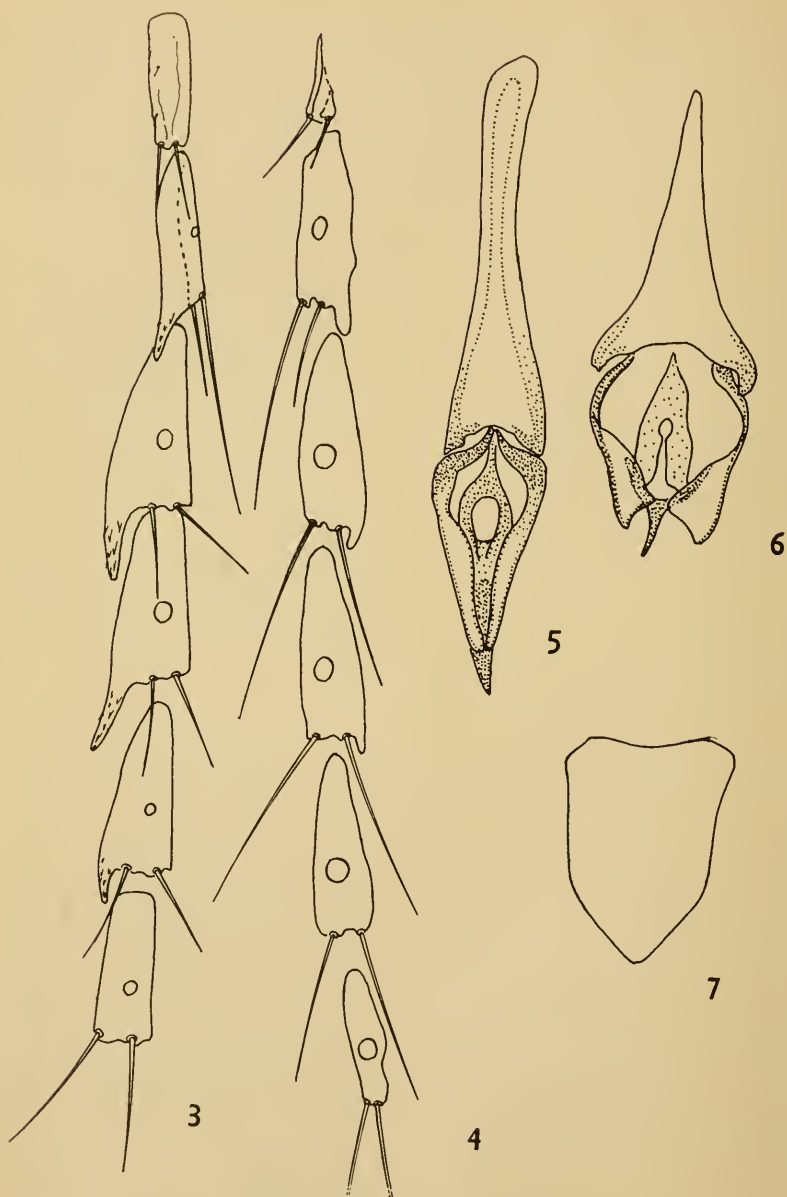
Polyplax meridionalis, new species, is a member of a loosely-linked group of *Polyplax* species which includes *P. phthisica* Ferris, *P. smallwoodae* Johnson, *P. hoogstraali* Johnson, *P. brachyrrhyncha* Cummings and *P. oxyrrhyncha* Cummings. All these species have a slender body form, the paratergal plates are similar in shape, all are African, and parasitize members of the rodent subfamily Murinae. *P. meridionalis*, new species, is most closely related to *P. oxyrrhyncha*. Superficially the species are very similar, but unlike other members of their group, in neither *oxyrrhyncha* nor *meridionalis* is the third segment of the antenna modified in the male. *P. oxyrrhyncha* has been taken from various species of *Acomys* from Sinai and other parts of Egypt, Uganda, and Kenya. It is probable that *meridionalis* follows a more southern distribution. The very different male genitalia of *meridionalis* and *oxyrrhyncha* (figs. 5 and 6) are reminiscent of the case of *P. phthisica* and *P. smallwoodae* which, except for the genitalia, are similar in appearance,

Lemurphthirus stigmatosus Ferris

(Figs. 8 and 9)

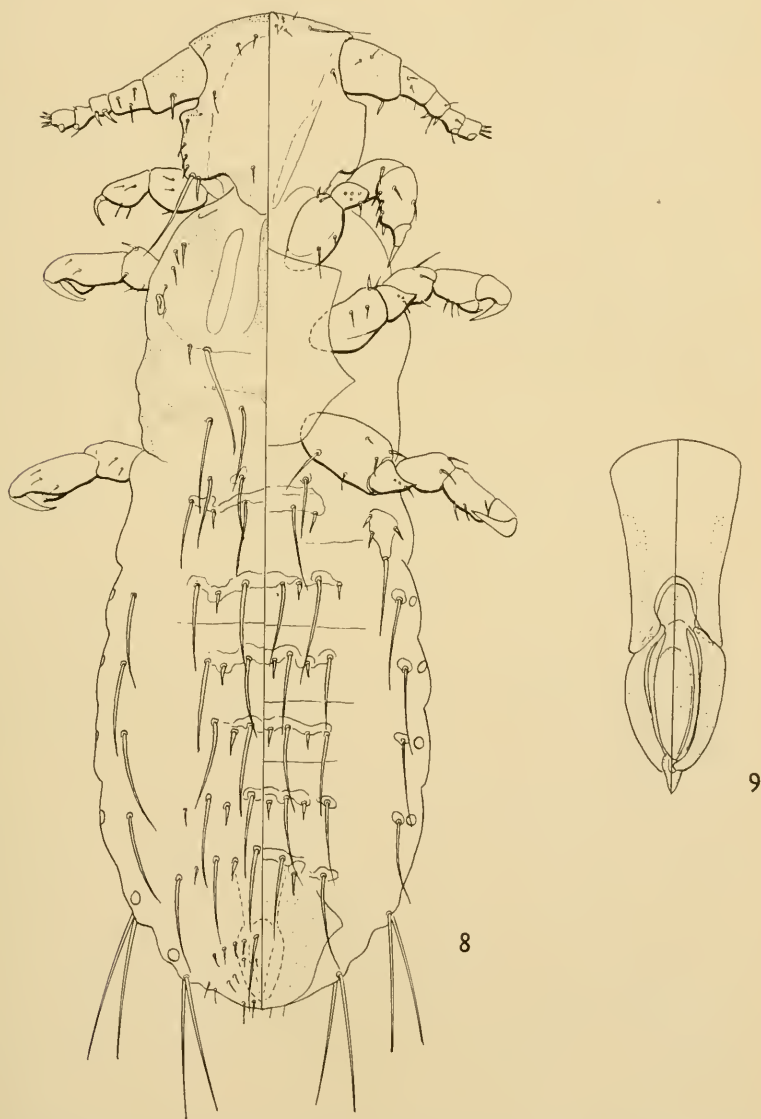
Lemurphthirus stigmatosus Ferris, 1954, Ann. Natal Mus., 13:92, figs. 1a-f.

This species was described by Ferris from female and nymphal specimens collected from *Galago (Otolemur) crassicaudatus*, near



Polyplax meridionalis, new species: Fig. 3, paratergal plates II-VII, female allotype; fig. 5, genitalia, male holotype; fig. 7, thoracic sternal plate, female allotype. *P. oxyrrhyncha* Cummings: Fig. 4, paratergal plates II-VII, female from *Acomys dimidiatus*, Sinai; fig. 6, genitalia, male from *Acomys dimidiatus*, Sinai.

Pietermaritzburg, Natal. During the Conover Angola Expedition, Gerd Heinrich collected both male and female specimens of *L. stigmatosus* from *Galago (Galago) senegalensis*, from Huila, Angola, 1954. Diagnosis, description and figures of the male follow.



Lemurphthirus stigmatosus Ferris. Fig. 8, male from *Galago senegalensis*, Angola; fig. 9, genitalia, male.

Diagnosis.—Like the female, male *stigmaticus* may be distinguished from *verruculosus* Ward in that the thoracic sternal plate does not have a narrow, median, anterior prolongation. The large spiracles of *stigmaticus* separate both sexes from *galagus* Bedford. In addition, male *stigmaticus* has the parameres of the aedeagus curved and narrowed apically (fig. 9) rather than having the apices divergent, flattened and truncate as is true of *galagus*.

Description.—**Male** (fig. 8). *Head* and *thorax* as in female except third antennal segment bears two short, dorsal spines. *Abdomen*: chaetotaxy as in female. Rows of setae on terga and sterna with more heavily sclerotized plates than in female and ventral setae near abdominal spiracles each on a small sclerotized plate. Ventral genital plate well-sclerotized and pigmented. *Genitalia* (fig. 9): Basal plate of aedeagus short and broad; parameres with broadly and evenly convex lateral margins, narrow throughout, with convergent acute apices. Pseudopenis a small triangular sclerite at tips of parameres.

Length.—Male, 1.25 mm.

The host relationships of *L. stigmaticus* and *L. galagus* are obscure. There is little doubt that *Galago* (*G.*) *senegalensis* is a true host of *L. galagus*. It is surprising that *stigmaticus*, first taken from *G. (Otolemur) crassicaudatus*, should also appear on *G. (G.) senegalensis*.

A TECHNIQUE FOR MASS REARING THE GREATER WAX MOTH (LEPIDOPTERA: GALLERIIDAE)

S. R. DUTKY, J. V. THOMPSON, and GEORGE E. CANTWELL¹

Members of the Insect Pathology Laboratory of this Division have received many requests for their method of mass rearing the greater wax moth (*Galleria mellonella* (L.)), both from entomologists and from commercial producers. The insect in its last instar is used in this laboratory as a propagation host for an insect pathogen bacterianematode complex.

The method is as follows: Thirty milligrams (about 1,000) of greater wax moth eggs that are near hatch is placed in a wide-mouthed gallon jar. To the eggs is added the complete medium necessary for rearing the larvae to the cocooned stage. This medium is a modification of that used by Haydak (1936). The rearing medium consists of 1200 ml. (255 g.) of dry Pablum² (Mead-Johnson mixed cereal), 240 ml. (319 g.) of a sterilized sucrose-glycerol-water mixture (1 part sucrose, 1.19 parts glycerol, 0.94 part distilled water), and 0.6 ml. of a vitamin mixture (Meads Deca-Vi-Sol).² Patton introduced the use of Pablum as a modification of Haydak's medium as reported by

¹ Entomology Research Division, A.R.S., U. S. Department of Agriculture, Beltsville, Md.

² Mention of these proprietary products does not necessarily imply their endorsement by the U. S. Department of Agriculture.

Peterson (1953). The Pablum is added to the sucrose, glycerol, water, and vitamin mixture in a separate container, mixed rapidly, then placed on top of the eggs in the rearing jar.

After the rearing medium is added, each jar is covered with a 20-mesh wire-screen disc, a Whatman No. 2 filter paper measuring 12.5 cm. in diameter, a cardboard gasket, and the jar lid. The gasket and the jar lid have circular holes 4 inches in diameter cut in their centers. The purpose of the filter paper is to prevent foreign matter from entering the jar.

The culture jars are placed at 30°C. ambient temperature for 6 weeks or at 34° for 4 weeks to await cocooning. When cocooning begins, mature larvae are harvested at 3-day intervals from the inner walls of the culture jars without disturbing the medium. Larvae that are to be used for bioassay or for propagation-host work should be removed between the time that spinning begins and the tight cocoon is formed. Removal at this time insures that the insect has voided waste material but has not begun to shorten just prior to pupating. Several partial harvests are generally made. After the third one, the medium is removed from the jars and consolidated for salvage. At this point usually only a few larvae remain but sometimes a considerable number may be present in the spent medium. By consolidation, the remaining larvae can be harvested without requiring the use of many rearing jars. Thus a larger harvest is obtained with little more effort.

Mature cocooned larvae of good quality can be stored for over a year without pupating and with negligible losses by holding them in half-pint ice-cream cartons, about 300 per carton at 15°C. and 60% relative humidity.

When necessary, separation of the larvae from the cocoons may be done by hand, which is a very time-consuming process. However, the cocooned larvae may be desilked by immersing them in a buffered sodium hypochlorite solution for 2 minutes. This solution consists of 500 ml. of a sodium hypochlorite bleach (5% available chlorine) mixed with an equal volume of a 5% sodium carbonate solution (25 g. sodium carbonate anhydrous, 500 ml. distilled water). The time of immersion is critical and care must be taken to prevent local heating by the powerful reagent that might injure the larvae. After desilking, the larvae are rinsed with water and dried on toweling.

Different amounts of eggs, vitamins, and medium have been combined in order to determine the most efficient and economical means of rearing greater wax moth larvae. Wasted medium results when less than 30 mg. of eggs per jar is used. More than 1,000 eggs per jar results in either smaller larvae or the necessity for refeeding or dividing the content and placing in two or more jars. Adequate ventilation is a problem. Any increase in the number of larvae adds to

² Mention of these proprietary products does not necessarily imply their endorsement by the U. S. Department of Agriculture.

the ventilation requirement. Results of tests with culture jars in large polyethylene bags (38 x 40 inches) indicated that development could be retarded for several months without injuring the larvae. This system was employed to retard development until the larvae could be more conveniently harvested.

Tests with the vitamin mixture used indicated that 0.3 ml. gave marked improvement in development over the control but did not give as good production as 0.6 ml. Amounts above 0.6 ml. did not increase the yield. The 10 vitamins present in Deca-Vi-Sol are A, D, C, B₁, B₂, B₁₂, niacinamide, pyridoxine, panthenol, and biotin. In preliminary tests, when these vitamins were added singly and in combination with each other, the indication was that niacinamide and B₂ used together gave the earliest maximum yield. When these two vitamins were added at the same time to the medium and held at 34° C., the average time until the first harvest was 32.7 days. When these vitamins were not added to the medium, the average time until the first harvest was 43.5 days.

Rearing should be done in the dark since when reared in the light the larvae tend to remain in the medium and harvesting becomes very difficult. After harvest the larvae are treated with carbon dioxide and stored immediately at 15°C and 60% relative humidity. Care should be taken to ascertain that immature larvae are not stored with cocooned or mature desilked insects. These immature larvae, particularly if they are not treated with carbon dioxide or stored at too high a temperature, will become cannibalistic. Care should also be taken to store the larvae at the proper humidity. Storage at high relative humidities results in fungus growth on the larvae.

By means of the rearing technique described, an average of 500 mature larvae can be harvested from each jar. This method represents about a 20 to 30% conversion per jar of medium to insect weight.

After rearing, 50 cocooned larvae per jar are placed in pint-sized Mason jars and held at room temperature. An accordion-folded strip of waxed paper (for oviposition) fastened with a paper clip is added, and the jars are capped with a filter paper circle held in place by the jar ring. About 8 days after emergence of the first moths, or about 16 days after setting up the jars, the eggs are harvested. A good yield is 300 milligrams per jar, or about 10,000 eggs. Before using, the eggs are held at 25°C until they are close to hatch. To delay hatch, eggs can be held at lower temperatures. Hatch time is about 4 days at 30°, 8 days at 25°, and 30 days at 18°. Eggs held for a month at 5° failed to hatch on incubation at 30°.

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SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1961

CORRESPONDING SECRETARY

(For the fiscal year 1 November 1960 to 31 October 1961)

Membership on 1 November 1960	495
Reductions:	
Resigned	11
Dropped	0
Deceased	5
Total	16
Increases:	
Elected to membership	21
Reinstated	0
Total	21
Net gain in membership	5

Membership on 31 October 1961	500
Classes of membership:	
Dues paying	474
Life	5
Retired	17
Honorary	4
Total	500

The membership is distributed among 45 States, the District of Columbia, 2 Territories, and 25 foreign countries.

Circulation of the Proceedings (September 1961 issue):

States	464
District of Columbia	94
U. S. Possessions	5
Foreign Countries	179
Total	742

Distribution of the Proceedings (September 1961 issue):

To members	478
To subscribers	264
Total	742

The *Proceedings* goes to members and subscribers in 50 States, the District of Columbia, 2 Territories, and 50 foreign countries.

Respectfully submitted, PAUL A. WOKE, *Corresponding Secretary.*

TREASURER

(For the period 1 November 1960 to 31 October 1961)

	General Fund	Publication Fund	Total
Cash on Hand November 1, 1960	\$ (394.47)	\$ 6,974.18	\$ 6,579.71

Receipts November 1, 1960 to

October 31, 1961	6,017.30	850.59	6,867.89
Totals	5,622.83	7,824.77	13,447.60
Expenditures November 1, 1960 to			
October 31, 1961	4,875.21	none	4,875.21
Cash on hand October 31, 1961	747.62	7,824.77	8,572.39
Totals	\$5,622.83	\$7,824.77	\$13,447.60

A copy of the complete Treasurer's report, approved by the Auditing Committee, is on file with the Recording Secretary.

Respectfully submitted, PRICE PIQUETTE, *Treasurer*.

CUSTODIAN

(For the fiscal year 1 November 1960 to 31 October 1961)

The value of items sold by the Custodian's office amounted to \$1256.69, more than twice as much as in the previous year. Of these items, \$194.20 was for 32 copies of the Memoirs, \$13.00 for 8 copies of the Weld volumes, \$1044.14 for miscellaneous volumes and numbers of the Proceedings (including two complete sets), and \$5.35 for miscellaneous reprints and papers.

Sales of the Memoirs were as follows: No. 1, 1 copy; No. 2, 1 copy; No. 3, 4 copies; No. 4, 19 copies; and No. 5, 7 copies. Sales of the Memoirs, especially of No. 5, have been very slow.

A copy of the complete, detailed report is on file with the Recording Secretary.

Respectfully submitted, H. J. CONKLE, *Custodian*.

EDITOR

(For the calendar year, 1961)

Four numbers of the Proceedings were published in 1961. Of the 316 pages published, 10 were devoted to advertising and 306 to scientific papers, notes, obituaries, book reviews, minutes of meetings, and announcements. Fifty-three scientific papers and notes were published during the year. The Society and the Proceedings benefitted measurably from a relatively large number of paid papers, but none of these caused the articles of regular contributors to be postponed.

Respectfully submitted, RICHARD H. FOOTE, *Editor*.

SOCIETY MEETING**702nd Meeting, Nov. 2, 1961**

The 702nd meeting of the Society was called to order by the President-Elect Harold H. Shepard, on November 2, 1961, at 8:00 p.m. in Room 43 of the U. S. National Museum, with 59 in attendance, 17 of whom were visitors. Minutes of the previous meeting were approved.

The Nominating Committee presented the following slate of officers for 1962: President, *H. H. Shepard*; President-Elect, *W. E. Bickley*; Recording Secretary, *O. S. Flint*; Corresponding Secretary, *P. A. Woke*; Treasurer, *C. C. Blickenstaff*; Editor, *R. M. Foote*; Custodian, *H. J. Conkle*; Chairman Program Committee, *R. H. Arnett, Jr.*; and Chairman Membership Committee, *W. S. Murray*.

Three persons were announced as candidates for membership: *Victor E. Adler*, *Don Ray Davis*, and *Richard Charles Froeschner*. Five persons were accepted as members: *Thomas J. Henneberry*, *Herbert E. Wave*, *Robert J. Lyon*, *Donald E. Ulrich*, and *John E. Lane*.

John Fales inquired about the decision made by the Society to submit names of its members for the Directory of the Washington Academy of Sciences. Dr. Shepard announced that the names of members in the Washington, D. C., area would be included and that \$25.00 would be contributed toward publication costs.

Notes and exhibits were given by *A. E. Brower* of Augusta, Maine, *Ted Bissell*, *Jack C. Jones*, and *Clyde S. Barnhart*.

The evening's speaker, *Roy W. Chamberlain*, Communicable Disease Center, Public Health Service, Atlanta, Georgia, presented an interesting and instructive talk on the transmission of virus diseases by arthropods. His comments engendered a lively and provocative discussion in which a number of persons participated.

Among the guests who were introduced were: *A. E. Brower*, *Margaret Hotchkiss*, and *Albert Rudnick*.

The minutes were taken by the Corresponding Secretary in the absence of the Recording Secretary. The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary*.

703rd Regular Meeting, December 7, 1961—

The 703rd meeting of the Society was called to order by the President, J. F. Gates Clarke, on December 7, 1961, at 8:00 p.m., in Room 43 of the U. S. National Museum. Of the 49 in attendance, 11 were visitors. Minutes of the previous meeting were approved as read.

Dr. Clarke commended the chairmen and members of the committees for their contributions to the Society and asked for reports from the committees.

One candidate for membership was announced: *Gerhard F. Fodde*. Three persons were accepted as members: *Victor E. Adler*, *Don Ray Davis*, and *Richard Charles Froeschner*.

P. A. Woke reported a slight increase in membership for the year; the membership now nears 500.

R. H. Nelson presented the Treasurer's and Auditing Committee's Report showing a balance of \$5,622.83 in the General Fund and \$7,824.77 in the Special Publication Fund. R. H. Foote, Editor, reported that some \$800.00 had been received for paid-papers and that the accounts of the *Proceedings* were in the black. A. B. Gurney acknowledged the assistance of Charles McComb in the preparation of the program for 1962 and mentioned the invited speakers for the next five meetings.

W. E. Bickley reported that he had attended meetings of the Cabinet of the Washington Academy of Sciences as the Society's Representative. The WAS continues to examine its structure and activities with respect to its future. The *Journal* is now a newsletter, not carrying technical papers. Membership is virtually open to anyone. Participation of the WAS in the Joint Board on Science Education continues in efforts to improve and stimulate science in junior and senior high schools through conferences, lecture series, and science fairs.

Doyle Reed moved that the nominations for officers be accepted; the motion was seconded and carried. The officers (see inside front cover) were elected unanimously.

Alan Stone exhibited five publications on mosquitoes, one of the most publicized insects. John Fales showed a movie on the control of face flies on beef and dairy cattle. J. F. Gates Clarke exhibited a copy of *Pacific Insects*, Monograph II, which includes excellent colored illustrations of some Antarctic areas made by J. L. Gressitt. Dr. Clarke reported that Dr. Robert Snodgrass has recently received the Leide Medal in a very impressive ceremony in Philadelphia.

Reports of the recent meeting of the Entomological Society of America in Miami were given by W. W. Wirth, R. H. Nelson, R. J. Barker, and J. F. G. Clarke. R. H. Nelson conveyed greetings to the Society from Paul W. Oman who wrote from Korea that he planned to be in India early in December.

The evening's speaker, Dr. Richard F. Darsie, Jr., of the University of Delaware, discussed his experience on the mosquito trail in Central and western South America, and illustrated his comments with Kodachromes.

Past President Clarke presented the gavel to President Shepard who adjourned the meeting at 10:05 p.m.—ERNESTINE B. THURMAN, *Recording Secretary*.

704th Regular Meeting, January 4, 1962—

The 704th meeting of the Society was called to order by the President, Dr. H. H. Shepard, on January 4, 1962, at 8:00 p.m. in Room 43 of the U.S. National Museum. Nine guests and 21 members were in attendance. Minutes of the previous meeting were approved as read.

One candidate for membership was announced: *Robert T. Taylor*. *Gerhard F. Fedde* was accepted for membership. The membership committee reported 21 new members in 1961.

A. B. Gurney asked for suggestions on how to increase attendance. The following suggestions were made: earlier mailing of meeting announcements, diversification of the program, serving of refreshments, uniting of December and January meetings into an annual meeting with banquet, and another meeting place or different meeting places each time.

J. F. G. Clarke showed a new publication, "Butterflies of the American Tropics; The Genus *Anea* (Lepidoptera, Nymphalidae)" by William Phillips Comstock, sponsored by Frank Johnson with help from the National Science Foundation. This is a study with excellent color plates but a somewhat misleading title.

T. Bissel discussed various strawberry aphids, and noted that *Pentatrachopus* sp. was actively reproducing at this late date. H. H. Shepard noted that there were aphids on the ivy outside his home in both late fall and early spring.

Dr. Paul A. Woke, National Institutes of Health, presented the evening's discussion, "The Attraction and Feeding Behavior of Bloodsucking Arthropods." The talk was illustrated with slides showing apparatus and field work in the vicinity of Chágres River in Panama.

After several guests were introduced, the meeting was adjourned at 10 p.m.—OLIVER S. FLINT, JR., *Recording Secretary*.

PUBLICATION DATE

The date of publication of Vol. 63, No. 4, of the *Proceedings* was 8 January 1962. The date of publication of Vol. 64, No. 1, will be found in Vol. 64, No. 2.

NOW AVAILABLE

Memoir 5
of the
Entomological Society of Washington

A CLASSIFICATION OF THE SIPHONAPTERA OF
SOUTH AMERICA

WITH DESCRIPTIONS OF NEW SPECIES

by Phyllis Truth Johnson

The study of South American fleas was begun in 1879 when Weyenbergh published the first descriptions of species from that region, using specimens mounted on cardboard as was usual in that day. These fleas were restudied in balsam by Jordan and Rothschild in England shortly after the turn of the century, and from that time to the present day a large number of siphonapterologists, both in England and the Americas, have contributed to this study. Dr. Johnson's work is the first comprehensive taxonomic treatment of the fleas of the region, which comprises Trinidad and all of the continent and its coastal islands. The contemplated 275 page volume will be indispensable to the serious student of this important order of insects.

Memoir 5 opens with two discussions of morphological characters, one devoted to the terms used in the taxonomic section and the other to their taxonomic validity and possible phylogenetic significance. All the families, tribes and genera known to occur in South America are completely described and illustrated, and the species within each genus have been listed with host and locality data. Descriptions of 17 new species and two new subspecies bring the total number to 170. Keys to families, tribes, genera, and species are included. The discussion of each genus is terminated by a section giving the synonymies of the hosts concerned. The 114 plates are said to contain among the best illustrations of fleas currently available, and are grouped according to family. A section listing hosts, each with the fleas known to occur on it, recapitulates the host-flea information; sections dealing with references, systematic index and list of abbreviations close the volume.

Orders at the price of \$9.00 to members and \$10.00 to non-members may be placed with the *Society* for Memoir No. 5. Orders should be addressed to *Mr. Herbert J. Conkle, Custodian, Plant Quarantine Branch, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.*

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ORGANIZED MARCH 12, 1884

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Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

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Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are \$5.00; initiation fee is \$1.00 (U. S. currency).

PROCEEDINGS

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 64

JUNE, 1962

No. 2

FURTHER STUDIES ON THE GENUS *DISSOMPHALUS* IN THE
UNITED STATES, MEXICO, AND THE GREATER ANTILLES
(HYMENOPTERA: BETHYLIDAE)

HOWARD E. EVANS, *Museum of Comparative Zoology,*
Cambridge, Mass.

Several years ago I presented a revision of the North American species of *Dissomphalus* in the pages of this journal (1954, 56: 288-309). At that time nine species were known, several of them from only a few specimens. In the last few years I have seen enough additional material to justify a supplementary report on the genus. New locality records are presented for most of the species, as well as comments on variation and sex associations. One new species is described from the United States, two from Mexico, and two from the Greater Antilles. This is the first time the genus has been recorded from the Greater Antilles. A key is presented which includes these additional species and also in some cases emphasizes different characters than did the key in my earlier paper.

The following abbreviations are employed for the various museums which supplied material for this study: CAS, California Academy of Sciences, San Francisco; CM, Carnegie Museum, Pittsburgh, Pa.; CNC, Canadian National Collections, Ottawa; CU, Cornell University, Ithaca, N. Y.; INHS, Illinois Natural History Survey, Urbana; MCZ, Museum of Comparative Zoology, Cambridge; UA, University of Arizona, Tucson; UCD, University of California, Davis; USNM, U. S. National Museum, Washington, D. C.

My 1954 paper included a brief discussion of structure and terminology, and it seems unnecessary to repeat that information here. One point, however, needs to be reaffirmed. The male genitalia of these wasps are exceedingly complex in spite of their very small size. It is impossible to do them full justice in the descriptions and figures. The figures should be regarded as rough sketches emphasizing only the more prominent features. In comparing specimens with them, one should also remember that complex structures seen from different angles often look very different. Also, parts of the genitalia are partially membranous and often present a rather different appearance in different specimens. Males can nearly always be placed satisfactorily without making use of the genitalia, but the latter structures provide so many excellent characters that they must be considered in revisionary studies.

SMITHSONIAN
INSTITUTION AUG 27 1962

In the keys and descriptions which follow, I have included all species known to me to occur in the United States and the Greater Antilles. With regard to Mexico I have been somewhat arbitrary. One species, *ocellatus* Kieffer, described from Tabasco, I have omitted, since it is unfamiliar to me. Another species, *biforcatus* Kieffer, described from Nicaragua and not known to occur in Mexico, I have included because I have recently had an opportunity to study the type. *D. rufipalpis* Kieffer, described from Bélize, is now known to occur in Mexico and is included here. Kieffer described two other species from Bélize, *clausus* and *xanthopoides*; it is quite possible that these species also occur in Mexico, but I have not seen them or made any attempt to include them here. There are doubtless new species to be discovered in Mexico, and the present paper can be considered no more than an introductory study of the *Dissomphalus* fauna of that country.

KEY TO SPECIES

Males

1. Second abdominal tergite without pits or depressions, merely with minute tubercles or compact clusters of minute setulae, in either case flanked by some large setae; ventral rami of aedoeagus very long and attenuate (**kansanus** group)..... 2
 Second abdominal tergite with a pair of distinct pits or shallow depressions; ventral rami variable..... 4
2. Clypeal carina very high, in profile forming a sharp angulation; ventral rami not quite as long as main part of aedoeagus (Eastern and midwestern U. S.)..... **kansanus** Evans
 Clypeal carina much lower than above, in profile not forming an angulation; ventral rami extremely long, much exceeding main body of aedoeagus 3
3. Ocelli slightly enlarged; transverse carina at front of pronotum followed by some large foveae; genitalia with parameres elongate, ventral rami of aedoeagus simple (fig. 3) (Arizona).....
 **arizonicus**, new species
 Ocelli very small; transverse carina of pronotum weak, the groove behind it also weak, barely foveolate; genitalia with parameres short and rounded, ventral rami bifurcate (fig. 1) (Chiapas).....
 **chiapanus**, new species
4. Second abdominal tergite with a pair of widely separated pits or depressions and without other modifications of this tergite (except for setae); aedoeagus with ventral rami relatively long and acute (**xanthopus** group) 5
 Second abdominal tergite with the pits close together on the median line, this tergite also with a pair of more lateral and anterior pale or roughened spots; ventral rami of aedoeagus short, not acute apically (**apertus** group) 11
5. Pits of second tergite shallow and elongate, transverse, each containing a linear series of minute spines, this tergite otherwise without

- setae; genitalia as in figure 4 (Costa Rica to Mexico).....
rufipalpis Kieffer
- Pits of second tergite circular or subcircular, sometimes set in depressions, never containing spines or setae in linear series; second tergite with some conspicuous setae laterad or mesad of the pits..... 6
6. Clypeus strongly expanded apically, only the median tooth distinct; second tergite with minute pits located in elongate depressions (Mexico).....
clypeatus Evans
- Clypeus less expanded apically and with three small apical lobes; pits of second tergite usually larger, if small not located in elongate depressions 7
7. Second tergite with strong setae just mesad of the pits, but only a few weak setae laterad of them; all apical parts of genitalia drawn out into slender, spear-like processes, tip of the aedeagus in the form of a pair of stout hooks (fig. 2) (Central Mexico) **falcatus**, new species
- Second tergite with setae laterad of the pits, but with few or none mesad of them; genitalia not as above..... 8
8. Prothorax largely straw-yellow, contrasting to the remainder of the body; pits of second tergite bowl-like, without raised margins (Cuba).....
collaris, new species
- Prothorax brownish or blackish, not differing in color from remainder of the body; pits of second tergite umbilicate, with raised margins .. 9
9. Median carina of propodeum not reaching transverse carina; pits of second tergite rather large; clypeal carina rather broad, flat-topped or round-topped (Eastern U. S. and Mexico)..... **xanthopus** Ashmead
- Median carina of propodeum reaching transverse carina; pits of second tergite relatively small..... 10
10. Median groove of first tergite extending well over half the length of the tergite; pits of second tergite very small, located in very shallow depressions (California)..... **californicus** Ashmead
- Median groove of first tergite extending about half the length of the tergite; pits of second tergite slightly larger and located in distinct depressions (Maine to North Carolina).....
barberi Evans
11. Second tergite with a transverse band of erect hairs surrounding the pits; clypeus with a strong median keel which is angulate in profile (Eastern U. S. and Mexico).....
apertus Kieffer
- Second tergite without erect hairs except those arising from or directly in front of the pits; clypeal carina low and even, not angularly projecting 12
12. Pits of second tergite longer than wide, having some rather long setae directly in front of them which are directed backward over the pits; more anterior, lateral spots on this tergite not pale, merely roughened, inconspicuous (Nicaragua)
bifoveatus Kieffer
- Pits on second tergite giving rise to short, straight setae and without longer setae in front of them; anterior, more lateral spots on this tergite pale 13
13. Legs and antennae light brown to straw-colored; apical elements of dorsal body of aedeagus well separated, elongate and somewhat

twisted, each with a blunt subapical lobe, the two lobes almost meeting medially (Alabama to Illinois, west to California)... **altivolans** Evans
 Legs and antennae strongly suffused with brown; apical elements of aedeagus shorter, close together, not lobed as above (Alabama to Texas) **nigrescens** Evans

Females

1. Middle tibiae with numerous stout spines on the outer side; head, except along midline of front, covered with very strong, well separated punctures; propodeum unusually long (Haiti)..... **singularis**, new species
 Middle tibiae with only a few weak spines if any; punctures of head much less pronounced than above (Continental North America)..... 2
2. Eyes with 10 to 15 facets, of moderate size; head dull, front (except at midline) covered with large, shallow punctures which are so close together that spaces between them form a reticulum..... 3
 Eyes with 4 to 8 facets; head at least somewhat shining medially, punctures smaller, the spaces between them not reduced to a reticulum 4
3. Eyes much longer than wide; surface reticulum of sides of front rather indistinct (Alabama to Illinois, west to California)..... **altivolans** Evans
 Eyes slightly larger than above and only slightly longer than wide; surface reticulum of sides of front strong (Eastern U. S.)..... **foveolatus** Brown and Cheng
4. Head strongly shining, front not or only very weakly alutaceous, also very weakly punctate; eyes very small..... **xanthopus** group¹
 Head not strongly shining, front moderately alutaceous, on the sides roughened by punctures and surface sculpturing; eyes slightly larger than above 5
5. Propodeal spiracles unusually large, directed dorsad, each with a narrowly elevated border (Mexico)..... **clypeatus** Evans
 Propodeal spiracles of normal size and without an elevated border (Alabama to Texas) ? **nigrescens** Evans

Kansanus Species-group

To this group belong three species which lack distinct pits on the second tergite but rather have a pair of tubercles or a group of stiff setulae in a small cluster. In all three species the propodeal carina ends much before the transverse carina. The genitalia are characterized by having extremely long ventral rami. No females can definitely be assigned here (it is possible that females of *kansanus* have been collected but cannot presently be separated from those of *xanthopus*).

Dissomphalus kansanus Evans

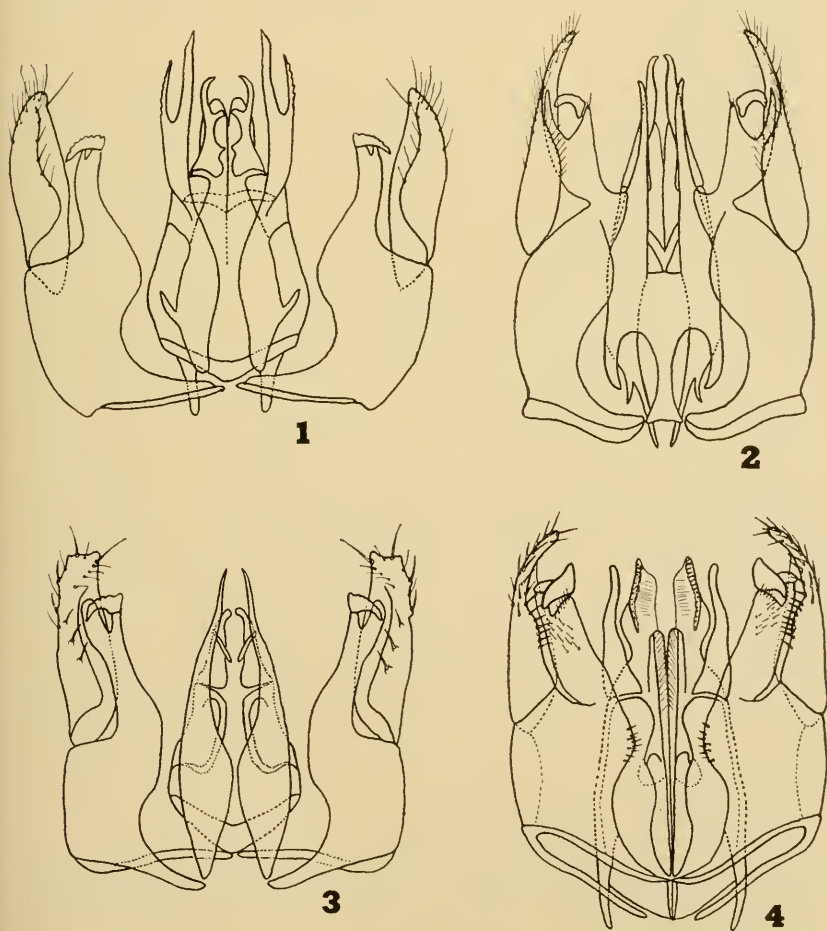
Dissomphalus kansanus Evans, 1954, Proc. Ent. Soc. Wash., 56: 302-303.

This species was described from a single specimen, but I have since seen several additional specimens which considerably expand the

¹The female *barberi* will also key out here, perhaps also *californicus*, *kansanus*, and some other species.

known range of the species. These specimens vary in size from 1.4 to 2.5 mm., the length of the fore wing from 1.5 to 2.1 mm. Body color varies from pale to dark castaneous; in every case the legs are wholly pale yellowish-brown or straw-colored. Little variation can be noted in the structure of the clypeus or the second tergite. The mandibles seem to have three teeth in all specimens; in my original description and accompanying drawing 1 apparently overlooked the small basal tooth.

Locality records for this species are as follows: FLORIDA: 1 ♂, Royal Palm Park, Dade Co., 29 January 1933 (A. L. Melander)



Male genitalia of *Dissonphalus* spp., ventral aspect. Fig 1, *chiapanus*, n. sp.; fig. 2, *falcatus*, n. sp.; fig. 3, *arizonicus*, n. sp.; fig. 4, *rufipalpis* Kieffer.

[MCZ]; PENNSYLVANIA: 3 ♂♂, Ohio Pyle, Aug. 1907 (H. Kahl) [CM]; ILLINOIS: 2 ♂♂, Congerville, 31 July 1940 (Ross & Riegel) [INHS]; 1 ♂, Seymour, 2 Aug. 1940 (Ross & Riegel) [INHS]; 1 ♂, Mason City, 3 Aug. 1937 (Ross & Burks) [INHS]; KANSAS: 1 ♂, Lawrence [type, USNM].

Dissomphalus arizonicus, new species

Holotype.—♂, ARIZONA: 5 mi. W. Portal, 27 June 1956 (O. L. Cartwright) [USNM, type no. 65767].

This species has genitalia and modifications of the second abdominal tergite similar but not identical to *kansanus*. The clypeus has only a low median carina and the ocelli are slightly enlarged. I have seen only one specimen.

Description of type.—Length about 3 mm.; length of fore wing 2.7 mm. Head piceous, thorax dark reddish-brown, abdomen shining brown with indistinct paler annulations; palpi straw-colored; mandibles and apical half of clypeus yellowish-brown; antennae medium brown except pedicel and tip of scape yellow-brown; legs bright yellowish-brown except coxae and to a lesser extent femora suffused with brownish; wings hyaline, veins and stigma brown. Mandibles with a strong apical tooth and two smaller additional teeth. Clypeus strongly trilobed, all three lobes rounded; median carina low, in profile weakly arched toward the base. Antennae slender, flagellar segments (except the last) each about 2.5 times as long as thick. Front strongly alutaceous, rather weakly shining, punctures numerous but rather shallow; front weakly impressed medially. Head as wide as high; eyes strongly bulging laterally; minimum width of front 1.2 times height of eye. Ocelli slightly larger and occipital carina stronger than in *kansanus*. Pronotum with an arching transverse carina anteriorly, behind which is a series of foveae. Notauli slender, complete, nearly parallel. Propodeum rather long, disc nearly 1.2 times as long as wide; median carina not nearly reaching transverse carina, which is strong; anterior two-thirds of disc with reticulate sculpturing, posterior third smooth and polished. Fore wing with discoidal vein interstitial with median vein, pigmented for a distance greater than length of basal vein. Median basal groove of first abdominal tergite broad, extending about half the length of the tergite. Second tergite with some setae on extreme sides, flanking a small group of short closely associated setae which do not appear to arise from a pit, merely from an opaque spot on the flat surface of the tergite. Genitalia with the parameres and volsellae very much like those of *kansanus*; aedoeagus with ventral rami simple, very long and actually surpassing the apex of the dorsal body, remainder of aedoeagus similar in a general way to *kansanus*, but differing in details (fig. 3).

Dissomphalus chiapanus, new species

Holotype.—♂, CHIAPAS, MEXICO: San Cristobal las Casas, 7500 feet elevation, 2 May 1959 (H. E. Evans) [MCZ, no. 30330].

This minute species resembles *kansanus* in most respects, but the clypeus lacks the high, angulate carina of that species and the genitalia are very different. Only one specimen is known.

Description of type.—Length about 2 mm.; length of fore wing 1.8 mm. Entire body dark brown except basal segments of abdomen somewhat paler; palpi straw-colored; mandibles yellowish-brown on apical half; first two antennal segments light brown, rest of antenna dark brown; front coxae brownish, middle and hind coxae and all trochanters light yellowish-brown; femora and tibiae medium brown, except joints paler; tarsi light brown; wings hyaline, veins and stigma brown. Mandibles with a strong apical tooth and two very small additional teeth. Clypeus trilobed, median lobe rather small; median carina moderately strong, gradually declivous to the apical margin, but without the high, sharp angle characteristic of *kansanus*. Antennae rather short, flagellar segments (except the last) only about 1.5 times as long as thick. Eyes strongly hairy. Front alutaceous, moderately shining, obscurely punctate; front without a median impression. Head longer than wide, head width .9 the head length; eyes small, not notably bulging laterally; minimum width of front 1.3 times height of eye. Ocelli small; occipital carina rather weak dorsally. Pronotum with a weak and irregular transverse carina anteriorly. Mesoscutum with notauli obsolete on posterior .4. Propodeum reticulate on basal two thirds, smooth and shining behind, median carina terminating far short of transverse carina. Discoidal cell of fore wing very weakly outlined by pigmented lines. First abdominal tergite with a median groove on basal half. Second tergite with a few setae on each side, flanking a strong setae which arises from the top of a short tubercle (essentially the same as in *kansanus*). Genitalia with the parameres much shorter than in *kansanus* and more round apically; ventral rami of aedeagus very long and divided apically into two slender processes, the shorter of which is strongly serrate; dorsal body of aedeagus very complex, the major element terminating in three strong hooks (fig. 1).

Xanthopus Species-group

The members of this group have a pair of widely separated depressions or pits on the second tergite, the pits usually flanked by setae; there are no other modifications of this tergite. The male genitalia show much variation. The females have minute eyes and have the head shining at least medially.

Dissomphalus xanthopus Ashmead

Dissomphalus xanthopus Ashmead, 1893, Bull. U. S. Nat. Mus., 45: 42. ♂

Psilobethylus lucidus Brown and Cheng, 1952, Psyche, 58: 146. ♀

This is the commonest species of the genus in collections, and is best recognized by the rather broad and flat-topped median elevation of the clypeus. The pits on the second tergite are characteristic although rather variable in size. The females show considerable variation in head shape, and I now believe that the female which I described and figured in 1954 as the allotype of *barberi* is actually *xanthopus*. At least the females now before me show much variation in the characters used to separate the two species previously, and the true female *barberi* does not have a concave vertex (see under that species below).

I have seen many additional specimens of this species, including one from Arizona, which represents a notable range extension for the species. New state records are as follows: KENTUCKY: 1 ♂. Crail Hope, July [MCZ]; 2 ♂♂, East Horse Cave [MCZ]; ARKANSAS: 3 ♀♀, Washington Co., March [INHS]; MISSISSIPPI: 1 ♂, Iuka, July [Univ. Kansas]; ARIZONA: 1 ♂, Buckeye, 29 Sept. 1955 (G. D. Butler) [UA].

***Dissomphalus barberi* Evans**

Dissomphalus barberi Evans, 1954, Proc. Ent. Soc. Wash., 56: 298-300.

This species was previously known only from Plummer's Island, Maryland. I have seen three additional specimens which greatly increase the known range of the species: NORTH CAROLINA: 1 ♂, Balsam Gap, Balsam Mts., 3315 feet, 23 Aug. 1930 (N. Banks) [MCZ]; MAINE: 1 ♂, 1 ♀, on same pin, Augusta, 24 August 1947, "flying 6 P.M." (A. E. Brower) [USNM].

The Maine specimens suggest that the male may carry the female about in flight during copulation, as also occurs in the related genus *Pristocera*. This female does not agree well with my description and figure of the supposed female of *barberi*; it will, in fact, key to *xanthopus* in my key, while many probable *xanthopus* females will run to *barberi*. The female is about 1.7 mm. long. The cephalic index is 71; the sides of the head bulge only weakly (more nearly parallel than figured for either *xanthopus* or *barberi* in my 1954 paper). The vertex is not at all concave. The front is strongly polished but a very faint surface reticulum can be detected. There are no notable differences in the thorax or abdomen from *xanthopus*. I am at this time unable to suggest any means of separating the females of these two closely related species.

***Dissomphalus falcatus*, new species**

Holotype.—♂, MEXICO, MEXICO: Ixtapan la Sal, 5500 feet, 9 August 1954 (J. G. Chilleott) [CNC, No. 7550].

This species stands close to *barberi* on most characters, but the setae on the mesal margin of the tergal pits are characteristic, as are the unusual genitalia. The name *falcatus* is meant to describe the slender, hook-like processes which make up the apical part of the dorsal body of the aedeagus (fig. 2).

Description of type.—Length about 3.8 mm.; length of fore wing 3.4 mm. Head and thorax piceous, abdomen dark brown, first tergite margined with light brown; palpi straw-colored; mandibles castaneous, teeth rufous; antennae dark brown except second segment and adjacent parts of first and third segments yellowish-brown; legs dark brown except paler at joints and also trochanters, front tibiae, and all tarsi light yellowish-brown; wings lightly tinged with brownish, veins and stigma dark brown. Mandibles slender, tridentate. Clypeus trilobed, median lobe somewhat angular, lateral lobes small, rounded; median carina strong, in

profile forming a straight line. Antennae short, middle flagellar segments each about 1.4 times as long as thick. Front strongly alutaceous, rather dull, punctures shallow but fairly prominent, separated by about or somewhat more than their own diameters. Eyes with very short, inconspicuous hairs. Head very slightly wider than high; front slightly narrower near bottoms of eyes than at their middle, minimum width of front 1.25 times height of eye. Ocelli in a compact triangle far removed from eyes; occipital carina complete though rather weak dorsally. Pronotum short, with smooth contours and no suggestion of a transverse carina or foveae; disc of pro- and mesonota strongly alutaceous, punctures rather weak; notauli complete. Propodeum with median carina strong, reaching transverse carina and continuing on down declivity; base of propodeal disc strongly reticulate, apical portion merely alutaceous; spiracles large, subcircular. Fore wing with discoidal cell closed off by well pigmented lines, first recurrent vein also weakly indicated and subdiscoidal vein continued on to wing margin. First abdominal tergite with a strong median groove which extends for slightly over half its length. Second tergite with the pits widely separated, moderately large (about as in *xanthopus*), subcircular but slightly longer than wide, located on the mesal faces of shallow depressions; there are only a few minute setae laterad of the pits, but close beside them on the mesal side there are many strong setae forming an arcuate series. Genitalia unusual in that all the apical parts are elongate and spear-like; parameres long, tapering to a point; digiti acutely pointed; ventral rami long and slender, slightly curved apically; dorsal body of aedeagus terminating in elongate processes which terminate in stout, recurved hooks (fig. 2).

Dissomphalus collaris, new species

Holotype.—♂, CUBA: Soledad, Cienfuegos, Jan.-Feb. 1927 (C. T. & B. B. Brues) [MCZ, No. 30340].

This is a minute species, but distinctively colored and with tergal pits quite different from those of any other species. It is the first species of the genus to be described from Cuba.

Description of type.—Length about 1.5 mm.; length of fore wing 1.35 mm. Head dark reddish-brown; prothorax wholly straw-yellow except posterior margin of pronotum darker; remainder of thorax and propodeum dark reddish-brown; abdomen dark reddish-brown except sides of basal segments paler; mandibles and apical margin of clypeus yellowish-brown; first two antennal segments yellowish-brown, remainder of antenna dull brown; legs wholly straw-colored; wings hyaline. Mandibles slender, tridentate. Clypeus trilobed, median lobe narrow and somewhat angular, lateral lobes broad, shorter than median lobe; median carina linear, low except weakly elevated basally. Antennae short, flagellar segments about 1.3 times as long as thick except apical segment about twice as long as thick. Front convex and shining, obscurely alutaceous, obscurely punctate. Eyes with very short hairs. Head as wide as high; inner orbits strongly converging below, minimum width of front very slightly greater than eye height. Ocelli small, far removed from eyes; occipital carina well defined dorsally. Pronotum rather flat, without a transverse carina. Notauli not reaching posterior margin of mesoscutum. Propodeum with median carina not nearly reaching trans-

verse posterior carina, posterior part of disc polished and smooth, median and anterior areas weakly reticulate; spiracles minute. Fore wing with discoidal vein distinct for a distance greater than length of basal vein, interstitial with median vein. First abdominal tergite with a median groove at extreme base. Second tergite with the pits widely separated, flanked by about three small setae; pits broadly elliptical, transverse, bowl-shaped, their bottoms polished and not bearing any noticeable spines or setae. Genitalia not studied.

Dissomphalus rufipalpis Kieffer

Dissomphalus rufipalpis Kieffer, 1910, Ann. Soc. Ent. France, 79: 44-45 [Type: ♂, BRITISH HONDURAS: Bélize (Coll. Baker) (Pomona College, Claremont, Calif.)].—Kieffer, 1914, Das Tierreich, 41: 500.

In this very distinctive species there are no setae on the second tergite and the pits are large and shallow and contain a linear series of minute spines.

Description of type.—Length 4.1 mm.; length of fore wing 3.3 mm. Head and thorax black, abdomen dark brown except suffused with paler basally and apically; mandibles light brown, somewhat paler on apical half than basally; clypeus dark brown; antennae light yellowish-brown, weakly infuscated on apical half of flagellum; legs, including coxae, light yellowish-brown except apical two thirds of hind femora suffused with dark brown; wings subhyaline, veins and stigma brown. Mandibles bidentate. Clypeus trilobed apically, median lobe acute; median carina strong, in profile nearly straight. First four antennal segments in a ratio of about 14:5:5:5, segment three $1.8 \times$ as long as thick, segment eleven about twice as long as thick. Front rather strongly and evenly alutaceous, barely shining, punctures numerous but shallow and barely noticeable; occipital carina complete though rather weak dorsally; eyes with some short, inconspicuous hairs. Head very slightly wider than high; minimum width of front 1.20 times height of eye; ocelli of normal size, in a compact triangle, far removed from eyes. Anterior face of pronotum rather steep, obscurely rugulose; disc strongly alutaceous, obscurely punctate. Mesoscutum alutaceous, somewhat shining, obscurely punctate; notauli complete, diverging anteriorly; scutellum wholly alutaceous, basal groove distinctly wider on the sides than medially. Propodeum short, disc about two thirds as long as wide; median carina complete, reaching the transverse carina, which is barely distinguishable amid the sculpturing; disc and upper part of posterior slope mostly covered with irregular reticulate sculpturing; spiracles elliptical. Fore wing with the discoidal cell wholly outlined by pigmented lines; subdiscoidal vein continued on nearly to wing margin, first recurrent veing also weakly indicated. First abdominal tergite with the basal groove extending for about half its length. Second tergite devoid of setae, with a pair of large, sublateral, transversely elliptical depressions each of which bears a linear series of minute spines. Genitalia with the parameres broad, except narrowed apically; aedoeagus with ventral rami slender, not quite as long as dorsal body, the latter ending in two compressed lobes with minutely serrated margins (fig. 4).²

²The genitalia described and figured are those of the specimen from Cordoba, Mexico; the genitalia of the type were not examined.

Other specimens studied.—BRITISH HONDURAS: 2 ♂♂, same data as type [paratypes, CU and Pomona College]; MEXICO: 1 ♂, Cordoba, 1 January 1941 (G. E. Bohart) [CAS]; COSTA RICA: 2 ♂♂, San José, 1940 (H. Schmidt) [Brazil Sec. Agric., São Paulo].

Apertus Species-group

Males of this group are easily recognized by the fact that the pits of the second tergite are close together medially; there are also some pale or at least roughened spots antero-laterally on this tergite. The females have generally larger eyes and more sculpturing on the head than in the preceding group.

Dissomphalus apertus Kieffer

Dissomphalus apertus Kieffer, 1914, Bull. Soc. Ent. France, p. 60.

This distinctive species ranges throughout eastern United States and eastern Mexico. New state records and Mexican records are as follows: NEW YORK: 2 ♂♂, Ithaca, Aug. (H. E. Evans) [MCZ, CU]; PENNSYLVANIA: 1 ♂, Pittsburgh [CM]; ILLINOIS: 1 ♂, Homer, 20 July 1941 (Ross & Riegel) [INHS]; TEXAS: 2 ♂♂, Brownsville, June, July [MCZ, KU]; MEXICO: 3 ♂♂, Cordoba, 1 January 1941 (G. E. Bohart) [CAS].

Dissomphalus foveolatus (Brown and Cheng)

Psilobethylus foveolatus Brown and Cheng, 1952, Psyche, 58: 143.

This may well represent the otherwise unknown female sex of *apertus*. The specimens from Yuma, Arizona, which I assigned to this species in 1954, I now believe to belong to *altivolans* Evans. New state records for *foveolatus* are as follows: GEORGIA: 1 ♀, Waycross, 24 June 1955 (H. S. Dybas) [Chicago Nat. Hist. Mus.]; ARKANSAS: 1 ♀, Washington Co., 15 March 1940 [INHS]; ILLINOIS: many ♀♀, Urbana, Caehe, Grand Tower, LaRue, Wolf Lake, Pocahtontas, Feb.-Sept., some from debris in hollow trees, others in decayed wood, others "in pack rat nest" [INHS].

Dissomphalus nigrescens Evans

Dissomphalus nigrescens Evans, 1954, Proc. Ent. Soc. Wash., 56: 308-309.

This species was described from males from Alabama, Louisiana, and Texas. I have seen no additional males of the species. A female from Washington Co., Arkansas, 16 June 1942 (M. W. Sanderson) [INHS] may possibly belong to this species. This specimen is 1.9 mm. long and wholly pale yellowish-brown. The eyes are of moderate size, longer than wide (much as in the related species *altivolans*), and have six large facets. The front is wholly and rather strongly alutaceous although somewhat shining, especially medially; the punctures on the sides are large although very shallow, separated by about or somewhat less than their own diameters. The propodeum is 1.9

times as long as its maximum width. Some of the setae of the middle tibiae are rather stiff and spine-like.

Dissomphalus altivolans Evans

Dissomphalus altivolans Evans, 1954, Proc. Ent. Soc. Wash., 56: 307-308.

This species was described from several males from Tallulah, La. I have now seen several additional males which greatly extend the known range of the species. Some of these males have the legs and antennae light brown, and there is enough variation in the sculpturing of the propodeum to make this character of little value in separating *altivolans* from *nigrescens*. Also, there is some variation in the strength of the serrations in the aedeagus, so that this character, too, seems of little use in separating these two species. The best characters are to be found in the shape of the apical parts of the aedeagus (as illustrated in my 1954 paper). The specimens before me show much variation in the size of the tergal pits; specimens from Arizona and California tend to have large pits which are set in a less distinct depression than is the case with eastern specimens.

New records for males are as follows: ALABAMA: 1 ♂, Tuscaloosa, 5 July 1949 (B. D. Valentine) [MCZ]; ILLINOIS: 1 ♂, Carterville, Williamson Co., 6 Sept. 1958 (V. Cole) [UCD]; ARIZONA: 4 ♂♂, Superior, 17 May 1946 (H. K. Gloyd, in light trap) [INHS, MCZ]; 1 ♂, Buckeye, 29 Sept. 1955 (G. D. Butler, swept from alfalfa) [UA]; 1 ♂, Patagonia, 5 Nov. 1955 (G. D. Butler, swept from alfalfa) [UA]; CALIFORNIA: 1 ♂, Calexico, Imperial Co., 20 Aug. 1958 (E. I. Schlinger, in alfalfa field) [USNM].

The light trap material from Superior, Arizona, which contained the four males listed above, also contained two females which almost certainly belong to this species. Discovery of these females led me to re-examine the Arizona females formerly assigned to *foveolatus*; these seem to agree well with the Superior specimens, and are here re-assigned to *altivolans*. Records for females of this species are as follows: TEXAS: 1 ♀, Bexar Co., 12 Sept. 1940, peach orchard [USNM]; ARIZONA: 2 ♀♀, Superior, June-Aug. 1948 (H. K. Gloyd, light trap) [INHS, MCZ]; 2 ♀♀, Ft. Yuma [USNM]; 3 ♀♀, Yuma, shore of Colorado River, 23 Jan. 1897 [USNM].

The females vary in length from 1.8 to 2.2 mm. and in color from pale yellowish-brown to rather dark castaneous. The eyes are in every case smaller and much more elongate than in *foveolatus*, though with more facets than in the supposed female *nigrescens* (about 10). The front is dull, the sculpturing much as in *foveolatus* but with less distinct reticulations. The propodeum is 1.9 times as long as its maximum width. In some specimens some of the setae of the middle tibiae are rather thick and somewhat spine-like.

Dissomphalus bifoveatus Kieffer

Dissomphalus bifoveatus Kieffer, 1906, Berlin. Ent. Zeitschr., 50: 250-251 [Type:

♂, NICARAGUA: San Marcos (Coll. Baker) (Pomona College, Claremont, Calif.)].—Kieffer, 1914, *Das Tierreich*, 41: 502.

This species stands very close to the preceding two, differing chiefly in having some rather long setae arising from directly in front of the tergal pits. I have seen no specimens other than the type.

Description of type.—Length 2.3 mm.; length of fore wing 1.8 mm. Entire body rather uniformly dark brown; mandibles light yellowish-brown; scape and base of flagellum straw-colored, flagellum infuscated beyond basal third, apically nearly as dark as body; front coxae and all femora medium brown, middle and hind coxae and tibiae light brownish, legs otherwise straw-colored; wings hyaline, veins and stigma brown. Mandibles slender, bidentate, inner tooth small but broad, its margin blade-like, oblique, sloping into inner mandibular margin. Clypeus tridentate, median tooth sharp, lateral teeth rounded and not especially prominent; median carina strong, in profile very weakly arched. First four antennal segments in a ratio of about 34:12:9:11, segment three very small, about $1.5 \times$ as long as thick, segment eleven about $1.7 \times$ as long as thick. Front moderately, uniformly alutaceous, distinctly shining, punctures shallow and inconspicuous; eyes with some short, inconspicuous hairs. Head as wide as high; minimum width of front 1.30 times height of eye; ocelli small, well separated, front angle of ocellar triangle less than a right angle. Pronotum short, disc margined anteriorly by a weak transverse carina, otherwise alutaceous, obscurely punctate, somewhat shining. Mesoseutum also alutaceous, moderately shining, obscurely punctate; notauli complete; scutellum wholly alutaceous, basal groove wider laterally than medially. Propodeal disc short, about 1.2 times as wide as long; median carina somewhat irregular, stopping well short of the posterior transverse carina, which is also somewhat irregular; disc and posterior slope with coarse reticulate sculpturing except posterior part of disc with a U-shaped area which is smooth and polished. Mesopleurum wholly alutaceous, obscurely punctate. Fore wing with transverse median vein erect, somewhat curved below, interstitial with basal vein, discoidal vein interstitial with media, weakly pigmented for a distance greater than length of basal vein, in fact the discoidal cell wholly weakly outlined and the subdiscoidal vein continued on weakly nearly to wing margin. First abdominal tergite with a strong basal groove extending for more than half its length. Second tergite with a pair of anterior, sublateral elongate roughened spots as well as a pair of strong median pits which are separated by slightly less than their own diameters and situated in a common shallow depression; the pits are pale and apparently densely filled with minute setae; there are also some longer setae directly in front of each pit which are directed back over the pits. Subgenital plate broadly truncate. Genitalia not studied.

***Dissomphalus singularis*, new species**

Holotype.—♀, HAITI: Camp Perrin, 24 May 1950 (H. B. Mills, in berlese funnel) [INHS].

This striking species is known from the female sex only, so I cannot say for certain that it belongs in the *apertus* group. The middle tibiae are strongly spinose, as in several other Neotropical species, whereas they are at most very weakly spinose in *apertus*, *altivolans*, and

nigrescens. Presumably *singularis* will fall in the genus *Parecitopria* Ogloblin (1930, Rev. Soc. Ent. Argent., 3: 15-17). The characters on which this genus was based seem to me to be subject to much variation, and I tentatively regard it as a synonym of *Dissomphalus*.

Description of type.—Length about 1.9 mm. Body uniformly dark castaneous except sides of basal abdominal segments somewhat paler; mandibles, antennae, and legs wholly light yellowish-brown; body clothed rather densely with short, pale setae. Mandibles with four teeth, basal two teeth very much smaller than apical two teeth. Clypeus narrowly truncate apically, with a high median carina which is abruptly cut off apically. Eyes dark, slightly longer than wide, facets not especially distinct, apparently about six in number. Head rather elongate, cephalic index only 68; sides of head subparallel, bulging only very slightly in the middle. Front uniformly alutaceous, though weakly shining; punctures absent from median strip, elsewhere small but deep and sharply defined, separated for the most part by about or slightly more than their own diameters. Dorsum of thorax and propodeum shining, weakly alutaceous, propodeum 2.2 times as long as its maximum width, disc with strong lateral margins; spiracles small, directed dorso-laterad. Middle tibiae with a considerable number of thick, spine-like setae for its full length on the outer side. Abdomen short, stout, shining, with a moderately long petiole.

**THREE HYMENOPTEROUS PARASITES OF AN AFRICAN
MUD-DAUBER WASP, *Sceliphron spirifex* (L.)**
(HYMENOPTERA)

On January 12, 1962, Plant Quarantine Inspectors N. Kitazaki, F. Larson and E. Imai of the Agricultural Research Service, U. S. Department of Agriculture, New York City, found a multicelled mud nest about 3 inches in diameter attached to the inside of the lid of a trunk from the hold of the recently arrived steamer African Moon. It is believed that the trunk came from the Union of South Africa. The occupants of the cells, mostly adults that had died enroute, were submitted to us for identification by L. M. Chilson, Port Entomologist in New York City. Two of them were females of a common Palaearctic and Ethiopian mud-dauber wasp, *Sceliphron spirifex* (L.), the species that constructed the nest. A female mutillid, *Dolichomutilla minor minor* Bischoff, was found in another cell; undoubtedly it was a parasite of the resting larva of *S. spirifex*. Two adult females and a fully colored female pupa of the chrysidid, *Chrysis (Pyria) lyncea* F., were found in three other cells; one parasite cocoon was found inside a host cocoon submitted with the specimens, so the chrysidid is certainly parasitic on the resting *Sceliphron* larva, as was reported by Edney (Oceas. Papers Natl. Mus. So. Rhodesia, No. 19, p. 636, 1954). Two large male ichneumonids, *Osprynchotus gigas* Kriechb., were recovered from two other cells; presumably this parasite also attacks the resting *Sceliphron* larva; other species of its genus have been reared from the sphecid, *Sceliphron* sp., and from vespid mud-daubers, *Synagris* spp.

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THE SPECIES OF *Mecynotarsus* RELATED TO *ELEGANS* LECONTE
(COLEOPTERA: ANTHICIDAE)

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When Champion described *Mecynotarsus sernotatus* from Guatemala, he noted its resemblance to *M. elegans*, from Florida, but also pointed out that it was similar to certain undesignated Australian species. Five additional species are described from Mexico, Central America and the West Indies in the present paper. All of these species are more similar to each other than they are to any other species in the genus; for convenience the assemblage is here called the Elegans-Group. Only one other species of *Mecynotarsus* is known from the Neotropical region, *M. schenklingi* Pic, described from Paraguay. It is described as having 4 or 5 lateral teeth on the prothoracic horn and therefore cannot be referred to the group.

The Elegans-Group differs from *Mecynotarsus*, s. str., of the Palaearctic region (see Heberdey, 1942) and the Nearctic region (*M. candidus* LeConte, its synonym *M. flavicans* Casey, and *M. delicatulus* Horn), in the following ways:

1. The prothoracic horn has only three large "teeth" on its sides, deeply separated by U-shaped excisions.
2. The prothoracic horn and the underside of the head lack isolated asperities.
3. The crest of the prothoracic horn is roughly parallel-sided and lacks any sign of a keel down its middle.
4. At least the median pair of tactile setae on the base of the pronotum is missing. The lateral pair may or may not be represented by two or more flattened postero-lateral setae.
5. The sides of the flattened front of the head have an oblique row of erect flattened setae, which outline the prothoracic horn when the head is elevated.
6. The setae on most of the body are modified into scales, which are involved in color patterns.
7. The setae on the eyes are modified into short, forward-directed curved scales.

The appendages are much less slender and the prothorax is differently shaped, but these characteristics are not easily defined. Additional features, which may or may not be of significance, are: eyes small and almost round; male pygidium only narrowly sclerotized, with the median portion exposed, sculptured and pubescent; aedeagus small, a feature shared with *Mecynotarsus*, s. str., but with penis and parameres longer than phallobase. In the type of the genus, *M. serriicornis* Panzer, and in *M. candidus* and *M. delicatulus*, the penis and parameres are somewhat shorter than the phallobase.

Because they are covered with scales and have inflated elytra, certain Australian species, such as *M. ziczac* King and *M. albellus* Pascoe, bear a superficial resemblance to the members of the Elegans-Group. They differ in all the other features listed.

All known species of the Elegans-Group have the metathoracic wings reduced to narrow fillets, expanded near the apex of the elytra. They are, quite obviously, flightless. Since the samples are small, it is conceivable that fully winged individuals occur in populations of even the described species.

Bionomics.—At least three of the species, *elegans*, *sexnotatus* and *nevermanni*, seem to be closely associated with sandy beaches and dunes. *Elegans* was described as abundant on the seashore at Capron, Florida and the author has observed the same species at Destin, in a beach dune area. Unlike *M. candidus* and *Amblyderus pallens* of farther north, *elegans* was hiding under things, especially the leaves of a plant which had peltate leaves lying on the sand, in swales, rather than burrowing in the dunes themselves. In mid-May the beetles were running around and mating near noontime, retreating under the leaves later in the day. Champion notes that *sexnotatus* was "found in profusion on the sea-beach . . ." and Nevermann's labels on the *nevermanni* specimens include "am Meeresstrand." *Salvadorensis* and *jamaicanus* were collected at coastal localities, although no habitat notes are affixed to the specimens.

Surprisingly, the two species now known from Mexico were not taken in association with either sand or shore. Both were collected well inland, in rich desert areas, *intermixtus* in an area of desert pavement and *balsasensis* in a fallow field. Both species were actively running around at noon.

Relationships within the group.—Since the preferred habitat may include both dunes and open fields, and since there seems to be no way of obtaining samples other than by an examination of the ground or a search under objects lying on the ground, the record of the species of the Elegans-Group must be very incomplete. No very searching analysis of distribution can be made until more is known about the limits of ranges.

Two subgroups are indicated by the material at hand. *Elegans*, *intermixtus* and *jamaicanus* have the phallobase of the male aedeagus laterally lobiform, and have the elytra pale, with a transverse submedian band and a postmedian oblique mark dark on each. *Elegans* is very distinct in color pattern but *intermixtus* and *jamaicanus* are obviously similar. It is of some interest that the one species known from the West Indies has its affinities with a species in northeastern Mexico, rather than with the species in Central America. All three species inhabit lands bordering on the Gulf of Mexico; only *intermixtus* has been collected far inland.

The remaining species have the male phallobase simple (unknown in *salvadorensis*) and have the elytra predominantly dark, with pale spots. *Sexnotatus* and *nevermanni* stand somewhat isolated. *Balsasensis* and *salvadorensis* have a basically similar color pattern and are probably closely related. All of the species in this subgroup inhabit lands bordering on the Pacific in Mexico and Central America; only *balsasensis* has been collected far inland.

KEY TO SPECIES

1. Postmedian dark mark on elytra not, or just barely, reaching suture..... 2
 Postmedian dark mark on elytra broad at suture; elytra sometimes mostly dark, with isolated pale spots..... 4
2. Elytral suture dark back to a narrow median transverse band; postmedian dark mark a narrow, oblique stripe. Florida and S. Alabama.....
 *elegans* LeConte
 Elytral suture pale between base and median band; basal half of elytra and disc of pronotum with brown scales mixed with the white scales...3
3. Dark scales intermixed with pale at the base of the elytra no paler than those in the transverse band; postmedian dark marking somewhat crescentic, the pale zone between it and the transverse band also curved. Nuevo Leon, Mexico.....*intermixtus*, sp. n.
 Dark scales intermixed with pale at base of elytra much paler than those in the transverse band, postmedian mark and base of elytra; pale zone between transverse band and postmedian mark almost transverse. Jamaica.....*jamaicanus*, sp. n.
4. Scales on elytra so sparse that the pale markings are not obvious in some lights; shiny body surface showing through obviously. Pale spots on elytra isolated; scales on rest of body mostly dark. Champerio, Guatemala.....*sexnotatus* Champion
 Pale pattern on elytra very distinct. Body with many pale scales..... 5
5. Entire tip of elytra pale, except perhaps very narrowly at suture. Pronotum brown down the middle, pale laterally. Puntarenas, Costa Rica.
*nevermanni*, sp. n.
 Pale spot at tip of elytra at least partly divided down the middle on each elytron. Midline of pronotum pale, flanked by a dark marking 6
6. Pale markings on elytra extensive, the humeral stripe extending down the sides and the mid-terminal spot large and cordate. Dark portion of elytra pale brown. Morelos, Mexico *balsasensis*, sp. n.
 Pale markings on elytra less extensive, the humeral mark not extending down the sides and the mid-terminal spot oval. Dark portion of elytra dark brown. La Union, Salvador*salvadorensis*, sp. n.

The measurements given in the following descriptions were made with an ocular micrometer. The following measurements need clarification. Total length was measured from the tip of the prothoracic horn to the tip of the elytra; head length from base to fronto-elypeal suture width across eyes; antennal segments in 0.01 mm., base to apex, length over maximum width; prothorax from base to head and from base to tip of horn, width at base, maximum and across the first crenulation of the horn; and elytra on a line across base connecting 45° intersections with the humeri.

Mecynotarsus elegans LeConte

(Figs. 1,8)

Mecynotarsus elegans LeConte, 1875, Trans. American Ent. Soc. 5:175.

Piceous to ferruginous, the appendages paler; upper surface shiny and rather

deeply punctured but almost completely hidden by scales. Scales on elytra ca. 0.04×0.01 mm., truncate or emarginate apically; those on pronotum slightly shorter; cinereous over most of body, ferruginous on base, suture before middle, a median transverse band and very oblique postmedian stripe on each elytron. Length 1.8—2.2 mm.

Measurements (of a δ from Destin, Florida); length 1.81mm.; head 0.31 mm. long, 0.33 wide; eyes 0.09×0.08 mm. Antenna scaled on segments 1 and 2, measuring 12/6, 8/5, 8/4, 8/4, 8/4, 8/4, 8/4, 8/5, 8/5, 6/5, 10/5. Prothorax 0.38 mm. long to head, 0.68 to tip of horn, 0.26 mm. wide across base, 0.41 maximum and 0.18 across horn. Crest narrow, 0.05 mm. across base, feebly and finely crenulate. Elytra slightly inflated, 1.13 mm. long, ca. 0.44 wide across base and ca. 0.67 maximum. Metatibia 0.49 mm. long; metatarsal segments 0.20, 0.13, 0.10 and 0.13. Male hypopygium shallowly but roundly emarginate.

Originally described from Capron, Florida, collected by Hubbard and Schwarz, with the note that it was abundant on the seashore. Re-described from a series taken at Destin, Okaloosa Co., Florida, May 15, 1948, F. Werner and W. Nutting, and from specimens from Royal Park, Florida, near the tip of the peninsula, and Baldwin Co., Alabama, Sept. 2, '11, H. P. Loding.

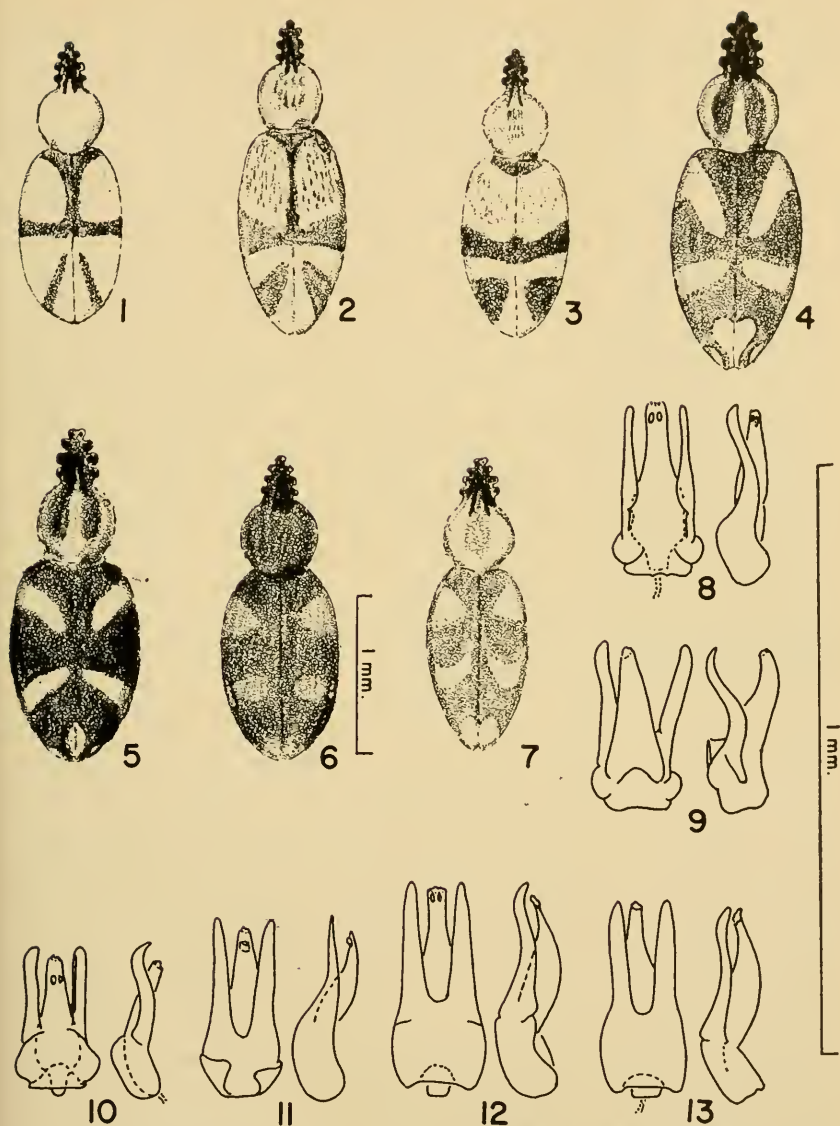
***Mecynotarsus intermixtus*, sp. n.**

(Figs. 2, 9)

Ferruginous, with the upper surface shiny, moderately deeply punctured but largely obscured by scales. Scales on elytra ca. $0.05 \times 0.00 \frac{2}{3}$ mm., truncate; subequal on pronotum; cinereous over most of body but ferruginous in a median transverse band, wide oblique mark behind the band and a mixed area toward base of elytra, and in a mixed area on the pronotal disc; the markings varying little. Elytra only slightly inflated, with humeri distinct. Length 2.0—2.25 mm.

Holotype δ : length 2.01 mm.; head 0.36 mm. long, 0.36 wide; eyes 0.10×0.08 mm. Antenna with scales on segments 1-4 and broad setae on 5-6, measuring 15/8, 8/5, 10/5, 8/5, 9/6, 9/6, 9/6, 8/6, 8/6, 8/6, 10/6. Prothorax 0.44 mm. long to head, 0.73 to tip of horn; ca. 0.31 mm. wide across base, 0.44 maximum and 0.18 across horn. Crest 0.04 mm. across at base, feebly and finely crenulate. Elytra 1.28 mm. long, 0.46 wide across base and ca. 0.74 maximum. Metatibia 0.46 mm. long; metatarsal segments 0.19, 0.10, 0.09 and 0.12. The δ hypopygium is very shallowly emarginate, with the side margins of the emargination not abrupt, but slightly tufted. The area before the emargination is slightly shinier than the surrounding surfaces. The female differs only in abdominal characters; the antennae are very similar to those of the male.

Holotype δ , allotype δ , 30 δ , 23 δ paratypes, El Paraiso, Nuevo Leon, Mexico (Rt. 1. km. 1078), rich desert, May 25, 1948, F. Werner and W. Nutting. 4 δ , 2 δ paratypes, 37 km. N. Monterrey, Nuevo Leon, Mexico (Rt. 1, km. 1035), May 25, 1948, F. Werner and W. Nutting. I have the following notes: El paraiso specimens were running on dry, rocky ground, near noon; the other specimens were running near some old drift next to a roadside ditch. Both areas were very dry at the time.



Dorsal view of head and prothorax. Fig. 1, *Mecynotarsus elegans* LeConte; fig. 2, *M. intermixtus* sp. n., holotype; fig. 3, *M. jamaicanus* sp. n., holotype; fig. 4, *M. balsacensis* sp. n., holotype; fig. 5, *M. salvadorensis* sp. n., holotype; fig. 6, *M. sexnotatus* Champion; fig. 7, *M. nevermanni* sp. n., holotype.

Aedeagi of *Mecynotarsus* spp. Fig. 8, *M. elegans* (ventral and lateral); fig. 9, *M. intermixtus* (ventral and lateral); fig. 10, *M. jamaicanus* (dorsal and lateral); fig. 11, *M. balsacensis* (dorsal and lateral); fig. 12, *M. sexnotatus* (dorsal and lateral); fig. 13, *M. nevermanni* (dorsal and lateral). Figs. 9, 11, 13 from paratypes, 10 from holotype.

Holotype and allotype in USNM (#65466). Paratypes in M.C.Z.; Calif. Acad.; British Museum; Oficina de Estudios Especiales, S.A.G., Mexico and in the collection of the author.

***Mecynotarsus jamaicanus*, sp. n.**

(Figs. 3, 10)

Piceous, the appendages pale; upper surface shiny and deeply punctured, densely clothed with scales. Scales on elytra ca. 0.04×0.01 mm., truncate; those on prothorax subequal; cinereous over most of body, piceous on base, postmedian band and large, triangular subapical marking on each elytron; ferruginous in a mixed area on base of elytra and disc of pronotum. Elytra slightly inflated. Length: 1.84 (holotype) and 1.82 mm.

Holotype ♂: head 0.33 mm. long, 0.36 wide; eyes 0.10×0.09 mm. Antenna with scales on segments 1-2, broad setae on 3-4, measuring $13/8, 10/4, 9/4, 8/4, 8/4, 8/4, 9/5, 8/5, 8/5, 8/5, 10/5$. Prothorax 0.41 mm. long to head, 0.69 to tip of horn; 0.28 mm. wide across base, 0.44 maximum and 0.18 across horn. Crest ca. 0.05 mm. across at base, slightly crenulate. Elytra 1.15 mm. long, 0.51 mm. across base and ca. 0.72 maximum. Metatibia 0.46 mm. long; metatarsal segments 0.23, 0.13, 0.10 and 0.13. Male hypopygium shallowly emarginate. ♀ like ♂ except on abdomen.

Holotype ♂, allotype ♀: Kingston, Jamaica. USNM #65470. The specimens, which are from the USNM collection, bear script locality labels, without indication of collector.

***Mecynotarsus balsasensis*, sp. n.**

(Figs. 4, 11)

Piceous with paler appendages, varying to ferruginous; upper surface shiny, moderately deeply punctured, largely obscured by scales. Scales on elytra truncate, ca. 0.05×0.01 mm., with some narrower ones intermixed; those on prothorax slightly shorter; cinereous on underside but mostly ferruginous above, with a pattern of two converging cinereous stripes and usually divided apical spot on each elytron, the humeral stripe extending half way to the apex along the margin. In some specimens the elytral suture is narrowly pale from base to middle. Pronotum with a longitudinally divided dark area on the disc. Elytra subinflated, very slightly ridged apically along the line that divides the apical pale spot. Length 1.9—2.6 mm.

Holotype ♂: length 2.30 mm.; head 0.41 mm. long, 0.42 wide; eyes 0.12×0.10 mm. Antenna with scales on segments 1-4, but scales narrow on 3-4, measuring $17/8, 10/5, 10/5, 9/5, 10/5, 10/5, 10/6, 10/6, 10/6, 9/6, 13/5$. Prothorax 0.49 mm. long to head, 0.90 to tip of horn; 0.36 mm. wide across base, 0.54 maximum and 0.27 across horn. Crest finely crenulate, ca. 0.10 mm. wide across base. Elytra 1.40 mm. long, 0.56 mm. wide across base and 0.84 maximum. Metatibia 0.54 mm. long, metatarsal segments 0.22, 0.13, 0.09 and 0.13. ♂ hypopygium shallowly but distinctly emarginate, with the side margins of the emargination abrupt.

Holotype ♂, allotype ♀, 64 ♂, 72 ♀ paratypes, 7 km. S. Alpuyecá, Morelos, Mexico (Rt. 3, km. 107), 3200'. VI-23-1948, on ground in

agricultural area, F. Werner and W. Nutting. In my notebook there is the further information that the specimens were running over the ground at noon, particularly in washes with fine gravel. The locality is in the drainage of the Rio Balsas.

Holotype and allotype in USNM (#65467). Paratypes in M.C.Z.; Calif. Acad.; British Museum; Oficina de Estudios Especiales, S.A.G., Mexico and in the collection of the author.

***Mecynotarsus salvadorensis*, sp. n.**

(Fig. 5)

Holotype ♀: length 2.15 mm.; ferruginous, the appendages slightly paler, surface shiny and moderately deeply punctured, largely obscured by scales. Scales on elytra ca. 0.05×0.01 mm., truncate; subequal on prothorax; cinereous on underside but largely piceous above, with two convergent stripes and divided apical spot on each elytron cinereous; disc of pronotum piceous except on midline, posterior margin and sides. Head ca. 0.38 mm, long, 0.41 wide; eyes 0.10×0.10 mm. Antenna with scales on segments 1-4, broad setae on 5-7, measuring 15/8, 8/5, 9/5, 8/5, 9/5, 9/5, 9/5, 9/5, 9/6, 9/6, 13/6. Prothorax 0.49 mm. long to head, 0.87 to tip of horn; 0.31 mm. wide across base, 0.49 maximum and 0.28 across horn. Crest of horn 0.10 mm. across base, the ridges of the crest broader than in the other species, finely crenulate. Elytra 1.28 mm. long, somewhat inflated, 0.56 mm. wide across base, 0.87 maximum. Metatibia 0.51 mm. long, metatarsal segments 0.24, 0.12, 0.09 and 0.12.

Holotype ♀: La Union, Sal[vador], Jan. 25, [19]30-10427. Blackwelder Collection (USNM #65469). La Union is on the shore of Golfo de Fonseca.

***Mecynotarsus sexnotatus* Champion**

(Figs. 6, 12)

Mecynotarsus sexnotatus Champion, 1890, *Biologia Centrali-Americana*, Insecta-Coleoptera 4(2): 215, pl. 9. f. 25-25a.

Dark piceous, the legs, and tibiae especially, tending to be paler, shiny, with the elytra deeply punctured; surface more than half visible because of the sparseness of the scales. Scales on elytra ca. $0.05 \times 0.00 \frac{2}{3}$ mm., with apices rounded; those on prothorax slightly shorter; piceous on most of upper surface but cinereous on three spots on each elytron, sides of prothorax and much of head; scales on underside narrow but cinerous. The pale markings are obscure because the cinerous scales are sparse, and somewhat translucent. Antenna with dark scales on first segment, measuring 14/5, 9/4, 8/5, 8/7, 9/8, 8/8, 8/8, 8/8, 8/7, 8/6, 9/5 in a ♂ in the M.C.Z. The ♂ antennae have segments 5-10 subtriangular and slightly flattened; ♀ antennae are nearly filiform. Eyes 0.10×0.09 mm. Crest of prothoracic horn 0.05 mm. across base. Metatibia 0.51 mm. long; metatarsal segments 0.24, 0.15, 0.12 and 0.14. Male hypopygium shallowly emarginate.

This species is mentioned by Champion as being common on the sea beaches of Champerico, Guatemala, on the Pacific coast. It has apparently not been collected again since Champion's time. Specimens from the *Biologia* series are in the U.S.N.M. and M.C.Z.

Mecynotarsus nevermanni, sp. n.

(Figs. 7, 13)

Piceous, the appendages paler; upper surface shiny, moderately deeply punctured, but largely obscured by scales. Scales on elytra ca. 0.05×0.01 mm., truncate; those on prothorax subequal; cinereous over much of body but ferruginous above with margins of pronotum and humeral and apical patch and crescentic median band on each elytron cinereous. In one specimen the pronotum is almost all cinereous. Elytra slightly inflated, separately pointed apically. Length 1.75—2.15 mm.

Holotype ♂: length 1.90 mm.; head 0.38 mm. long, 0.38 wide; eyes 0.10×0.10 mm. Antenna with scales on segments 1-2, measuring 12/6, 8/5, 9/4, 6/5, 8/8, 8/7, 8/7, 8/6, 8/6, 12/6, with segments 4-8 subtriangular. Prothorax 0.46 mm. long to head, 0.74 to tip of horn; 0.33 mm. wide across base, 0.46 maximum and 0.26 across horn. Crest of horn 0.06 mm. across base, finely crenulate. Elytra 1.16 mm. long, 0.47 mm. wide across base and 0.69 maximum. Metatibia 0.49 mm. long; metatarsal segments 0.23, 0.14, 0.09 and 0.13. Hypopygium shallowly emarginate and just perceptibly excavated. In the ♀ allotype the middle antennal segments are only slightly triangular and more slender than in the male.

Holotype ♂, allotype ♀ and 5 ♂ paratypes (1 of which lacks head and prothorax), Puntarenas, Costa Rica, 21-VII-1929, F. Nevermann, am Meeresstrand. Holotype, allotype and 4 paratypes in USNM (#65468), 1 paratype in collection of author.

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LECTOTYPE DESIGNATIONS IN THE GENERA *LYTTA* FABRICIUS AND *LINSLEYA* MACSWAIN, AND A REDESCRIPTION OF THE TYPE OF *LYTTA MARGARITA* (FALL)

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Most of the nominal species assigned to the genus *Lytta* were originally described from series of specimens without published designation of holotypes. Lectotypes were designated in my study of this genus (Selander, 1960, Illinois Biol. Monogr., no. 28) for the species described under these circumstances by Haag-Rutenberg and Wellman but not for those described by Bland, Champion, Fall, LeConte, Skinner, and (with one exception) Horn. In the present paper I am designating lectotypes for the species of *Lytta* of these latter authors as

¹This study was supported by a National Science Foundation Research Grant (G8698).

well as for five species of Fall, Horn, and LeConte formerly placed in *Lytta* but presently assigned to the genus *Linsleya*, which I revised several years ago (Selander, 1955, Amer. Mus. Novitates, no. 1730).

Each specimen designated as a lectotype herein was selected from syntypes in the collection of the author of the species represented. In most cases, the specimen selected bears the original author's determination label. The species are listed alphabetically, with the generic name of the original combination given in parentheses following the specific name. Locality data published with the original description of a species but not indicated on the label or labels attached to the lectotype are enclosed in brackets. Synonymy and bibliographic references to original descriptions are given in the studies cited above.

With these designations, all nominal species of *Lytta* and *Linsleya* described by the authors mentioned above are now represented by either holotypes or lectotypes. In my work on the genus *Lytta* I suggested that the unique specimen of *Lytta margarita* (Fall) had been lost with the Fuchs collection, but I find that this specimen was retained by Fall and is now in his collection in the Museum of Comparative Zoology. Consequently, I have taken this opportunity to present a redescription of this specimen, following the lectotype designations.

For permission to examine type material in their respective institutions and for other favors, I am indebted to P. J. Darlington, Jr., Museum of Comparative Zoology, Harvard University (MCZ); J. A. G. Rehn and T. Eads, Academy of Natural Sciences of Philadelphia (ASNP); and C. M. F. von Hayek, British Museum (Natural History) (BMNH).

LECTOTYPE DESIGNATIONS IN LYTTA

- aeneipennis* LeConte (*Cantharis*). Female, Santa Isabel, California, Type 5130, MCZ.
- agrestis* Fall (*Cantharis*). Male, Arizona, Type 24298, MCZ.
- auriculata* Horn (*Lytta*). Male [Kern River region], California, Type 8119, ANSP.
- biguttata* LeConte (*Lytta*). Male, Santa Fe, New Mexico, Type 5123, MCZ.
- blaisdelli* Fall (*Cantharis*). Male, Cantara, 2750 ft., Siskiyou County, California, Type 24299, MCZ.
- childii* LeConte (*Lytta*). Female, San Francisco, California, Type 5120, MCZ.
- chloris* Fall (*Cantharis*). Male, Kaweah, 4275 ft. [Tulare County, California], Type 24300, MCZ.
- cooperi* LeConte (*Lytta*). Male [Wenass River to Fort Colville], Type 5115, MCZ.
- crotchii* Horn (*Cantharis*). Male [San Diego], California, Lectotype 8188, ANSP.
- cyanipennis* LeConte (*Cantharis*). Female, Oregon, Type 5117, MCZ.
- difficilis* Fall (*Cantharis*). Male, La Mesa, San Diego, California, April 9, 1897, Type 24301, MCZ.
- dolosa* LeConte (*Lytta*). Male, Mendocino, California, Type 5131, MCZ.

- erebea* Champion (*Cantharis*). Male, Huetamo, Michoacán, Höge, BMNH.
fulvipennis LeConte (*Lytta*). Male, Texas, Type 5124, MCZ.
funerea Fall (*Cantharis*). Female, Lake County, California, Type 24302, MCZ.
incommoda Horn (*Cantharis*). Male, Southern California, Type 8117, ANSP.
insperatus Horn (*Cantharis*). Male [Mojave Desert], California, Lectotype 8113, ANSP.
intricata Champion (*Cantharis*). Male, Villa Lerdo, Durango, Höge, BMNH.
lugens LeConte (*Cantharis*). Female, San Diego, California, Type 5133, MCZ.
lugubris Horn (*Cantharis*). Male [Owens Valley], California, Type 8268, ANSP; previously designated by Selander (1960, Illinois Biol. Monogr., no. 28, p. 121).
magister Horn (*Lytta*). Female [Owens Valley], California, Lectotype 8112, ANSP.
melaena LeConte (*Lytta*). Female [State of Sonora, Mexico] (silver disk = "Valley of Gila"), Schott, Type 5113, MCZ.
michoacanae Champion (*Cantharis*). Male, Huetamo, Michoacán, Höge, BMNH.
moesta Horn (*Calospasta*). Female, California, Lectotype 8086, ANSP.
molesta Horn (*Cantharis*). Male, Southern California [probably near Visalia], Lectotype 8115, ANSP.
morosa Fall (*Cantharis*). Female, Poway, California, Type 24305, MCZ.
morrisoni Horn (*Calospasta*). Male, Southern California, Lectotype 8087, ANSP.
mutilata Horn (*Cantharis*). Male, Arizona, Type 8110, ANSP.
nigripilis Fall (*Cantharis*). Male [Sierra Nevada], Tulare County, California, Type 24306, MCZ.
nitidicollis LeConte (*Cantharis*). Male [San Diego], California, Type 5132, MCZ.
occipitalis Horn (*Cantharis*). Male, Southern California, Lectotype 8116, ANSP.
peninsularis Fall (*Cantharis*). Male, Cape San Lucas [Lower California], Type 24307, MCZ.
pilsbryi Skinner (*Cantharis*). Male, High Bridge, Pecos [River], Texas, Type 8063, ANSP.
polita Horn (*Porcospasta*). Male [Southern Coast Range], California, Type 8072, ANSP.
purpurescens Fall (*Cantharis*). Male, Riverside, California, March 28, Type 24308, MCZ.
refulgens Horn (*Lytta*). Female, Millerton, California, Type 8120, ANSP.
salicis LeConte (*Lytta*). Female [Great Salt Lake City], Type 5118, MCZ.
signaticollis Champion (*Cantharis*). Male, Matamoros Izúcar, Puebla, BMNH.
smaragdula LeConte (*Cantharis*). Male [mountains around Santa Isabel], California, Type 5129, MCZ.
stolidi Fall (*Cantharis*). Female, San Francisco County, California, March, Type 24309, MCZ.
stygica LeConte (*Cantharis*). Male, Oregon, Type 5128, MCZ.
subviolacea Champion (*Cantharis*). Male, Durasnal, Oaxaca, BMNH.
tarsalis Bland (*Lytta*). Female, Illinois, Lectotype 3328, ANSP.
tenebrosa LeConte (*Cantharis*). Female, San Diego, California, Type 5121, MCZ.
ungicularis LeConte (*Pomphopoea*). Female [Illinois], Type 5109, MCZ.
viridana LeConte (*Lytta*). Male [Rocky Mountains] (green disk = "Nebraska, etc."), Type 5119, MCZ.
vulnerata LeConte (*Cantharis*). Female [San Diego], California, Type 5114, MCZ.

LECTOTYPE DESIGNATIONS IN LINSLEYA

chalybea LeConte (*Cantharis*). Male, Oregon, Type 5135, MCZ.

compressicornis Horn (*Lytta*). Male [Owens Valley, California], Lectotype 8121, ANSP.

convexa LeConte (*Lytta*). Male, Texas, Type 5136, MCZ.

gentilis Horn (*Cantharis*). Female, New Mexico, Type 8114, ANSP.

infidelis Fall (*Cantharis*). Male, Castle Crag, California, July 25, Type 24303, MCZ.

REDESCRIPTION OF THE TYPE OF *LYTTA MARGARITA* (FALL)

Black. Vertex and frontal area of head and pronotum a very deep, reddish orange. Length: 25 mm.

Head quadrate; tempora not prominent, forming right angles with dorsal margin, which is weakly convex; surface distinctly microreticulate and micropunctate, finely, sparsely punctate, the punctures much more conspicuous than in *magister* and *vulnerata*; vertex tumid; frontal area between eyes flattened and alutaceous. Pronotum similar in form to that of *magister* but on each side there is a blunt lateral tubercle at the lateral angle, a similar one midway between the lateral angle and the base, and a third, shorter one more mesad in position near the base; there is a great degree of bilateral symmetry in the form of the tubercles; disk irregular, with some alutaceous markings and with a depression at center before middle, another on each side behind middle, and another on each side just mesad of lateral angle. Elytra as in the interior race of *vulnerata* but more strongly microreticulate and therefore duller. Femora, tibiae, and tarsi obviously shorter and wider than in *magister* and *vulnerata*, this difference especially well marked in the case of the tibiae. Tarsi with pads (pale pubescence) moderately developed and not divided on fore and middle legs, completely absent on hind legs. Outer hind tibial spur broadly spoon-shaped, twice as wide as inner spur, which is itself widened and spatulate.

Male.—Antennae much as in *vulnerata* but with segments not quite as elongate and with intermediate segments a little less inerassate; segments III and IV not much enlarged; V and VI subequal, weakly inerassate; VII largest, slightly wider than preceding segments; VIII as wide as VI; and X slightly smaller than VI. Fifth abdominal sternum feebly emarginate. Emargination of sixth sternum about as illustrated in my study for *funerea* but even shallower; lateral lobes of sternum not produced. Pygidium distinctive, produced to an obtusely rounded apex, with sides very evenly areuate.

Remarks.—There is a black scar on the right side of the pronotum of the type specimen just behind the second lateral tubercle. In addition, there is a dent on each side of the head below the tempora. These dents are of such a nature that they could have been made by grasping the head of the beetle between a pair of fine forceps. Similar dents occur on the head of one of the specimens of *vulnerata* from Kern County, California, in the Fall collection.

The position assigned to *margarita* in my classification on the basis of its original description is apparently correct. Other characters of the species are as described by me for the *Magister* Subgroup. The type specimen is labeled Santa Margarita Island, Type 24304 (MCZ).

THE BLACK CITRUS APHID, *TOXOPTERA AURANTII* (FONSCOLOMBE),
IN MARYLAND

(HOMOPTERA: APHIDAE)¹

Toxoptera aurantii was first found in Maryland in August 1960. Numerous examples of winged and wingless forms were observed to be feeding on second-growth shoots of English holly, *Ilex aquifolium*, in a small nursery near Centreville. The nursery fronts on the Chester River almost within sight of Chesapeake Bay, and is approximately 30 feet above sea level at about 39 degrees latitude. *T. aurantii* has not been known to occur on the eastern seaboard north of Wilmington, N. C., where the climate is considerably milder than in Maryland. The black citrus aphid is typically a warm-weather insect, thriving under conditions that permit the growth of citrus and less hardy camellias, and it was questionable whether the species could overwinter in Maryland's comparatively colder climate. However, the aphid survived the most severe winter in a decade when the temperatures at Centreville were as follows:

<i>Degrees F.</i>	<i>December</i>	<i>January</i>	<i>February</i>
Lowest	2.0	15.0	-1.0
Average maximum	40.2	37.0	47.2
Average minimum	19.9	19.5	27.5

In June 1961, winged and wingless forms of *aurantii* were again found in fairly large numbers, attended by unidentified ants, on both *Ilex aquifolium* and *I. rugosa*. Only apterous specimens were found in July, however, and few were alive; but dead, parasitized insects were present in large numbers, with as many as 20 attached to the underside of a single leaf of English holly. Two hymenopterous parasites that emerged from aphids were identified by C.F.W. Muesebeck, of the U. S. National Museum, as *Lysiphlebus testaceipes* (Cress.), a common parasite of aphids. The final 1961 collection was made October 11 when only winged females were present. Neither sexual forms nor eggs were found.

Nursery inspections during 1961 revealed two additional infestations of *aurantii*. Winged females were found in August on *I. aquifolium* at Earleville, about 25 miles north of Centreville, and in October on Chinese holly, *I. cornuta*, near Baltimore.

Holly has been known to be a host of *aurantii* in the United States since 1921 when A. C. Mason (Fla. Ent. V(2):24) reported the aphid from *Ilex opaca* in Florida. In addition to the collections already mentioned in Maryland, specimens are present in the U. S. National Museum from yaupon, *I. vomitoria*, Beaumont, Tex., Mar. 8, 1939, and Port Arthur, Tex., June 4, 1942; Japanese holly, *I. crenata*, Pensacola, Fla., Sept. 27, 1943; and holly, *Ilex sp.*, Dougherty Co., Ga., June 12, 1957.

WARREN T. JOHNSON, *University of Maryland*, and LOUISE M. RUSSELL, *Entomology Research Division, Agric. Res. Serv., U.S.D.A.*

¹Misc. Publ. No. 457, Contrib. No. 3346, Md. Agric. Expt. Sta., Department of Entomology (Project H-69).

A NEW STREPSIPTERAN PARASITIC ON COREIDAE
(STREPSIPTERA: HALICTOPHAGIDAE AND HEMIPTERA: COREIDAE)

R. M. BOHART, *University of California, Davis*

Through the efforts of E. O. Pearson and R. G. Fennah of the Commonwealth Institute of Entomology, London, I have been able to examine specimens of a Strepsipteran attacking the coreid, *Pseudotheraptus wayi* Brown. The bug is reported by Brown (1955) as a pest in Zanzibar, British East Africa, causing an early drop of cocoons. The parasite is a new species of *Halictophagus* which is noteworthy in a number of respects, but especially since it is the first record of stylopization in the Family Coreidae. Other Hemiptera previously known to be parasitized are Membracidae, Cicadellidae, and Cercopidae by *Halictophagus* Curtis; Fulgoroidea by *Elenchus* Curtis; and Pentatomidae, sensu lato, by *Callipharixenos* Pierce, *Coriorenos* Blair, *Triozocera* Pierce and *Dundorenos* L. de Carvalho.

In general appearance the male is a "typical" species of *Halictophagus* but unusually large. The female has a remarkably long cephalothorax, an ovoid brood passage opening, and 4 genital openings instead of the usual 1 to 3.

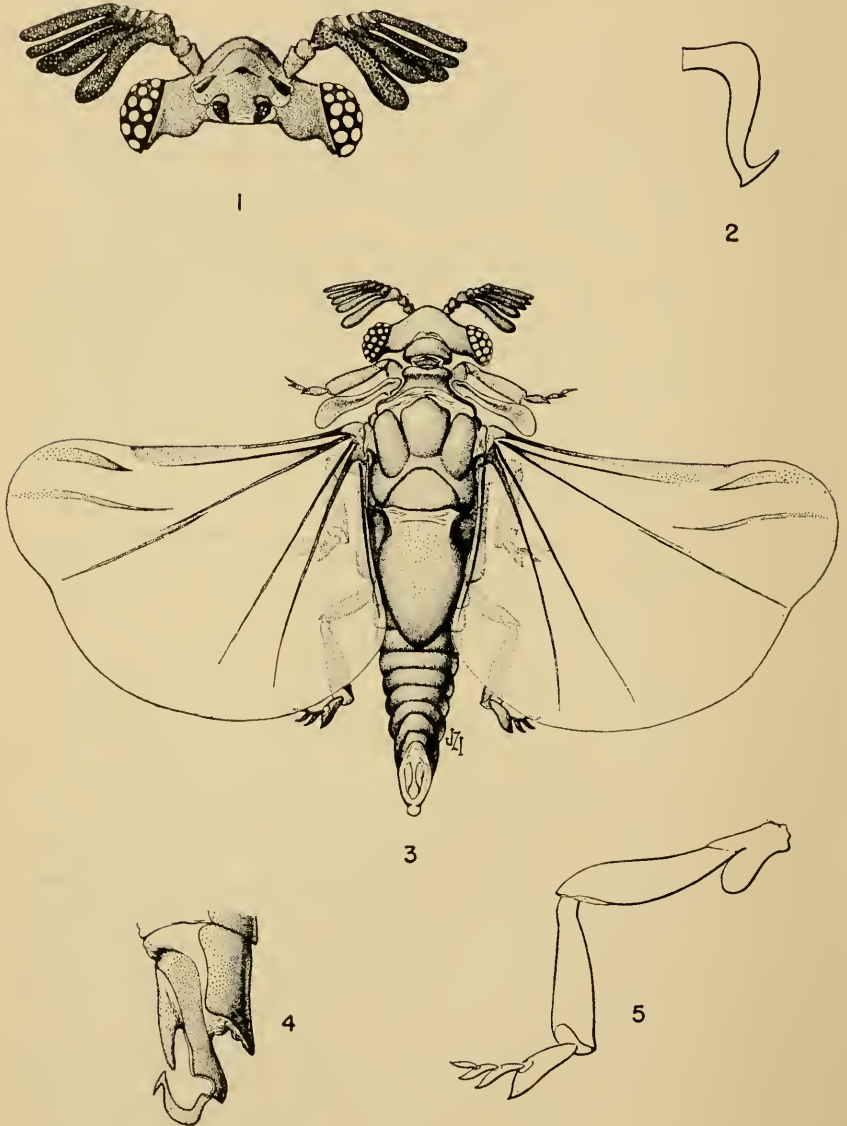
The holotype and paratypes have been returned to the British Museum (Natural History). Other paratype females are in collections of the U. S. National Museum, California Academy of Sciences, and University of California, Davis.

***Halictophagus zanzibarae* Bohart, new species**

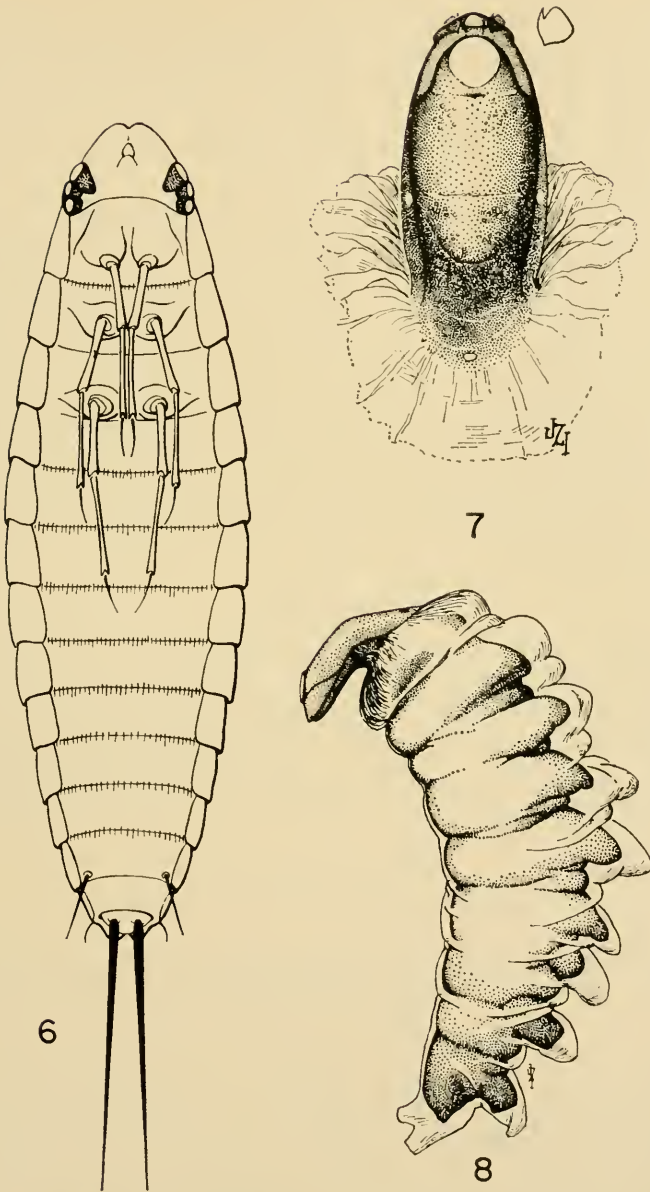
Male.—Antenna compact, segments 3-4 with basal lengths about equal to those of 1-2 respectively, those of 5-6 shorter, first two segments without sensoria, remaining segments completely covered with small sensoria (fig. 1). Mandible tapering to a point, very short as is palpus, terminal segment of palpus with numerous sensoria (fig. 1); compound eye with about 15 facets visible in dorsal aspect. Body structure in dorsal view as shown in fig. 3; fore tibia in side (outer) view nearly one-half as broad as long, longer than fore coxa; fore basitarsus large and nearly circular in outer view, hind leg profile as in fig. 5; mid and hind tibiae not excavated externally. Sternites II-VI with a pair of quadrate spots, partially fused on IV-VI; terminal segments of abdomen and aedeagus in lateral view as in figs. 3 and 4. Length of antenna 0.6 mm., breadth of head 0.7 mm., length of metanotum 1.5 mm., overall length of slide-mounted specimen 2.9 mm.

Female.—Profile, ventral view of cephalothorax as in figs. 7-8. Mandible with a sharp tooth at inner apex opposed by a prominent hump; brood canal opening nearly circular, forming a slightly raised disc in profile; spiracles closer together than to front of head; basal collar cape-like, usually with a median clear area; abdomen with 5 partially sclerotized segments the last 4 of which bear openings into the brood canal. Width of cephalothorax 0.3-0.4 mm., proportions as in figs. 7-8.

First stage larva.—Structure as in fig. 6. Length of body proper 0.12 mm., length of posterior stylets 0.05 mm.



Figs. 1-5, *Haliotophagus zanzibarae*, n. sp., male. Fig. 1, head, ventral; fig. 2, aedeagus, lateral; fig. 3, dorsal view; fig. 4, terminal abdominal segments, lateral; fig. 5, hind leg, lateral.



Figs. 6-8, *Halictophagus zanzibarae*, n. sp. Fig. 6, first stage larva, ventral; fig. 7, female cephalothorax, ventral; fig. 8, female, lateral.
 Illustrations were made by Mrs. Julia Iltis.

Material Examined.—Holotype male, 17 paratype females, and 1 paratype slide of first stage larvae, Zanzibar, Indian Ocean, British East Africa, February, 1959, ex *Pseudotheraptus wayi* Brown, F. L. Vanderplank collector. Also, 2 females in situ on the host, collected on Zanzibar by B. H. Hyde-Wyatt. The 2 females are located, one on either side, above the hind coxa, the cephalothorax exerted from between the bug's thorax and abdomen.

Systematics.—The male of this species differs from others known by the combination of compact antennae, no sensoria on the 2 basal antennal segments but many on the terminal palpal segment, the broad separation of the prescutum and scutellum, and the non-excavated mid and hind tibiae. In my key to the genus *Halictophagus* (Bohart, 1943) it runs to *omani* Bohart except for the palpal sensoria, fewer eye facets, and larger size. There is superficial similarity to *H. javanensis* (Pierce) from Java, and *H. paradeniya* (Pierce) from Ceylon. The mouthparts of *zanzibarae* are much shorter than those of *paradeniya*, the tibiae are not excavated as in *javanensis*, and the scutellum is more broadly rounded than in the other two species, which were figured by Pierce (1918). The female is unique by the great length of the cephalothorax and the nearly circular opening to the brood canal.

REFERENCES

- Bohart, R. M., 1943. New species of *Halictophagus* with a key to the genus in North America. *Ann. Ent. Soc. Amer.* 36:341-359.
- Brown, E. S., 1955. *Pseudotheraptus wayi*, a new genus and species of coccid injurious to coconuts in East Africa. *Bull. Ent. Res.* 46:221-240.
- Pierce, W. D., 1918. The comparative morphology of the order Strepsiptera together with records and descriptions of insects. *Proc. U. S. Natl. Mus.* 54: 391-501.

A NEW XENOTARSONEMUS WITH A NOTE ON *X. VIRIDIS* (EWING) (ACARINA: TARSONEMIDAE)

DONALD DE LEON, *Erwin, Tennessee*

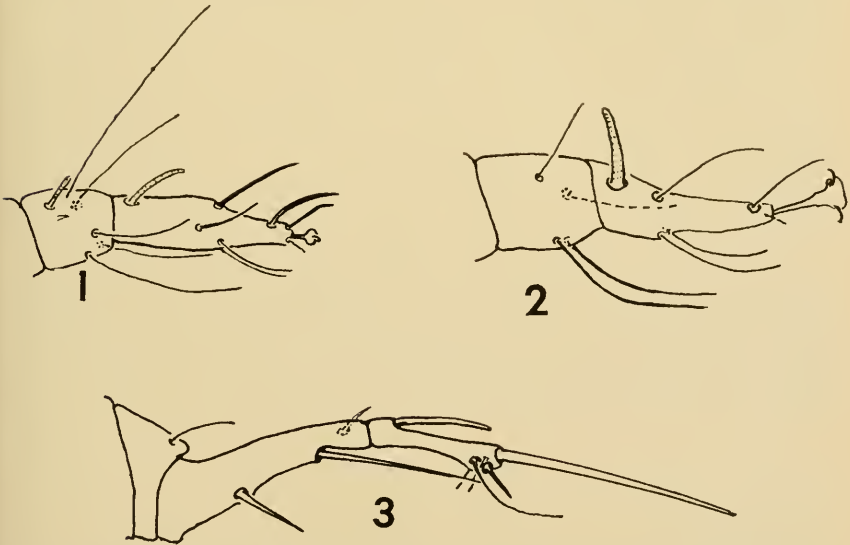
Including the species described below, the genus *Xenotarsonemus* contains four species and nothing certain is known of the feeding habits of any of them.

Xenotarsonemus viridis (Ewing), described from specimens collected on strawberry leaves by F. F. Smith in Maryland, October 1933, had not until recently been recollected. In August 1960, the writer collected two male tarsonemids on *Commelina communis* growing at an elevation of about 2700 feet near Erwin, Tennessee; when it was found that the mites were *X. viridis* an extensive search was

made in the same area for more specimens. A large amount of leaves and stems of *C. communis* and other herbaceous vegetation, including *Fragaria*, was examined over a period of about a month. Not another specimen of *viridis* was seen.

KEY TO THE SPECIES OF XENOTARSONEMUS (MALES)

1. Leg IV with the large sensory rod of tibiotarsus extending beyond distal end of tibiotarsus 2
 Leg IV with the large sensory rod of tibiotarsus not extending beyond distal end of tibiotarsus 3
2. Femur IV with dorsal seta about twice as long as first ventral seta.....
 *viridis* (Ewing)
 Femur IV with dorsal seta about two-thirds as long as first ventral seta
 *cadeae* Cromroy
3. Tibiotarsus about 2½ times as long as wide, sensory rod situated at about mid-length of segment*denmarki* Beer
 Tibiotarsus over 4 times as long as wide, sensory rod situated near anterior end of segment*butcheri*, n. sp.



Xenotarsonemus butcheri, n. sp., male. Fig. 1, tibia and tarsus of leg I; fig. 2, tibia and tarsus of leg II; fig. 4, leg IV.

***Xenotarsonemus butcheri*, n. sp.**
 (Figures 1-3)

Xenotarsonemus butcheri resembles *X. denmarki* Beer, 1960, but differs from that species in having most of the dorsal setae longer,

the sensory rods of tarsi I and II tapering from base to tip, a much more slender tibiotarsus, and in other characters. The female is unknown.

Male.—Body ranging in color from amber to black; length from tip of palpus to distal end of genital papilla 132.¹

Dorsal chaetotaxy.—Propodosomal setae arranged as in *X. denmarki* and of the following lengths from front to rear: 25, 23-32, 42, 38; hysterosomal setae 29-45-58, 56-68, and 11 long, first (the humeral) near side of body and about 7 from main body suture; second in line with and about midway between first and third (distance between first and third 37); third pair situated mediolaterally, their bases 18 apart; fourth pair situated at outer basal edge of genital papilla and 11 apart.

Ventral chaetotaxy.—First propodosomals 5 long, 11 apart and 3 behind apodemes I; second propodosomals 7 long, 14 apart, and 3 to 6 behind apodemes II; first hysterosomal 16 long, second 12 long situated as for *denmarki*.

Apodemes.—Anterior median apodeme distinct to and joining with apodemes II, apodemes II together forming an even transverse arc; anterior median apodeme posterior of apodemes II indistinct as are the transverse apodemes; apodemes III straight, without medially directed extensions at anterior ends.

Legs.—Tarsus I and tibia I with setae and annulated sensory rods as shown in figure 1, sensory rod of tarsus 7 long, that of tibia about 4.5 long; tarsus II and tibia II with setae and annulated sensory rod as shown in figure 2, sensory rod tarsus 8 long and noticeably coarser than sensory rod of tarsus I. Leg IV as shown in figure 3, femur 26 long, anterior ventral seta 8 long, posterior ventral seta 18-23 long, dorsal seta about 6 long; tibiotarsus 16 long, 2.5 wide at narrowest part, dorsal sensory rod 9 long, large subterminal seta 26-33 long.

Holotype.—Male, Everglades National Park, Florida, March 7, 1959 (D. De Leon), on *Kosteletzkya* sp. *Paratypes*.—2 males, collected with the above male. The species is named for Dr. F. Gray Butcher of the University of Miami, Coral Gables, Fla. A paratype will be deposited in the University of Florida Collections, Gainesville; the other two specimens are in the author's collection.

REFERENCES

- Beer, R. E., 1960. A new species of *Xenotarsonemus* from Florida. Fla. Ent. 43(1):23-27.
- Cromroy, H. E., 1958. A preliminary survey of the plant mites of Puerto Rico. Jour. Agr. Univ. Puerto Rico. 42(2):39-144.
- Ewing, H. E., 1939. A revision of the mites of the subfamily Tarsoneminae of North America, the West Indies and the Hawaiian Islands. U.S.D.A. Tech. Bull. 653, 63 pp.

¹ In the following description all measurements are given in microns.

**MONOCERONYCHUS BOREUS, A NEW SPECIES OF SPIDER MITE
FROM OREGON**(ACARINA: TETRANYCHIDAE)¹G. W. KRANTZ,² *Oregon State College, Corvallis*

The members of the genus *Monoceronychus* McGregor are characterized by Pritchard and Baker (1955) as elongate forms with an anterior propodosomal projection, and which lack integumental striae in the region of the third pair of dorsocentral hysterosomal setae. Representatives of the genus have been found only on monocotyledonous or gymnospermous plants, while species of the closely related genus *Aplonobia* Womersley apparently are confined to dicotyledonous plants. An exception to this relationship is *Aplonobia corynetes* (P. and B.) which has been collected only from grass. This species originally was described as belonging to the genus *Monoceronychus* in the paper cited above, but more properly fits the diagnosis of *Aplonobia* (Baker, personal communication).

Seven species of the genus *Monoceronychus* are cited in the key provided by Pritchard and Baker (1955). Collecting data indicates a more or less southern and southwestern distribution of the described forms (California, Florida, and North Carolina). It is of some interest, therefore, that the species described below was taken from grass on a high mountain slope (3600') in Oregon, where temperatures often are below freezing.

***Monoceronychus boreus*, n. sp.**

(Figs. 1-3)

Female—Length of idiosoma averages 189 μ with a range of 165-198 μ ; width of idiosoma at the level of insertion of legs III averages 418 μ , with a range of 396 to 429 μ . Rostrum extending well beyond the base of femur I. Stylophore slender, weakly acuminate anteriorly and with slight lateral concavities posteriorly. Legs I shorter than body; distal hair of internal pair of duplex setae little more than half the length of distal seta of external pair; with five tactile setae and one sensory hair proximal to duplex setae; femoral setae slender and spiny. Duplex setae of tarsus II (fig. 2) similar in length to internal pair of tarsus I.

Dorsum with anterior shield and posterior unstriated area; propodosomal shield patterned as illustrated (fig. 3) and ending anteriorly in a short rostral projection; anterior propodosomal setae spinose, inserted in lateral protuberances, somewhat larger than second and third pairs of propodosomal setae. Dorsomedian portion of idiosoma transversely striated and bearing the humeral, first dorsolateral and first dorsocentral hysterosomal setae. Dorsocentral hysterosomals spinose, smaller than dorsolaterals. Third dorsocentrals inserted on elongate, weakly reticulate and patterned posterior unstrated area (shield?). With three pairs of large heavily spinose caudal setae.

¹ Accepted as Technical paper No. 1369. Oregon Agricultural Expt. Station.

² Associate Professor of Entomology, Oregon State University, Corvallis.

Perigenital integument (fig. 1) strongly folded laterally and posteriorly; anal shield more or less truncate posteriorly.

Male.—Unknown.

Type locality.—Four females from Grass Mountain Summit, Benton County, Oregon, five miles northwest of Alsea, elevation 3600'; Oct. 3, 1960: in grass (collected by J. D. Lattin). *Holotype* female will be deposited at the U. S. National Museum, Washington, D. C. *Paratypes* will be deposited in the collections of the University of California, Berkeley, and of Oregon State College, Corvallis.

M. boreus may be separated from the other described species of *Monoceronychus* through the use of the following key.

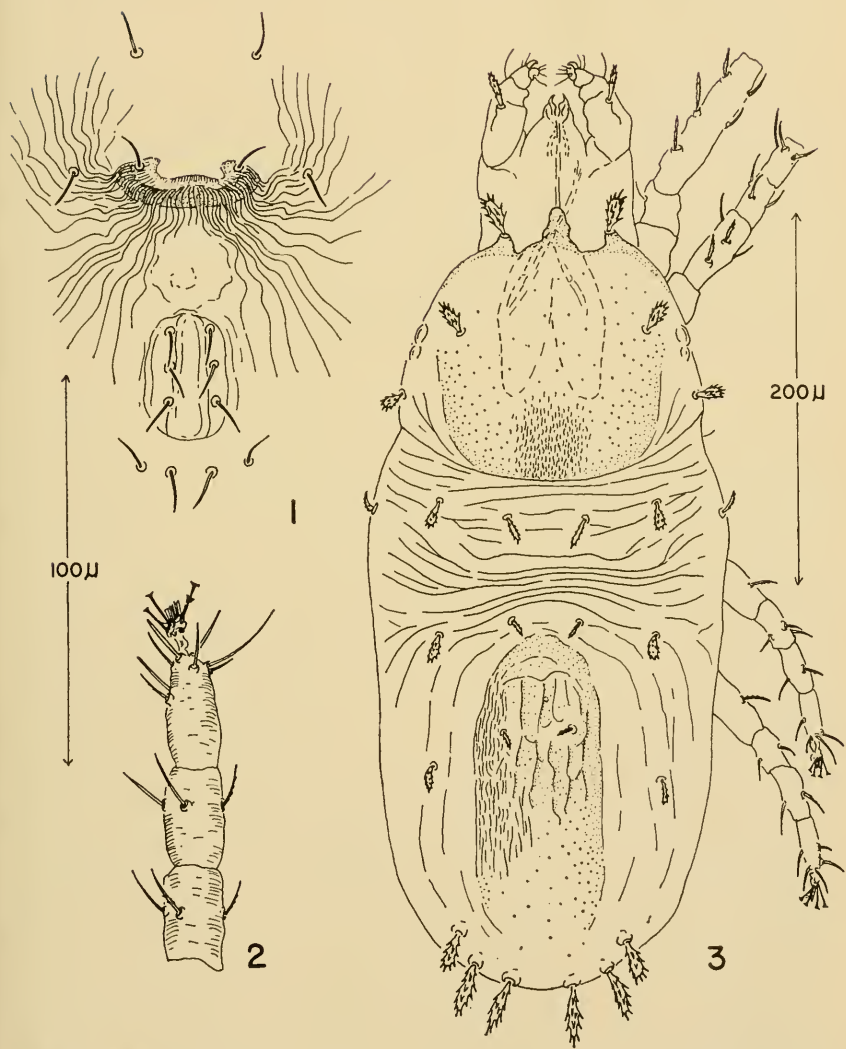
EMENDED KEY TO THE GENUS MONOCERONTYCHUS MCGREGOR

(Adapted from Pritchard and Baker, 1955)

- | | |
|---|------------------------------|
| 1. Propodosoma with anteromedian projection much shorter than rostrum..... | 2 |
| Propodosoma with anteromedian projection as long as, or longer than, rostrum | 7 |
| 2. Hysterosoma with caudal two pairs of setae slender, weakly spinose..... | 3 |
| Hysterosoma with caudal two pairs of setae spatulate or broadly lanceolate | 5 |
| 3. Anterior legs longer than body | machetes P. & B. |
| Anterior legs shorter than body | 4 |
| 4. Caudal two pairs of setae elongate, more than twice as long as third dorsocentral hysterosomals | enoplus P. & B. |
| Caudal two pairs of setae short, only slightly longer than third dorso-central hysterosomals | mcgregori P. & B. |
| 5. Hysterosoma with caudal three pairs of setae broadly spatulate..... | |
| | californicus McGregor |
| Hysterosoma with caudal three pairs of setae broadly lanceolate..... | 6 |
| 6. Third dorsocentrals distinctly shorter and narrower than third dorso-laterals; propodosomal pattern made up of broken longitudinal striae | boreus , n. sp. |
| Third dorsocentrals similar in length and breadth to third dorsolaterals; propodosomal pattern areolate | aechmetes P. & B. |
| 7. Propodosomal projection covering only rostrum; hysterosoma with caudal three pairs of setae slender, tapering, and set on strong tubercles | scolus , P. & B. |
| Propodosomal projection covering entire gnathosoma; hysterosoma with caudal three pairs of setae differing in size and shape and set on small tubercles | linki P. & B. |

REFERENCES

- Pritchard, A. E., and E. W. Baker, 1955. A revision of the spider mite family Tetranychidae. Pacific Coast Entomological Society Memoir Series, vol. 2, 472 pages.



Monoceronychus boreus, n. sp. Fig. 1, genitoanal region of female; fig. 2, tarsus II of female; fig. 3, dorsum of female.

**A PTILONYSSID MITE FROM THE SPARROW HAWK,
FALCO SPARVERIUS¹
(ACARINA: RHINOYSSIDAE)**

R. W. STRANDTMANN, *Department of Biology, Texas Technological College,
Lubbock*

Among a collection of several hundred slides and vials of mites sent to me for identification by Dr. Elwin E. Bennington was a series from the Sparrow Hawk, *Falco sparverius*. A hasty check of the literature indicated it to be a new species and measurements and illustrations were made preparatory to presenting a description. Subsequently a more thorough study of the literature revealed that I had *Ptilonyssus cerchneis* Fain, 1957. But since there are no previous reports of Rhinonyssidae from Falconiforme birds in the United States, and because the specimens before me differ slightly from Fain's description, I decided to report the incidence in some detail.

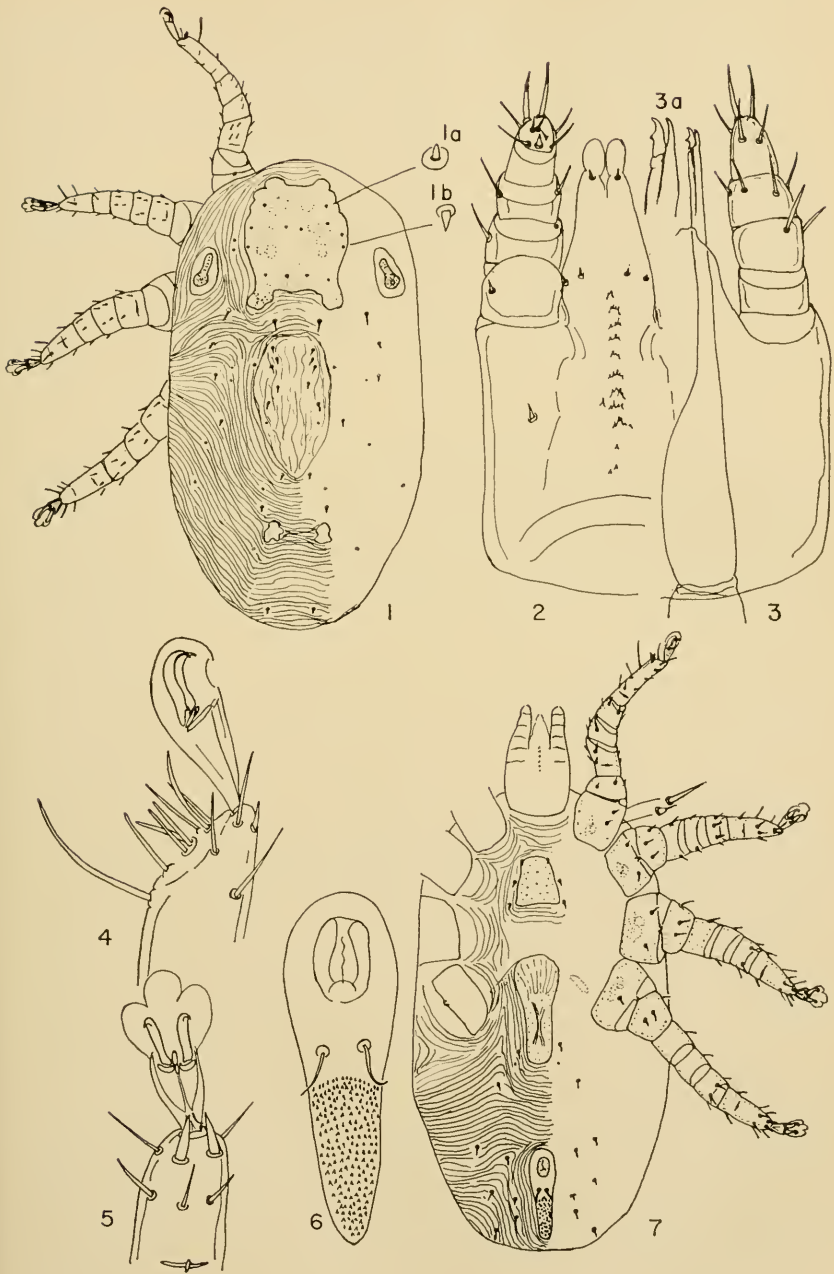
***Ptilonyssus (Rhinonyssoides) cerchneis* Fain, 1957
(Figs. 1-7)**

Characters diagnostic of the species are: the shape of the podosomal shield; the 5 pairs of small setae in the center of the dorsum; the long, narrow anal plate with only 2 setae and very extensive cribrum.

The specimens before me differ from Fain's description in several minor respects. Fain gave the length as 1128 microns. Of 16 females before me the largest was 1100, the average was 900 microns, but the L x W ratio was the same. The ratio was also the same for the dorsal and anal plates and for the legs. The sternal and genital plates, however, had ratios different from Fain's. In the specimens before me the sternal plate filled nearly the whole area between the sternal setae; in Fain's, less than 1/2 the area is filled. Fain gave the length of the genital plate as 165 μ , in the specimens I have, the plate varied from 210-260, averaging 220 μ . My specimens show an extra pair of setae ventrally between the genital and anal plates. On the dorsal side (Fig. 1), I have indicated 2 pygidial platelets. These are not plates in the sense that they are sclerotized, as in *Ptilonyssus, sensu strictu*, they are merely non-straitated areas. In the dorsal view I present what might be interpreted as a medial plate but it is only a slight hump, a characteristic I was unable to properly convey with my poor artistic ability.

¹This study was supported in part by grant-in-aid E-616 from the National Institutes of Health.

Ptilonyssus (R) cerchneis Fain, female. Fig. 1, dorsal view; figs. 1a & 1b, two dorsal plate setae enlarged; fig. 2, ventral view of right side of gnathosoma; fig. 3, dorsal view of right side of gnathosoma, including the right chelicera; fig. 3r, chela, enlarged; fig. 4, dorso-lateral aspect of left tarsus I; fig. 5, ventral aspect of tarsus II; fig. 6, anal plate, enlarged; fig 7, ventral view, including enlarged view of coxa I setae.



Note that the deutosternal teeth (Fig. 2) are in multiple and irregular rows and that the anterior hypostomal setae are quite distant from the posterior, paired setae.

Host—*Falco sparverius*, the Sparrow Hawk. Fain took the mite from *Cerchneis tinnunculus rufescens*, which is a small falcon very much like the sparrow hawk.

Locality.—Greeley, Colorado, U.S.A., Elwin E. Bennington, collector. The birds were collected in connection with encephalitis investigations at Greeley, Colorado. I am indebted to Dr. Bennington for referring the mites to me for study.

It is interesting to note that in the only other two species of *Ptilonyssus* reported from Falconiforme birds *P. (R.) donatoi* Pereira and de Castro, and *P. (R.) souzai* Pereira and de Castro, the anal plate also has only two setae, and the pygidial plate is lacking.

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- Pereira, C. e M. P. de Castro. 1949. Revisão da subfamilia "Ptilonyssinae Castro, 1948" com a descrição de algumas especies novas. Arq. do Instituto Biol. 19:218:235.

BOOK REVIEW

THE NEST ARCHITECTURE OF THE SWEAT BEES (HALICTINAE): A COMPARATIVE STUDY OF BEHAVIOR, by S. F. Sakagami and C. D. Michener, Univ. of Kansas Press, 135 pp., 181 figs., 1962. \$5.00, bound.

This group is of particular interest because in their life history the species range from those which are strictly solitary through various intergrades to those which are truly social with a queen and worker caste. The authors have made an exhaustive review of the literature, and have combined this with unpublished observations by themselves and their associates. Their valuable synthesis utilizes data on about 125 of the 2000 known species. An important feature is a proposed classification of nest architecture which recognizes eight different basic types, many of which have several subtypes. The authors conclude that there has been much parallel evolution in nest structure. They also state that there is insufficient information on systematics and nest structure to permit definite conclusions as to relations between them.

—KARL V. KROMBEIN, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington 25, D. C.*

A NEW SPECIES OF IXODES FROM MALAYA

(ACARINA: IXODIDAE)

GLEN M. KOHLS, *Rocky Mountain Laboratory, P.H.S., Hamilton, Mont.**Ixodes malayensis*, new species

(Figs. A-F)

Type Data.—Holotype (only specimen known), a slightly engorged female from a tree shrew, *Tupaia glis*, Mt. Brinchang, 5200' elevation, Cameron Highlands, Pahang, Malaya, February 13, 1958. Collected by Lt. Colonel R. Traub, then Commanding Officer, U. S. Army Medical Research Unit, based at Kuala Lumpur. Deposited in the Rocky Mountain Laboratory collection; RML No. 35721.

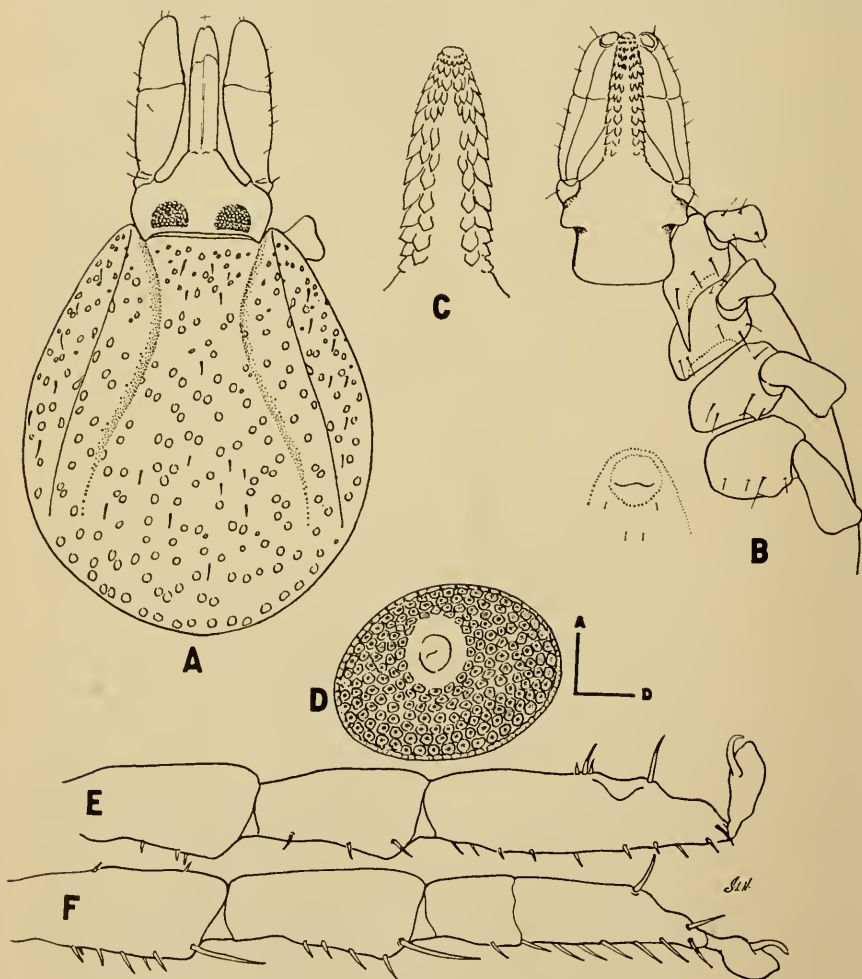
DESCRIPTION.—*Body*, length excluding capitulum, 2.5;¹ width, 1.7. *Capitulum*, length, tips of palpi to tips of cornua, 0.81; width of basis, 0.48. Lateral margins of basis slightly convex, posterior margin between the moderate blunt cornua, straight. Porose areas large, subcircular, somewhat depressed, and separated by about three-fourths the diameter of one. Palpi moderate in length, lateral margins nearly straight, median margins curved; widest near apex of segment 2; combined length of segments 2 and 3, 0.56. Ventrally, basis constricted behind the blunt, flattened auriculae; transverse sutural line only faintly suggested; posterior margin broadly rounded. Palpal segment 1 with a small ventral plate. Hypostome long, length of toothed portion about 0.47; sides mildly convex, apex rounded; dentition apically 4/4 in 2 transverse rows, then 3/3 to about mid-length, then 2/2 to base, lateral denticles largest, medians very small. *Scutum*, shape as figured. Length, 1.26; width, 1.19. Color darker anteriorly and laterad of cervical grooves. Lateral carinae mild, nearly straight, extending from scapulae to near posterolateral margins; area laterad of carinae depressed; cervical grooves distinct, extending from emargination to near ends of lateral carinae, convergent anteriorly, divergent posteriorly; punctations deep, uniformly distributed, large over most of the scutum but somewhat smaller laterad of lateral carinae. A few fine yellowish hairs present. *Legs* long, reddish-brown. Coxa I with a very long, sharp internal spur reaching about halfway across coxa II, no external spur; coxa II with no spurs; coxae III and IV each with a short blunt external spur, but no internal spurs; posterior borders of all coxae salient. Trochanters unarmed. Tarsi tapered step-wise. Length of tarsus I, 0.65; metatarsus 0.37. Length of tarsus IV, 0.60; metatarsus, 0.43. Pulvilli of all tarsi nearly as long as claws. *Spiracular plate* suboval; greatest dimension about 0.37. Goblets numerous. *Genital aperture* situated between coxae IV. *Anal groove* in form of an inverted U; anus situated far posteriorly.

I. malayensis superficially resembles *I. spinicoxalis* Neumann, 1899, of Sumatra and Java but is readily distinguished by the uniform rather than peripheral distribution of the scutal punctations and by the absence of external spurs on coxae I and II.

Excluding the very small, aberrant, bat-infesting species *Ixodes* (*Lepidixodes*) *paradoxus* Kohls and Clifford, 1961, in which porose

¹Measurements are in millimeters.

areas are not discernible, only 2 other species of the genus, *I. granulatus* Supino, 1897, and *I. weneri* Kohls, 1950 (Kohls, 1957), are known to occur in Malaya. *I. granulatus* has 2 short spurs on coxa I, the auriculae are much reduced, and cornua are absent or only faintly suggested. *I. weneri* also has 2 spurs on coxa I but the internal is about twice as long as the external and the auriculae are in the form of prominent, posteriorly directed horns.



Ixodes malayensis, new species, female. A, capitulum and scutum, dorsal; B, capitulum, coxae and genital area, ventral; C, hypostome; D, spiracular plate (A = anterior, D = dorsal); E, tarsus and metatarsus, leg I; F, tarsus and metatarsus, leg IV.

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- Kohls, Glen M., 1957. Malaysian Parasites, XVIII. Ticks (Ixodoidea) of Borneo and Malaya. Stud. Inst. Med. Res. Malaya, 28, 65-94.
- Kohls, Glen M. and Carleton M. Clifford, 1961. A new species of *Ixodes* (*Lepidixodes*) from bats in Malaya, North Borneo, and the Congo (Acarina-Ixodidae). *Acarologia* 3(3): 285-290.

THE OCCURRENCE OF IXODES AFFINIS NEUMANN ON BLACKBEARD ISLAND, GEORGIA

(ACARINA: IXODIDAE)

On September 29, 1960, an investigation was undertaken to determine if an unusually heavy infestation of ticks possibly could be causing mortality of white-tailed deer on Blackbeard Island, Georgia, a 6,000 acre coastal island and National Wildlife Refuge which contains about 3,000 acres of deer habitat. Mr. Lawrence Wineland, Wildlife Technician, stated that the deer herd consisted of approximately 300 animals averaging about 60 pounds each and that ticks (species unknown) appeared to be much more abundant on all animals than they had been at any previous time during the past few years. This was indicated by the fact that Mr. Wineland's pack of beagles had been plagued with ticks all summer.

An effort was made to capture several deer and inspect them for ticks, especially the cattle-fever tick, *Boophilus annulatus*. An 8 point buck was captured and close inspection (by Marshall) revealed an estimated 100 mature ticks. Sixteen of these were preserved and an attempt was made to identify them at the Southeastern Cooperative Wildlife Disease Study Laboratory. Since no positive identification could be made, specimens were sent to Dr. Glen M. Kohls, Sanitarian Director, U.S.P.H.S. Rocky Mountain Laboratory, Hamilton, Montana. Dr. Kohls identified all these tick specimens as *Ixodes affinis* Neumann. This is a new record for Georgia and only the second report of the occurrence of this South and Central American tick in the United States. Kohls and Rogers (1953, Jour. Parasit. 39(6): 669) reported the collection of one specimen of the species on a lynx, *Lynx rufus floridanus*, in North Florida in 1948 and two additional specimens in the same area, one on a dog and the other on a lynx, in 1951. Cooley and Kohls (1945, NIH Bull. 184:34) recorded *Ixodes affinis* from deer in Brazil, Guatemala and Panama and Kohls and Rogers (1953) from deer in southern Mexico.

Ticks were collected by Mr. Wineland from his beagles all during the following summer (1961) in an effort to see whether more *I. affinis* could be found, but not a single specimen was taken. The 1018 specimens taken from the dogs were identified by the senior author as *Amblyomma americanum* (Linn.) (494 specimens); *Dermacentor variabilis* (Say) (426 specimens); *Ixodes scapularis* Say (96 specimens) and *Rhipicephalus sanguineus* (Latreille) (two specimens).

Nine white-tailed deer were examined for ectoparasites during an archery hunt January 1-5, 1962. Of the 33 ticks removed from these animals, 24 were identified as *Ixodes scapularis* Say and nine as *Amblyomma americanum* (Linn.)

Samples of the specimens of *I. scapularis* taken both from the dogs and from the deer were checked by Dr. Kohls and the identifications verified.

It is interesting to note that all the ticks removed from the buck in 1960 were *Ixodes affinis* yet no additional specimens of this species have since been found on deer or dogs on the Island. This additional record of sixteen specimens of *Ixodes affinis* taken in Georgia does, however, strengthen the indication that the species is permanently established in the United States.

—HORACE O. LUND, *Department of Entomology*, and CHARLES M. MARSHALL and FRANK A. HAYES, both *Southeastern Cooperative Wildlife Disease Study, School of Veterinary Medicine*, all at *University of Georgia, Athens*.

SARCOPHAGA ALDRICHI AS A PARASITE OF ENNOMOS SUBSIGNARIUS (HBN.)

(DIPTERA: SARCOPHAGIDAE and LEPIDOPTERA: GEOMETRIDAE)

Defoliation of the southern Appalachian hardwoods by the elm spanworm, *Ennomos subsignarius*, has continued and spread since it was first observed in 1954 on the Chattahoochee National Forest in Georgia. Investigations to determine the presence of natural parasites and their kinds have been undertaken during this period. See Speers (1958, Southeast. Forest Expt. Sta. Progress Rept., 15 pp., Nov.); Davis (1960a, *ibid.*, a special report, 17 pp., Feb.); (1960b, Proc. Ent. Soc. Wash. 62(4):247-248). The purpose of this note is to add another parasite to these lists and to indicate something of its relative abundance.

Residents and tourists alike in this area of defoliation have continually expressed their distaste for the repeated occurrence each spring of excessive numbers of "large pesky black flies." The writer in the spring of 1959 (Davis 1960a) and again in the springs of 1960 and 1961 has found *Sarcophaga aldrichi* to be the most abundant fly in the area. It often occurred in such large numbers that it was nearly impossible to keep oneself free of them.

In 1959, collections of elm spanworm larvae and pupae, which were reared for their parasites, produced numerous dipteran puparia that failed to proceed immediately with their development to adult flies. These puparia were held throughout the summer at room temperature on moist filter paper in petri dishes. With the onset of cold weather these dishes with their puparia were placed in a household refrigerator for approximately two months. Upon return of the puparia to room temperature, twelve *Sarcophaga aldrichi* emerged. The capacities of this dipteran as a parasite of lepidopterous larvae and pupae has been discussed in detail by Hodson (1938, Jour. Econ. Ent. 32(3):396-401). This is the first time that *Sarcophaga aldrichi* has been recorded as a parasite of the elm spanworm.

Determinations were made by personnel of the Entomology Research Division, ARS, U. S. Department of Agriculture.

—ROBERT DAVIS, *Department of Entomology, University of Georgia, Athens*.

**REDESCRIPTIONS OF TWO CERVID-INFESTING ANOPLURA
FROM SOUTHEAST ASIA**

PHYLLIS T. JOHNSON, *Gorgas Memorial Laboratory, Panama, R. de P.*

The specimens of *Haematopinus longus* Neumann and *Solenopotes muntiacus* Thompson discussed in this paper were collected in Cambodia by Charles Wharton in 1952. For both species, these are the first collections reported since the original descriptions, and confirm the natural occurrence of *H. longus* on *Cervus unicolor*, a host-louse relationship which had been in some doubt.

Because of certain equivocal features of the original descriptions and lack of complete illustrations, both *H. longus* and *S. muntiacus* are redescribed and illustrated. All the specimens are in the collections of the U. S. National Museum.

***Haematopinus longus* Neumann**

(Figs. 1-5)

Haematopinus longus Neumann, 1912, Bull. Soc. Zool. France 37:141, fig. 1.

Ferris, 1933, Contributions toward a monograph of the sucking lice 1(6):469, fig. 276. Ferris, 1951, The sucking lice, p. 91.

Type data.—The type series consisted of males and females collected from *Cervus unicolor*, Kota, Nepal.

Specimens examined.—Two males, three females, from *Cervus unicolor*, Cambodia: Stung Traling-Koské, 23 March 1952, C. Wharton collector, RTB-15386.

This species is easily distinguished from other described members of the genus by a combination of the following: the body is long and slender, the posterior head margins are only slightly convergent, and the thoracic sternal plate is rectangular and longest in the longitudinal axis of the body.

Description.—*Male* (fig. 3): Head twice as long as broad or somewhat longer; portion anterior to antennal bases less than half entire length of head; posterior head margins only somewhat convergent. *Thorax.* Thoracic sternal plate (fig. 2, ♀) rectangular, longest in the longitudinal axis of the body; dorsolateral projection of metanotum triangular, apically acute. *Abdomen* with one row of small setae on each segment dorsally and ventrally; membranous except for genital plate and small round plates on which are inserted the most lateral seta of each of dorsal rows on segments 2-8. Paratergal plates conical, projecting from body wall laterally. *Aedeagus* (fig. 5): Pseudopenis slightly asymmetrical, apically acute or narrowly rounded; preputial sac definitely asymmetrical, with rounded knob on one side at articulation with basal plate. *Female* (fig. 1): Essentially as male except for details of the *genitalia* (fig. 4). Lateral setigerous lobes of the eighth segment ("gonopods") long and narrow, with setae along entire length of slightly divergent mesal margins, rounded apically, no setae extending on to apex or lateral margins. Terminal lobes of abdomen long, apically acute.

Length.—Male, 3.0-3.3 mm.; female, 3.8-4.3 mm.

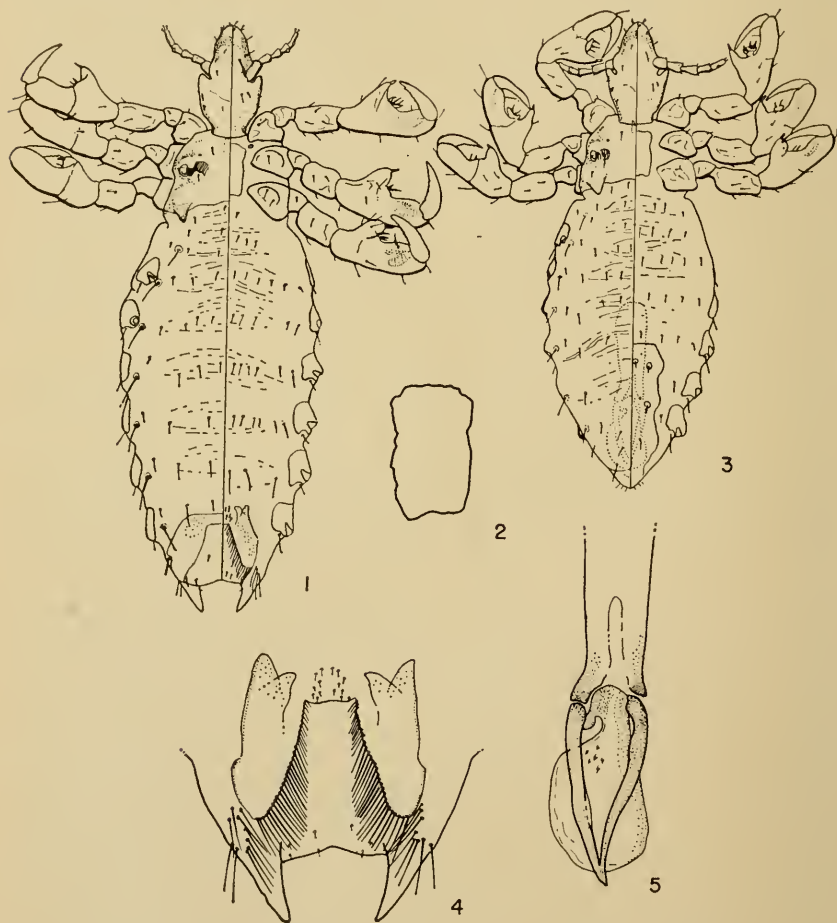
Solenopotes muntiacus Thompson

(Figs. 6-10)

Solenopotes muntiacus Thompson, 1938, Ann. & Mag. Nat. Hist., Series II, 1:634, figs. a-d. Ferris, 1951, The sucking louse, p. 256.

Type data.—Male holotype, female allotype, seven male, and eight female paratypes from *Muntiacus muntjac* (as *Muntiacus malabarius*) Mousakande, Gammaduwa, Ceylon.

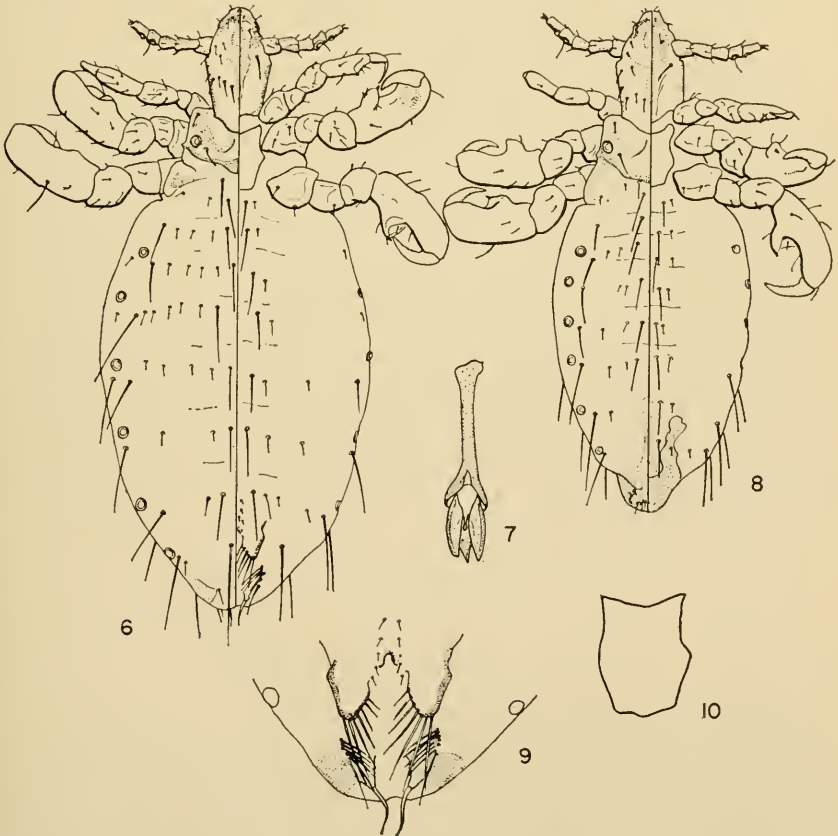
Specimens examined.—Three males, nine females from *Muntiacus muntjac*, Cambodia: Koské, 3 April 1952, collected by C. Wharton, RTB-15374.



Haematopinus longus Neumann, Cambodia, from *Cervus unicolor*. . Fig. 1, female; fig. 2, thoracic sternal plate, female; fig. 3, male; fig. 4, genital segments, female; fig. 5, aedeagus.

Separable from other *Solenopotes* species by the shape of the head, which has the postantennal angles sharp, at times almost right-angled; the post antennal margin straight, slightly convergent posteriorly; and lacking any indication of occipital angles.

Description.—*Male* (fig. 8): Head about twice as long as broad; rounded anteriorly; postantennal angles sharply defined; postantennal margins straight to insertion of head in thorax, slightly convergent posteriorly, no occipital angles. *Thorax* with sternal plate (fig. 10, ♀) slightly produced at each anterolateral angle, so that anterior margin is concave; lateral margins sinuate; posterior apex truncate. *Abdomen* dorsally and ventrally with two long setae medially on each of typical segments; one or more small setae laterad to these; dorsally with long lateral seta by each spiracle. Spiracles only very slightly protuberant. *Genitalia*. Genital plate lyre-shaped with irregular margins, anterior arms not strongly



Solenopotes muntiacus Thompson, Cambodia, from *Muntiacus muntjac*. Fig. 6, female; fig. 7, aedeagus; fig. 8, male; fig. 9, genital segments, female; fig. 10, thoracic sternal plate, female.

curved or narrowed. Aedeagus (fig. 7) with basal plate long, thin, and with long posterior arms; parameres acute both anteriorly and posteriorly, broadest medially, with convex lateral and mesal margins; pseudopenis acutely triangular. *Female* (fig. 6): Much as in male except often with more small setae on dorsum of abdomen. *Genitalia* (fig. 9) with "gonopods" angulate laterally, obtusely pointed apically; fringe of setae on posteriorly-divergent mesal margins. Apical lobes of abdomen short, acute.

Length.—Male, 1.1-1.3 mm.; female, 1.5-1.8 mm.

NEW SYNONYMY, NEW HOMONYMY, AND NEW ASSIGNMENTS
IN MICROLEPIDOPTERA
(LEPIDOPTERA: STENOMIDAE)

W. DONALD DUCKWORTH, *North Caroline State College, Raleigh, N. C.*

J. F. Gates Clarke's study of Meyrick's type specimens in the British Museum provided a starting point for a more natural arrangement of the genera and species of the Stenomidae. His utilization of characters of the male and female genitalia to support his new assignments indicates the value of these structures in the characterization of taxa within the family. His work, however, was limited to species described by Meyrick and located at the British Museum.

Since Clarke's study was published the present author has had the opportunity to examine types of many of Meyrick's species and those of other authors, principally Busek's, deposited at the United States National Museum. The study of these types has revealed many new facts which are recorded in the following notes.

The new assignments and other changes herein indicated are based on a study of the genitalia. Extensive revisionary studies in the family are currently being undertaken but the present paper makes possible the proper assignment of the species treated.

Genus *Anadasmus* Walsingham

Anadasmus Walsingham, 1897. Proc. Zool. Soc. London, p. 100.

Anadasmus gerda (Busek), n. comb.

Gonioterma gerda Busek, 1914. Proc. U. S. Nat. Mus., 47:52.

Type locality.—Porto Bello, Panama.

Remarks.—Examination of the male genitalia of the type indicates that this species belongs in the genus *Anadasmus* rather than *Gonioterma* in which it was described. It is closely related to *Anadasmus leontodes* (Meyrick) but is readily separable from it by having the vesica armed with many small cornuti. The vesica of *leontodes* is armed with one large cornutus and its distal portion is covered with concentric bands of fine spiculate cornuti.

Genus *Antaeotricha* Zeller

Antaeotricha Zeller. 1854. Linn. Entom., 9:390.

Antaeotricha demas (Busck), n. comb.

Stenoma demas Busck. 1911. Proc. U. S. Nat. Mus., 40:223.

Type locality.—St. Jean, Maroni River, French Guiana.

Remarks.—The genitalia of *demas* are characteristically those of an *Antaeotricha* and leave no doubt as to its assignment there.

Antaeotricha lampyridella (Busck), n. comb.

Stenoma lampyridella Busck. 1914. Proc. U. S. Nat. Mus., 47:41.

Type locality.—Cabima, Panama.

Remarks.—The distinct coloration of this species is thought to mimic a large lampyrid beetle which occurs in the same locality. The genitalia are typical of the genus *Antaeotricha*.

Antaeotricha sagax (Busck), n. comb.

Stenoma sagax Busck. 1914. Proc. U. S. Nat. Mus., 47:40.

Type locality.—Porto Bello, Panama.

Remarks.—Examination of the genitalia of Busck's type, a female, shows definitely that this species belongs in *Antaeotricha*. The ductus bursae is enlarged and corrugated in very much the same manner as in *manzanitae* Keifer to which *sagax* is probably related.

Antaeotricha venatum (Busck), n. comb.

Stenoma venatum Busck. 1911. Proc. U. S. Nat. Mus., 40:217.

Type locality.—St. Jean, Maroni River, French Guiana.

Remarks.—Examination of the genitalia of Busck's type, a female, leaves no doubt as to its proper assignment in *Antaeotricha*.

Antaeotricha vivax (Busck), n. comb.

Stenoma vivax Busck. 1914. Proc. U. S. Nat. Mus., 47:40.

Type locality.—Cambina, Panama.

Remarks.—Closely related to *venatum* Busck and clearly an *Antaeotricha*.

Genus *Cerconota* Meyrick

Cerconota Meyrick. 1915. Exot. Mier., 1:385.

Cerconota aphanes (Walsingham), n. comb.

Stenoma aphanes Walsingham. 1912. Biol. Centr.-Amer., 4:167.

Type locality.—Volcan de Chiriqui, Panama.

Remarks.—This species has been synonymized with *sciaphilina* Zeller, but examination of the genitalia of the types show numerous distinguishing characters. The genital plate of *sciaphilina* is heavily sclerotized and asymmetrical whereas the genital plate of *aphanes* is reduced to a small band around the ostium. Because of these differences, I hereby remove *aphanes* from synonymy and place it in the genus *Cerconota* where the genitalia indicate it belongs.

Cerconota nitens (Butler), n. comb.

Cryptolechia nitens Butler. 1882. Cistula Entom., 2:188.

Type locality.—Amazon.

Remarks.—The genitalia are typical *Cerconota* and leave no doubt as to its proper assignment in that genus.

Cerconota sciaphilina (Zeller), n. comb.

Cryptolechia sciaphilina Zeller. 1877. Hor. Soc. Ent. Ross., 13:289.

Stenoma torophragma Meyrick. 1915. Exot. Mier., 1:439.

Type locality.—Mexico.

Remarks.—Examination of the genitalia clearly indicates the proper assignment of this species to *Cerconota*. The dumbbell-shaped signum in the corpus bursae is typical of the genus, and the structure of the male genitalia supports this conclusion.

Genus **Chlamydastis** Meyrick

Chlamydastis Meyrick. 1930. Exot. Mier., 4:13.

Chlamydastis tryphon (Busek), n. comb.

Stenoma tryphon Busek. 1920. Ins. Inse. Mens., 8:89.

Type locality.—Cayuga, Guatemala.

Remarks.—This species is very closely related to *laetis* Busck, the type species of *Chlamydastis*, and unquestionably belongs here.

Genus **Gonioterma** Walsingham

Gonioterma Walsingham. 1897. Proc. Zool. Soc. London., p. 101.

Gonioterma dimetropis (Meyrick), n. comb.

Stenoma dimetropis Meyrick. 1932. Exot. Mier., 4:297.

Type locality.—Guerrero, Mexico.

Remarks.—This species is closely related to *Gonioterma expansa* (Meyrick), but is readily separable from it by the shape of the harpes. In *dimetropis* they are narrow basally and expanded apically, but in *expansa* they are wider basally. Also, there is only one cornutus in *dimetropis* but several in *expansa*.

Genus **Stenoma** Zeller

Stenoma Zeller. 1839. Isis, 32:195.

Stenoma aesiocopia Walsingham

Stenoma aesiocopia Walsingham. 1913. Biol. Cent.-Amer., 4:179.

Stenoma aphrogramma Meyrick. 1929. Trans. Ent. Soc. London, 76:515.

(New Synonymy)

Type localities.—Vera Cruz, Mexico (*aesiocopia*); Taboga, Panama (*aphrogramma*).

Remarks.—Meyrick's use of the white hind wings as a distinguishing character of *aphrogramma* is useless when compared with *aesiocopia* which also has white hind wings. Examination of the genitalia indi-

states that Meyrick described *aphrogramma* from a series of females of Walsingham's species *aesiocopia*.

***Stenoma completella* (Walker), n. comb.**

Cryptolechia completella Walker. 1864. Cat. Lep. Brit. Mus., 29:718.

Type locality.—Ega, Brazil.

Remarks.—Examination of the male and female genitalia leaves no doubt that this species was improperly assigned to the genus *Timocratica* Meyrick.

***Stenoma lithoxesta* (Meyrick)**

Stenoma lithoxesta Meyrick. 1915. Exot. Micr., 1:432.

Stenoma fenestra Busck. 1914. Proc. U. S. Nat. Mus., 47:44. (New Synonymy.)

Type localities.—Bartica, British Guiana (*lithoxesta*); Sixola River, Costa Rica (*fenestra*).

Remarks.—I have examined Busck's type of *fenestra* and the genitalia are identical with the genitalia figured for Meyrick's species by Clarke.

Genus *Timocratica* Meyrick

Timocratica Meyrick. 1912. Trans. Ent. Soc. London, p. 706.

***Timocratica anseli*, new name**

Timocratica albella Amsel. 1956. Bol. Ent. Venezolana, 10:306.

(Preoccupied)

Timocratica albella Zeller. 1839. Isis, 29:196.

Type locality.—Caracas, Venezuela.

Remarks.—Amsel, in his study of the microlepidoptera of Venezuela, described this species as *Timocratica albella* which is preoccupied by a Zeller species described in 1839. I therefore propose the new name *anseli* for this primary homonym.

***Timocratica liniella* (Busck), n. comb.**

Stenoma liniella Busck. 1910. Proc. Ent. Soc. Wash., 12:80.

Type locality.—Sixola River, Costa Rica.

Remarks.—This species is very closely related to *Timocratica cantatrix* (Meyr.) both in color pattern and genitalia. Moreover, the genitalia of both species are atypical for the genus and further study may necessitate the erection of a new genus for both species.

***Timocratica subovalis* (Meyrick), n. comb.**

Stenoma subovalis Meyrick. 1932. Exot. Micr., 4:304.

Type locality.—Brazil, R. Xingu, Ponte Nova.

Remarks.—Very near *albella* Zeller, but distinct. Examination of the genitalia leaves no doubt as to the proper assignment of this species in *Timocratica*.

REFERENCE

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A NEW COCKROACH OF THE GENUS *NAHUBLATTELLA* FROM
ECUADOR, *NAHUBLATTELLA ECUADORANA* SP. N.
(ORTHOPTERA: EPILAMPRIDAE)

ISOLDA ROCHA E SILVA ALBUQUERQUE,¹ *Museu Nacional, Rio de Janeiro, Brazil*

For more than 10 years the cockroach here described has been intercepted frequently by Plant Quarantine inspectors of the U. S. Department of Agriculture, who have found it in bananas shipped from Ecuador. Since it is distinctive both in color markings and anatomical characters, and there is no question about the country of origin, a name is desirable. The great majority of specimens have been found in shipments which have arrived at New Orleans, La.

Nahublattella ecuadorana sp. n.
(Figs. 1-8)

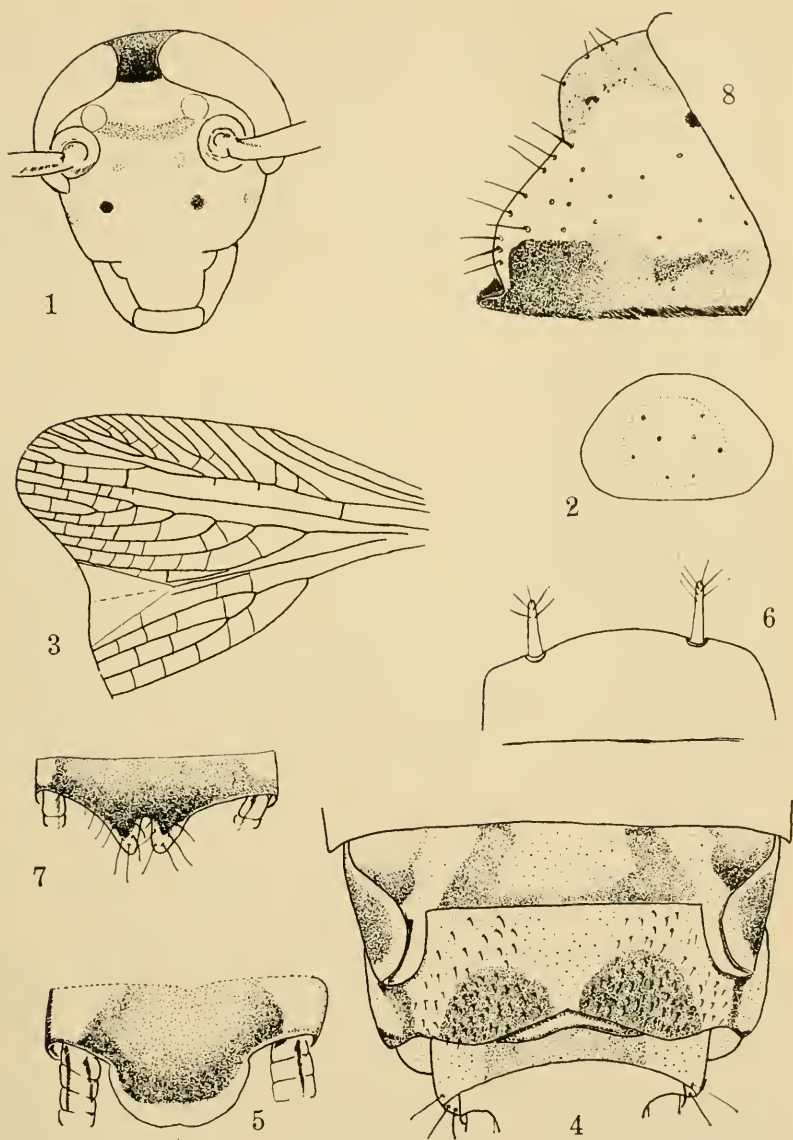
This new species is a member of *Nahublattella*, a genus recognized by Bruijning in 1959. In general form it bears a close resemblance to *aristonice* (Hebard), but has a narrower interocular space, different lateral pockets of the male fifth abdominal tergite and different male sexual characters. From *incompta* (Hebard) it may be separated by the much less heavily marked head and pronotum and different dorsal specialization of the male abdomen.

Type ♂ (U. S. National Museum Type No. 65779) Ecuador, on bananas, in cargo at San Pedro, Calif., Aug. 22, 1959.

Size large and form broad. Interocular space narrow, two-sevenths width between antennal sockets. Ocellar spots distinct. Maxillary palpi with fourth segment slightly shorter than third, fifth a little more than half as long as fourth. Pronotum transverse, broad elliptical with point of greatest width meso-caudad, lateral margins broadly arcuate. Tegmina and wings fully developed, the former with 14 rami of media at apical margin, and five anal veins. Wings with radial sectors not clubbed distad and five complete branches of cubitus. Intercalated triangle very small. Dorsal surface of abdomen with lateral portions of sixth tergum strongly reflexed and forming a longitudinal pocket on each side; seventh and eighth tergum having the caudal margin notched and raised mesad. Supra-anal plate with lateral margins oblique, having a median portion produced and bilobate. Subgenital plate symmetrical, lateral margins declivent to the similar simple, straight styles; median portion of margin very weakly convex. Ventrocephalic margin of cephalic femur with a row of elongate spines which decrease gradually in size distad and terminate in three elongate spines; ventro-caudal margin with five spines. Pulvillus moderately developed. Tarsal claws symmetrical, ventrally with a flange of teeth. Arolia present.

Allotype ♀ Ecuador, on bananas at New Orleans, La., Feb. 20, 1953.

¹This work was done in the United States on a grant from the Guggenheim Memorial Foundation.



Nahublattella ecuadorana n. sp. Fig. 1, head; fig. 2, pronotum; fig. 3, portion of wing; fig. 4, dorsum of specialized portion of abdomen; fig. 5, supraanal plate; fig. 6, subgenital plate; fig. 7, supra-anal plate; fig. 8, subgenital plate.
 (All figures are drawn from the holotype except 7 and 8, which are from the allotype.)

Agrees closely with male, differing as follows: Interocular space broader, slightly less than half width between antennal sockets. Dorsal surface of abdomen unspecialized. Supra-anal plate *U* emarginate meso-distad, the lateral apices rounded. Subgenital plate simple, lateral margins convex; median portion produced and broadly convex.

General coloration: Head ochraceous buff, marked with chestnut brown on a broad interocular bar, a narrow and weak interocellar band, a pair of flecks between antennal sockets and a pair of flecks on each side below antennal sockets. Pronotum with disk ochraceous tawny with few symmetrical chestnut dark brown spots as the figure shows. Lateral margins of pronotum transparent. Tegmina and wings immaculate. Abdomen buffy with a submarginal band suffused with brown on each side, the sterna with a transverse median suffusion of brown, becoming smaller on each caudad. Dorsal surface of abdomen suffused with brown. Legs buffy with brown flecks at the bases of the spines.

Total length: ♂ 19-20 mm, ♀ 18-19; length of pronotum: ♂ ♀ 3; width: ♂ ♀ 4.8; length of tegmina: ♂ ♀ 15; width: ♂ 4; ♀ 3.8.

The 55 paratypes, all originating in Ecuador, include 2 males and 2 females taken with the holotype, one male and one female intercepted at San Pedro, Calif., Feb. 28, 1961, and others intercepted as follows: New Orleans, La., various dates in December to April, also July, 1950-1961, 21 males, 21 females, 3 nymphs, Brownsville, Tex., dates in November and April, 1951, 1952, one male, 2 females; Hawaii, June 21, 1952, 1961, one female.

My sincere thanks go to Dr. Ashley B. Gurney, of the U. S. Department of Agriculture, for his kindness in helping and giving me the opportunity to write this paper. The opportunity of consulting the collection of the Academy of Natural Science of Philadelphia, through the cooperation of James A. G. Rehn, is also gratefully acknowledged.

THE SYNONYMY OF ZIMMERIA WITH COTIHERESIARCHES

(HYMENOPTERA: ICHNEUMONIDAE)

Cotihersiaraches was described by Telenga in 1929 (Zool. Anz. 83: 185), to include *C. meyeri* Telenga, 1929, and *C. niger* Telenga, 1929. No genotype was designated. *Zimmeria* was described by Heinrich in 1933 (Mitt. Zool. Mus. Berlin 19: 159), to include *Eurylabus dirus* Wesmael, 1853, which was designated as genotype.

I have studied the type specimens of these names and find that *Zimmeria* is a synonym of *Cotihersiaraches*, and that *Cotihersiaraches niger* is a synonym of *Eurylabus dirus*. Correct nomenclature for the two species would therefore be *Cotihersiaraches dirus* (Wesmael) and *C. meyeri* Telenga. The type of *Cotihersiaraches* is hereby designated as (*C. niger* Telenga) = *dirus* (Wesmael).

The genus belongs in the subfamily Ichneumoninae, tribe Pristicerotini. The two known species are Palearctic.

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THE GENUS CURRANOPS HARRIOT

(DIPTERA: OTITIDAE)

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The genus *Curranops* was erected in 1942 to include the single species *Tetanops apicalis* Cole. Another species, one originally described by Coquillett in the richardiid genus *Epiplatea*, must also be referred here. Both species are small flies found sparingly from Arizona to British Columbia. Nothing is known about their biology.

Genus **Curranops** Harriot

1942. Jour. N. Y. Ent. Soc. 50: 249; Steyskal, 1961. Ann. Ent. Soc. Amer., 54: 404. Type of monotypic original designation, *Tetanops apicalis* Cole.

The genus may be separated from related forms by the key in my paper cited above. Its relationships are apparently with *Tetanops* and *Tujunga* but the species are easily recognized by the presence of but a single pair of scutellar bristles and by an only rudimentary propleural bristle. In both species wing vein R₁ may or may not have a few setulae. The color of body, legs, and wing-tip (usually blackish) is quite variable.

The two known species may be separated as follows:

- 1 (2). Parafacials transversely wrinkled, especially opposite bases of antennae, pruinose only adjacent to eye; front not more than 1.1 times as long as wide; antennae not more than .66 as long as face; male with aedeagus armed with two zones of bristles, a basimedial backwardly directed group and a group near the apex on an expansible vesicle..... **C. apicalis** (Cole)
- 2 (1). Parafacials smooth, with a narrow band of white pruinosity crossing over from upper orbit to face at a point near middle of length of face; front 1.6 times as long as wide; antennae .8 as long as face; male with aedeagus armed with a single group of long, apically directed bristles in its medial fifth.....
..... **C. scutellaris** (Coq.)

Curranops apicalis (Cole)

Tetanops apicalis Cole, 1921. Proc. Calif. Acad. Sci. (4) 11:328.

Curranops apicalis (Cole), Harriot, 1942. Jour. N. Y. Ent. Soc. 50: 249; Steyskal, 1961. Ann. Ent. Soc. Amer., 54: 404.

Cole's unique female specimen was from Corvallis, Oregon. In my paper cited above, the head, wing-tip, and male postabdomen of a specimen from California are figured. Harriott cites specimens from

Mount Rainier National Park, Washington, and Carmel, California. I have seen specimens from Arizona (Parker Creek, Sierra Ancha), California (Mix Canyon, Solano Co.; Montara, San Mateo Co.; Leavitt, Mono Co.), Montana (Glacier Park), and British Columbia (Robson and Vernon, in Canadian National Collection).



Fig. 1. *Curranops scutellaris* (Coq.), Putah Canyon, Calif., head.

***Curranops scutellaris* (Coquillett), comb. nov.**

(Fig. 1)

Epiplatea scutellaris Coquillett, 1900. Jour. Ent. Soc. 8: 25; Hendel, 1911. Gen. Ins., fasc. 113: 194; Deutsch. Ent. Zts. 1911: 194; Aczél, 1950. Acta Zool. Lilloana 9: 10.

I have examined Coquillett's type, from Dunsmuir, Siskiyou Co., California, through the courtesy of Curtis W. Sabrosky. The only other material I have come across is a female from Putah Canyon, Yolo Co., California (Univ. of Calif.) and a considerable series recently sent me for determination by Prof. Jane Dirks-Edmunds from Saddleback Mt., Lincoln Co., Oregon. Although the type, which was named for its reddish scutellum, is paler in many of its parts than the Oregon series, they are structurally alike.

OVERWINTERING CULISETA MELANURA LARVAE

(DIPTERA: CULICIDAE)

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The biology of *Culiseta melanura* has been of special interest since the virus of eastern encephalitis was isolated from this mosquito in 1951 (1). However, during the past ten years attempts to rear this species in the laboratory for intensive experimental studies have been unsuccessful. This has been partly due to the long period of suspended growth of the larvae that occurs late in the fall season. Until this dormant larval period can be broken and reliable yields of pupae developed from larvae reared in the laboratory, the colonization of this mosquito will remain tedious. The purpose of this paper is to present results of study of overwintering *C. melanura* larvae in the laboratory concerning success in stimulation of pupation by addition of liver concentrate to the larval medium.

MATERIALS AND METHODS

Late in the fall season, gravid adult *C. melanura* were collected in sheltered resting places and maintained in the laboratory until eggs were oviposited. Larvae hatched from these egg rafts were reared in water in flat enameled pans at room temperature ($76^{\circ} \pm 12^{\circ}$ F.). Purina rabbit feed pellets were added as food during the first two weeks of development until the fourth instar period. The larvae were then maintained in this medium for 4 weeks to be certain that all had suspended growth, and when no pupation was observed, the larvae were divided into experimental groups of 100 each. During the winter months of 1957-58, the effect of enriched larval medium was tested as shown in Table 1. In preliminary experiments with enriched medium, it was found that it was necessary to bubble compressed air through the water to prevent stagnation and scum formation that was detrimental to the larvae. Therefore, compressed air at the rate of 40 to 60 bubbles per minute from 0.6 cm. rubber tubing was allowed to pass through the medium in all experiments with nutritional supplements.

Twelve pans, each containing two liters of tap water and 100 dormant larvae were maintained at $76^{\circ} \pm 4^{\circ}$ F. First, larvae in four pans were given enriched medium and those in the remaining eight observed as controls for a two-week period. In this treatment 200 mg. of dried yeast was added to pan No. 1, plus two grams of calf-meal medium (2) (Casein 25 per cent, whole milk powder 25 per cent, wheat germ 20 per cent, lard 24.5 per cent and 0.5 per cent cod liver oil—400 units D/gm. oil) and 2 ml. of 5 per cent solution of Wilson's liver concentrate (Wilson Laboratories, 4221 South, Western Ave. Blvd., Chicago 9, Ill.). The water in pan No. 2 was treated with 200 mg. of dried yeast powder while 2 gm. of calf meal medium was added to No. 3, and 2 ml. of the 5 per cent liver concentrate was added to No. 4. The results are shown in Table 1.

Following this, a combination of supplements identical to those added to No. 1, with the exception that the liver concentrate solution was increased to 4 ml., was added to No. 5 and No. 6. To No. 7 only 4 ml. of liver concentrate was added, and the resulting percentage of pupation is shown in Table 1.

After this, the combined nutritional supplements, as used in No. 5 and No. 6 was added to Nos. 8, 9, and 10 for replication of that test.

When four weeks had elapsed without a further significant amount of pupation, the remaining larvae in pans No. 1-6 were retreated with the combined nutritional supplement as shown in Table 1.

RESULTS

From the results, it may be seen that the addition of yeast or calf-meal medium alone as nutritional supplements was not followed by pupation. However, the addition of 2 ml. of liver concentrate to the combination of ingredients or the addition of the liver concentrate alone was followed by some pupation. When the amount of liver concentrate was doubled, as when added to pan No. 7, 28 pupae developed within two weeks, while none developed in the controls. The combination of the calf-meal, yeast and 4 ml. of liver concentrate was effective as a nutritional supplement since the addition of these ingredients to the larval medium was followed by a significant percentage of pupation in each of six tests. In the six tests 49 per cent of 600 larvae pupated within a two-week period following treatment as compared with no pupation among 1100 larvae that were untreated and observed as controls. Upon retreatment of the surviving larvae after a four-week resting period, essentially the same results were obtained.

DISCUSSION

In a period of suspended growth, fourth instar larvae of *C. melanura* persist throughout the winter months. This behavior is quite different from that of larvae developing early in the summer when growth is continuous and pupation follows completion of the fourth instar period. In study of the biology of this species, in 1953 (3), it was noted that contrary to the observation of Smith (4) the larvae hatched from eggs collected late in the fall, completed their development and pupated without a period of suspended growth. Burbutis and Lake (5) reported that overwintering larvae were often found in completely dark rock caves where water temperatures remained cold in the spring season and photoperiod variation would have little effect. Likewise, Hayes (6) observed that overwintering larvae were found deep in mud at the bottom of the breeding holes. Thus, one of the principal variable factors left was the change in the nutrient material available in the larval medium. Since mosquito larvae have been extensively utilized in studies of mosquito nutrition, a great variety of dietary components necessary for normal growth and development are known (Trager (7), Gilmour (8)). However in tests utilizing nutritional supplements rich in a variety of components it became obvious that neither yeast powder nor the enriched calf-medium of

Table 1. Experimental treatment of dormant *Culiseta melanura* larvae with nutritional supplements and the percentage of pupation during the two-week period following treatment.

Pan No. larvae	Treatment	% Pupation in 2-week period	Treatment	% Pupation in 2-week period	Treatment	% Pupation in 2-week period	Retreatment No. of survivors ¹	% Pupation in 2-week period
1	100 calf meal yeast liver conc.	7	-----	0	-----	0	(93) calf meal yeast, 4 ml. liver conc.	42
2	100 yeast	0	-----	0	-----	0	(100) "	55
3	100 calf meal	0	-----	0	-----	0	(100) "	38
4	100 2 ml. liver conc.	5	-----	1	-----	0	(94) "	49
5	100 control	0	calf meal yeast 4 ml. liver conc.	56	-----	2	(44) "	61
6	100 control	0	calf meal yeast, 4 ml. liver conc.	51	-----	0	(46) " Retreatment Controls	22
7	100 control	0	4 ml. liver conc.	28	-----	0	(69) -----	0
8	100 control	0	control	0	calf meal yeast, 4 ml. liver conc.	60	(40) -----	0
9	100 control	0	control	0	"	53	(41) -----	0
10	100 control	0	control	0	"	48	(52) -----	0
11	100 control	0	control	0	control	0	(100) -----	0
12	100 control	0	control	0	control	0	(99) -----	0

¹Number of larvae diminished by mortality before retreatment.

Hubbell were adequate. On the other hand, addition of the liver concentrate resulted in some pupation even when it was the sole additive. When combined with the yeast and calf-meal, approximately fifty per cent of the larvae pupated within two weeks.

The effect produced by microorganisms in the media may be involved in the situation. Chapman (9) recently reported that contrary to the activity of *C. melanura*, winter collected larvae of *Culex erythrorhax* that remained dormant outside became active, changed instars, pupated and emerged as adults when held at room temperature. In the present study, however, it is difficult to relate the microbial growth to the pupation of the larvae since no readily distinguishable differences were observed in the quality or quantity of microbial growth that occurred in the media enriched with yeast and calf meal with or without the liver concentrate. It was, therefore, concluded that a factor or factors were contributed by the addition of liver concentrate to the medium that simulated pupation of dormant *C. melanura* larvae.

SUMMARY

Study of overwintering *Culiseta melanura* larvae in the laboratory was conducted to elucidate factors that stimulate pupation of the dormant larvae. Because various temperatures and photoperiods were ineffective in the field, nutritional supplements added to the larval medium were tested. Addition of calf meal medium and yeast failed to activate the larvae, but the addition of Wilson's liver concentrate resulted in pupation of significant numbers of the larvae within a two-week period following treatment.

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**NOTES ON TWO SPECIES OF OROGETON,
PREDACEOUS ON BLACK FLY LARVAE**

DIPTERA: EMPIDIDAE and SIMULIIDAE

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During the summer of 1958 in the vicinity of Anchorage, Alaska, some empidid larvae were noticed in upland spring-fed streams, in association with several species of black fly larvae, and actually feeding upon them. Apparently the mats of silken threads made by the black fly larvae for attaching themselves to the substrate in the swift water may also serve the same purpose for these predators. A somewhat similar association of empidids and black fly larvae was observed at Little Clear Creek in the Adirondaeks according to Needham and Betten (1901), but predatism was not noticed on that occasion. Peterson (1960) reports having occasionally observed empidid adults preying upon black fly adults.

It was necessary to rear these predaceous larvae to adults for identification. Dr. Richard H. Foote, Entomology Research Division, ARS, U.S.D.A., identified the reared males. Two species were involved—*Orogeton cymbalista* Melander and *Orogeton* sp. possibly *basalis* Lw. Superficial resemblance of the adults, and larval and pupal association led me to conclude the reared females are these two species also. Most of the specimens concerned are deposited in the collection at the U. S. National Museum and the Canadian National Collection. The material includes preserved larvae, one reared male and four reared females of *cymbalista* with their associated larval and pupal exuviae; and larvae, pupae, 14 reared males and 19 reared females of the other species and some of these adults also have associated larval and pupal exuviae.

These mature empidid larvae, figs. 1 and 2, are about 8 mm. long, maggot-like; integument white or with greenish tinge, rough, granular or spiny; head small, retracted; thorax cone-shaped; abdominal segments 1 to 7 each with six seta-like translucent lateral processes per side; eight pairs of fleshy prolegs bearing crochets of varying lengths, anterior pair shortest, posterior pair longest; last abdominal segment terminating in four caudal tapering projections, the two dorso-laterad ones each bearing a spiracle and four long terminal setae, and the two posterior ones each bearing only two long terminal setae.

The pupae, fig. 4, are about 5 mm. long, white to tan, with dark eyes when mature; a row of spines toward posterior margin of each of first seven abdominal tergites, and abdomen terminates in two flattened spines having curved tips; abdominal sternites 3 to 7 with one spine toward each side, and on rear segments a few tiny spines at the base of that single spine; spiracles protrude from surface of integument; four setae (two conspicuous) at base of antennae.

Laboratory rearing was undertaken expressly for identification but a little additional information about the habits of these empidids in captivity was also obtained. Larvae and pupae were transported

to the laboratory on wet cotton in small Petri dishes. The cubic inch plastic emergence cages used for association of individual black fly adults and their pupal exuviae (Sommerman, 1956) with slight modifications proved quite satisfactory for these larvae and pupae during the 10 month period they were confined. A little wet absorbent cotton was tamped in the bottom of the cage covering the entire floor and the tube. Later it was found that cellucotton was better because the crochets and processes on the larvae did not become entangled in fibres when the larvae were occasionally transferred to clean cages. Some of the cages were used without tubes, in which case a small firm wad of absorbent cotton was stuffed through the hole in place of the tube. It was flattened under the cage and spread out on the inside so it closed the hole firmly. It not only prevented the larvae from escaping but also served as a wick to keep the cellucotton, which was placed on top of it, wet. These tubeless cages were then placed on a plastic sponge in a dish of water. Some cages were kept in the refrigerator at about 40°F. while others were left on the window sill, outside in summer and inside in winter. Each cage contained one or two empidid larvae—some of the largest ones taken from the streams in August and September, also a small piece of rotting wood or dead leaf, and, during the warm months when it was possible to get black fly larvae, an effort was made to keep one living black fly larva in each cage as food. The cages were examined daily and a live black fly larva was substitute for the drained or dead carcass. Some of the black fly larvae died and others were killed but not eaten by the empidids so these carcasses were removed to keep the cages from becoming foul, and, of course, they were not included in the count of black fly larvae eaten (drained). After several months the cotton and cellucotton disintegrated, perhaps from rotting or from the action of the digestive fluids of the predators. For that reason, and also because some of the cages became infested with nematodes and tartigrades it was necessary to occasionally transfer the larvae to clean cages.

When the empidid larvae were not crawling about they were usually in a tunnel under the cotton on the floor of the plastic cage or under the piece of wood. The paired larvae were frequently resting side by side, directly in contact with each other. They were not cannibalistic, but did kill other diptera larvae besides black flies, and also caddis fly larvae that were offered them. They approached their prey and touched it, then immediately stabbed it. The prey instantly relaxed and apparently died. The empidid larva inserted its head farther into the prey and apparently secreted juices that quickly digested the muscle and fatty tissue which it then sucked up leaving only a sac consisting of the head capsule, body integument, gut and its contents. During the winter when the black fly larvae were not available some of the empidids fed on the dead wood or decaying leaves.



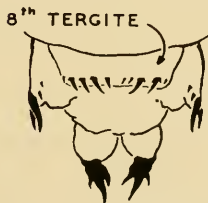
2. LARVA (SIDE VIEW)



1. LARVA (DORSAL VIEW)



3. METATHORAX (DORSAL VIEW)



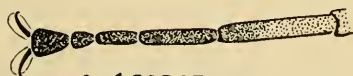
5. PUPAL TERMINALIA



4. PUPA



7. 2nd ABD. TERGITE ♀

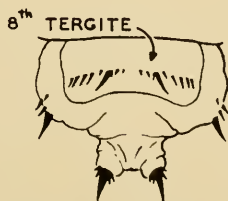


6. ♂ FORETARSUS

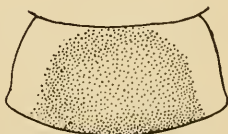
FIGS. 1-7 *OREOGETON* SP. POSSIBLY *BASALIS* LW.



8. METATHORAX (DORSAL VIEW)



9. PUPAL TERMINALIA



10. 2nd ABD. TERGITE ♀



11. ♂ FORETARSUS

FIGS. 8-11 *OREOGETON* *CYMBALLISTA* MEL.



Oreogeton cymballista Melander

The superficial characters distinguishing *cymballista* from the other species treated herein are as follows:

Last two fore-tarsal segments, fig. 11, of male about as broad as third segment is long, densely clothed, and last two segments of all tarsi of both male and female very dark, in sharp contrast with other tarsal segments; darkly pigmented area of second abdominal tergite of both sexes, fig. 10, female, broad, about as broad as long; eighth sternite of female dark. Pupae have abdominal tergites 2 through 7 each with a posterior row of spines, each row containing 6 long spines (exclusive of the laterad clump) with very short spines between them; eighth tergite, fig. 9, with two long mesad spines and three or more short spines laterad of them. Mature larvae have a row of inconspicuous bushy protuberances on dorsum of last thoracic segment, fig. 8, each protuberance separated by a space equal to three or four times its width; lateral abdominal processes shorter than crochets; integument granular. The name of this species very likely has reference to the last two very broad segments of the fore-tarsi of the males for they are suggestive of cymbals.

On August 4, 1958 larvae of *O. cymballista* were taken from two cold springfed streams above timber-line at about 2,650 feet elevation in Arctic Valley, which is approximately 15 miles east of Anchorage. One of the streams was 3 to 12 inches wide, less than an inch deep in the current, and up to four inches deep in pools under the little falls. The speed was estimated to be three feet per second to tumbling. The bottom consisted of moss, roots of scrubby willows and occasionally a rock or a few small stones. Larvae of the black fly *Prosimulium travisi* Stone were present in the stream. The other stream was larger, being from one to three feet wide, one to three inches deep, and up to a foot deep in pools, and having a speed of two to three feet per second. Because of construction work the previous summer the stream bed in the section where these larvae were taken was new and bare, the bottom consisting of sand, gravel, rocks, and huge boulders and a few roots of scrubby willows. Larvae of the black flies, *Prosimulium onychodactylum* D. & S., and a species of *Gymnopaia* were also present in this stream. Most of the empidid larvae in these two streams usually were not far removed from black fly larvae, and the former were found attached to the underside of loose stones and on and in dead wood, roots, leaves and sticks caught at little falls. Pupae of *cymballista* were not taken in the field because these habitats were still all covered with snow when visited on May 27, 1959. It is probable that these pupae would be found in the same general microhabitats as those of the following species.

Five *cymballista* larvae kept through the winter in the laboratory pupated between June 6 and 11, and a male and four females emerged between June 14 and 20. Two female larvae in one cage consumed five black fly larvae between September 9 and 16 and then stopped feeding though larvae were available until November 22. Between April 22 and May 6 they consumed eight more larvae. Another pair,

a male and a female larva, consumed five black fly larvae between September 9 and November 8. Between April 24 and May 20 they consumed ten more black fly larvae. These four *cymballista* larvae were kept in the refrigerator from October 4 until the adults emerged the following June. The third pair of larvae, which were left in the tubeless cages on the window sill, consumed sixteen larvae between September 5 and November 22 and eight more between April 24 and May 19. This last pair, of which only one female survived, apparently consumed or predigested some of the wood when black fly larvae were not available because the piece diminished in size noticeably during December and January and contained grooves along the under side.

Oreogeton sp., possibly *basalis* Lw.

This species differs from *cymballista* superficially as follows:

Last two fore-tarsal segments, fig. 6 of male about as broad as half the length of the third segment; pigmentation of last two segments of all tarsi of both male and female practically unicolorous with second and third segments; darkly pigmented area of second abdominal tergite of both sexes, fig. 7 female, a narrow line about three times as long as broad; eighth sternite of female pale. Pupae have abdominal tergites 2 to 7 each with a posterior row of spines of three relative lengths—about six long ones, a few very short ones and many intermediate, some of which are almost as long as longest ones; eighth tergite, fig. 5 with at least four long spines, several intermediate and a few short ones. The larvae have a row of conspicuous bushy protuberances on dorsum of last thoracic segments, fig. 3, each protuberance separated by a space equal to one or two times its width; lateral abdominal processes longer than crochets; integument granular and spiny.

Larvae or pupae of this species were taken from five small spring-fed streams and reared to adults in the laboratory. One stream was at mile 1.3 on Eklutna Lake Road (elevation about 500 feet) and two others at Eklutna Lake (elevation about 875 feet), which is about 36 miles north east of Anchorage. Another stream was near mile 5 on Arctic Valley Road (elevation approximately 1,500 feet) and another at Arctic Valley (elevation 2,600 feet) about 15 miles east of Anchorage. The streams were from six inches to three feet wide, from less than an inch to six inches deep, with speeds from one to three feet per second to tumbling. The maximum stream temperatures ranged from 42° to 49°F. The stream bottoms varied some, consisting of moss, roots, small stones, soil, sand, gravel, dead leaves and wood. The streams below timberline were for the most part densely shaded with alders.

The larvae taken from these streams were on the undersides of loose stones, on and in rotting wood and roots, and in clumps of dead leaves caught in the streams, especially at the brink of little falls. They were never as abundant as the black fly larvae in the streams and the most productive collecting yielded twelve larvae from one handful of leaves caught in roots at the brink of a little falls. In general the larvae

were scarce, estimated at less than one per selected square foot of stream bed. They were taken in association with, and were preying upon the following species of black flies: *Gymnopais* sp., *Prosimulium doveri* Somm., *fulvum* (Coq.), *hirtipes* 2 (Alaskan), *onychodactylum* D. & S. and *travisi* Stone. Tiny larvae one to two mm. in length when alive, were present in some of the streams from May to July. In one stream they were found within a foot of the spring where the stream originated. Mature larvae and pupae were also taken from May to July.

Pupae were found along the margin of the streams, above the present water level, but probably not above the springtime high water mark, in wet leaves, moss, decaying wood, and soil. On May 27 in the soil just under the moss on the inner side of a curve at a little falls more than a dozen larvae and pupae were taken from less than a square foot of stream bank. There the bank was exposed to the sun because the alder leaves were just starting to unfold and the soil temperature was 60°F. The larvae had tamped out little cells in the soil, which had a short exit tunnel to the loose moss above. Some of these larvae were ready to pupate as indicated by the distended anterior end and the tail end withdrawn from the larval integument. Empty pupal exuviae were taken in the field as early as the last week of May, just as the leaves were unfolding. Pupae were collected in the field on May 19 and brought into the laboratory where they were left on moist cellulocotton on the window sill. Adults emerged May 30 to June 1.

The larvae kept through the winter in the laboratory pupated between June 2 and 13 and three males and three females emerged between June 10 and June 22. Two larvae kept in one cage consumed fourteen black fly larvae between September 4 and October 30 and eight more between April 24 and May 16. One of these larvae died in the process of pupating. The other five larvae were lone individuals and one consumed five larvae between September 10 and October 3 and six larvae between April 24 and May 21. Another ate nine larvae between September 18 and November 11 and appeared not to have eaten any black fly larvae in the spring. The fourth one had eleven larvae between September 19 and October 11 and three more from April 26 to May 3. The fifth had fifteen larvae between September 18 and November 25 and only two more between April 26 and May 5. The sixth one had eleven larvae between September 18 and November 25 and only one larva on May 6. During the winter the larvae were not very active and it is doubtful that they would have done much feeding even if black fly larvae had been available.

These empidid larvae appeared to cease feeding on their prey about a month before pupation occurred. During that time they were relatively inactive, but did finally select a spot in the cotton where they tamped out a cell just below the surface and most of the time constructed an exist tunnel at the top. Shedding the larval integument is a relatively quick process requiring about five to fifteen minutes from the time the split occurs until the pupa squirms free. About

four to five days after pupation the eyes darkened. The pupal stage lasted 7 to 10 days.

These moist cages were not satisfactory for the adults because they often became stuck to the wet cotton or to the side of the cage and soon died, so did not become completely hardened or colored.

Thus it appears that the larvae of *Oreogeton* may have a restraining influence on black fly larval populations in some streams, especially if some behave in nature as they did in the laboratory, killing many more larvae than they actually ate.

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ETHIOPIAN LYGAEIDAE III. A NEW GENUS OF ORSILLINAE FROM SOUTH AFRICA (HEMIPTERA: HETEROPTERA)¹

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During the course of a study of the South African lygaeid fauna for the Swedish publication "South African Animal Life" I had occasion to set aside an unusual orsilline that I had received through the good offices of Mr. A. L. Capener and which did not appear to fit well into any of the existing genera. More recently I have had an opportunity while at the British Museum to review several genera of Orsillinae previously known to me only from the literature. This survey has led me to the conclusion that the South African specimen must be considered as an undescribed genus. Furthermore, the species from South Africa described by Distant as *Nysius rubromaculatus* belongs to the same taxon. In mentioning this in correspondence with Mr. P. D. Ashlock he most generously forwarded to me for consideration two additional specimens from Liberia that prove to represent still a third species of the genus.

It is true that in view of the multiplicity of genera already existing in the literature of the Lygaeidae one should be conservative in the creation of additional categories. However, in the Orsillinae,

¹This work was supported in part by Grant No. NSF-G5631, National Science Foundation.

thanks largely to the work of Usinger, we appear to have an intelligible generic concept. The specimens discussed in this paper appear to be at least as distinct from other taxa in the subfamily as are the majority of the existing genera.

Hyalonysius, new genus

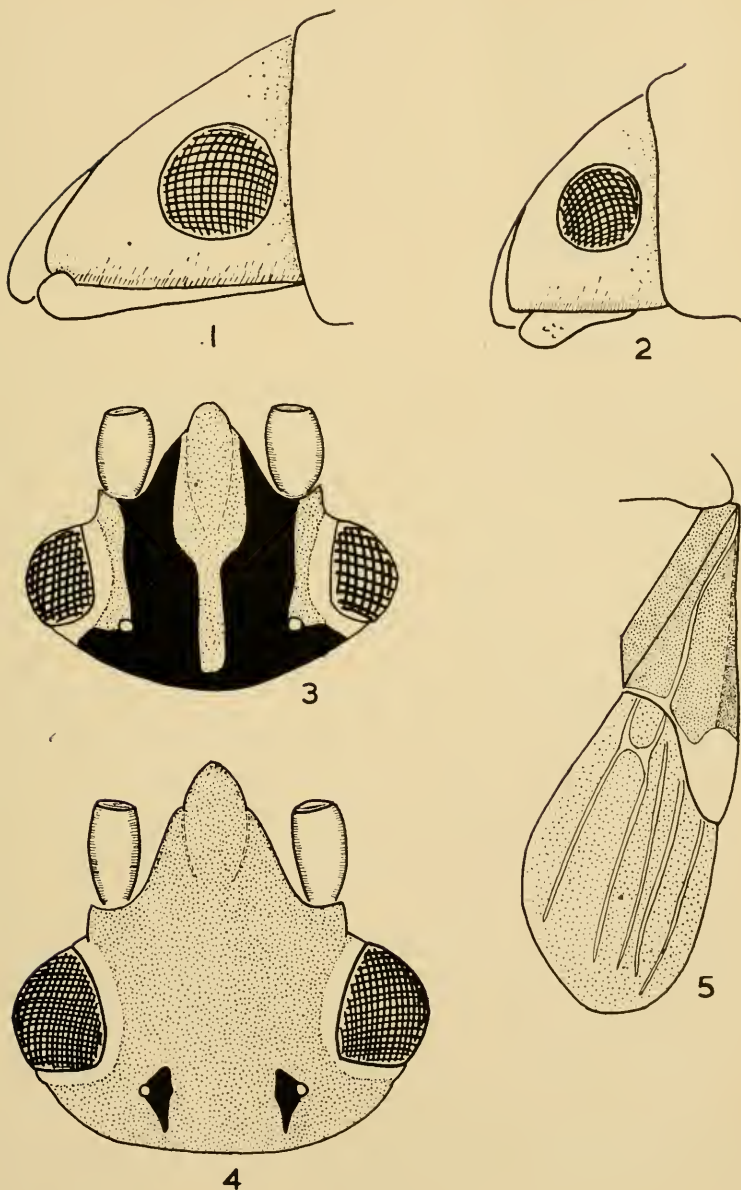
Clavus and corium hyaline, transparent, with large opaque macula present on apex or corium; lateral corial margins subparallel, slightly convergent to apex; head narrower than pronotum across humeri, eyes non-stylate, but prominent and possessing a stripe of white adjacent to inner margins; bucculae strongly elevated anteriorly; pronotum and scutellum conspicuously punctate, the latter with a prominent y-shaped elevated carina present; posterior margin of metapleuron straight sided or moderately sinuate, the caudo-dorsal angle rounded; hemelytra complete (fig. 5), clavus well differentiated, non-punctate, membrane with well developed venation, apical margin of corium strongly concavely sinuate; membrane exceeding apex of abdomen; body not conspicuously flattened, less than twice as broad as deep; body surface clothed with short, semi-decumbent sericeous hairs; anterior femora mutic.

Type-species: *Hyalonysius pallidomaculatus* new species.

This genus differs from all other Orsillinae known to me by virtue of the hyaline clavus and corium (which gives the species somewhat the appearance of miniature Rhopalidae) and by the possession of large opaque maculae at the apices of the coria. In general habitus there is considerable resemblance to *Nysius* itself, but in addition to the hyaline makeup of the hemelytra the lateral corial margin is straight as in *Belonochilus*, *Camptocoris* and *Ortholomus*. Both *rubromaculatus* and *ashlocki* have a general habitus more similar to *Ortholomus* species than does *pallidomaculatus*. In Usinger's world key to genera *Hyalonysius* will key to couplet 14.

KEY TO SPECIES OF HYALONYSIUS

1. Head projecting forward of anterior margin of eye for one-half total head length (fig. 4); opaque macula at apex of corium red; bucculae elongate and attaining base of head (fig. 1)..... **rubromaculatus** (Dist.)
 Bucculae short, terminating a considerable distance short of base of head (fig. 2); head projecting cephalad of anterior margin of eye for less than one-half of total head length (fig. 3); opaque macula at apex of corium either white, infuscated or red 2
2. Large species over 5.00 mm. in length; opaque macula on apex of corium reddish-orange; venter chiefly black; anterior lobe of metapleuron black strongly contrasting with pale scent gland orifice; interocular space two-thirds length of head..... **ashlocki**, n. sp.
 Small species not over 4.00 mm.; opaque macula on apex of corium white; venter pale; anterior lobe of metapleuron pale, nearly concolorous with scent gland orifice; interocular space much greater than two-thirds head length..... **pallidomaculatus**, n. sp.



Hyalonysius rubromaculatus (Distant): Fig. 1, head, lateral view; fig. 4, head, dorsal view. *H. pallidomaculatus*, n. sp.: Fig. 2, head, lateral view; fig. 3, head, dorsal view; fig. 5, right forewing, dorsal view.

Hyalonysius pallidomaculatus new species

General coloration pale testaceous; head striped, base black with a broad black band midway between meson and inner margin of eye to apex of jugal and encompassing all of latter except a narrow mesal strip (fig. 3); apical one-half of tylus and stripe around each eye white, remainder of head tan; body marked with black to dark brown on calli, a central blotch anteriorly on meson of pronotum and three small spots on posterior margin, one on each humeral angle and one on meson, basal one-half of scutellum, basal half of each connexival segment above (giving a spotted effect), mesally on venter; legs pale with incomplete basal and subapical brown bands; apex of corium with a very large opaque white macula (fig. 5) suffused with dusky; body rather sparsely clothed with short, semi-decumbent sericeous pile; pronotum and scutellum distinctly punctate, the latter very coarsely so.

Head relatively short, tylus anterior to eyes much shorter than one-half total head length, eyes not stalked but somewhat produced laterad, length head .77 mm., width head 1.00 mm., interocular space .60 mm.; pronotum moderately convex, sloping anteriorly, lateral margins slightly sinuate, length pronotum .80 mm., width 1.30 mm.; scutellum with a strongly elevated y-shaped carina, the stem smooth and laevigate; length scutellum .55 mm.; clavus and corium uniformly transparent, hyaline with exception of apical corial macula but with apical corial margin and mesal vein pale white, well differentiated from remainder of surface, lateral corial margins straight, very gently, evenly broadening caudad, membrane greatly exceeding apex of abdomen, extending beyond apex for almost same distance as that from apex of corium to apex of abdomen, distance apex clavus-apex corium .75 mm., distance apex corium-apex membrane 1.05 mm.; connexivum narrowly exposed for most of length and strongly upturned; labium elongate, slightly exceeding metacoxae, first segment reaching base of head, length labial segments I .45 mm., II .45 mm., III .47 mm., IV .38 mm.; bucculae strongly sinuate, rounded and narrowed caudally, terminating far from base of head (fig. 2); length antennal segments I .22 mm., II .50 mm., III .47 mm., IV-missing. Total length 3.80 mm.

Holotype.—♂. **Union of South Africa**: Johannesburg, XII-27.1950 (A. L. Capener). In United States National Museum, USNM Type No. 65723.

Paratypes.—6 ♂, 7 ♀. **Union of South Africa**: *Cape Province*: Katberg 4,000 ft. Oct. 1932 and I-15-i, 1933; Somerset East Sept. 1930; Swellendam 17-Xii-31, 18.1.32; Tradouw Pass 13.I.1932; Robertson Pass nr. Mossel Bay 2,000 ft. 4.IX.1932; Mossel Bay Aug. 1921; Ceres April 1925. (R. E. Turner). In British Museum (Nat. Hist.) and author's collection.

Hyalonysius rubromaculatus (Distant), new combination

Nysius rubromaculatus Distant 1904, 352-3.

General coloration bright yellowish-tan; marked with dark brown on humeri, extreme apex of pronotum mesally, scutellum particularly apically, claval commissure and a lateral spot on antenniferous tubercles; irregularly marked area immediately caudo-mesad of ocelli black (fig. 4); apex of corium with a very large reddish smooth maculation; a white stripe present around each compound

eye and strongly contrasting with red-brown of remainder of head; clothed over nearly entire body with short semi-decumbent sericeous hairs; pronotum and scutellum conspicuously punctate, the latter more coarsely so.

Head very elongate and much extruded before eyes, the length of tylus before eye equal to one-half total head length (fig. 4); eyes slightly produced laterad but not stalked, bucculae attaining or nearly attaining base of head (fig. 1), length head 1.10 mm., width head 1.15 mm., interocular space .70 mm.; pronotum with lateral margins moderately sinuate, posterior lobe more convex and sloping cephalad, a distinct median longitudinal stripe present, becoming obsolete before posterior margin, this latter margin nearly straight, length pronotum 1.00 mm., width 1.70 mm.; scutellum with a well developed y-carina, the arms most strongly raised, length scutellum .80 mm.; hemelytra with entire clavus and corium hyaline except for large reddish apical macula on corium, lateral corial margins straight, leaving the strongly upturned connexivum exposed for most of its length, membrane abraded but definitely exceeding apex of abdomen, distance apex clavus-apex corium 1.05 mm., distance apex corium-apex membrane 1.35 mm.; labium obscured, but elongate, probably at least attaining metaeoxae, first segment extending well onto anterior portion of prosternum, length .95 mm.; bucculae sinuate, tapering posteriorly to reach base of head; length antennal segments I .25 mm., II .70 mm., III .60 mm. IV-missing. Total length 5.25 mm.

Material examined.—Holotype ♀, **Union of South Africa**: *Transvaal*, Zoutpansberg 1903 (H. Junod). In British Museum (Natural History.)

***Hyalonysius ashlocki* new species**

General coloration testaceous, extensively marked with black to dark brown as follows: head dorsally with exception of narrow midline, tylus and stripe around each eye, pronotum across calli becoming expanded near lateral margins over entire anterior lobe, a broad median longitudinal stripe on posterior pronotal lobe and as a large diffuse spot on humeri, scutellum with exception of white median carina, as a narrow stripe along apical corial margin, basal one-half of each abdominal connexivum; nearly entire ventral surface black except for yellowish or whitish areas as a stripe below eye, bucculae, acetabula, anterior and extreme posterior portions of prosternum, scent gland orifice and narrow posterior lobe of metapleuron; appendages nearly uniform yellowish, apical segment of labium and third tarsal segment darker; corium with a large opaque sub-apical orange macula; clothed with very short, inconspicuous sericeous, decumbent hairs; surface appearing polished and shining; head and hemelytra impunctate or nearly so, pronotum with numerous well separated coarse punctures, those on scutellum becoming irregular and confluent laterad of median carina.

Head well produced forward of eyes but less acuminate than in *rubromaculatus*, well exceeding apex of first antennal segment, bucculae short not extending caudad beyond anterior margin of antenniferous tubercles, eyes prominent, length head 1.00 mm., width across eyes 1.23 mm., interocular space, .65 mm.; pronotum with posterior lobe strongly convex, much raised above anterior lobe, lateral margins weakly sinuate, posterior margin slightly convex, posterior lobe with a weak slender median carina that does not attain posterior margin, length pronotum 1.10 mm., width pronotum 1.55 mm.; scutellum with a very strongly raised

y-shaped carina, the arms most strongly produced, length .75 mm.; hemelytra typical for genus with clavus and corium hyaline and a large opaque macula present at apex of corium, lateral corial margin straight or nearly so, membrane well exceeding apex of abdomen, distance apex clavus-apex corium 1.10 mm., distance apex corium-apex membrane 1.40 mm.; labium elongate, extending well onto third abdominal sternite, third segment attaining metacoxae, length labial segments I .75 mm., II .73 mm., III 1.00 mm., IV .60 mm.; length antennal segments I .30 mm., II .95 mm., III .75 mm., IV-missing. Total length 5.50 mm.

Holotype.—♂ **Liberia**: Suakoko, 24 Feb. 1952 (Blickenstaff). In United States National Museum, USNM No. 65724.

Paratype.—♀ Same data as holotype. In author's collection.

This species appears superficially most closely related to *rubromaculatus* by its rather elongate head, size, shape, and orange-red color of the corial macula. The posterior pronotal lobe of *ashlocki* is much more strongly convex and arched than is that of *rubromaculatus* and the bucculae are short and lobate as in *pallidomaculatus*. The general habitus of this species is much like that of *Ortholomus* species.

The color differences between the three species of *Hyalonysius* are very striking but may not remain so clear cut when a more adequate series is available for study.

I take pleasure in dedicating this handsome species to Mr. P. D. Ashlock, one of the outstanding younger students of the Lygaeidae.

Acknowledgments

I should like to express my sincere appreciation to Mr. A. L. Capener of South Africa and Mr. P. D. Ashlock (U. of California) for forwarding specimens for study, and to Dr. W. E. China and Mr. R. J. Izzard of the British Museum (Natural History) for making working facilities and specimens available during 1960-1961.

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CORRECTION

In the paper by Harry D. Pratt and Harold George Scott entitled "A key to some beetles commonly found in stored foods," which appears in Vol. 64, No. 1, of the *Proceedings*, the last line of couplet 70A (p. 49) should read, "*Australian spider beetle, Ptinus ocellus* Brown."

A NEW SPECIES OF THE MILLIPED GENUS *POLYLEPISCUS* FROM MEXICO, WITH SOME REMARKS ON THE STATUS OF THE GENUS
(POLYDESMIDA: EURYURIDAE)

RICHARD L. HOFFMAN, *Biology Department, Radford College, Radford, Virginia*

Despite the large size and imposing body form of individual animals, the species of *Polylepiscus* are apparently so scarce that the discovery of each new form is a matter of some interest (only seven species are known, most of them only from the type series). Most of these forms have been described by competent students of the Diplopoda, such as Carl and Pocock, but the genus remains in some doubt, particularly as regards its relationships to *Pseudamplinus*—with which it is sympatric—and to *Amplinus* of northern South America. Distinctions between genera of the nominal family Euryuridae are based largely upon some form of the gonopods, yet these appendages fail to offer an absolute distinction at least between *Polylepiscus* and *Pseudamplinus*, since the triramous gonopod more or less characteristic of the former genus occurs also in two species of the latter. At the present, these two genera are distinguished by the shape of the hypoproct, the importance of which has been questioned by some recent investigators (notably C. A. W. Jeekel, in letters and conversation). My general agreement with this skepticism must be admitted, yet in general body form there seems to be two perfectly distinct and easily recognizable groups of species involved.

In view of this condition, I was particularly pleased to receive specimens of a new species of polylepiscid collected in Chiapas and presented to me by Dr. Ross T. Bell. In addition to enlarging the genus by one more species (the second known without distinct tergital sculpture), this form provided the opportunity for a search for details which might reflect generic distinctions between this genus and *Pseudamplinus*—a search which has been at least partially successful.

Genus *Polylepiscus* Pocock

Polylepiscus Pocock, 1909, Biol. Centr. Amer., Chilopoda and Diplopoda, p. 154.

—Attems, 1938, Das Tierreich, lief. 69, p. 300 (in part).—Hoffman, 1954, Journ. Washington Acad. Sci., vol. 44, p. 52.

Euplinus Chamberlin, 1952, Ann. Ent. Soc. America, vol. 45, p. 578.

Type-species.—Of *Polylepiscus*, *P. stollii* Pocock, by original designation and monotypy.

Diagnosis.—A genus of the family Euryuridae characterized by the caudal prolongation of the peritremata into spiniform, often incurved, processes; and by the occurrence of a strigilis on the anterior face of the scapulorae of most body segments. From *Pseudamplinus*, the only other genus of the family having similar gonopod structure, *Polylepiscus* differs also in the normal, semicircular profile of the hypoproct.

Remarks.—The distinctively triramous appearance of the male gonopod is virtually diagnostic of *Polylepiscus*. But the same configuration occurs also in two species (*triramus* and *erichsonii*) of the allied genus *Pseudamplinus*, and thus compels reconsideration of the status of these two groups. Normally, such similarity in gonopod structure is *prima facie* evidence of a monophyletic assemblage; the two genera under discussion were originally separated by Pocock only by the difference in shape of the hypoproct. That this basis for generic recognition is a shaky one, even when reinforced by the prolonged peritrematic spines, is undeniable. In comparing specimens of the two groups I find only one additional point of distinction: the presence in *Polylepiscus* of a curious denticulate area on the anterior edge of the paranotal scapularae. This character was noted by Pocock (who used the adjective "serrulate" to describe the condition) but was not emphasized as a generic one. In fact, Pocock and subsequent authors, all of whom apparently observed the structure only from the dorsal aspect, interpreted it as a single row of spinules. Actually the condition involves a small area or field of denticles, as indicated by the accompanying illustration. Apparently it is characteristic of *Polylepiscus*, and worthy of special designation. Since the function may well be of a stridulatory nature—associated with the prolonged peritrematic processes of the preceding segments—it may be appropriate to introduce the term "strigilis" (Lat., a rasp) for this development. The adjectival form, of course, will be "strigilate."

Since the presence of strigiles coincides with the various other details which collectively impart a characteristic form to the species of *Polylepiscus*, I think it is desirable to maintain the distinction between that genus and *Pseudamplinus*. Of course, future discoveries may reveal intermediate forms, in which case *Pseudamplinus* must be submerged as the junior synonym, dating only from 1954.

Distribution.—Guatemala and the adjoining Mexican state of Chiapas, chiefly in the mountainous regions.

Species.—Seven, one with two subspecies, separable by the details stipulated in the following key:

KEY TO THE KNOWN FORMS OF POLYLEPISCUS

- | | |
|--|----------------------------|
| 1. Pores of 19th segment completely lateral; metatergites smooth or nearly so, polygonal areas present or absent, but if present not obscured by granulation | 2 |
| Pores of 19th segment on dorsal side of peritremata; the dorsum rugulose or granular with polygonal areas obscured..... | 5 |
| 2. Dorsum entirely smooth, no trace of polygonal areas except vaguely defined on some of the paranota..... | 3 |
| Dorsum with well-defined polygonal areas..... | 4 |
| 3. Large species, width 10 to 12 mm., caudolateral corners of paranota of segments 3-19 produced caudad; dorsum with a median row of large spots.
..... | trimaclatus Hoffman |

- Small species, width 5 to 7 mm., caudolateral corners of paranota of segments 5-19 produced caudad; dorsum without a median row of light spots..... *campanulae*, n. sp.
4. Polygonal areas smooth, not tuberculate except faintly so on some of the paranota..... *stolli* Pocock
- Polygonal areas distinctly tuberculate..... *furcifer* Pocock.
5. Middorsal region of tergites distinctly sculptured; posterior edge of paranota with a distinct basal lobe; tergite of 19th segment granular; entire upper surface of paranota yellow..... 6
- Middorsal region of tergites smooth; posterior edge of paranota without distinct basal lobe; tergites of 19th segment smooth or only rugose; only lateral half of paranota yellow..... 7
6. Paranotal scapulae strigilate on segments 6-17..... *burgeri* Causey
- Paranotal scapulae strigilate on segments 10-17 (?18)..... *actaeon* Pocock
7. Large species, width 13 to 15 mm.; caudolateral corners of paranota of segments 5-16 produced caudad; tibiotarsus of gonopod slender, distally curved away from the solenomerite.....
- *heterosculptus heterosculptus* Carl
- Smaller, width 9 to 11 mm.; caudal corners of paranota of segments 4-16 produced caudad; tibiotarsus of gonopod heavier, crossing behind tip of solenomerite..... *heterosculptus pococki* Hoffman

***Polylepiscus campanulae*, n. sp.**

(Figures 1, 2)

Diagnosis.—A species of *Polylepiscus* distinguished by its small size, completely smooth tergites, curvature of the subterminal branch of the gonopod, and occurrence of strigiles on segments 6 through 18.

Type specimens.—Male holotype, U. S. Nat. Mus. Type No. 2776 D-617, male topoparatype, Acad. Nat. Sci. Philadelphia, two males and two female topoparatypes in my personal collection; all collected along Rt. 190, seven miles east of San Cristobal de los Casas, Chiapas, on July 15, 1956, by Ross T. Bell.

Description of holotype.—Adult male, ca. 36 mm. in length, 6.5 mm. in greatest width. Body slender and parallel-sided over segments 4-17; paranota rather small and depressed, continuing slope of dorsum and imparting a highly vaulted appearance to the body.

Color in life blackish dorsally. Caudolateral third of the paranota, distal half of epiproct, four basal podomeres, and four basal antennal articles yellow. Distal podomeres and antennal articles brownish-purple.

Head moderately convex, smooth and polished, both vertigial and interantennal grooves deep and distinct, forming a pronounced inverted Y-shaped impression. Antennae set low on head and rather close, the interantennal isthmus narrow (0.9 mm.), antennal sockets set off below and laterally by deep depression, and subtended by a small but distinct ovoid genal convexity on each side. Sides of cranium behind antennal sockets distinctly striated. Genae with broad flat margins and a distinct genal notch. Clypeus and frons separated by a shallow but

distinct transverse depression. Facial setae: 0-0 vertigial, 1-1 frontal just below level of antennae, 1-1 frontal still lower on frons and more widely spaced; 3-3 clypeal, of which four are evenly spaced in a transverse median row and one widely separated at each end and located near the genal notch; 8-8 labral.

Antennae rather short (5.0 mm.) and robust, not reaching back to caudal edge of 3rd segment, set closely together (interantennal isthmus about equal to length of 2nd article). Articles 2-5 subelavate and essentially similar in size and shape, article 6 subcylindric and larger; articles 1-3 virtually glabrous, 4-7 sparsely but evenly clothed in slender declivent yellow setae. Length relationship of articles: $6 = 3 > 2 > 4 > 5 > 1 > 7$. Terminal article with four small sensory cones, each isolated by the inturned distal edge of article 7.

Collum arched, laterally much depressed, the surface smooth and polished except for a few obscure tubercles near the lateral ends; marginal ridges pronounced, becoming finer mesially but still distinct almost to the middorsal area. Collum of same width as 2nd segment.

Body segments all basically similar in structure, the prozonite separated from the metazonite by a distinct, costulate, interzonal groove. On the dorsal side, metatergites distinctly elevated over level of prozonites. Dorsal surface of both subsegments similar in texture: entirely smooth but with a dull luster; no trace of polygonal areas or granulations. Paranota of moderate width, very markedly depressed about 30 degrees below the horizontal, their discal areas convex and set off by deep grooves from the elevated paranotal margins. Paranota essentially transverse, not swept forward even on anterior segments; anterior edges typically straight or only slightly convex near the base, posterior edges distinctly concave, these shapes becoming accentuated in going caudad on the body, with the posterior angle of the large peritrematic swelling becoming increasingly produced and spiniform as usual in the genus, but not to the extent seen in *P. stolli* or *P. actaeon*. Ozopores completely lateral on all segments, thus forming a distinct marginal notch when the paranota are viewed in dorsal aspect. Posterior edges of paranota of segments 4-17 with a row of tiny tubercles, these even extending to tip of the paranotal spine on its inner side. Scapulae all marginal, nearly straight, those of segments 5-18 provided with a strigilis composed of 3-4 subparallel rows of small acute tubercles (fig. 1).

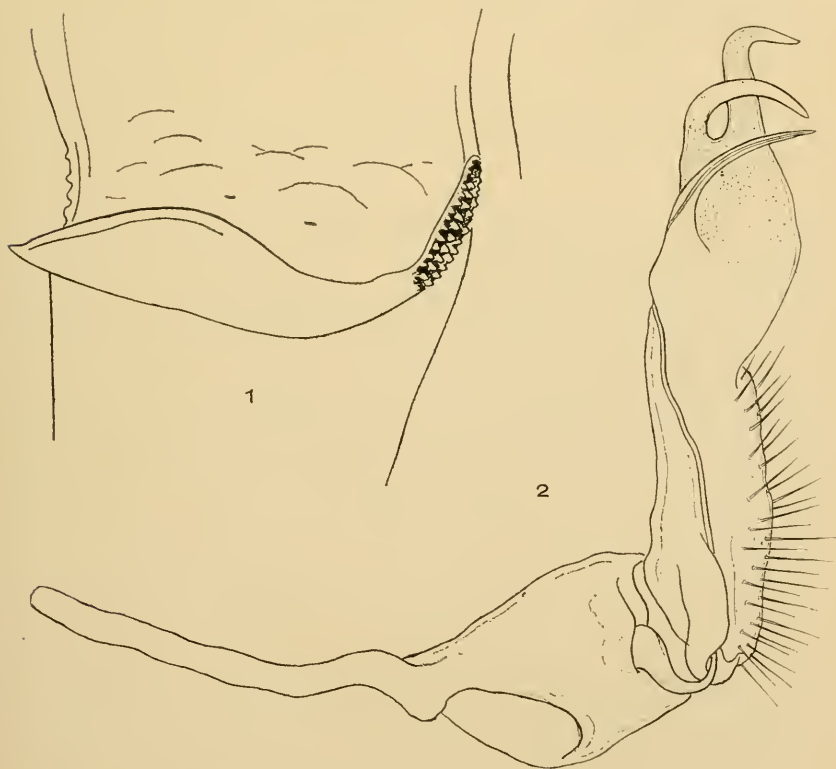
Paranota of segments 18-19 small, the posterior peritrematic spine short and blunt, without any marginal tubercles. Segment 20 with the usual broad, parallel-sided epiproct and broad basal lappet on each side formed by the thickened caudal edge of the segment down the sides. Paraprocts small, almost flat and granular except for a large polished ovoid median elevated area in each. Dorsal paraproctal setae set directly on the thickened marginal rim, the ventral setae borne on the smooth discal elevation. Each paraproct with a small but distinct lateral basal condyle which overlaps on the lateral end of the hypoproct. Latter subtrapezoidally-semicircular in outline, smooth, tumid, the paramedian setiferous tubercles obscure and well removed from the edge of the hypoproct.

Podosterna distinctly formed and elevated, the anterior face of each exactly perpendicular to the interzonal groove. Each podosternum is smooth and glabrous, crossed by a distinct transverse groove between the two legpairs, and by a vaguely defined median longitudinal groove; little evidence of subcoxal elevations. Interzonal groove broad and shallow down sides and across venter, but

sharply defined. Sides of metazonites between legs and paranota irregularly granulate and set with occasional acute tubercles, the latter often in a small cluster above posterior coxal sockets, but never arranged in a row up the caudal margin of the segments. Stigmata small and inconspicuous, very long and narrow; anterior stigmata without evident rims and located in the interzonal groove in front of the anterior coxae; posterior stigmata somewhat smaller, and with slightly elevated rims, located between the coxal sockets. Supracoxal condyles poorly defined, very small, and widely separated from the stigmata.

Legs rather small and short (about 6.0 mm in length); coxa and prefemur of greater diameter than the other podomeres; all are virtually glabrous except the tarsus which is provided with a small number of macrosetae around the pretarsus and on the dorsal side of the distal third. Length relationship of the podomeres: $3 > 6 > 2 > 1 > 5 > 4$. Tibiae and tarsi brownish, the others yellow. Pretarsus long, slender, curved, without carinae.

Sterna of anterior segments: conical sternal processes occur on segments 3-6; those of segments 3 and 4 are in contact medially, those of 5 and 6 are distinctly



Polylepiseus campanuae, n. sp. Fig. 1, lateral aspect of right paranotum of segment 10, showing development of the strigilis on the anterior face of the paranotal seapulora; fig. 2, the same, mesial aspect of left gonopod of paratype.

separated and located adjacent to the coxal bases. Sternum of segment 6 rather distinctly broader and flattened between the legs of the 7th pair.

Gonopod aperture small, oval, located entirely in the metazonite of segment 7, its lateral and caudal edges flared outward to form a high marginal rim, the anterior edge flush with the segmental surface. Gonopods small, medially in contact, with the distal branches interdigitating. Coxae small, cylindrical, glabrous, fused with very long and slender sternal apodemes. Prefemoral portion of telopodite about half the length of that article, distal half glabrous, flattened, with three slender, ventromedially directed processes, the lowest the solenomerite (figure 2). Terminal process bent ventrad at a right angle, the subterminal more evenly curved, its tip almost touching that of the solenomerite.

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SOCIETY MEETINGS

705th Regular Meeting, Feb. 1, 1962—

The 705th meeting of the Society was called to order by the President, H. H. Shepard, on February 1, 1962, at 8:00 p.m. in Room 43 of the U. S. National Museum. Fifteen guests and 27 members were in attendance. Minutes of the previous meeting were approved as read.

Two candidates for membership were announced: *Claude C. Custer*, and *Thomas W. Donnelly*. *Robert T. Taylor* was accepted to membership and introduced. M. D. Leonard introduced Donald E. Ullrich, who was attending his first meeting since election to membership.

The composition of the membership committee was announced: William S. Murray (Chairman), Joseph E. Webb, Jack W. Bongberg, Richard Froeschner, and Price Piquett.

F. L. Campbell showed two leaflets issued by the Australian Plant Quarantine Board.

H. H. Shepard called attention to a shelf of new books in the Agriculture Library. A new book by H. R. Shepherd published in 1961 by Interscience Publishers entitled "Aerosols: Science and Technology" was favorably discussed.

O. S. Flint mentioned that stoneflies of the genera *Allocapnia* and *Taeniopteryx* were not active.

Dr. J. F. G. Clarke introduced the first speaker of the evening, *Dr. A. Diakonoff* of the Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands. He presented a most interesting illustrated talk on a "Collecting trip to the South Celebes," an

area rarely visited, but of great interest. J. F. G. Clarke of the Smithsonian Institution presented the second half of the evening program telling of "An entomologist's misadventure in the South Pacific." In contrast to the previous expedition, this never reached its destination, the island of Rapa, but became lost soon after leaving Tahiti. After a harrowing 13 days at sea land was finally reached with an hour's fuel left.

Robert L. Usinger was introduced to the meeting, prior to its adjournment at 10 p.m.—*OLIVER S. FLINT, JR., Recording Secretary.*

706th Regular Meeting, Mar. 1, 1962—

The 706th meeting of the Society was called to order by the President, H. H. Shepard, on March 1, 1962, at 8:00 p.m. in Room 43 of the U. S. National Museum. Thirty-eight members and 25 guests were present. Minutes of the previous meeting were approved as read.

Three candidates for membership were announced: *Victor H. Zeve*, *Bruce F. Eldredge*, and *Charles F. Hartley*. *Clyde C. Custer* and *Thomas W. Donnelly* were accepted to membership.

The composition of the program committee was announced: Ross Arnett (Chairman), Ronald Hodges, Eugene Gerberg, and Victor Adler.

J. F. Cooper called for a vote on when to hold the joint picnic with the Insecticide Society of Washington. The vote favored either the 2nd or 16th of June at the Log Lodge. The 200th meeting of the Insecticide Society was announced for the 3rd Wednesday in May.

F. L. Campbell called attention to the XVI International Congress of Zoology that will be held in Washington on August 21-27, 1963. Also shown were the new English edition of "Beetles" by Ewald Reitter published by Putnam, the 7th volume of the Annual Review of Entomology, and a recent issue of the Journal of the Washington Academy of Sciences in which is published Dr. Arnett's paper that was presented to the Society last year.

H. H. Shepard presented a report on the 11th annual Texas Agricultural Aviation Conference and Short Course on Pest Control from which he had just returned.

H. J. Conkle showed the literature published by the U. S. Plant Quarantine Division, and discussed the films and TV announcements that are available for use in border areas.

T. H. Bissell reported that the strawberry aphids are still active, although in reduced numbers. Several excellent Kodachrome slides of the aphids were shown.

J. H. Fales gave a preliminary report on his work on the length of proboscis of butterflies. More than 400 individuals of 46 species in 8 families have been measured so far. Data was given which showed that the proboscis length for a given species was quite constant and the sexes were similar. The proboscis length varied between 30 and 66% of the body length in the Satyridae, Danaiidae, Nymphalidae, and Lycaenidae. In the Papilionidae, Pieridae, and Hesperidae the proboscis were of a much greater percentage of the body length and in some cases exceeded the body length.

The evening's speaker, Dr. Dietrich Bodeustin of the University of Virginia, presented a most interesting illustrated lecture on "An analysis of eye develop-

ment in insects." Much recent work on the hormonal control and other factors involved in this fascinating problem were presented.

After the introduction of many visitors, the meeting was adjourned at 10 p.m.—OLIVER S. FLINT, JR., *Recording Secretary*.

707th Regular Meeting, April 5, 1962—

The 707th meeting of the Society was called to order by the President, H. H. Shepard, on April 5, 1962, at 8 p.m. in Room 43 of the U. S. National Museum. Twenty-nine members and 17 guests were present. Minutes of the previous meeting were approved as read.

Two candidates for membership were announced: *Andrew T. Hessel* and *David Shriver*. Three candidates were accepted to membership: *Bruce F. Eldridge*, *Charles F. Hartley*, and *Victor H. Zeve*.

C. C. Blickenstaff reported that the annual picnic will be held on Saturday, June 2, at the Log Lodge (date subsequently changed to June 16).

R. H. Nelson showed the last three numbers of the *Miscellaneous Publications* of the Entomological Society of America, which is proving to be an excellent series.

J. F. G. Clarke showed the first volume of L. Vari's *Lithocolletidae* work on the Microlepidoptera of South Africa. The species are beautifully illustrated in color and line drawings.

J. H. Fales spoke on his attempt to rear the skipper, *Atryonopsis hianna* (Seudder). A specimen collected at Beltsville, Maryland, on May 22, 1960, in the course of the next ten days in the laboratory, laid 17 eggs. Ten of these were on the blades of sweet vernal grass, *Anthoxanthum odoratum* L., and 9 were on the underside. The remaining eggs were on the glass and wood of the cage. None of the eggs hatched. This is possibly the first known occurrence of the eggs of this species and a probable host.

O. S. Flint described a "Gazetteer of Utah Localities and Altitudes" available from the Division of Biology of the University of Utah.

Dr. C. P. Alexander of the University of Massachusetts gave the evening's talk on "The Net-winged Midges." In addition to discussing the group's relationships, morphology and taxonomy, he showed excellent colored slides of the habitats of the western representatives of the family.

Dr. José Liebermann, a student of the Acridoidea presently studying types in North American museums, was introduced to the Society. He brought greetings from the Argentine entomologists and presented the Society with a pair of the Patagonian grasshopper *Nahuclia rubriventis* which he described. Dr. Shepard thanked him on behalf of the Society and sent return greetings to Argentina.

The meeting was adjourned at 10 p.m.—OLIVER S. FLINT, JR., *Recording Secretary*.

ANNOUNCEMENT

Short scientific articles not exceeding one printed page, with or without small illustrations, are welcome and usually will be published promptly. See previous recent issue for format.—Ed.

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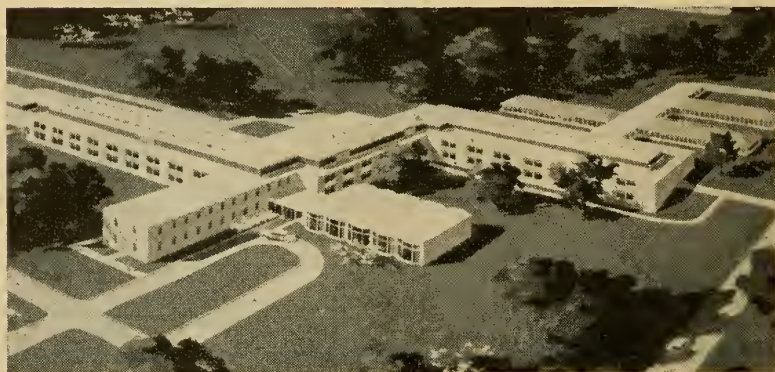
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Insects

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of the

ENTOMOLOGICAL SOCIETY

of WASHINGTON

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

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ORGANIZED MARCH 12, 1884

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Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are \$5.00; initiation fee is \$1.00 (U. S. currency).

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Published quarterly beginning with March by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are \$6.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 64

SEPTEMBER, 1962

No. 3

THE GENUS *PERIMEDE* CHAMBERS IN NORTH AMERICA
NORTH OF MEXICO

(LEPIDOPTERA: WALSHIIDAE)

RONALD W. HODGES, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington 25, D. C.*¹

In 1874 Chambers proposed *Perimede* for the new species *erransella*. Subsequently, Busck (1909) described *particornella* which has been removed to *Walshia* (Hodges, 1961), and Braun (1919) described *falcata*. In this paper three new species are described, bringing the number of known species for our fauna to five. In addition, the male and female genitalia of *erransella* and *falcata* are figured for the first time.

P. erransella has been reared from the leaves of *Taxodium*, *Ulmus*, and *Quercus*; the food plants of none of the other species are known.

I wish to thank the following persons and institutions for allowing me to study the specimens under their care (the letters in brackets indicate the abbreviations used in citing the location of specimens). Dr. Annette F. Braun [AFB]; Mr. D. R. Davis [DRD]; Dr. J. G. Franclemont [JGF]; Mr. M. O. Glenn [MOG]; Mr. C. P. Kimball [CPK]; Dr. A. B. Klots [ABK]; Mr. L. M. Martin, Los Angeles County Museum [LACM]; Dr. P. J. Darlington, Museum of Comparative Zoology [MCZ]; Mr. D. C. Ferguson, Nova Scotia Museum of Science [NSMS]; Dr. J. F. Gates Clarke, United States National Museum [USNM]. Specimens in the Cornell Collection and my collection are indicated by [CU] and [RWH] respectively.

Genus *Perimede* Chambers

Type. Perimede erransella Chambers, 1874. Monobasic.

Perimede Chambers, 1874, Can. Ent., 6: 51.—Chambers, 1875, Can. Ent., 7: 52.—Chambers, 1877, Can. Ent., 9: 147.—Chambers, 1878, Bull. U. S. Geol. Geog. Surv. Terr., 4: 160.—Chambers, 1880, Jour. Cincinnati Soc. Nat. Hist. 2: 203, fig. 35.—Busek, 1909, Proc. Ent. Soc. Washington, 11: 96.—Walsingham, 1910, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera, 4: 18.—Braun, 1919, Ent. News, 30: 263.—Forbes, 1923, Mem. 68, Cornell Univ. Agric. Exp. Sta., 328.—Fletcher, 1929, Mem. Dept. Agric. India, Ent. Series, 11: 168.—Forbes, 1931, Jour. Dept. Agric. Porto Rico, 4: 357.—McDunnough, 1939, Mem. So. California Acad. Sci., 2: 64.

¹This work was carried out in the Department of Entomology, Cornell University, Ithaca, N. Y.

Description.—Head smooth-scaled; tongue scaled, moderate in length; maxillary palpus slightly drooping at base of tongue; labial palpus recurved, reaching beyond vertex, second segment longer than third; antenna one-half to two-thirds length of forewing, scape elongate equaling total length of pedicel and first three segments of shaft, simple, pecten present or absent. Legs: dorsal surface of metathoracic tibia with long scales. Forewings: lanceolate, apex acute; 12 veins present; 1b furcate basally; 2 from two-thirds to three-fourths of cell; 3 from before end of cell; 2-6 subparallel distally; 7 and 8 stalked; 11 from before 2, from one-half to two-thirds of cell. Hindwings: linear, apex acute; 7 veins present; 1 absent; 2, 3, and 4 parallel; 6 and 7 approximate at two-thirds length of wing, diverging distally. Male genitalia: vinculum narrow; valvae linear, symmetrical; a glandular structure arising from base of outer surface of each valva, dorsal segment of this structure terminating with a spine, ventral portion lobate; aedeagus articulating with sacculus; uncus bifid; soeii and gnathos absent. Female genitalia: bursa copulatrix and ductus bursae membranous; two signa; ostium bursae variable in position; apophyses anteriores not connected by a sclerotized band.

KEY TO THE NORTH AMERICAN SPECIES OF PERIMEDE BASED UPON MACULATION

1. Upper half of face white 2
 Upper half of face bronze-brown or shining fuscous 3
2. Third segment of labial palpus white on outer surface *latris* Hodges
 Third segment of labial palpus fuscous on outer surface *battis* Hodges
3. Apices of third and fourth metathoracic tarsal segments white or buff 4
 Third and fourth metathoracic tarsal segments unicolorous *ricina* Hodges
4. Forewing broadest at one-third, tapering gradually to apex
 *erransella* Chambers
 Forewing with dorsal margin parallel to costal margin from one-third to
 two thirds or three-fourths, tapering rapidly to apex *falcata* Braun

KEY TO THE NORTH AMERICAN SPECIES OF PERIMEDE BASED UPON THE MALE GENITALIA

1. Spines of valvae symmetrical (Fig. 2) 2
 Spines of valvae asymmetrical (Fig. 5) 3
2. Spines of valvae sinuate; apex of valva rounded (Fig. 2) *latris* Hodges
 Spines of valvae straight; apex of valva drawn to a point ventrally (Fig.
 3) *erransella* Chambers
3. Spine of left valva coiled (Fig. 5) *battis* Hodges
 Spine of left valva not coiled (Fig. 1) 4
4. Apices of uncus blunt; valvae narrow (Fig. 1) *ricina* Hodges
 Apices of uncus acute; valvae broader (Fig. 4) *falcata* Braun

KEY TO THE NORTH AMERICAN SPECIES OF PERIMEDE BASED UPON THE FEMALE GENITALIA

1. Seventh sternum symmetrical 3
 Seventh sternum asymmetrical 2
2. Ostium bursae at middle of seventh sternum (Fig. 6) *ricina* Hodges
 Ostium bursae at apex of seventh sternum (Fig. 8) *latris* Hodges

3. Ostium bursae between sixth and seventh sterna (Figs. 7 and 10) 4
 Ostium bursae at apex of seventh sternum (Fig. 9) *falcata* Braun
4. Two invaginations containing scales anterior to ostium bursae (Fig. 10)
 *battis* Hodges
- Without such invaginations (Fig. 7) *erransella* Chambers

Perimede erransella Chambers

(Figs. 3, 7, 11)

Perimede erransella Chambers, 1874, Can. Ent., 6: 52.—Chambers, 1875, Can. Ent., 7: 52.—Chambers, 1877, Can. Ent., 9: 147.—Chambers, 1878, Bull. U. S. Geol. Geog. Surv. Terr., 4: 160.—Chambers, 1880, Jour. Cincinnati Soc. Nat. Hist., 2: 203, fig. 35.—Braun, 1919, Ent. News, 30: 263.—Forbes, 1923, Mem. 68, Cornell Univ. Agric. Exp. Sta., 328.—McDunnough, 1939, Mem. So. California Acad. Sci., 2: 64.

Perimede errantella (*sic*), Walsingham, 1910, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera, 4: 18.—Fletcher, 1929, Mem. Dept. Agric. India, Ent. Series, 11: 168. misspelling.

Laverna erransella, Riley in Smith, 1891, List of the Lepidoptera of boreal America, 106.

Mompha erransella, Dyar, 1902 [1903], Bull. U. S. Natl. Mus., 52: 542.—Kearfott, in Smith, 1903, Check list of the Lepidoptera of boreal America, 118.

Description.—Tongue and maxillary palpus pale fuscous. Labial palpus pale fuscous on inner surface, dark fuscous-brown on outer surface. Face pale shining fuscous, a row of dark brown scales in front of each eye; vertex darker than face. Antenna dark fuscous-brown, pecten absent. Thorax dark fuscous-brown. Legs buff-white overlaid with darker scales outwardly; metathoracic femur buff-white, dark brown basally and apically; metathoracic tibia dark brown basally, fuscous-brown on outer surface, a subbasal, medial and apical pale streak; metathoracic tibial spurs buff-white, with a preapical dark brown annulation; apices of metathoracic tarsal segments buff-white. Forewings buff, heavily overlaid with fuscous-brown; a black spot at one-third on fold, one at one-half on middle of wings, and one at apex; a small costal patch of white scales at three-fourths, another just before apex; a few white scales preceding apical black spot, and a few white scales in apical cilia; cilia dark fuscous-brown apically, paler dorsally. Hindwings dark fuscous-brown, cilia pale fuscous. Abdomen dark fuscous-brown with a few pale scales dorsally, overlaid with buff-white scales ventrally. Male genitalia: as in figure 3 (R.W.H. slide no. 19). Female genitalia: as in figure 7 (R.W.H. slide no. 667). Alar expanse: 7-14 mm.

Type.—Museum of Comparative Zoology.

Type locality.—Covington, Kentucky.

Specimens examined.—

CANADA:

NOVA SCOTIA: 5 m, Boulderwood, Halifax, August 12-17, 1960 (D. C. Ferguson), [NSMS, RWH]; 1 m, White Pt. Beach, Queens Co., August 8, 1953 (J. H. McDunnough), [NSMS]. QUEBEC: 1 f, St-Roch, August 14, 1949 (A. Robert), [USNM].

UNITED STATES:

FLORIDA: 1 m, Apalachicola, reared from *Taxodium*, emerged June 7, 1906 [USNM]; 1 m, Hastings, "3/196" [MCZ]; 2 m, 2 f, Homestead, March 25 through May 8, 1959 (D. O. Wolfenbarger), [CPK]; 5 m, 3 f. Siesta Key, Sarasota Co., January 3 through November 14 (C. P. Kimball), [CPK, RWH]. ILLINOIS: 4 m, 8 f, Putnam Co., June 3 through September 10 (M. O. Glenn), [MOG]. KENTUCKY: 1 m, Holotype, Covington; 1 f, Big Black Mtn, Letcher Co., June 9, 1933 (Annette F. Braun), [AFB]. LOUISIANA: 1 m, Vowells Mill, 4/02 (W. G. Dietz), [MCZ]. MARYLAND: 6 m, 1 f, Plummer's Island, May through August 1903 (A. Busek), [USNM, LACM, MCZ]; 4 f, Washington, D. C., April through July (A. Busek), [USNM]. MASSACHUSETTS: 1 m, 2 f, Barnstable, June 25 through September 17, 1949 (C. P. Kimball), [CPK]; 1 m, Framingham, September 12, 1906 (C. A. Frost), [LACM]. MISSOURI: 1 m, 2 m. W. St. Louis, August 1904 (A. Busek), [USNM]. NEW JERSEY: 1 f, Essex Co. Park, June 17 (W. D. Kearfott), [MCZ]. NEW HAMPSHIRE: 6 m, 8 f, Dublin, no date given (A. Busek), [LACM, USNM]; 1 m, Silver Lake, Chesham, July 18, 1930 (A. B. Klots), [ABK]. NEW YORK: 7 m, Ithaca, September 18, 1930 (W.T.M.F., A. B. Klots), [CU, ABK]; 9 m, 1 f, Six Mile Creek, Ithaca, June 12 through September 23 (J. G. Franclemont, R. W. Hodges), [JGF, RWH]; 1 m, The Shack, McLean Reservation, July 13, 1924 [CU]; 2 m, Monroe, bred from elm leaves, emerged June 10 and 14, 1938 [CU]; 2 f, Monroe Co., August 28, 1949 (C. P. Kimball), [CPK]; 1 f, N. Perarsburg, bred from elm leaves, emerged June 3, 1936 [CU]; 1 f, Nyack, bred from elm leaves, emerged June 10, 1936 [CU]; 1 m, 1 f, Pearl River, bred from elm leaves, emerged June 15 and July 4, 1936 [CU]; 1 f, Pelham, September 2, 1954 (A. B. Klots), [ABK]; 1 m, S. Haverstraw, bred from elm leaves, emerged June 14, 1936 [CU]; 1 m, Yonkers, June 14, bred from elm leaves, emerged June 13, 1936 [CU]; 2 f, Yonkers, June 14, 1936 (A. B. Klots), [ABK]. NORTH CAROLINA: 9 m, Highlands, June 29 through August 30, 1958 (R. W. Hodges), [RW, CU]. OHIO: 2 m, 1 f, Cincinnati, August 13 through October 6 (Annette F. Braun), [AFB]; 1 f, Clermont Co., May 25, 1913 (Annette F. Braun), [AFB]; 1 m, Mineral Springs, Adams Co., September 12, 1928. PENNSYLVANIA: 3 m, 2 f, Hazelton, June 25 through August 25, 1896 (W. G. Dietz), [MCZ]; 1 m, 1 f, Oak Station, July 2 and 8 (F. A. Marloff), [AFB, USNM]. SOUTH CAROLINA: 23 m, 7 f, Cherry Hill Recreation Area, S. C. Route 107, 2000 feet elev., Oconee Co., August 7 through September 7, 1958 (R. W. Hodges), [CU, RW]. TENNESSEE: 1 m, Monteagle, 2000 ft., August 17, 1931 (A. G. Richards, Jr.), [ABK]. VIRGINIA: 1 m, 1 f, Falls Church, reared on *Quercus velutina*, emerged May 13, 1913 (S. A. Rohwer), [USNM]; 1 m, Great Falls, June 12, 1919 (A. Busek), [USNM].

***Perimede falcata* Braun**

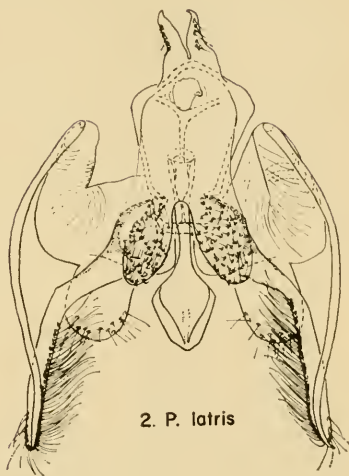
(Figs. 4, 9, 12)

Perimede falcata Braun, 1919, Ent. News, 30: 263.—Forbes, 1923, Mem. 68, Cornell Univ. Agric. Exp. Sta., 328.—McDunnough, 1939, Mem. So. California Acad. Sci., 2: 54.

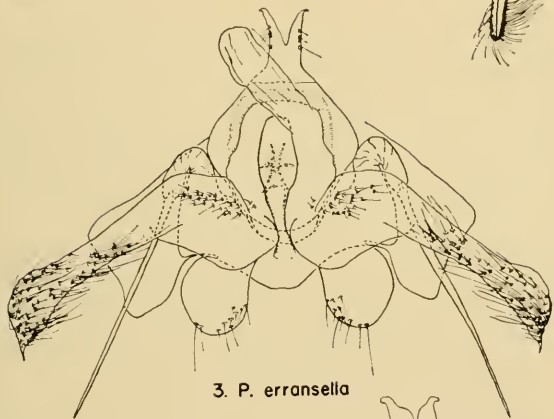
Description.—Head, thorax and forewings fuscous-brown with bronze reflections. Antennae lacking pecten. Forewings: a black spot at one-third on fold;



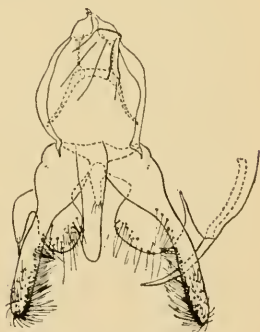
1. *P. ricina*



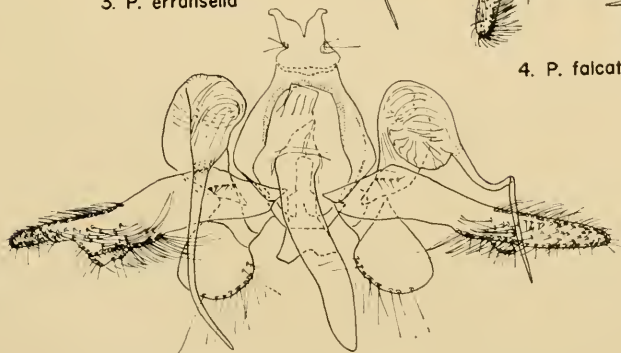
2. *P. latris*



3. *P. erransella*



4. *P. falcata*



5. *P. battis*

Male genitalia of *Perimede* species. Fig. 1, *P. ricina* Hodges; fig. 2, *P. latris* Hodges; fig. 3, *P. erransella* Chambers; fig. 4, *P. falcata* Braun; fig. 5, *P. battis* Hodges.

one at one-half on middle of wings, followed by a few white scales; one at two-thirds on middle of wings, preceded by a few white scales; and one at apex, preceded by a few white scales; a costal and a dorsal patch of white scales at three-fourths; a preapical costal patch of white scales; cilia concolorous with wing to tornus, paler dorsally; outer half of cilia along outer margin white. Hindwings fuscous-brown, apex dark brown, cilia buff-brown. Undersurface of wings dark apically. Legs buff-white overlaid with fuscous-brown; metathoracic femur buff-white, dark brown basally and apically; metathoracic tibia dark brown basally, fuscous-brown on outer surface, a subbasal, medial, and apical pale streak; metathoracic tarsal segments buff-white. Abdomen fuscous-brown, several buff-white scales ventrally. Male genitalia: as in figure 4 (R.W.H. slide no. 635). Female genitalia: as in figure 9 (R.W.H. slide no. 634). Alar expanse: 8-14 mm.

Type.—Collection of Annette F. Braun.

Type locality.—Cincinnati, Ohio.

Specimens examined.—

CONNECTICUT: 3 m, 1 f, East River, July 8 through August 2 (Chas. R. Ely), [USNM, LACM]. FLORIDA: 1 m, Archbold Biological Station, Highlands Co., March 29, 1959 (R. W. Hodges), [RWH]; 1 m, Gulf Coast Exp. Sta., Bradenton, March 17, 1956 (E. G. Kelsheimer), [CPK]; 1 m, 3 f, Homestead, February 10-28, 1959 (D. O. Wolfenbarger), [CPK, RWH]; 2 m, Royal Palm St. Park, March 18, 1939 (J. C. Bradley), [CU]; 17 m, Siesta Key, Sarasota Co., February 10 through December 30 (C. P. Kimball), [CPK, CU, RWH]. ILLINOIS: 5 f, Putnam Co., June 25 through August 10 (M. O. Glenn), [MOG, RWH]. KENTUCKY: 1 m, no further data (Aug. Busek), [LACM]. MARYLAND: 1 f, Plummer's Island, July 1903 (Aug. Busek), [USNM]. MASSACHUSETTS: 12 m, Barnstable, June 23 through July 18 (C. P. Kimball), [CPK, RWH]. NEW YORK: 1 f, Fishers, July 21, 1933 [ABK]; 1 m, 1 f, Ithaca, July 1 through August 3 (W. T. M. F.), [CU]. PENNSYLVANIA: 4 m, 1 f, Pittsburgh, June 12 through July 16 (Henry Engel), [AFB, LACM, USNM].

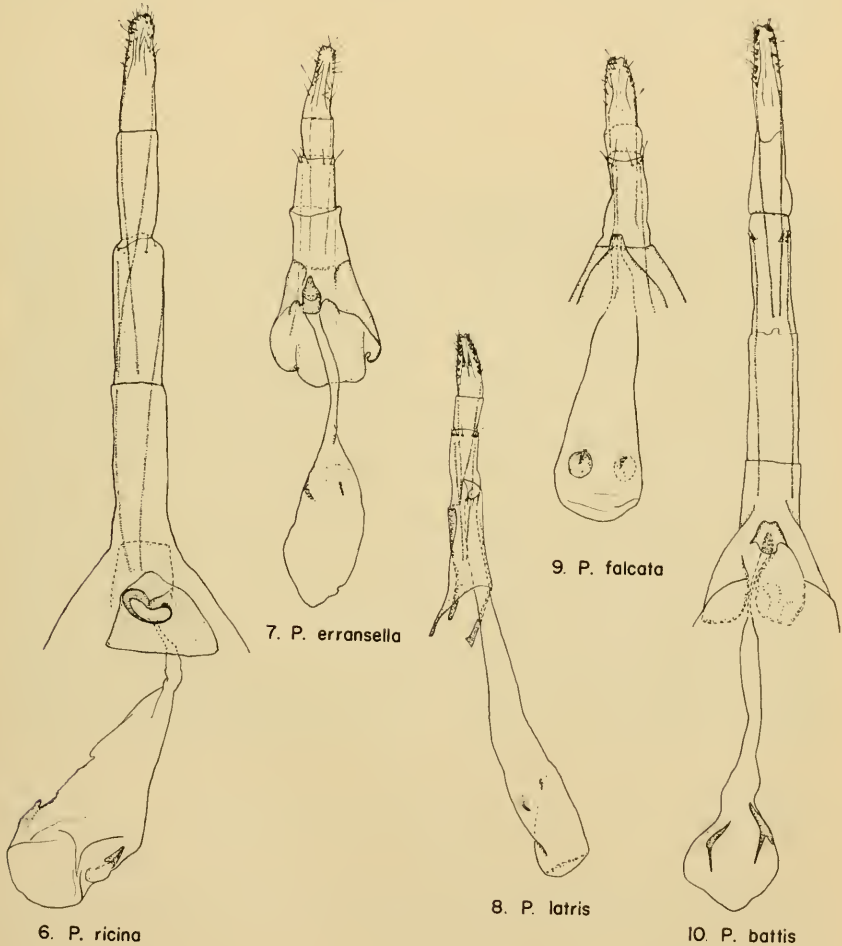
***Perimede ricina*, new species**

(Figs. 1, 6)

Description.—Head, thorax and forewings fuscous-brown with bronze reflections. Antenna lacking pecten. Forewings: a black spot at one-third on fold; one at one-half on middle of wing, followed by a few white scales; one at two-thirds on middle of wings, preceded by a few white scales; and one at apex, preceded by a few white scales; a costal and a dorsal patch of white scales at three-fourths; a preapical costal patch of white scales; cilia concolorous with wing to tornus, paler dorsally; outer half of cilia along outer margin white. Hindwings fuscous-brown, apex dark brown, cilia buff-brown. Under surface of wings dark apically. Legs buff-white overlaid with fuscous-brown; metathoracic femur buff-white, dark brown basally and apically; metathoracic tibia dark brown basally, fuscous-brown on outer surface, a subbasal, medial, and apical pale streak; metathoracic tarsus with third and fourth segments unicolorous, apices of first, second and fifth segments buff-white. Abdomen fuscous-brown, several buff-white scales ventrally. Male genitalia: as in figure 1 (R.W.H. slide no. 1067). Female genitalia: as in figure 6 (R.W.H. slide no. 632). Alar expanse: 10-14 mm.

Holotype.—Female, Ithaca, New York, July 31, 1922 (W. T. M. F.), (R. W. H. slide no. 332), [Cornell University Type No. 3825].

Paratypes.—ILLINOIS: 2m, 1 f, Putnam Co., July 4 through August 10, 1944-1956 (M. O. Glenn), [MOG]. KENTUCKY: 1 m, nr. Ezel, Morgan Co., July 17, 1935 (Amette F. Braun) [AFB]. MASSACHUSETTS: 1 m, 1 f, Barnstable, July 12 and 15, 1949 (C. P. Kimball), [CPK, RWH]; 2 f, Martha's Vineyard, July 23 (F. M. Jones), [USNM]. NEW YORK: 1 m, Ithaca, August 8, 1924 (W.T.M.F.), [CU]; 1 m, Ithaca, July 30, 1959 (D. R. Davis), [DRD];



Female genitalia of *Perimede* species. Fig. 6, *P. ricina* Hodges; fig. 7, *P. erransella* Chambers; fig. 8, *P. latris* Hodges; fig. 9, *P. falcata* Braun; fig. 10, *P. battis* Hodges.

1 m, no further data (Beutenmueller), [USNM]. OHIO: 1 f, Hazelwood, September 7, 1920 (Annette F. Braun), [ΔFB].

Discussion.—*Perimede ricina* is superficially very close to *falcata*; however, the third and fourth metathoracic tarsal segments being unicolorous in *ricina* will separate the two species. In the male genitalia the valvae of *ricina* are more slender than those of *falcata*, and they become broad more abruptly toward the base in the former species than they do in the latter one. In the female genitalia of *ricina* the ostium bursae is slightly posterior of the middle of the seventh abdominal sternum; the ostium bursae of *falcata* is terminal on the seventh abdominal sternum.

***Perimede latris*, new species**

(Figs. 2, 8, 14)

Description.—Tongue white basally, fuscous distally. Maxillary palpus white. Labial palpus white, outer surface of first and second segments fuscous. Face and vertex white; a row of fuscous scales before each eye. Antenna with pecten present, fuscous. Thorax buff-white overlaid with fuscous. Legs white overlaid with fuscous-brown; metathoracic tibia dark brown basally, buff-white subbasally, medially, and apically; tarsal segments fuscous, apices of first four segments and all of fifth buff-white; tibial spurs buff-white, apices darker. Forewings buff-white heavily overlaid with fuscous; a black spot on fold at one-third; one at middle of wing at one-half, followed by a few white scales; one at middle of wing at two-thirds, preceded by a few white scales; and one at apex, preceded by a few white scales; a costal white spot at three-fourths; and another just before apex; a subdorsal white spot at five-sixths; cilia fuscous to tornal area, paler dorsally. Hindwings fuscous-purple, apex black, cilia pale fuscous-buff. Apices of wings black on undersurfaces. Abdomen fuscous-brown intermixed with white scales. Male genitalia: as in figure 2 (R.W.H. slide no. 613). Female genitalia: as in figure 8 (R.W.H. slide no. 627). Alar expanse: 7-10 mm.

Holotype.—Male, Madera Canyon, 4880 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, July 24, 1959 (R. W. Hodges), [Cornell University Type No. 3826].

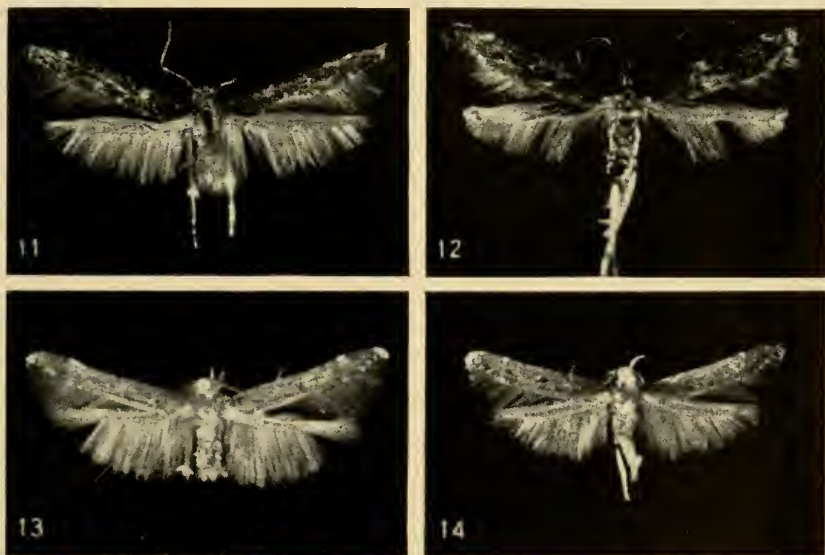
Paratypes.—10 m, 10 f, same locality as type, dates from July 24 through August 22, 1959 [British Museum (N. H.), CU, RWH, USNM].

Discussion.—On the basis of maculation *latris* is very close to *battis*; however, the outer surface of third segment of the labial palpus being white in *latris*, as contrasted with fuscous in *battis*, will separate the two species. The male genitalia of *latris* differ from those of *battis* in the following characters: the spines of the valvae of *latris* are symmetrical; those of *battis* are asymmetrical. The aedeagus of *latris* becomes broad a short distance before the apex, that of *battis* tapers gradually to the apex. The width of the valva at one-half the length is one-fifteenth the length in *latris*; in *battis* this ratio is two-fifteenths. In the female of *latris* the seventh sternum is asymmetrical; the seventh sternum of *battis* is symmetrical.

Perimede battis, new species

(Figs. 5, 10, 13)

Description.—Tongue white basally, fuscous distally. Maxillary palpus white. Labial palpus fuscous, inner surface of second and base of third segments white. Face white with blue reflections, a row of fuscous scales in front of each eye; vertex pale fuscous. Antenna with pecten present, fuscous. Thorax buff-white overlaid with fuscous. Legs white overlaid with fuscous-brown; metathoracic tibia dark brown basally, buff-white subbasally, medially, and apically; tarsal segments fuscous, apices of first four segments and all of fifth buff-white heavily overlaid with fuscous; a black spot on fold at one-third; one at middle of wing at two-thirds, preceded by a few white scales; and one at apex, preceded by a few white scales; a costal white spot at three-fourths; and another just before apex; a subdorsal white spot at five-sixths; cilia fuscous to tornal area, paler dorsally. Hindwings fuscous-purple, apex black, cilia pale fuscous-buff. Apices of wings black on undersurface. Abdomen fuscous-brown intermixed with white



Perimede species. Fig. 11, *P. erransella* Chambers, Ithaca, New York; fig. 12, *P. falcata* Braun, Putnam Co., Illinois; fig. 13, *P. battis* Hodges, Madera Canyon, Santa Rita Mountains, Arizona; fig. 14, *P. latris* Hodges, Madera Canyon, Santa Rita Mountains, Arizona.

scales. Male genitalia: as in figure 5 (R.W.H. slide no. 612). Female genitalia: as in figure 10 (R.W.H. slide no. 624). Alar expanse: 7-10 mm.

Holotype—Male; Madera Canyon, 4880 feet, Santa Rita Mountains, Santa Cruz Co., Arizona, September 17, 1959 (R. W. Hodges), [Cornell University Type No. 3827].

Paratypes.—27 m, 41 f, same locality as type, dates from July 20 through September 13, 1959 [British Museum (N. H.), CU, RWH, USNM]; 2 f, same data as type except for elevation, 5600 feet, August 1, 1959 [CU, RWH]; 3 f, Peña Blanca Canyon, Santa Cruz Co., Arizona, August 7 and 8, 1959 (R. W. Hodges), [CU, RWH].

Discussion.—See the comments under *latris* for the characters used to distinguish between *battis* and *latris*.

Grateful acknowledgement is made to the Grace H. Griswold Fund of the Department of Entomology of Cornell University for assuming the cost of engraving the plates.

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- Busck, August.** 1909. Notes on Microlepidoptera, with descriptions of new North American species. Proc. Ent. Soc. Washington, 11: 87-103.
- Hodges, Ronald W.** 1961. A review of the genus *Walshia* Clemens with descriptions of new species (Lepidoptera: Gelechioidea). Bull. Brooklyn Ent. Soc., 56: 66-80.

BOOK REVIEW

THE SIPHONAPTERA OF JAPAN, by Kohei Sakaguti and E. W. Jameson, Jr. Pacific Insects Monograph 3:1-169, illus. Published by Entomology Department, Bernice P. Bishop Museum, Honolulu. Price: \$4.00 bound, \$3.25 unbound (remittance to Pacific Insects, Bishop Museum, Honolulu (17, Hawaii, U.S.A.))

The first 15 and last 17 pages of this excellent monograph include discussions of the ecology, host-specificity, and patterns of evolution and geographic distribution of fleas and their hosts in the Japanese islands. The general discussions are explained by carefully chosen examples from the Japanese fauna which serve to reflect the intelligently planned surveys of Japanese Siphonaptera which have been carried out since 1952 by the authors and many interested colleagues. To emphasize the completeness of these surveys, it should be mentioned that more than 35% of the species of fleas known in Japan were described after 1952.

In the systematic discussions are included keys to the 8 families, 38 genera and 69 species and subspecies of fleas now known to occur in Japan. Diagnostic characters of all the species are illustrated in the beautifully executed drawings. Detailed records of capture occur under each species heading as well as comments on the general host and geographic distribution. Discussion of generic relationships and species-group relationships may be found under the appropriate headings. Species are not described except in the keys.

The authors and editors deserve to be congratulated on the production of a fine addition to the literature on Siphonaptera.

P. T. JOHNSON, *Gorgas Memorial Laboratory, Panama, R. de P.*

THREE NEW ANOPLURA FROM AFRICAN RODENTS

(ANOPLURA: HOPLOPLEURIDAE)

PHYLLIS T. JOHNSON, *Gorgas Memorial Laboratory, Panama*

The three new anopluran species described in this paper represent two common rodent-infesting genera, *Hoplopleura* and *Polyplax*. As well as the new species, the previously unknown male of *Polyplax paradoxa* Johnson is described and illustrated, and notes are included on *Polyplax meridionalis* Johnson.

***Hoplopleura dendromuris*, new species**

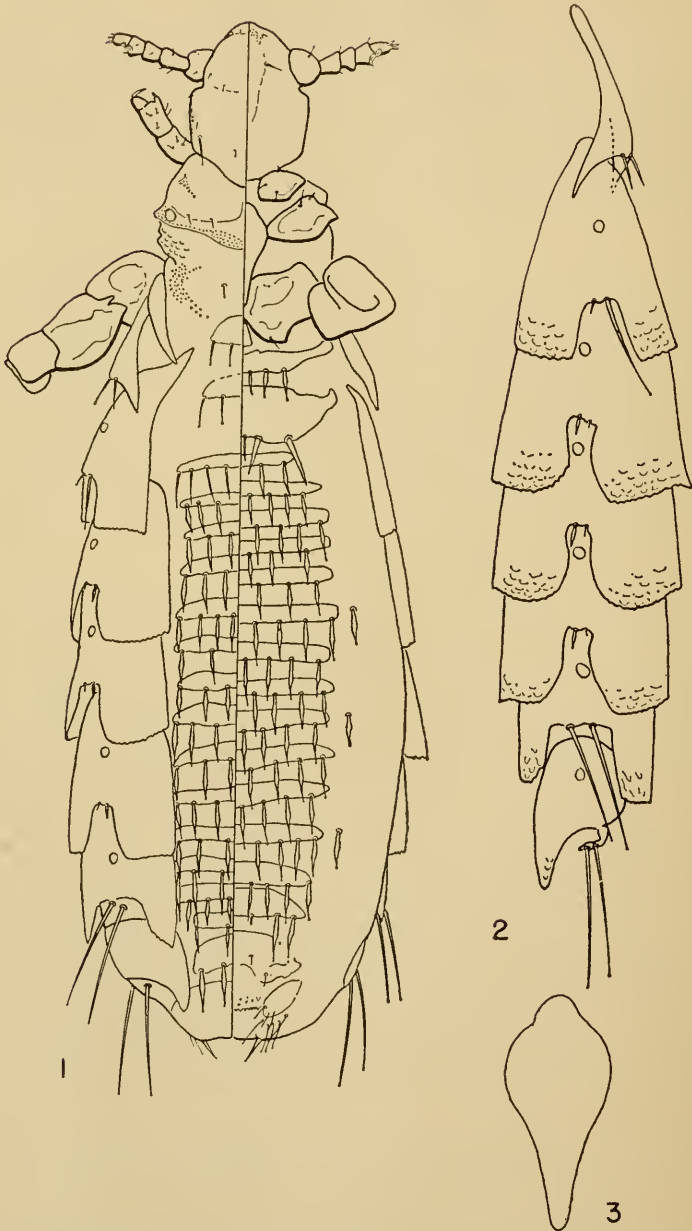
(Figs. 1-3)

Hoplopleura intermedia, Ferris, 1921, Contributions toward a monograph of the sucking lice, pt. 2:91 (*partim*, records from *Dendromus*). Hopkins, 1949, Proc. Zool. Soc. London, 119(2): 484 (records from *Dendromus*). Ferris, 1951, The sucking lice, p. 137 (*partim*, records from *Dendromus*).

Type Data.—Female holotype, two female paratypes from *Dendromus mesomelius insignis*, U. S. N. M. mammal no. 184091 (*Dendromus insignis*), Kaimosi, British East Africa (Kenya). Holotype and one paratype deposited in the collections of the Stanford University Natural History Museum. One paratype deposited in the collections of the U. S. National Museum.

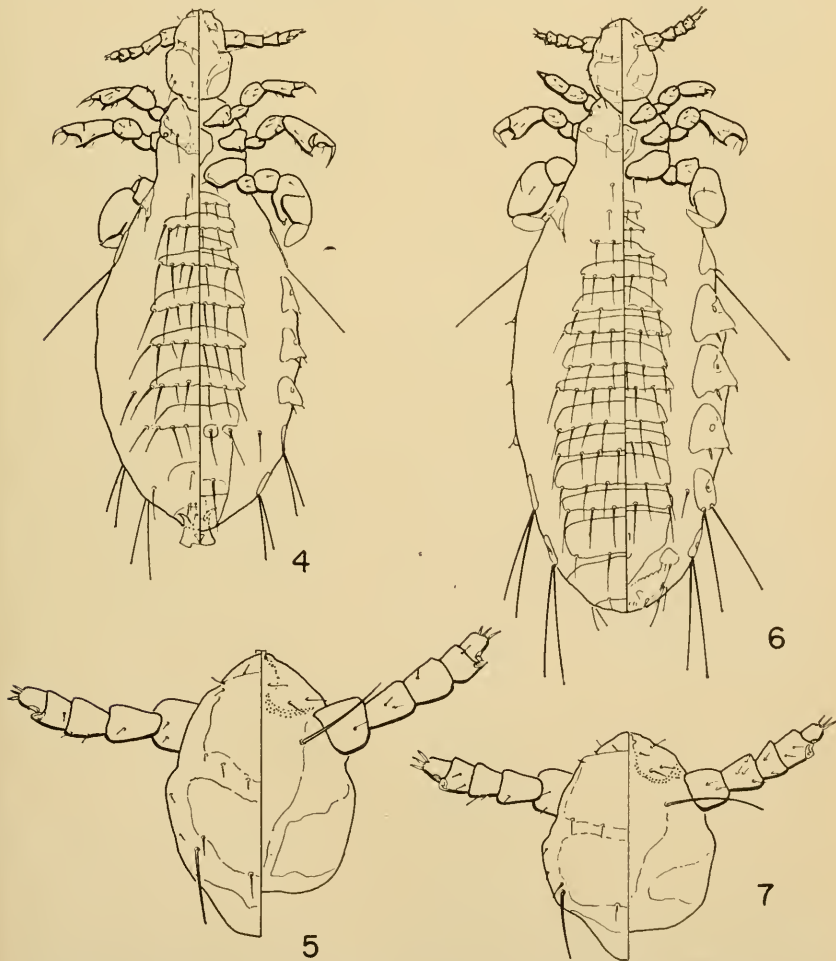
Diagnosis.—*H. dendromuris*, n. sp., like *H. patersoni* Johnson and *H. laticeps* Ferris, forms a connecting link between the *hesperomydis-affinis* group of *Hoplopleura* and the *enormis* group. Like the *enormis* group, *dendromuris* has only very small setae on the thoracic dorsum, but there is no tendency toward subdivision of the apical lobes of the paratergal plates and the thoracic sternal plate is not short and broad. *H. dendromuris*, n. sp., is like members of the *hesperomydis-affinis* group in shape of the thoracic sternal plate and paratergal plates, but differs in having only small setae on the thoracic dorsum. It may be immediately separated from the African members of the *hesperomydis-affinis* group (*intermedia* K. & F., *zelotomydis* Johnson, *inexpecta* Johnson, and *captiosa* Johnson) by lacking large, long setae on the thoracic dorsum, as well as by differences in form and chaetotaxy of the paratergal plates, and type and numbers of setae in the tergal and sternal abdominal rows. Among other differences, *dendromuris* is separable from *laticeps* Ferris by not having the apical lobes of paratergal plates III-VII deeply subdivided, and from *patersoni* Johnson in that *dendromuris* has two apical lobes on plate VII and one on plate VIII.

Description.—*Female* (fig. 1): *Head* less than twice as long as broad, not patterned or rugose dorsally. Lateral postantennal margins straight and parallel. Thorax faintly rugose laterally below spiracles. Mesothorax with two small setae dorsally on either side. Thoracic sternal plate (fig. 3) with posterior half narrowly elongate, posterior apex rounded, width at broadest point (measured in horizontal plane of body) less than half total length. *Legs* as in genus. Parts of some legs



Hoplopleura dendromuris, n. sp., female holotype. Fig. 1, female; fig. 2, paratergal plates; fig. 3, thoracic sternal plate.

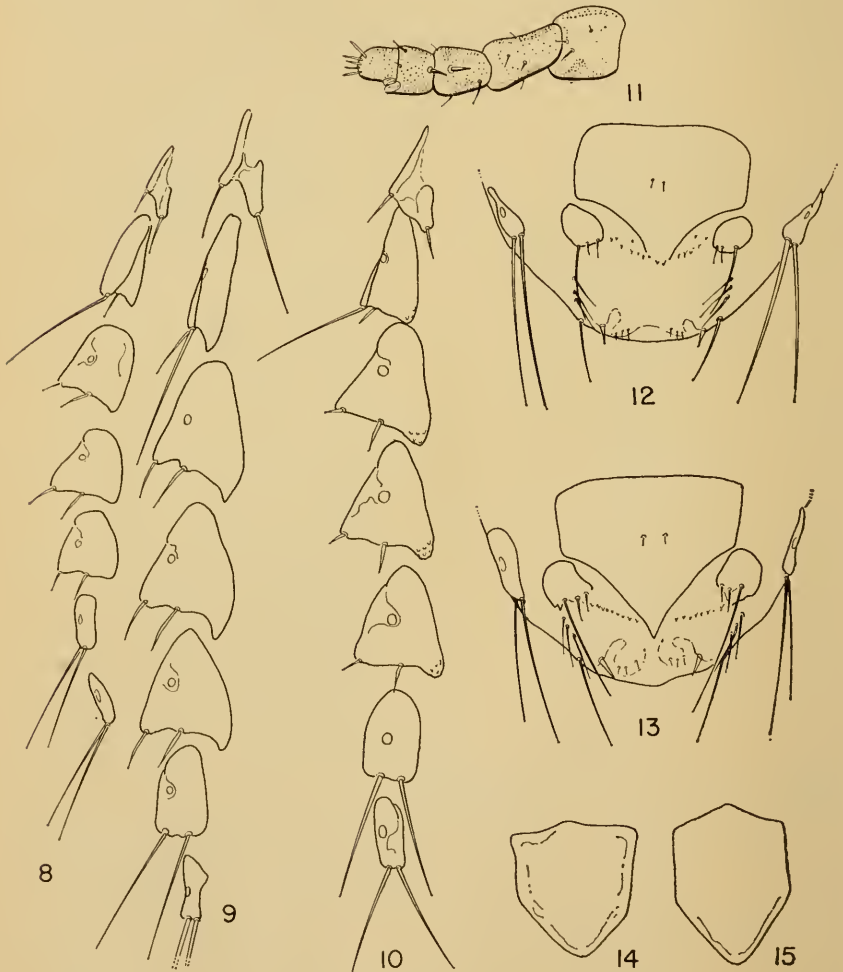
missing in holotype. *Abdomen.* With 16 sternal and 17 tergal plates which bear large setae on posterior margins. Typical plates with setae stout, sword-shaped. No setae off plates dorsally. Ventrally, 3 setae off plates on either side in holotype, 4 in paratypes. Paratergal plates (fig. 2) with apical lobes slightly scaly; seta-bearing portion of plate II with apical angles acute but not elongate, pair of apical setae not extending to apices of lobes; plate III with lobes rectangulate, one long apical seta reaching beyond apices of lobes; other seta very small; plates IV-VI with rectangulate, subequal, apical lobes, pairs of apical setae on each plate small, one of these setae stout, other hairlike; plate VII with narrow, truncate apical lobes and two long apical setae; plate VIII with one narrow,



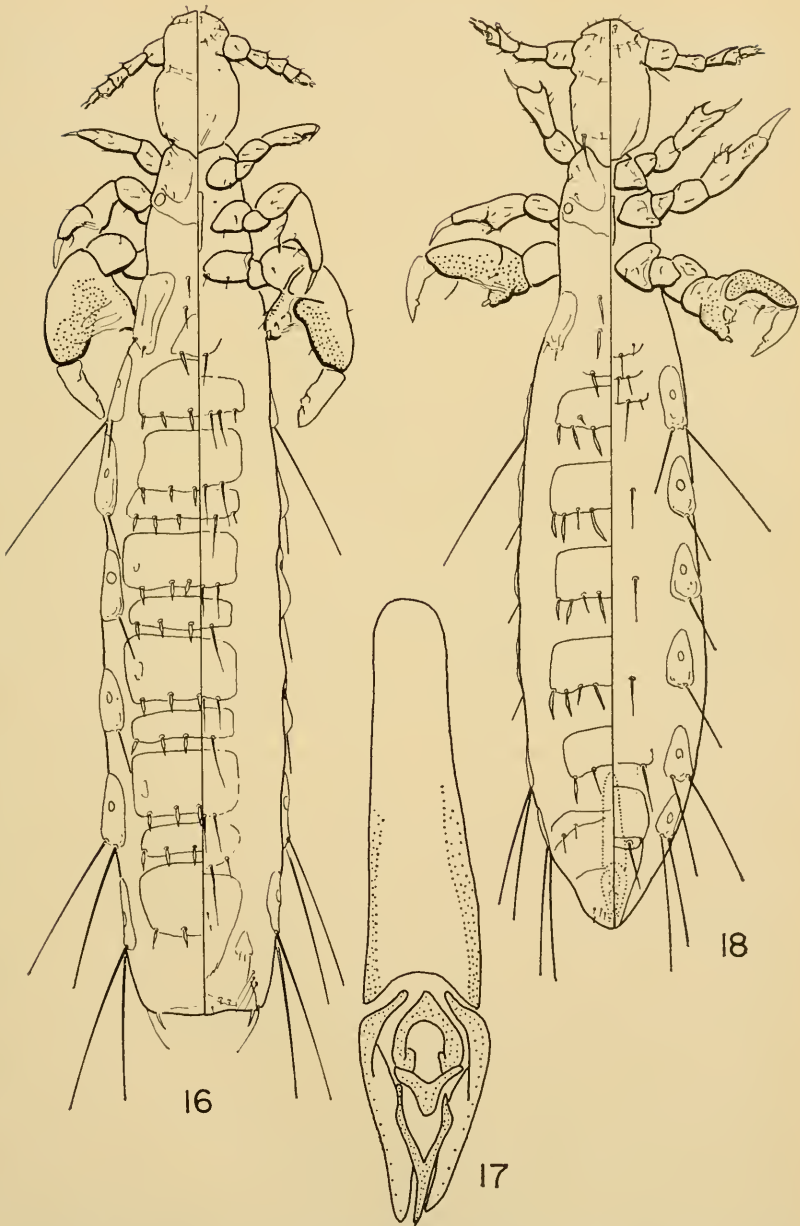
Polyplax paradoxa Johnson. Fig. 4, male; fig. 5, head, female. *Polyplax solivaga*, n. sp, female holotype. Fig. 6, female; fig. 7, head.

rounded dorsal apical lobe which is less than half as long as entire plate, including lobe, with two long apical setae. *Genitalia* not distinctive. *Male* unknown.

Length.—1.0 mm.



Polyptax paradoxa Johnson. Fig. 8, paratergal plates II-VIII, male; fig. 9, same, female; fig. 11, dorsum of antenna, male; fig. 12, genitalia, female; fig. 15, thoracic sternal plate, female. *Polyptax solivaga*, n. sp. Fig. 10, paratergal plates II-VIII, paratype; fig. 13, genitalia, holotype; fig. 14, thoracic sternal plate, holotype.



Polyplax dolichura, n. sp. Fig. 16, female holotype; fig. 17, aedeagus, allotype; fig. 18, male allotype.

***Polyplax solivaga*, new species**

(Figs. 6, 7, 10, 13, 14)

Type Data.—Female holotype, 3 female paratypes from *Rattus chrysophilus* (*Aethomys chrysophilus*), Nwambia Pan, Kruger National Park, Transvaal, 3 August 1959, no. KW-45.

Holotype and one paratype deposited in the collections of the South African Institute for Medical Research. Two paratypes deposited in the collections of the U. S. National Museum.

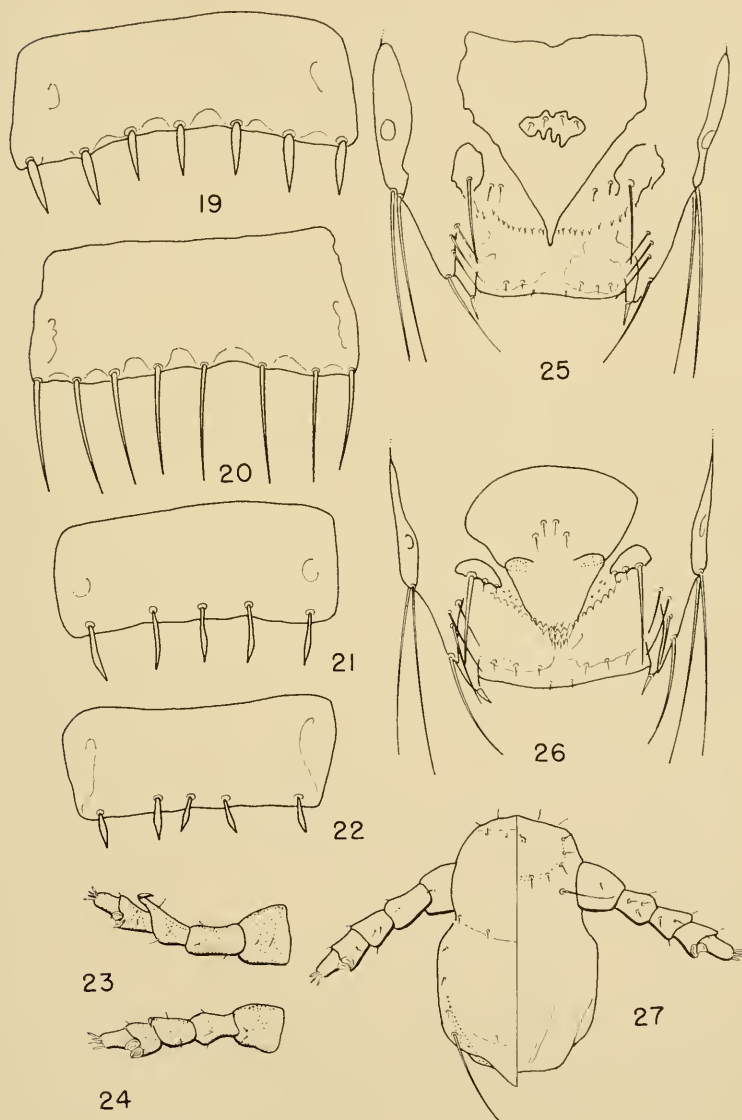
Diagnosis.—A member of the *otomydis* group. Separable in the female from *otomydis* Ferris, *vacillata* Johnson, and *myotomydis* Johnson, in that both the apical setae of paratergal plates IV-VI are much less than half the length of the corresponding plate. Different from *caluri* Johnson in having four marginal setae on the last dorsal abdominal plate. Separated from *cummingsi* Ferris in that the second ventral abdominal plate has only two large setae, and because the sternal and abdominal plates of the abdomen are normal, not reduced. Different from *asiatica* Ferris in that abdominal plates are present. *P. solivaga*, n. sp. is most closely allied to *P. paradoxa* Johnson. It may be separated from *paradoxa* in the female by the following: In *solivaga* the setae on paratergal plates IV-VI are all less than one-third the length of the corresponding plate and the apical lobe is broader and rounder (compare figs. 9 and 10); the thoracic sternal plate is broader and shorter (compare figs. 14 and 15); and the head is also broader and shorter (compare figs. 5 and 7). The genitalia are similar in the two species but *solivaga* has the posterior apex of the genital plate acute (compare figs. 12 and 13).

The female *paradoxa* drawn for comparison with *solivaga*, n. sp., is from *Meriones* sp., 50 mi. E. of Cairo, East Desert Governorate, Egypt, 10 Dec. 1959, IHH 12436.

Description.—*Female* (fig. 6): *Head* (fig. 7) little longer than broad, lacking distinct postantennal angles and occipital angles. Setae on gular plate (ventrally) extending beyond base of second antennal segment. *Thorax* with thoracic sternal plate (fig. 14) almost as broad as long. *Legs* typical of genus. *Abdomen* with tergal and sternal plates normal, not strongly reduced. Second sternal plate with two long posteromarginal setae flanked by one minute seta on either side; last tergal plate with four posteromarginal setae. Paratergal plate II with the two apical setae short, no more than half length of plate; plate III with one apical seta longer than plate, other short and stout, with one rounded, slightly scaly apical lobe; plates IV-VI with single, scaly, rounded, apical lobe, apical setae less than one-third length of plate bearing them, setae stout, of approximately equal size; plates VII-VIII lacking apical angles, with usual long apical setae. *Genitalia* (fig. 13) with apex of genital plate sharply triangulate. *Male* unknown.

Length.—Holotype: 1.1 mm.; paratypes: 1.2 mm.

Ferris (1923) and Bedford (1929) recorded *P. cumminasi* Ferris from *Aethomys chrysophilus* in Zululand and Eastern Transvaal. Johnson (1960) said that the specimens from *Aethomys* might be found to constitute a new species. I have since examined Ferris's



Polyplax meridionalis Johnson, female. Fig. 19, first dorsal plate of sixth abdominal segment; fig. 26, genitalia. *Polyplax oxyrrhyncha* Cummings, female. Fig. 20, first dorsal plate of sixth abdominal segment; fig. 25, genitalia. *Polyplax brachyrrhyncha* Cummings. Fig. 21, first dorsal plate of sixth abdominal segment, female; fig. 24, dorsum of antenna, male. *Polyplax dotichura*; n. sp. Fig. 22, first dorsal plate of sixth abdominal segment, female holotype; fig. 23, dorsum of antenna, male allotype; fig. 27, head, female holotype.

specimens which are supposedly from *A. chrysophilus*, Mfongosi, Zululand (from the Durban Museum), and they appear to be *cummingsi*. Since *cummingsi* and *solivaga* are closely related species, it seems unlikely that the two louse species would share a single host, nor is a joint occurrence on *Aethomys* explainable on geographical grounds. As well, *cummingsi* apparently occurs on species of *Dasymys*, and its normal occurrence on *Aethomys* would be unexpected. Since the data are incorrect on others of the Anoplura Ferris received from the Durban Museum (which I have examined), mislabelling or wrong host identification on the part of the Mfongosi *cummingsi* specimens is possible. Bedford's examples of "*cummingsi*" from Eastern Transvaal may be *solivaga*, n. sp.

***Polyplax paradoxa* Johnson**
(Figs. 4, 5, 8, 9, 11, 12, 15)

Polyplax paradoxa Johnson, 1960, U. S. Dept. Agri. Tech. Bull. no 1211:72.

The description of *paradoxa* was based on the female holotype from *Meriones* sp. and 16 female paratypes from various species of *Meriones* taken in Egypt and Israel. The male was not described. Fortunately, one male of *paradoxa* and several associated females were included in Egyptian material collected during 1959 by Dr. Harry Hoogstraal and his associates of NAMRU-3, Cairo. Collection data are: from *Meriones* sp., 50 mi. E. of Cairo, East Desert Governorate, Egypt, 10 Dec. 1959, HH 12436.

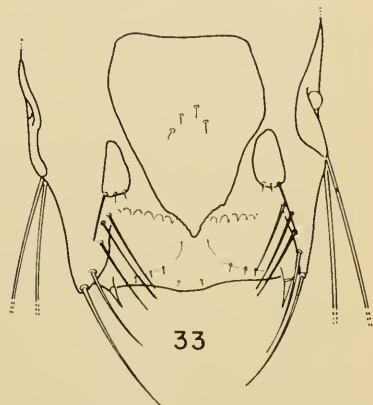
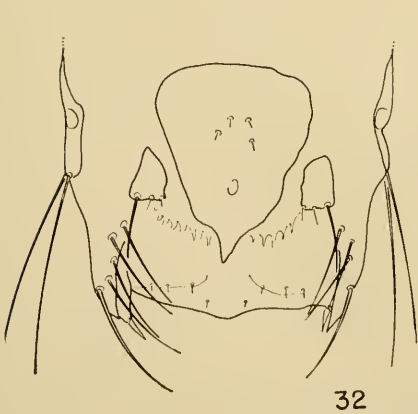
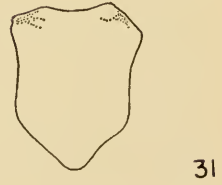
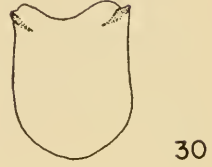
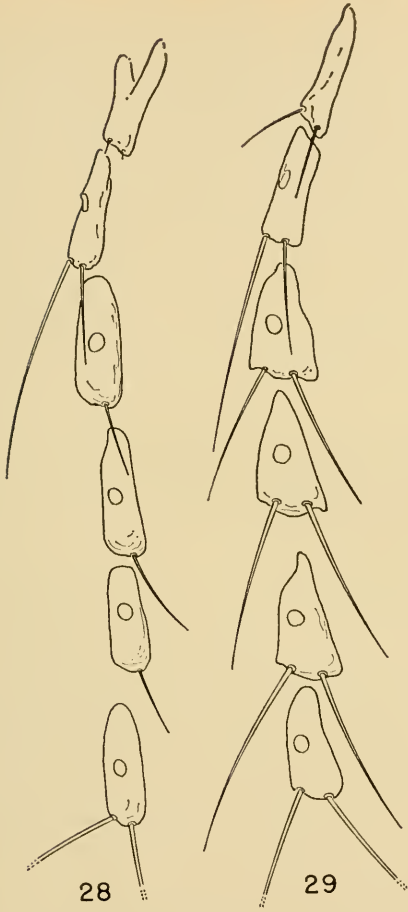
Diagnosis and Description of Male (fig. 4).—Similar to the female except in details of the genitalia and antennae. Paratergal plate setae (fig. 8) are like those of the female but the apical lobes of plates III-VI are not so pronounced. The aedeagus is extended in the only male available and thus cannot be described. *P. paradoxa* is separable in the male from other members of the *otomydis* group for which males are known in one or more of the following: The basal segment of the antenna is not at all enlarged, nor the third and fourth antennal segments modified, though each of these segments bears the usual enlarged seta (fig. 11); the tergal and sternal abdominal plates are normal, not reduced; the thoracic sternal plate lacks an anterior prolongation.

Length.—Male: 1.0 mm.

***Polyplax dolichura*, new species**
(Figs. 16-18, 22, 23, 27, 28, 33)

Type Data.—Female holotype, male allotype, one male, one female, paratypes from *Acomys albigena*, Yabous, Blue Nile Province, Sudan, 22 April 1960, Hoogstraal, Heyneman, and Gaber collectors. Holotype deposited in the collections of the United States National Museum.

Polyplax dolichura, n. sp., female holotype. Fig. 28, paratergal plates II-VII; fig. 33, genitalia. *Polyplax brachyrrhyncha* Cummings, female. Fig. 29, paratergal plates II-VII; fig. 32, genitalia. *Polyplax meridionalis* Johnson, female. Fig. 30, thoracic sternal plate. *Polyplax oxyrrhyncha* Cummings, female. Fig. 31, thoracic sternal plate.



Diagnosis.—Closely allied to *Polyplax brachyrrhyncha* Cummings, with male and female genitalia and head shape much the same in the two species. *P. dolichura*, n. sp., is immediately separable from *brachyrrhyncha* in both male and female in that paratergal plates IV-VI have only one apical seta (compare figs. 28 and 29). Female *dolichura* is further separable in that the setae on the dorsal abdominal plates are very short (compare figs. 21 and 22). In the male *dolichura* differs from *brachyrrhyncha* in that the third segment of the antenna has its distal prolongation more pronounced (compare figs. 23 and 24).

The specimens of *brachyrrhyncha* drawn for comparison with *dolichura*, n. sp., were from *Acomys albigena*, Paloich, Khor Adar, Upper Nile Province, Sudan, 14 April 1960, Hoogstraal et. al. collectors.

Description.—*Female* (fig. 16): *Head* (fig. 27) broadly rounded just before antennae, postantennal angles rounded, postantennal margins parallel, occipital angles slight. *Thorax* longer than broad, thoracic sternal plate narrow, poorly sclerotized. *Legs.* Tibiotarsal segment of third leg enlarged and heavily sclerotized, with corresponding large, rugose claw. *Abdomen* long and slender, sternal and tergal plates present on all segments though faintly sclerotized, especially on venter. Setation as in figure, setae on tergal plates very short, slightly inflated medially, apically acute, none of them as long as length (measured in longitudinal plane of body) of the narrower tergal plate on each typical segment (fig. 22). Setae on sternal plates normal, not especially thick or short. Paratergal plates (fig. 28) lacking free apical angles, plate II with two small apical setae; plate III with one long seta and one seta shorter than plate; plates IV-VI each with single apical seta which is no longer than plate bearing it; plates VII-VIII with usual pair of long apical setae. *Genitalia* (fig. 33) with genital plate roughly triangular; lateral setigerous lobes of eighth segment longest in an anterior-posterior direction, narrowest anteriorly, bearing one long and two short setae on posterior margin.

Male (fig. 18): *Head* as in female except for antennae (fig. 23); third antennal segment strongly modified, anterodistal angle produced into long narrow process which bears apical, enlarged, posterodorsally-directed seta. *Thorax* and *legs* as female. *Abdomen* with setation as in figure, segment 2 with one faint sternal plate, segment 3 with two faint sternal plates, segments 4-6 lacking plates, segment 7 with faint plate, genital plate present but faint. Paratergal plates as in female. *Aedeagus* (fig. 17) with long apically converging parameres which enclose apically acute, narrowly triangular pseudopenis.

Length.—Female holotype: 1.8 mm.; paratype: 2.0 mm.; male allotype: 1.5 mm.; paratype: 1.8 mm.

***Polyplax meridionalis* Johnson**

(Figs. 19, 26, 30)

Polyplax meridionalis Johnson, 1962, Proc. Ent. Soc. Wash. 64(1): 51, figs. 1-3, 5, 7.

The male holotype and female allotype of *meridionalis* Johnson were taken from *Acomys cahirinus*, Bechuanaland Protectorate. Since its

description I have seen two females and one male nymph from *A. cahirinus*, Blantyre, Nyasaland, which are probably *meridionalis*. These specimens were lent to me through the courtesy of Dr. T. Clay of British Museum (Natural History). In most ways these specimens are like the type series but the thoracic sternal plate (fig. 30) is different, being rounded posteriorly rather than angled and thus quite different from the thoracic sternal plate of *P. oxyrrhyncha* Cumings (fig. 31). Other differences from *oxyrrhyncha* (also exhibited by the allotype of *meridionalis*) are found in the female genital segments. In *meridionalis* the genital plate is convex anteriorly and the lateral setigerous lobes of the eighth segment are longest in the horizontal axis of the body (compare figs. 26 and 25). For greater ease in identification of *oxyrrhyncha* and *meridionalis*, I have included comparative drawings of a typical dorsal abdominal plate for each species (figs. 19 and 20).

The specimen of *P. oxyrrhyncha* drawn for comparison with *meridionalis* is from *Acomys dimidiatus*, St. Catherine's Monastery, Sinai, Egypt, 14 May 1953, HH 9354-56.

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ROBERT EVANS SNODGRASS

July 5, 1875—September 4, 1962

Dr. Robert E. Snodgrass, the dean of American insect morphology and Honorary President of this Society, passed away quietly in his sleep on September 4, 1962. A forthcoming issue of the Proceedings will be devoted to his memory.

NOTES ON THE GENUS *ICTERICA* LOEW IN NORTH AMERICA

(DIPTERA: TEPHRITIDAE)

The genus *Ictericia* was established by Loew (1873, Smiths. Misc. Collect. 256, Pt. III: 287) for two very closely related and rather rare North American tephritid species which have in common a narrow, blunt wing, vein R_{4+5} with slender bristles dorsally, body and legs yellow with few dark markings, a short, very broad ovipositor, the dorsocentral bristle at the level of the anterior supra-alar, and 3 lower and 2 upper fronto-orbital bristles. Curran (1934, Families and Gen. N. Amer. Diptera, p. 287) keys the genus and illustrates the typical wing pattern. In many respects *Ictericia* resembles *Eurosta* Loew, and is in fact related to that genus, the species of which, however, usually have a greasy appearance and a much darker wing pattern. *Trypeta seriata* Loew was designated the type-species by Coquillett (1910, Smiths. Misc. Collect. 37:555).



Stigmatal areas in wings. Fig. 1, *Ictericia circinata* (Loew); fig. 2, *I. seriata* (Loew).

I. circinata is described in detail by Loew (1873:288) and in all the specimens we have seen is distinguished from *I. seriata* (Loew) (1862, Smiths. Misc. Collect. 8:64) by the pattern in the stigmatal area of the wing (figs. 1 and 2). In gross view the markings around the margin of the wing disk of *seriata* are somewhat darker than those of *circinata*, and the dark anterior margin of the latter contains 3 minute but distinct light spots apicad of the stigma. The types of both species are in the Museum of Comparative Zoology at Harvard College, Cambridge, Massachusetts. *Ictericia fasciata* Adams (1904, Kans. Univ. Sci. Bull. 2: 449) is *Eutreta baccharis* (Coquillett).

To our knowledge *circinata* has been collected only in New York, New Jersey, Michigan, and Wisconsin. The distribution of *seriata* is much more extensive and includes the area bounded by Nebraska, Arizona, Maine, and New Jersey.

G. C. STEYSKAL and RICHARD H. FOOTE, both *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

DESCRIPTION OF THE PUPA OF *CULISETA MELANURA*(DIPTERA: CULICIDAE)¹RICHARD F. DARSIE, JR., EDWARD E. TINDALL and A. RALPH BARR²

It is now well established that *Culiseta melanura* (Coquillett) is involved in the transmission of eastern encephalitis in the eastern United States (Chamberlain *et al.*, 1951; Holden *et al.*, 1954; Burbulis and Jobbins, 1957; Feemster, 1958). Such an important species should be recognizable in all of its stages. The present report is a detailed description of the pupa, previously undescribed.

In this description the setal nomenclature of Barr and Myers (1961) is used. The range, mode and mean number of branches for each hair are listed in Table 1.

***Culiseta (Climacura) melanura* (Coquillett)**

Cephalothorax (Fig. 1).—Ocular setae 1, 2 and 3 usually double or triple, long, and pedunculate; seta 2 subequal to 3 in length; prothoracic setae 4, 6, and 7 long, sometimes pedunculate, generally 2- to 5-branched; seta 6 about as long as 7; 5 3- to 7-branched; mesothoracic setae 8 and 9 long, pedunculate, generally 4- to 5-branched; metathoracic setae (Fig. 3) 10 and 11 long, with an average of 8 and 5 branches respectively; 12 pedunculate, long, 2- to 4-branched.

Respiratory Trumpet (Fig. 2).—Base narrow, widening toward apex; surface distinctly reticulate, with a small tracheoid patch near base; 0.35 to 0.51 mm. long; averaging 2.14 times as long as pinna and 2.85 times as long as its greatest diameter.

Abdomen (Fig. 3).—Reticulation on segment 1 between float hairs usually present and distinct, but with thin lines; *Hair 0* absent on I; single, usually minute, anterior on II-VIII. *Hair 1* a well developed float hair on I; long, usually 10- or 11-branched on II; long, 4- to 10-branched on III-IV; 2- to 6-branched on V to VII; absent on VIII. *Hair 2* single, medium to long on I and II; minute to small on III-VII; absent on VIII. *Hair 3* short on I-III, longer on IV-VII; with 3-5 branches on I; 1-5 branches on II; usually double on III-IV; 2-4 branches on V-VII. *Hair 4* long, sometimes pedunculate; usually 4- to 6-branched on I-IV; double or triple on V-VIII. *Hair 5* short on I, medium to long, sometimes pedunculate on II-VII, somewhat stout on IV-VII; usually 4- to 6-branched on I to III; long, usually 4- to 8-branched on IV to VII. *Hair 6* single, very long on I; long on II-VI, medium on VII; 1- to 4-branched on III-IV; 1- to 3-branched on V-VI; usually 4- to 6-branched on VII; absent on VIII. *Hair 7* dorsal on I, lateral on II, long, 1- to 5-branched on I and II; ventral, small to medium, pedunculate, generally 2- to 4-branched on III-V; long, single on VI

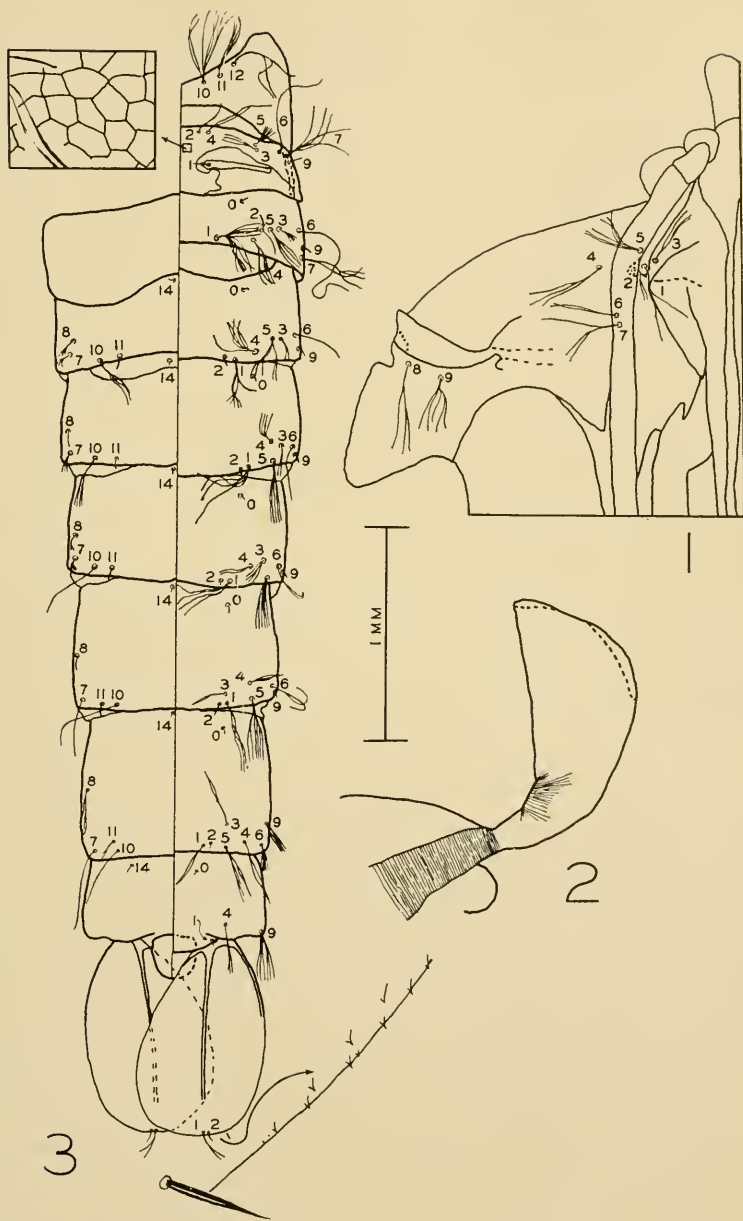
¹Published as Miscellaneous Paper No. 415 with the approval of the Director of the Delaware Agricultural Experiment Station. Publication No. 317 and Scientific Article 333 of the Department of Entomology, January, 1962.

²Associate Professor and Research Fellow respectively, Department of Entomology, University of Delaware; and Supervisor of Vector Research, Bureau of Vector Control, California Department of Public Health, Fresno, California. The authors are indebted to Dr. Harold C. Chapman of the United States Department of Agriculture, University Station, Reno, Nevada, for furnishing some of the material used in this study.

Table 1. Record of the branching of the setae on the pupae of *Culiseta melanura*.

Seta	Range	Mode*	Average	Seta	Range	Mode*	Average
Cephalothorax				Abdomen IV (Cont'd)			
1	1-4	2	2.1	5	4-9	6:8	6.8
2	1-4	2	2.3	6	2-4	2:3	2.6
3	1-4	3	2.9	7	1-5	2:1	2.1
4	2-5	3	3.4	8	1-3	1	1.3
5	3-7	5	4.9	9	1	1	1
6	2-5	3:2	2.8	10	1-4	2	2.2
7	2-5	3:4	3.5	11	1	1	1
8	2-6	4	3.9	Abdomen V			
9	3-7	5:4	4.7	1	2-6	4:5	4.9
Methathorax				2	1	1	1
10	5-10	8:7	8.2	3	3-5	3:4	3.6
11	3-8	5:4	5.2	4	1-4	2	2.2
12	2-4	3	3.3	5	3-8	6:8	6.4
Abdomen I				6	1-3	3	2.4
2	1	1	1	7	1-5	3:4	3.3
3	3-5	4	3.9	8	1-2	1	1.2
4	2-7	5:4	4.3	9	1	1	1
5	3-6	4:5	4.4	10	1-2	1	1.1
6	1	1	1	11	1	1	1
7	1-5	4	3.9	Abdomen VI			
9	1-2	1	1.2	1	2-5	4:3:5	3.9
Abdomen II				2	1	1	1
1	6-14	11:10	11.2	3	1-3	2	2.1
2	1	1	1	4	2-4	3:2	2.8
3	1-5	1	1.6	5	4-9	5:7:8	6.6
4	3-10	6	5.4	6	1-3	3	2.6
5	3-8	5:4	4.9	7	1	1	1
6	1	1	1	8	1-2	1:2	1.5
7	1-5	1:4	2.7	9	1	1	1
9	1	1	1	10	1	1	1
Abdomen III				11	1	1	1
1	5-10	7	7.4	Abdomen VII			
2	1	1	1	1	2-4	3	2.9
3	1-5	2	1.9	2	1	1	1
4	4-9	5:6	5.8	3	1-4	2	2
5	4-9	5:6	6.2	4	1-4	2	2
6	1-4	3	2.6	5	3-6	5:4	4.8
7	1-4	2	2.5	6	2-7	4:5:6	5.1
8	2-5	3	3.1	7	1	1	1
9	1	1	1	8	2-4	2:3	2.9
10	1-4	2:3	2.1	9	4-7	5	5.5
11	1	1	1	10	1	1	1
Abdomen IV				11	1-2	1	1.3
1	3-9	5:6	5.9	Abdomen VIII			
2	1	1	1	4	1-3	2	2.4
3	1-3	2	1.7	9	6-10	?	8.5
4	3-4	4	3.7	Paddle			
Abdomen V				1	1-3	1:2	1.7
Abdomen VI				2	1	1	1

*Mode—Represents 50 percent or more of the hairs counted.



Pupa of *Culiseta melanura* (Coquillett). Fig. 1, portion of cephalothorax; fig. 2, respiratory trumpet; fig. 3, metathorax and abdomen (dorsal—right; ventral—left. Drawn from a ♀ collected in Orlando, Florida, Feb. 10, 1955, by H. C. Chapman.

and VII. *Hair 8* absent on II; medium, usually 3-branched on III and VII; generally single on IV-VI. *Hair 9* minute to small; sometimes double on I: single on II-VI; long, 4- to 7-branched on VII; long, 6- to 10-branched on VIII. *Hair 10* absent on II; long, pedunculate, 2- to 3-branched on III-IV; long and single, seldom 2-branched on V-VII. *Hair 11* absent on II; small and single on III-VI; small to medium, sometimes pedunculate, 1- to 2-branched on VII. *Hair 14* absent on II; single, minute, medio-anterior on III-VII; single and small, displaced laterally on VIII. Segment IX with small hair (1) near posterior corner.

Hypopygium.—With prominent, dark spicules ventrally in both sexes.

Paddle (Fig. 3).—Ovoid, submarginal denticles present on apical one fourth of border; surface smooth, midrib not reaching apex; terminal seta 1 medium, often pedunculate, single or double; accessory seta 2 small and single; index 1.39-1.74, averaging 1.58.

The description is based on the following specimens: NEW HAMPSHIRE, 7 ♀♀ and 1 ♂ from Center Harbor (in poor condition); CONNECTICUT, 1 ♀ and 2 ♂♂ presumably from that state (R. D. Wallis); NEW JERSEY, 2 ♂♂ from Lahaway (Brakeley), 2 ♀♀ from Mays Landing (H. C. Chapman), FLORIDA, 9 ♀♀ and 2 ♂♂ from Orlando (H. C. Chapman).

The pupa of *C. melanura* can be distinguished from all other known Nearctic *Culiseta* pupae by the presence of a second apical seta on the paddle. A key to all the known Nearctic *Culiseta* pupae will be published in the near future by one of us (Barr, 1962) and the reader is referred to this work for identification of the group. It also contains a discussion of the generic concept of *Culiseta* pupae.

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NEW NORTH AMERICAN TABANIDAE. XVI. A NEW SPECIES FROM
THE SOUTH TEXAS GULF COAST

(DIPTERA)

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Spring collecting by Dr. Richard B. Eads on the south coast of Texas has disclosed what is apparently a new, preinictive but uncommon element in the common *Tabanus nigrovittatus* complex, a group of horseflies called "green-heads" that is well-known and often pestiferous in the eastern United States. The new form adds to the complexity of this expanding group of Nearctic flies and likely will be found farther south along the gulf coast of Mexico. Its present known geographic isolation is analogous to that of *T. texanus* Hine (1907) with which it flies, and the 2 probably have had a recent evolutionary derivation from common ancestry.

Tabanus eadsi, new species

(Figs A, B)

A medium-sized fly with lined, red-sided abdomen, bicolored legs, brown costal cell and single eye stripe, related to *T. quinquevittatus* Wiedemann but the costal cells darker, antennal scapes not quite as thickened, frons and callosity of female broader, and upper eye facets of male coarser, a little more extensive. Beard and pleural pile straw yellow, palpi darker yellow.

Holotype ♀, 11 mm. Eyes bare with a single purple eye stripe on green ground (relaxed). Frons yellow pollinose and short pilose, bowed in middle and a little narrowed below as figured, index 1:3.4; callosity piecise, subquadrate with rounded corners, sinuate across top, narrowly separated from eyes and from lanceolate median callus, a very slender, dark median line below vertex. Subcallus and upper cheeks buff-yellow pollinose. Face and lower cheeks pale buff, sparsely yellow hirsute. Antennae red, the style sharply black (2 apical annuli missing), plate shallowly excavated; scape black-haired, not taller than pedicel or plate. Palpi deep yellow, somewhat thickened and with black and yellow hairs basally, but gradually tapered not slenderized apically, blunt with mostly yellow hairs apically.

Notum and scutellum sparsely buff pollinose over blackish integument, with sparse short yellow and black hairs, and indistinctly lined anteriorly; antearal tubercles pale reddish, black-haired; pleura buff pollinose with pale yellow pile. Fore coxae, femora and apical halves of fore tibiae blackish with mostly black hairs; remainder of tibiae contrasting orange-red, darkened at apices of two hind pairs, with concolorous hairs. Wings hyaline, costal cells brown, venation normal. Halteres orange yellow.

Abdomen with two continuous, regular, dark, black-haired submedian, longitudinal stripes enclosing a subparallel-sided, buff-gray, yellow-haired stripe, the sides of the first 3 tergites broadly brick-red and yellow-haired, the remainder darkened. Venter reddish on first 3 sternites, and incisures of the remainder, a mesal black spot on the first 2 not reaching hind margin of the second; darkened on sides of sternite 3 and thence caudad.

Allotype ♂, 10.5 mm. Like the female except for the usual sex differences. Head enlarged, wider than thorax, area of coarsely enlarged facets occupying the

upper two-thirds and rolled over the occipital margin, eliminating the post-ocular rim seen in the female. Antennal scapes likewise slender. Apical palpal segment long oval, not produced anteriorly.

Both from salt grasses bordering Boca Chica beach on Brazos Island at south tip of Padre Island, Cameron Co., Texas, 4 April 1961. R. B. Eads. In collection of the author through courtesy of the collector. A paratype female, same data, in collection of R. B. Eads, and another same locality but 17 April. A paratype male in collection CBP, in essential agreement with allotype from "Galveston, Texas, May, F. H. Snow" (same data as for types of *T. texanus* Hine), and one in collection L. L. Pechuman from the beach "7 mi. W. Sabina Pass, Tex., 6.V.58, Evans & Flint." A pair also from Galveston, 10 June 1917, J. M. Aldrich in the U. S. National Museum. The Galveston specimens have few to no black hairs apically on fore coxae.

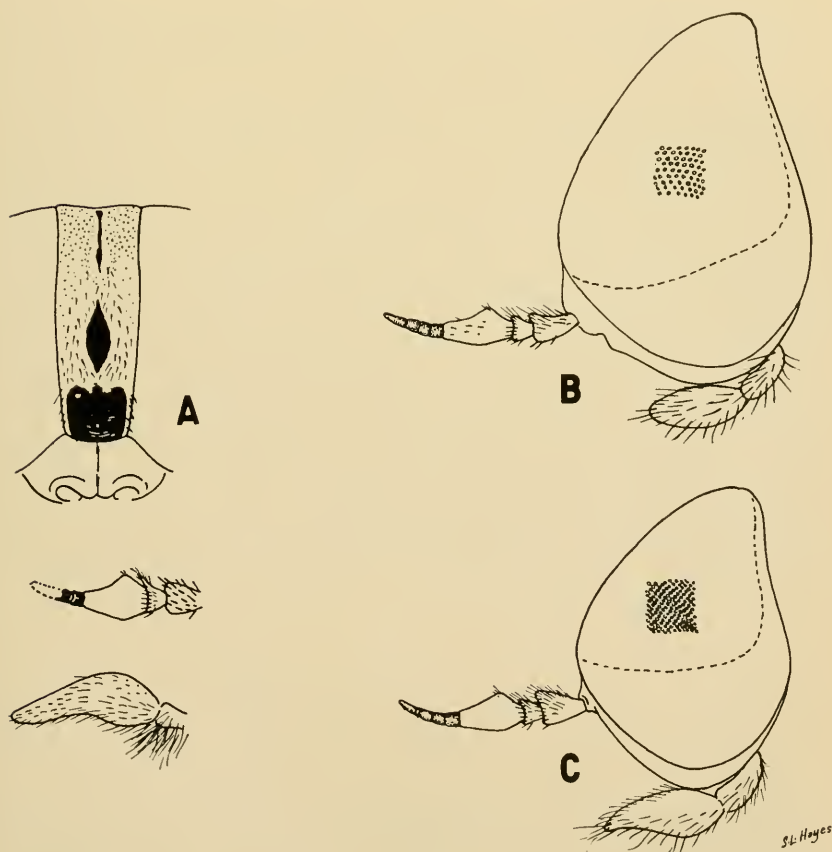
While *T. texanus* Hine, of which Eads has also taken 4 males and many females in the vicinity of Brownsville, including Brazos Island, has considerable resemblance to the above, the dark abdominal lines in both sexes (including sides of tergites 2 and 3, unlike *eadsi*) are consistently broken into quadrivittate rows of crescentic dashes seldom reaching the hind margins of the tergites; the pale median line is thus composed of a row of distinctly truncated triangles. The general abdominal color is yellowish gray, the more yellowish antennal plate often has a dark lateral line, the paler palpi are more attenuated in the females and less rounded or often pointed apically in the males, while the scapes in the latter sex are a little more enlarged.

Like the more common *T. texanus*, *T. eadsi* appears to be a geographic segregate from the *nigrovittatus-quinquevittatus* complex on the Texas Coast with some analogy to the smaller, more grayish *T. cayensis* Fairchild of the Florida keys.

Because the syntype male and female of *T. texanus* at Ohio State University carry the same Galveston printed labels and pins as one paratype male of *T. eadsi* above, and were all apparently collected together, the types at Ohio State University were borrowed through courtesy of Professor J. N. Knull for re-study. Both syntypes agree with the present concept of *T. texanus* and the male differs from *T. eadsi* as described above. The female is herewith designated as lectotype which is in conformity with the sex reported by Stone (1938) as "type." It is yellower, especially in the femora, because of age and mild greasing, than any of the considerable series taken by Eads near Brownsville, or than 2 other females I have from Galveston, one from the original Snow series. The palpi are almost entirely white-haired in the type of *T. texanus*. Only one of the four males taken by Eads has palpi as pointed apically as the syntype male, and only one other has a similar, moderate dark blotch in the middle of sternite 4. But these are only minor variations.

Because of the yellowish beard and pleural pile, *T. eadsi* relates to *T. quinquevittatus* Wiedemann more closely than to *T. nigrovittatus* Macquart in spite of its coastal location. The somewhat wider, bowed

fronts with subquadrate callosities and black coxal hairs in the females are distinctive, as are the darker costal cells. *T. nigrovittatus* var. *fulvilineis* Philip is a more eastern, though coastal, form with white beard and pleural pile, pale palpi, yellow median stripe, yellow venter and often femora, while the noncoastal *T. quinquerittatus* is more yellowish with the same ventral dark suffusion but narrower fronts with taller callosities and palpi more slenderized apically in the females. That *fulvilineis* does reach Texas, however, is attested by a pair from a series taken as prey of *Bembex* wasps by Howard E. Evans in June, 1956, on the beach 17 miles west of Sabine Pass, and forwarded to me by L. L. Pechuman. Further collecting may reveal that *T. cadsii* is an earlier spring form.



Tabanus cadsii, n. sp., Cameron Co., Texas. Fig. A, frons, antenna, and palp; fig. B, profile of head, male, compared with that of *T. nigrovittatus* Macq., Stratford, Conn. (fig. C).

S. L. Hayes

In Stone's (1938) keys to both sexes of *Tabanus*, *T. cadsii* would run to *T. vicarius* Walker (= *quinquevittatus* Wied.) but would separate there as indicated above.

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A NEW RECORD FOR PARASIMULIUM FURCATUM MALLOCH

(DIPTERA: SIMULIIDAE)

Parasimulium furcatum was described by Malloch in 1914 from a single poor specimen from Humboldt County, California. This specimen was restudied by Knab (1915, Ins. Insc. Mens. 2: 177-180) and Stone (1941, Proc. Ent. Soc. Wash. 43: 146-149). Trips to the type locality by several collectors failed to discover more specimens. Now two more males have been found among undetermined Simuliidae in the Melander Collection at the U. S. National Museum. The data for both these are Viento, Oregon, July 1, 1917, A. L. Melander. This locality is on the Columbia River in Hood River County.

External characters not noted in the type specimen because of its poor condition are: Antenna, wing veins, halter, legs, first two abdominal segments, and distimere yellow or yellowish brown; head, thorax, and rest of abdomen dark brown; a pronounced bulla behind the eye as found in *Gymnopais* Stone; submedian fold of wing unforked and fading out toward wing margin.

Although this fly is unusual, I would still retain it in the subfamily Prosimuliinae as type of the tribe Parasimuliini.

ALAN STONE, Entomology Research Division, Agric. Res. Serv., U. S. Department of Agriculture, Washington, D. C.

BOOK NOTICE

GENETICS AND TWENTIETH CENTURY DARWINISM: Cold Spring Harbor Symposia on Quantitative Biology, Volume 24, 321 + xv pages, 138 figures and 2 plates, published by the Biological Laboratory, Cold Springs Harbor, New York. Price \$8.00.

EIGHT NEW SPECIES OF METACHROMA FROM THE WEST INDIES

(COLEOPTERA: CHRYSOMELIDAE)

DORIS H. BLAKE, *Smithsonian Institution, Washington, D. C.*

Five of the following new species of *Metachroma* were collected in Jamaica by T. H. Farr of the Institute of Jamaica. Of the remaining three species, all from the United States National Museum collection, one is from Haiti, one from Oriente Province, Cuba, and one from Nassau in the Bahamas.

***Metachroma nigromaculatum*, n. sp.**

(Fig. 4)

About 4.5 mm. in length, oblong oval, shining, the elytra with striate punctures distinct only in basal half and not over basal callosities, deep reddish brown with darker areas on pronotum, about base of elytra and a large dark area in middle; legs pale with banded femora and tibiae.

Head with interocular space approximately half width of head, head alutaceous over occiput, lower front shiny, frontal tubercles well marked with a median line, reddish brown with darker area in middle of the front. Antennae yellowish or reddish brown, the outer joints deeper in color, slender. Prothorax with rounded sides, slightly contracted over head, smooth, polished, impunctate, reddish brown with an indefinite dark area on each side. Scutellum reddish brown. Elytra with basal callosity smooth, nearly impunctate, the striate punctures only distinct in basal part of elytra, reddish brown with a vittate piceous mark over basal callosity and rather indefinite darker spots below humerus and scutellum, a large dark area beginning at the middle and extending below, connected at the suture. Body beneath reddish brown, the legs yellowish brown, the femora with a dark ring at apical narrowing, the tibiae dark before apex. Length 4.5 mm.; width 2.3 mm.

Type male, U. S. N. M. Type No. 65894, collected at Kinscoff, Haiti, August 2, 1935, by R. E. Blackwelder.

Remarks.—The absence of striate punctation in the apical half of the elytra and the large dark elytral spot are distinguishing characters of this species.

***Metachroma nassauense*, n. sp.**

(Fig. 7)

About 5.5 mm. in length, broadly oblong oval, shining, deep reddish brown, the pronotum polished, elytra strongly punctate, the punctures becoming fainter towards apex.

Head with interocular space about half width of head, densely and rugosely punctate down front, shining, deep reddish brown. Antennae yellowish brown, very slender. Prothorax broad and convex, with rounded sides, polished deep reddish brown, very minutely punctate. Scutellum dark brown. Elytra broad and convex, polished, with rows of coarse punctures becoming over very slightly elevated basal callosities and towards apex finer; entirely deep reddish brown. Body beneath reddish brown, the abdomen more yellowish brown, glabrous, the space

between anterior coxae coarsely punctate, legs reddish brown, the femora coarsely punctate and pubescent at apical narrowing. Middle and hind tibiae emarginate near apex. Length 5.7 mm.; width 3 mm.

Type female, U. S. N. M. Type No. 65895, collected at Nassau, Bahamas.

Remarks.—This is closely related to *Metachroma adjustum* Suffrian, but is larger and more deeply reddish brown, and does not have the paler sides and apex, although it is somewhat less deeply colored at the apex. *M. wolcotti* Bryant from Haiti is also of this group, but is more finely punctate.

***Metachroma moaense*, n. sp.**

(Fig. 5)

About 3 mm. in length, oblong, oval, shining, the pronotum densely and finely punctate, the elytra with strong striate punctures distinct to the apex, the pronotum with an oblique depression in anterior half on either side; pale yellow brown with a rather indistinct reddish brown vitta on each side, the elytra with several reddish brown spots, legs and undersurface pale.

Head with interocular space a little less than half width of head, occiput with a darker median line down front, impunctate, pale, lower front rugosely punctate, jaws brownish. Antennae with the five outer joints dark, basal ones paler. Prothorax with a rather uneven surface, with an oblique depression on either side anteriorly, densely and moderately finely punctate, shining, yellow brown with a rather faint reddish brown vitta on either side. Scutellum pale. Elytra strongly striate punctate, the punctures distinct to the apex, shining yellow brown with rather faint reddish brown spot along the side and in a line of three or four down the middle of each elytron, possibly a more distinct pattern in a darker specimen. Body beneath entirely pale, the legs yellowish brown, middle and hind tibiae emarginate: Length 3.2 mm.; width 1.5 mm.

Type female, U. S. N. M. Type No. 65896, collected in Moa, Oriente Province, Cuba, by Acuña.

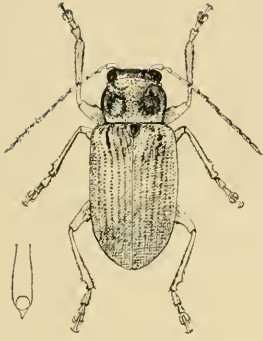
Remarks.—The color pattern of this small beetle most closely resembles that of *M. fenestratum* Blake, which also has vittate markings on the pronotum, but the elytra in this Cuban beetle are much more coarsely punctate.

***Metachroma macrum*, n. sp.**

(Fig. 3)

About 4 mm. in length, oblong oval, shining, head and pronotum strongly and densely punctate, elytra with strong striate punctures becoming fainter at apex, the front and hind femora toothed, yellowish brown.

Head with interocular space more than half width of head, densely and strongly punctate, also alutaceous, entirely reddish brown. Antennae yellowish brown, the outer joints a little wider. Prothorax with rounded sides, somewhat constricted over head and with a slight depression on either side, shining, densely and strongly punctate, entirely yellowish or reddish brown, sometimes with darker



1. *Melachroma acutulum*



2. *Melachroma paulini*



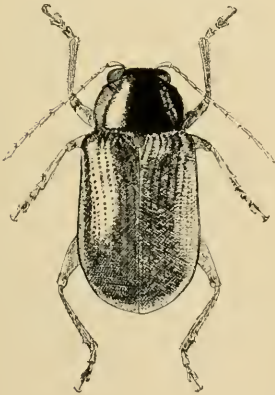
3. *Melachroma macrum*



4. *Melachroma nigromaculatum*



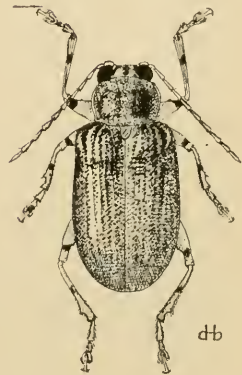
6. *Melachroma farrii*



7. *Melachroma nassauense*



5. *Melachroma moaense*



8. *Melachroma rugosum*

brown areas. Scutellum yellowish brown. Elytra with a basal callosity and with striate punctation, the intervals a little costate, the punctures near apex becoming finer; shining yellowish brown. Body beneath and legs yellowish brown, the front and hind femora minutely toothed. Length 3.8 mm.; width 1.8 mm.

Type male, U. S. N. M. Type No. 65897, and 2 paratypes in Institute of Jamaica, from Christiana, Manchester, Jamaica, collected 11 June, 1959, by T. H. Farr.

Other localities.—Hardwar Gap, St. Andrew Parish, Jamaica, B. W. I., 1 Nov. and 28 June, 1959, by T. H. Farr.

Remarks.—This is one of the narrow elongate species of *Metachroma* with the front and hind femora toothed. It is so far the smallest of that group.

***Metachroma acutulium*, n. sp.**

(Fig. 1)

About 5 mm. in length, elongate oblong oval, shining, head and prothorax strongly punctate, elytra striately punctate, the punctures becoming indistinct at apex, front and hind femora toothed, pale yellowish brown with the occiput deep brown, and two roundish brown areas on pronotum, the front and hind femora minutely toothed.

Head with interocular space about half width of head, a round hole in middle of front, head alutaceous and coarsely and densely punctate, deep reddish brown over occiput down to eyes, yellowish brown in lower front. Antennae very slender, the outer joints scarcely any wider, but deeper in color. Prothorax with rounded sides, a tooth on each angle, constricted and somewhat depressed over the head and becoming more convex before the middle, shining, densely but not coarsely punctate, yellowish brown with two roundish brown areas on either side. Scutellum brown. Elytra elongate, narrowed toward apex, with a strong intrahumeral sulcus and small basal callosities, striate punctation dense and strong except towards apex where it becomes evanescent, shining, faintly alutaceous, yellow brown. Body beneath and legs yellowish brown, a little deeper brown at apex of femora and base of tibiae. Front and hind femora minutely toothed. Length 4.8 mm.; width 2.1 mm.

Type male, U. S. N. M. Type No. 65898, from Hardwar Gap, St. Andrew Parish, Jamaica, B. W. I., collected 2 March, 1956, by T. H. Farr.

Remarks.—This species, also one of the elongate *Metachromas* with toothed front and hind femora, and with the elytra narrowed at the apex, strongly resembles *M. chapini* Blake from Jamaica, but is a paler colored beetle with less convexity of the prothorax and a shiny and not alutaceous surface, and a pronounced fovea in the middle of the head and a differently shaped aedeagus.

***Metachroma paulum*, n. sp.**

(Fig. 2)

About 2.5 mm. in length, broadly oblong oval, shining, the pronotum densely and distinctly punctate, elytra with distinct striate punctures in basal half becom-

ing indistinct towards apex and over basal callosities, yellowish brown to piceous.

Head with interocular space less than half width of head, shining, very densely and coarsely punctate, reddish brown. Antennae reddish brown, the outer joints somewhat wider. Prothorax with rounded sides, smoothly convex, a little constricted over the head, densely and distinctly punctate, shining reddish brown to piceous. Scutellum reddish brown or piceous. Elytra shining, with striate punctures becoming on sides, over basal callosities and after the middle indistinct, reddish brown or piceous. Body beneath and legs reddish brown or piceous. Length 2.5 mm.; width 1.5 mm.

Type male and 2 paratypes, U. S. N. M. Type No. 65899. One paratype in Institute of Jamaica, all collected in St. Catherine, 2 miles N. E. of Spanish Town, Sligoville Road, 16 Sept. 1957, by T. H. Farr.

Other localities.—Newport, Jamaica, Feb. 18, 19, 1937, collected by E. A. Chapin and R. E. Blackwelder.

Remarks.—This is similar in size and shape to the Cuban species, *M. elachistum* Blake but the aedeagi are quite different in the two species. Suffrian's *M. puncticollis (cubacola* Clav.) is described as having the thorax not very densely but plainly punctate, the disk sometimes brownish or with a weak brassy green lustre, which does not fit either of these small reddish brown or piceous species with densely punctate prothorax.

Metachroma rugosum, n. sp.

(Fig. 8)

About 5.5 mm. in length, elongate oblong, rather dull alutaceous, the head and pronotum somewhat sparsely punctate, the elytra very coarsely punctate, the punctures irregularly striate, and between these rows the surface especially at base of elytra subcostate; yellowish brown, the head with a dark mark down front, pronotum with darker areas on each side, the femora and tibiae pale with a dark brown ring.

Head with interocular space about half width of head, a groove about eyes and a median line down front about which are fine punctures, lower front more densely punctate, surface alutaceous and yellowish brown except a median dark area, extreme base of head dark. Antennae yellowish brown, basal joints more slender. Prothorax moderately convex with rounded sides, dull alutaceous, rather sparsely and irregularly punctate, yellowish brown with indefinite darker brown areas on each side. Scutellum yellowish brown. Elytra alutaceous and with coarse punctures, irregularly striate, somewhat costate, especially at base margin not visible from above, yellow brown, not very shiny. Body beneath and legs yellowish brown, the femora constricted and with a dark ring around this narrowed area, the tibiae in middle dark ringed. Both anterior and posterior femora toothed. Length 5.6 mm.; width 2.8 mm.

Type female, U. S. N. M. Type No. 65900, collected on the west slope of Mt. Horeb, St. Andrew Parish, Jamaica, B. W. I., 11 April, 1955, by T. H. Farr.

Remarks.—The irregularly striate punctation and costation of the elytra distinguish this species. It belongs to the same group of *Meta-*

chromas as *M. gracile*, *oteroi*, and *cavicolle* Blake, all of which are elongate, with toothed anterior and posterior femora. This is unusual in having dark rings about its legs and in the rugose, irregularly punctate elytra.

***Metachroma farri*, n. sp.**

(Fig. 6)

About 5.5 mm. in length, broadly oblong oval, shining, the pronotum finely and densely punctate, the elytra striately punctate, yellow brown with the prothorax more reddish brown.

Head with interocular space a little more than half width of head, occiput smooth, shining, sometimes with a trace of median depression which is often deeper brown, the lower front alutaceous and finely punctate, usually reddish brown. The usual groove about eyes. Antennae reddish or yellowish brown, the outer joints tending to be darker. Prothorax moderately convex, polished, very finely and densely punctate, reddish brown. Scutellum reddish brown. Elytra shining deep yellowish brown, striately punctate with the punctures at base coarser and rather deeply set, becoming at apex shallow but still distinct, in basal part a suggestion of costation between rows of punctures. Body beneath and legs yellowish or reddish brown, sometimes almost piceous, the apex of femora tending to be a little deeper in color, femora not toothed, middle and hind tibiae emarginate near apex. Length 4.8-5.8 mm.; width 2.6-3 mm.

Type male U. S. N. M. Type No. 65901, and three paratypes from the Palisadoes at Kingston, Jamaica, B. W. I., collected 25 July, 1961, 11 Nov., 1957, and 14 Dec., 1958 by T. H. Farr; two paratypes in Jamaica Institute.

Remarks.—This is unlike either *M. piccum* Blake or *M. flavolimbata* Blake from Jamaica being a lighter colored beetle. The aedeagus is similar to that of the group of broad *Metachromas*.

BOOK REVIEW

A HANDBOOK OF BIOLOGICAL ILLUSTRATION, by Frances W. Zweitel, Phoenix Science Series, The University of Chicago Press. Price \$1.95

A biologist does not necessarily have to be an artist to be able to adequately illustrate his works. This handbook is written for the biologist who is not an artist but requires guidance in acquiring the techniques and handling the materials necessary to produce clear, well-defined illustrations. It is a guide to the fundamentals of biological illustrating, the use of special drawing aids and time- and labor-saving devices. The handbook should be read by every biologist who wishes to improve his scientific efforts by effective illustrations.

EUGENE J. GERBERG, *Insect Control & Research, Inc., Baltimore 28, Maryland.*

**OBSERVATIONS ON THE STRUCTURE AND CONTENTS OF
YELLOW JACKETS' NESTS¹**

(HYMENOPTERA)

ELIZABETH E. HAVILAND, *University of Maryland, College Park*

In 1947 two nests of the yellow jacket *Vespula maculifrons* (Buys.) were examined and observations given in a note at the April 1948 meeting of the Entomological Society of Washington. Since then ten other nests have been examined with records made of size, population, etc.

After dark each nest was killed by pouring from one to two cups of gasoline quickly down the entrance hole. The next day, beginning by probing the entrance hole to determine direction and distance to the nest cavity, the nest was exposed by digging to one side of the cavity and thereby exposing the nest. All adult yellow jackets were picked up. The nest was measured and, as nearly intact as possible, placed in a box. Other measurements and counts were made as soon as possible.

The gasoline fumes killed the adults but not the pupae and larvae. For several days adults would emerge from capped cells. For three days the larvae would extend the anterior end when any solid object passed over their cells.

The opening to each nest was nearly spherical and one-half inch in diameter with an area about two inches across cleared of vegetation (grass, clover, etc.) around it. In all but one nest this opening was from two to twelve inches from the top of the nest cavity and connected to it by a tunnel in the soil. This tunnel was one-half inch in diameter. It ran nearly level with the surface of the ground usually just under the sod where the soil was firm. All the nests studied were in clay soil but this may not apply in other areas where the soil is of a different character.

The paper covered nest was nearly spherical unless a large stone or root prevented. The excavated cavity, in which the nest was suspended, was roughly one-half inch larger than the nest. In the bottom of each cavity there was a pile of small stones. They were any shape and from the size of half of a pea to the size of a walnut. It was evident that the objects that could not be chewed into a size that could be carried were excavated around.

The papery nest was suspended by one or two short heavy stalks, similar to other vespid nests, from a stone or root. The papery cover of the nest was several layers thick with an irregular surface. It looked much like that of the bald-faced hornet, *V. maculata*, except that the color was tan and brown rather than gray. However, this papery cover was much more brittle and fragile than that of *V. maculata*. Only in October was it possible to keep the papery cover intact.

¹Miscellaneous Publication Number 444, Contribution Number 3319 of the Maryland Agricultural Experiment Station, Department of Entomology.

Earlier in the year it broke up at the slightest touch much as charred paper does.

The combs of the nest are nearly round sheets each one suspended by a few heavy stalks one-half inch from the one above it.

The top one was somewhat smaller in diameter than the one below. If there were four sheets of comb the second and third were about the same size. The fourth or last was always smaller. When there were five the third was the largest with the second and fourth about the same size. Typically the cells in all the sheets of comb except the lowest were of the same size. All were small cells in which workers develop. The bottom comb was made of larger cells in which males and females of the next generation were raised. It was clear that many of the cells were used at least twice and a few a third time to rear workers. The number of adult males and females found in some nests made it seem probable that the same was true for the large cells where the males and queens developed.

For any sheet of comb the cells all around the edge were not fully drawn out although many contained eggs or small larvae. The capped cells or larvae of one size were usually in an irregular ring.

When comparisons between the nests (Table 1) are made a few more facts are clear. Nests examined before the middle of August contained no cells for rearing the next generation males and queens. This large celled comb was found in all nests opened in September. Since adult males and queens were also present from the middle of September on, the males and queens must develop rapidly. By the end of October most of the adults of all forms have disappeared from the nest. Only one undemolished nest was found in October.

Both nests found in September 1960 were larger and more populous than the two found that month other years. There were nearly twice as many cells in the 1960 nests as in any others. The number of adult workers found was also larger but not to such a great extent.

There was no consistent relationship between time of year and the number of males and queens found or in the number of capped cells or larvae present in the combs. This would be expected since temperature, rainfall, food, etc. vary from year to year.

One nest of *Vespa arenaria* (F.) was examined in July 1953. This species builds a similar nest but it is hung from a support above but near to the ground surface. It was hidden in the leaves and plants on the ground. Another difference noted was that in July the nest had the large celled comb, and that there were new males and queens present.

In the literature it is interesting to note that observations made by C. L. Marlatt in 1891 indicate that Vespinae were much more numerous in the greater D. C. area than now and that the nests were larger.

A. L. Gaul has studied yellow jackets extensively and some of his observations have been on *V. maculifrons*. His findings are similar to mine although he has been more interested in manipulating the colonies and studying reactions than I have.

TABLE I. Size and Population of Some Yellow Jacket Nests

Nest No.	Date examined	Size of nest, inches	No. combs	Adults		
				Female	Male	Workers
5	6-27-53	3¼ × 3¼	4	1	0	127
10	7- 7-56	4⅓ × 3	4	1	0	126
3	7-30-50	5½ × 5¼	5	1	0	390
8	8- 8-56	10 × 4	2	1	0	590
9	8-12-56	6 × 5	5	1	0	635
4	9-15-50	9½ × 6	5	1 + 1	30	1026
11	9-16-60	11 × 8½	6	1 + 120	1023	1281
13	9-27-61	11 × 8	5	1 + 54	414	764
12	9-28-60	12 × 10	8	1 + 43	654	2192
7	10-26-54	4 × 3½	4	1 + 12	5	7

Small cells			Large cells			Total cells	
Capped cells	Larvae	Eggs & empty	Capped cells	Larvae	Eggs or empty	Small	Large
307	348	150	0	0	0	1101	0
387	460	648	0	0	0	1495	0
1040	595	709	0	0	0	2344	0
1114	642	1080	0	0	0	2836	0
1352	696	617	0	0	0	2665	0
1362	359	999	116	61	247	2543	424
173	932	7791	199	140	527	8896	866
348	635	3397	44	41	73	4380	158
1477	1202	4395	217	113	351	7074	681
17	0	1590	10	0	66	1607	76

C. D. Duncan has made exhaustive observations on Vespinae in California and other areas in the west. He studied specimens of *V. maculifrons* but does not describe nests, discuss habits, or give populations for them. His observations on *V. pensylvanica* could be used as a guide to extensive observations on other species of social insects.

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MATING IN *XYLOCOPA VIRGINICA*

(HYMENOPTERA: APIDAE)

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The limited records of mating of the carpenter bee, *Xylocopa virginica* (Linnaeus) (cf. review by Balduf, 1962, *Ann. Ent. Soc. Amer.* 55: 263-271), prompt me to record a recent observation.

In late April, 1962, in my yard at Bethesda, Md., my attention was attracted to a male *Xylocopa virginica* hovering near the trunk of a large apple tree, about 2 feet above ground and 4 inches from the trunk, to which was clinging a female of that species. The male hovered usually in one position, only occasionally bobbing up or down slightly. The female remained almost motionless for some time, except for slight movements of a leg or an antenna. After several minutes, she finally launched into flight, and instantly the male darted in and seized her and the two tumbled to the ground.

As the two lay in the grass, I noted that copulation had been effected, and saw the spasmodic contractions of the abdomen of the male. However, in a short time, probably only a few seconds, the two broke apart, whereupon the male resumed its hovering a few inches behind and above the motionless female, this time of course hovering only a few inches above the ground.

This second hovering having continued for some time, I decided to provoke the female to flight, to see if the performance would be repeated. Unfortunately, I disturbed the male at the same time, and he disappeared, ending the observation.

It is often noted that males hover outside the exit holes of the nest burrows, with a "bobbing dance, a funny, vertical (bobbing up and down) flight in front of the burrows," but that "the actual mating behavior was seldom seen" (Rau, 1933, *The Jungle Bees and Wasps of Barro Colorado Island*, pp. 234-240). Rau records one instance of a momentary struggle in the air, after which the female dropped into the grass, followed by the male which "hovered above the place, evidently not seeing the object of his search" because in a few minutes he flew away.

My observation suggests that the hovering is a lying-in-wait for the female to be airborne. The male seen by Rau hovering over the grass probably had not really lost sight of the female. The female that I observed, both on the tree trunk and in the grass, was readily available to the male, and ambushed by it, but seizure and copulation did not take place until the female was actually in flight. Perhaps this is a carryover habit from the necessity of waiting until the female leaves the protection and tight quarters of the nest hole before copulation is possible.

THE FEMALE OF *SOLIERELLA MIRIFICA* PATE

(HYMENOPTERA: SPHECIDAE)

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Dr. V. S. L. Pate (1934, Ent. News, 45:243. *Solierella* (*Silaon*) *mirificus*) described this rather striking little wasp from a single male which was collected thirty miles east of Quijotoa, Pima County, Arizona, 28-29 August, 1927 (J. C. Bradley) (Cornell University, Type No. 1320). As Dr. Pate stated, *Sol. mirifica* belongs "to the *chilcensis* group and is apparently most closely related to *S. lucidus* Rohwer but may be readily distinguished from that species as well as any others of the group by the singular structure of the antennae and the anterior coxae and the pattern of the hind wings."

In 1950, F. X. Williams, in "Wasps of the genus *Solierella* in California" (Proc. Calif. Acad. Sci., Fourth Series, XXVI, on pages 372-373, described *Solierella corizi*, male and female, and made note that this species is evidently very close to *Solierella mirifica*, as judged by the males of both species. Both have very much the same markings, the subclavate antennae with several of the flagellar segments drawn out beneath, similar clypeal margins and the strongly excavate fore trochanters.

The female of *Solierella mirifica* has remained unknown until very recently when in early May, 1961, Dr. Karl V. Krombein, of the U. S. National Museum, sent me for determination four specimens comprising two species of female *Solierella* which Dr. Mont Cazier, Director of the Southwest Research Station of the American Museum of Natural History at Portal, Cochise County, Arizona, had taken in September and October, 1960, two miles northeast of the Research Station. The specimen taken there on October 11, agrees well enough with the form of my *Solierella corizi* that bears a protuberance behind each posterior ocellus, while the three other females—two taken September 19, and the third September 25, have generally finer sculpture. These three specimens I consider to be *Solierella mirifica* Pate, and with this view Dr. Krombein concurs.

Solierella mirifica Pate

I herewith give a description of the female of *Solierella mirifica*: Allotype.—Length 6.5 mm. Black: head and thorax subopaque, abdomen somewhat shining and with a minutely reticulate appearance; mandibles with the broad basal part whitish, the remainder mostly red; antennae with some dull reddish at apex of scape; a wide spot on each side of pronotum—the dorsal interspace about equaling one-half the transverse length of one of these spots—creamy white; posterior margin of pronotal lobes, tegulae and axillary sclerites and postscutellum, whitish, apex of femora 1 and 2 above and continuing beneath to near base, a strong stripe dorsad along the length of tarsi 1-3, creamy white; tibiae piceous black. Wings infusate apically. Clypeus produced lobelike mesad, its gently convex

surface with a shining subfusiform carina almost attaining the margin; above the base of the antennae the median carina is linear and runs into the finely granulate euneate frontal swelling, a fine, slightly procurved groove extends behind the posterior ocelli, ocellar triangle right-angled, each posterior ocellus distant hardly twice its diameter from the compound eye; mandibles slightly emarginate for their basal portion; antennae rather slender, the articles short, 3 and 4 subequal, 12 approximately half again as long as 11. Vertex with very fine close punctures appearing subgranulate. Mesonotum widely and shallowly sulcate mesad, finely and closely punctate and only a little shining mesad; scutellum with somewhat less close punctures; disc of propodeum mainly opaque, with carinae fanning from base, its apical portion finely margined, sides of propodeum very closely subobliquely carinulate, posterior face delicately cleft. Second submarginal cell nearly equilateral, receiving the first recurrent almost interstitially at base and the second recurrent at about its middle. Posterior coxae on the inner side towards base with a thorn-like process. Abdomen finely reticulate-punctate, pygidial disc very finely punctate, thus rendering it a non-polished area. Vestiture: sericeous pile, golden tinged in antennal fossulae, white on mesopleura, less conspicuous and rather segmental on abdomen.

Allotype.—Female, 1X-19-1960. Two other females, 1X-25-1960. All two miles N. E. Portal, Cochise Co., Arizona (M. Cazier). One of the females has been retained for the California Academy of Sciences. The other female has a heteropterous bug pinned with it which was determined by Dr. R. C. Froeschner of the Entomology Research Division, U. S. Department of Agriculture as a nymph of Coreini, either *Ficana* or *Catorhintha*, probably the former genus.

Discussion.—The important differences between *Solierella mirifica* and *Solierella corizi* are those of sculpture. Dr. Pate's excellent description of the male type of *Solierella mirifica* indicates that the sculpture of his species is generally finer than that of the male of *Solierella corizi*. The female of *S. mirifica* has much finer puncturation than has the female *S. corizi* so that its head and notum have a rather dull appearance, the punctures are usually closer, just walled off; in *S. corizi* the more separate punctures permits a rather shining surface; this puncturation, often arranged in more or less longitudinal trend with the punctures frequently more than their diameter apart, makes for a rather polished appearance. While the interspace between the two creamy white spots on the pronotum of all three specimens of female *Solierella mirifica* is equal to about one-half the transverse length of one of these spots, it is far narrower in all the female *Solierella corizi* that were recently examined, including the single specimen from the same locality from which the three *Solierella mirifica* were obtained.

All the *Solierella corizi* obtained in the San Diego, California area have the vertex bituberculate.

I am indebted to Dr. Karl V. Krombein, of the United States National Museum, for the opportunity of studying these interesting little wasps.

ON SOME JAMAICAN TRIATOMINAE AND EMESINAE

(REDUVIIDAE: HEMIPTERA)

J. MALDONADO-CAPRILES, *College of Agriculture and Mechanic Arts, Mayaguez, Puerto Rico*, and THOMAS H. FARR, *The Institute of Jamaica, Kingston, B. W. I.*

The Reduviid material treated in this paper includes five new records from Jamaica, the description of a new species of *Nesotriatoma* Usinger 1944, the description of the allotypes of *Ghilianella spinicaudata* Maldonado and *Ploiaria umbrarum* McAtee and Malloch, and new locality records for a number of species.

Gowdy (1926) in his *Catalogus insectorum Jamaicae*, listed only two Emesinae, *Emesa mantis* (F) and *Ploiaria rufoannulata* (Bergroth), and two Triatominae, *Triatoma rubida* Uhler and *T. rubrofasciata* (DeGeer). *Ploiaria umbrarum* McAtee and Malloch, *Ghilianella signoreti* (Dohrn), *G. spinicaudata* Maldonado and *G. spinata* Maldonado have been described from Jamaica. The other species treated here are new records. The political subdivision Parish is abbreviated as P. throughout the remainder of the paper. We are indebted to Dr. R. L. Usinger for the loan of a specimen of *Nesotriatoma flavida*.

Subfamily PLOIARIINAE

Emesa mantis (Fabricius) 1794

Material examined (collected by T. H. Farr): One ♂ and one ♀, August 1954, from Second Breakfast Spring, St. Andrews. One ♀, May 1955; one ♀, June 1956; one ♂ and one ♀, July 1956; one ♂, September 1958; one ♂, April 1960; one ♂, October 1960; all from Long Mountains in St. Andrews Parish. Two ♂♂, August 1955; one ♂, July 1960; from Trelawny P. One ♂, August 1954, west bank of mouth of Río Grande; one ♀, July 1955, one mile east of Caledonia Peak; Portland P. One ♀, August 1954, two miles north of Golden Grove; one ♂, July 1953, from St. Thomas P. Collected from spider webs on steep rock walls, one specimen collected while feeding on a spider, exuviae often found on the webs.

Emesopsis nubilus Uhler 1893

Material examined.—One ♀, March 1954, Swallowfield; one ♀, November 1954, and one ♀, September 1954 from Cross Roads; all from St. Andrew P. One ♂ November 1957, Ocho Rios, St. Ann P.

Empicoris rubromaculatus (Blackburn) 1889

Material examined.—One ♀, March 1954, C. B. Lewis, collector, Upper Mountain View, St. Andrew P.

Empicoris armatus (Champion) 1898

Material examined.—One ♂, April 1960, Portland Ridge, Clarendon P., T. H. Farr collector.

***Empicoris errabundus* (Say) 1832**

Material examined.—Three ♀♀, as follows—January 1960, Marces Gap, St. Andrew P., and December 1959, Morant Bay, T. H. Farr collector; December 1960, Cockpit country, T. H. Farr and J. Maldonado collectors.

***Ploiaria rufoannulata* (Bergroth) 1911**

Material examined.—One ♀, October 1957, Rio Cobre Gorge, St. Catherine P.; one ♂ and one ♀, May 1955, and one ♀, July 1954, Port Henderson. One ♀, January 1960, one-half mile south of Portland Cottage, Clarendon P. One ♀, September 1954, Wilson's Run, Trelawny P. One ♂ and one ♀, January 1955, two miles southwest of Ecclesdown, Portland P.; one ♀, July 1958, Hardwar Gap, Portland P.

***Ploiaria umbrarum* McAtee and Malloch 1925**

Jamaica, holotype male

Female.—Head, thorax, front legs, beak, and abdomen to about middle brownish; abdomen gradually darker caudad. Lateral margin of mesonotum white. Antenna and midleg brownish, unmarked; hind legs with femur apically and tibia basally conspicuously white. Wings with light brownish veins, whitish, without distinctive markings.

Head to apex of antennal socket, slightly longer than head across eyes (15:13); eyes from above one and one-half times as broad as interocular space. Anterior lobe with a short median carina anteriorly to interocular depression. Relative length of antennal segments: 80:65:20:15; the first segment slightly longer than length of body. Relative lengths of beak: 18:18:22. Fore coxa slightly longer than fore tibia (34:27); two-thirds of fore femur (34:50). Trochanter with a long anteriorly directed slightly curved spine (fig. 1). Spines of latero-ventral surface of forefemur forming a single series, spines arising from elevations, and slightly curved forward. Prothorax shorter than mesothorax (15:21). Discal cell of forewing narrow, slightly over five times as long as greatest width, as long as costal cell; cross vein at about three fourths from base of longitudinal vein. Very similar to the male. Overall length 9 mm.

Female genitalia.—Seventh tergum broader than long; eighth shallowly v-shaped on upper margin (fig. 2), globular except for a shallow depression above and to each side of the median line.

Allotype.—Female, August 1955, Trelawny P., Windsor Cave; R. Bengry collector; in the collection of the Institute of Jamaica. Other material examined; two ♂♂, August 1955 and March 1960, T. H. Farr collector, and one paratype, female, in the senior author's collection, August 1955, R. P. Bengry collector; all specimens from Windsor Cave, Trelawny P.

The genitalia of the male of *Ploiaria umbrarum* are illustrated in figures 3, 4, 5, and 6. The drawing of the internal genitalia in figure 3 is diagrammatic and approximate; they consist of a slightly curved sclerotized phallobase (p), a Y-shaped connective (c), and a very long endosme (e) coiled inside the last segment.

***Metapterus fraternus* (Say) 1832**

Two specimens at hand, one ♂ from St. Andrew P., Half Way Tree, July 7, 1960, T. H. Farr collector and one ♀, from Fort Simmonds, January 1, 1945,

collected in a light trap, are so different from the described species that we thought it to be an undescribed new species. However, the male genitalia (figure 7) proved it to be a color form of *Metapterus fraternus* (Say). We are grateful to Dr. Petr Wygodzinsky for comparing the genitalia with that of typical material at his disposition.

***Ghilianella spinicaudata* Maldonado 1960**

Jamaica, holotype female

Male.—Dark brown with lighter tibiae. First antennal segment with ten narrow yellowish annuli more or less uniformly distributed; other segments unbanded. Interantennal spine yellowish above. Beak with apical half of first and second segments yellowish. Fore coxa and femur irregularly spotted with yellowish. Mid and hind femora each with five incomplete yellowish annuli and many yellowish spots irregularly distributed. Mid and hind tibiae with two or three inconspicuous yellowish annuli on basal half. Abdominal terga each with a narrow yellowish area on base of lateral margin. Abdominal sterna irregularly spotted with yellow, spots more abundant and slightly larger after third visible sternum. Body and legs with very sparse short appressed pilosity.

Head granulose, granulations conspicuous. Interantennal spine moderately long, straight.

Thoracic segments sparsely granulate; relative length of segments; 27:19:10. Prothorax with humeral angles roundly produced upward. Claws of fore tarsi two, the inner very short and closely appressed to base of outer. Armature of forefemur with inner row consisting of alternating fine setae and short spines, the setae arising from wart-like bases. Outer row of spines similarly arranged but with more spines, with four longer spines forming a third row on the outside. In the female there is a fourth row more to the outside. First spine of forefemur slightly curved, at one and one-half times its length from tip of trochanter. Basal half of forefemur gradually thickened to first spine. Abdomen deeper than wide; without bulbous swelling; very slightly widening from base to apex of seventh segment. First tergum with well developed caudally inclined conical projection. Posterolateral angles of third to sixth terga slightly produced laterally; hind margin of terga angularly produced caudad and with a median wart, the wart on the sixth the biggest; surface of terga sparsely granulate. Seventh tergum as in figure 7, medianly longer than sixth, carinate, transversely corrugate on apical half; slightly widening to basal third, tapering to apical two-thirds and hence abruptly narrowing to apex; hind margin produced into a long spine that surpasses claspers by over a clasper length. Hind margin of second to fifth sterna straight; the sixth broadly and shallowly concave; of seventh straight with a very small median notch. Eighth sternum broad, visible on its entire width, hind margin straight, as in figure 9. Hypopygium opening upwards; upper lateral margin stepped, apical margin produced into a hook; base of hook projecting caudad and apex hidden by the clasper, hook standing clear from the hypopygium.

The species with males possessing a hook on the apical margin of the hypopygium are: *Ghilianella fenestrata*, *G. uncinata*, *G. patruela*, *G. gibbiventris*, *G. strigata*, *G. neivai*, *G. apiculata*, and *G. campulligaster*. Unlike *G. spinicaudata* the first five have bulbous abdomens. The shape of the seventh tergum and hypopygium easily separates *G. spinicaudata* from the last three. Will run to first

part of couplet 22 in the senior author's key to the males. Can be separated from *apiculata* as follows:

. . . almost glabrous; hypopygium opening upward, apical hook of hypopygium pointing cephalad; 19 mm. long . . . *G. spinicaudata*

. . . vestiture unusually abundant; hypopygium opening caudad; hook of hypopygium pointing upward; 27 mm. long . . . *G. apiculata*

Allotype.—Male, Jamaica, Portland, Green Hills rain forest, August 3, 1956, B. and B. Valentine collectors. In the senior author's collection.

Ghilianella signoreti (Dohrn) 1860

There are 24 specimens, including both sexes, in the collection of the Institute. The male hypotype is included among these. This species has been collected from St. Andrew, St. Catherine, Clarendon, Manchester, Westmoreland, Trelawny, and St. Ann Parish.

Ghilianella spinata Maldonado 1960

Described from Jamaica. Type material in the senior author's and the Institute of Jamaica collections.

Subfamily TRIATOMINAE

Nesotriatoma Usinger 1944

This genus was erected by Usinger (1944) to include *Triatoma flavida* Neiva 1911 and *Nesotriatoma bruneri* Usinger 1944. Wygodzinsky (1949) later considered *N. bruneri* as a synonym of *N. flavida*. The genus can be separated from other triatomine genera by the angulate humeri and spines at base of the scutellum. So far the genus is limited to Cuba and Jamaica.

Nesotriatoma obscura, new species

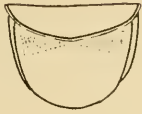
Male.—General color blackish brown, with brownish femora, and margins of connexivium spotted apically with yellow or light brown (fig. 10).

Head blackish brown; eyes brown, first antennal segment blackish brown, second and third brownish; first rostral segment blackish brown, second blackish brown with apex brownish, third brownish. Neck blackish brown above; ventrally and laterally, brownish. Mesonotum blackish brown; projection of anterolateral angle, lateral carina and discal longitudinal carina of posterior lobe brownish; ventrally and laterally blackish brown. Scutellum blackish brown, extreme tip brownish. Mesothorax and metathorax laterally and ventrally blackish brown. Coxae, trochanters, and femora blackish brown and shiny. Tibiae and tarsi light brown, contrasting with the darker femora. Hemelytra blackish brown, with small yellow-

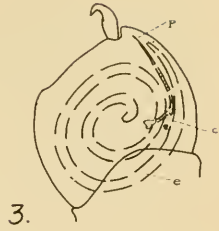
Ptoiaria umbrarum McAtee and Malloch. Fig. 1, female, allotype, fore trochanter, lateral view; fig. 2, female, allotype, caudal end of abdomen; fig. 3, male, last abdominal segment, lateral view; p-phallobase, c-connective, e-endosome; fig. 4, male, last abdominal segment, dorsal view; fig. 5, male, last abdominal segment, ventral view; fig. 6, male, phallobase and "connective," lateral view. *Metapterus fraternus* (Say). Fig. 7, male, aedeagus, lateral view. *Ghilianella spinicaudata* Maldonado, male. Fig. 8, male allotype, seventh tergum, dorsal view; fig. 9, male allotype, last abdominal segments, lateral view. *Nesotriatoma obscura*, n. sp. Holotype, male.



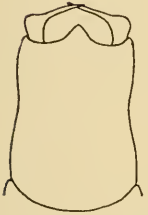
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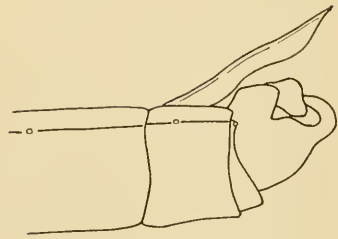
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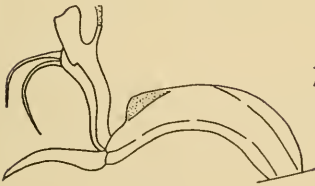
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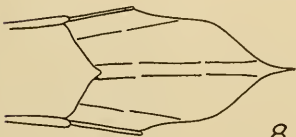
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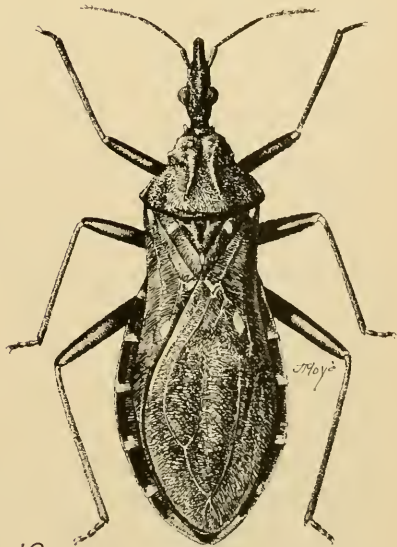
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ish areas as follows: basally where claval suture and Sc meet, on clavus near basal angle of scutellum, on a-a cross vein and on M on base of membrane. Abdominal sterna blackish brown or brownish. First five connexivial segments ventrally and dorsally with apical third yellowish or tawny; last segment brownish from basal third to apex. Genital segments blackish brown. Spiracles yellowish.

Pilosity on body very scarce, appressed, brownish; more abundant on legs, ventrally on abdomen, and in genital segments.

Head including neck, longer than thorax, as in figures 11 and 12. Eyes on dorsal aspect slightly over one half width of interocular space (5:8). Anteoocular space to apex of antennal socket less than twice as long as postocular space (10:6). Ocelli conspicuous, each in a shallow depression; closer to posterior margin of head than to posterior margin of eye. Rostrum glabrous; relative lengths of segments: 11:26:7, first segment reaching to apex of antennal tubercle, second to neck, and third to middle of stridulatory groove. Head and thorax dorsally conspicuously granulate; granulations small and somewhat elongate on thorax. Antennal segments: 11:31:21:15; first two with very short pilosity, last two with scattered long pilosity; first segment thicker than second, second thicker than last two. Pronotum wider than long (50:32); constriction before middle; anterior lobe with humeral angles sharply produced; with two discal and one posterolateral small tubercles; medianly sulcate, sulcus deeper where it meets transverse pronotal constriction; surface mostly granulated and with some smooth areas forming an irregular pattern; laterally corrugate. Posterior lobe with two divergent longitudinal carinae on disc; conspicuously and thickly covered with somewhat elongate granulations; posterolateral angle subangularly produced as a plate; lateral margin carinate. Scutellum (fig. 13) slightly longer than wide at base; with a pair of short, anteriorly directed slender tubercles at middle of base reaching just above hind margin of pronotum; with a small discal depression; with a small lateral conical projection; surface rugose; apex elongate, horizontal, cylindrical.

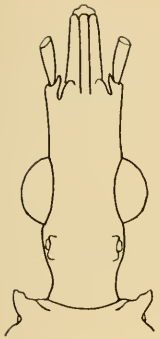
Front wings reaching to before apex of abdomen. Abdominal sterna finely transversely striate. Connexivium well developed; apical angles of all segments very slightly produced so that the margin is not a straight line. Overall length 14 mm.

Genital segments as in figures 14 and 15.

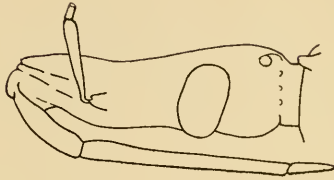
Female.—Very similar to the male in coloration and dimensions. Variations in coloration as follows: eyes gray or silvery; longitudinal carina on posterior lobe of pronotum concolorous with disc; yellowish spots on base of wing less conspicuous, on base of membrane missing. Penultimate connexivial segment as in the male or unmarked; last segment with connexivium uniformly blackish brown or brownish on apical half.

Pygidium triangular as in figures 16, 17, 18; densely pilose. Overall length 16 to 17 mm.

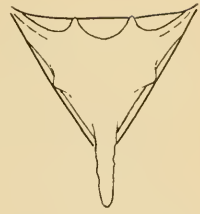
Nesotriatoma obscura, n. sp. Fig. 11, holotype, male, head from above; fig. 12, holotype, male, lateral view of head; fig. 13, holotype, male, scutellum; fig. 14, holotype, male, genital segments, lateral view; fig. 15, holotype, male, genital segments, caudal view; fig. 16, female allotype, genital segments, lateral view; fig. 17, female allotype, genital segments, dorsal view; fig. 18, female allotype, genital segments, ventral view. *Nesotriatoma flavida* (Neiva). Fig. 19, dorsal aspect; fig. 20, scutellum.



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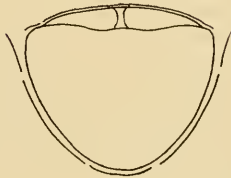
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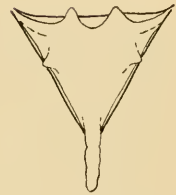
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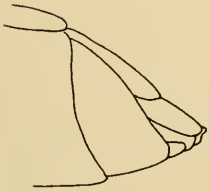
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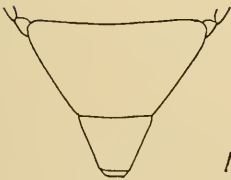
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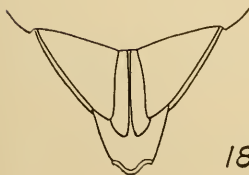
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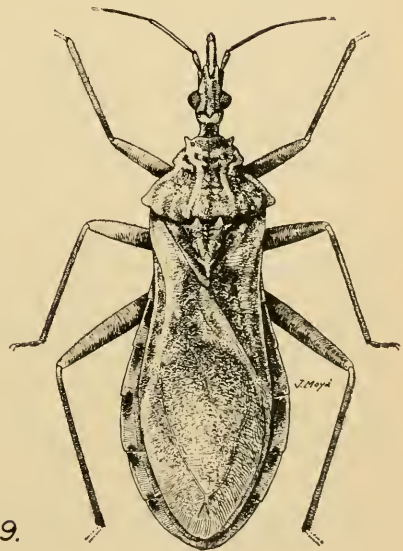
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Holotype.—Male, Mandeville, Manchester P., Jamaica, B. W. I., March 1961, E. S. Panton collector, deposited in the Institute of Jamaica. Allotype same locality, September 1960, E. S. Panton collector, on back of label reads: "bit a woman while she was sleeping"; in the senior author's collection. Paratype, female, same collecting data as allotype, in the Institute of Jamaica, specimen crushed; very similar to allotype, slightly paler, and with the last connexival segment light on apical half.

The genus *Nesotriatoma* now includes two species, namely, *N. flavida* and *N. obscura* n. sp. The first is light brown (fig. 19) and the latter blackish brown with small yellowish areas as described above; the shape of the scutellum is different as can be seen from figures 20 and 21.

***Triatoma rubida* (Uhler) 1894**

This species is listed by Gowdey as occurring in Jamaica.

***Triatoma rubrofasciata* (DeGeer) 1773**

Material examined (from the collection of the Institute of Jamaica).—One ♀, January 1952, Half Way Tree, F. A. McDermott collector, one ♀, June 1951, Sallowfield, C. B. Lewis collector; one ♂, no other data; one ♂, January 1951, Kingston, B. N. Fletcher collector; one ♀, September 1954, Kingston, G. R. Proctor collector; one ♂, February 1952, R. Rattray collector; one ♀, September 1956, Institute of Jamaica, Kingston, T. H. Farr collector. At the Department of Agriculture, Kingston, there are three specimens collected by C. G. Gowdey as follows: one from Hope Garden, October 1920, one from Blue Castle, February 1922; and one from Hill Gardens.

SUMMARY

Three species of Triatominae and eleven of Emesinae (Reduviidae) are listed as occurring in Jamaica, namely: *Nesotriatoma obscura* n. sp., *Triatoma rubrofasciata*, *T. rubida*, *Emesa mantis*, *Emesopsis nubilus*, *Empicoris rubromaculatus*, *E. armatus*, *E. errabundus*, *Ploiaria rufoannulata*, *P. umbrarum*, *Ghilianella spinicaudata*, *G. spinata*, *G. signorcti*, and *Mctapterus fraternus*.

Besides the new species of *Nesotriatoma* the male allotypes of *Ploiaria umbrarum* and *Ghilianella spinicaudata* are described.

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A NEW LIMNOCORIS FROM VENEZUELA

(HEMIPTERA: NAUCORIDAE)

IRA LA RIVERS, *University of Nevada, Reno*

The following new species of *Limnocoris* differs from *L. stâli* Montandon 1897, the only other Venezuelan species, in its much smaller size (*L. stâli* is almost twice as large), and from *L. lutzi* La Rivers 1957 in the below mentioned points of flight capacity and shape of the male genital process. The genus *Limnocoris* is uniquely distinctive and is known from southern South America to southern United States, being nearly as widespread as *Ambrysus* Stål 1862. Many more species of *Limnocoris* undoubtedly remain to be described from inaccessible areas of South and Central America.

Subfamily LIMNOCORINAE (Stål) 1876

Genus *Limnocoris* Stål 1860

Limnocoris Stål 1860, Konig. Svenska Vetén.—Acad. Handl. 2(7): 83. Montandon, 1897, Boll. Mus. Zool. Anat. Univ. Torino 12(297): 1. La Rivers, 1950, Ann. Ent. Soc. Amer. 43(3): 373; 1956, Ent. Soc. Wash. Proc. 58(2): 92-94; 1957, Pan-Pac. Ent. 33(2): 71-75.

***Limnocoris menkei*, species novum**

*General appearance*¹.—Small in size, 7 mm. long and 5 mm. wide. Dark in color, slightly more mottled and hence somewhat lighter anteriorly. Dull, opaque, weakly impunctate overall.

Head.—Ratios are: (1) total length to width (including eyes) 40::75 (53%); (2) anterior distance between eyes to posterior distance 37::30 (81%); (3) anterior distance between eyes to inner eye length 37::31 (84%); (4) posterior distance between eyes to greatest length of head posterior to this line 30::3 (10%).

Pronotum.—Ratios are: (1) width between anterior angles to width between posterior angles 72::128 (56%); (2) median length to greatest width 44::128 (34%); (3) distance between anterior and posterior angles on same side to perpendicular distance between anterior angle and baseline of pronotum 54::58 (93%); (4) percent of curvature of the lateral pronotal edge (viewed perpendicular to the front plane of section) about 18 (Av. 54::10).

Scutellum.—Dark, lightening at tips; ratio of three sides, anterior and two laterals, 64::46::46.

Hemelytra.—Dark, unicolorated, lightening only along outer emboliar edges. Embolia typically narrow anteriorly, broadening posteriorly with an outward swelling; length-to-greatest width 68::24 (35%). Hemelytra nearly attaining abdominal tip, prominently exposing connexival edges posterior to embolia. Capable of flight, with hindwings of full length.

Venter.—Yellowish, lighter in color than dorsum. Connexival posterolateral angles moderately spinose. Female subgenital plate undistinctive, flattened at tip

¹For general characteristics of the genus and most of its species, which are remarkably similar in external morphology, see La Rivers 1956 or 1957.

outline. Male genital process on hind margin of fifth tergite (to the right of the median line) resembles that of *Limnocoris lutzi* La Rivers 1957 but is blunter and broader (see illustration). *L. menkei* and *L. lutzi* are similar in size, but further differentiated in that the latter is flightless, with greatly abbreviated wings.

Legs.—Typical and non-diagnostic. Prolegs predaceous, with incrassate femora (ratio of length-to-greatest median width is 50::26 (52%). Meso- and meta-legs slim, long and narrow (walking construction), equipped with swimming hairs. Mesoleg data—femur 1.8 mm. long, ratio of length-to-greatest median ventral width 50::8 (16%); tibia 1.2 mm. long, ratio of length-to-greatest median ventral width 34::5 (15%). Metaleg data—femur 2.5 mm. long, ratio of length-to-greatest median ventral width 67::10 (15%); tibia 1.5 mm. long, ratio of length-to-greatest median ventral width 65::7 (11%). Meso- and meta-tibia 3-segmented, basal segment small; tarsi tipped with strong, curved claws.

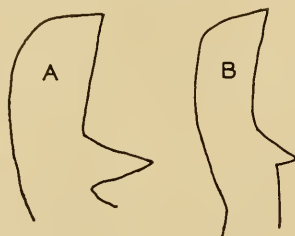


Fig. 1, right lobes of the fifth male tergites, showing tooth-like projections. A, *Limnocoris signoreti* Montandon 1897; B, *L. menkei*, new species.

Type Locality Data.—VENEZUELA; 42 kilometers southeast of Maturin, Monagas; 3 July, 1958; Arnold S. Menke.

Location of Types.—Holotypic male, allotypic female and one paratype in the collection of the Los Angeles County Museum, California; one paratype in the collection of the writer, Reno, Nevada.

Comparisons.—Differs from *Limnocoris stâli* Montandon 1897, the other Venezuelan species, in its much smaller size (*L. stâli* is almost twice as large), and from *L. lutzi* in the previously mentioned points of flight capacity and shape of the male genital process.

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NEW SPECIES OF CHEYLETIDAE

(ACARINA)

FREDERICK CUNLIFFE, *Keene State College, Keene, N. H.*

The Cheyletidae here described were sent to me by E. W. Baker, U. S. Department of Agriculture, Washington, D. C. Three of these species belong to the genus *Paracheyletia* Volgin, which now contains most of those species previously included in the genus *Cheyletia* Haller; one species belongs to the related genus *Eucheyletia* Baker; and the other to the genus *Cheyletus* Schrank.

***Paracheyletia congensis*, new species**

(Fig. 1)

This species is distinguished by the striate, punctate dorsal shields and dorsal setal pattern, and by the shape of the palpal setae.

Female.—Gnathosoma long, prominent; rostrum bottle shaped, lightly punctate; peritreme slight, not obvious; palpal femur punctate, strongly elbowed at middle; dorsal seta of femur broadly lanceolate, serrate; palpal genual seta broad, serrate; other palpal setae typical for genus; palpal claw with seven to eleven basal teeth. Propodosomal and hysterosomal shields distinct, lightly striate, punctate; all dorsal body setae short, broad, serrate, those on posterior of hysterosomal shield and body margin narrow. Dorsal setae of legs I and II mostly broad, or lanceolate, serrate; those on legs III and IV only slightly lanceolate. Sensory rod of duplex setae of leg I long, slender, tactile seta tiny. Body $382\ \mu$ long by $223\ \mu$ wide.

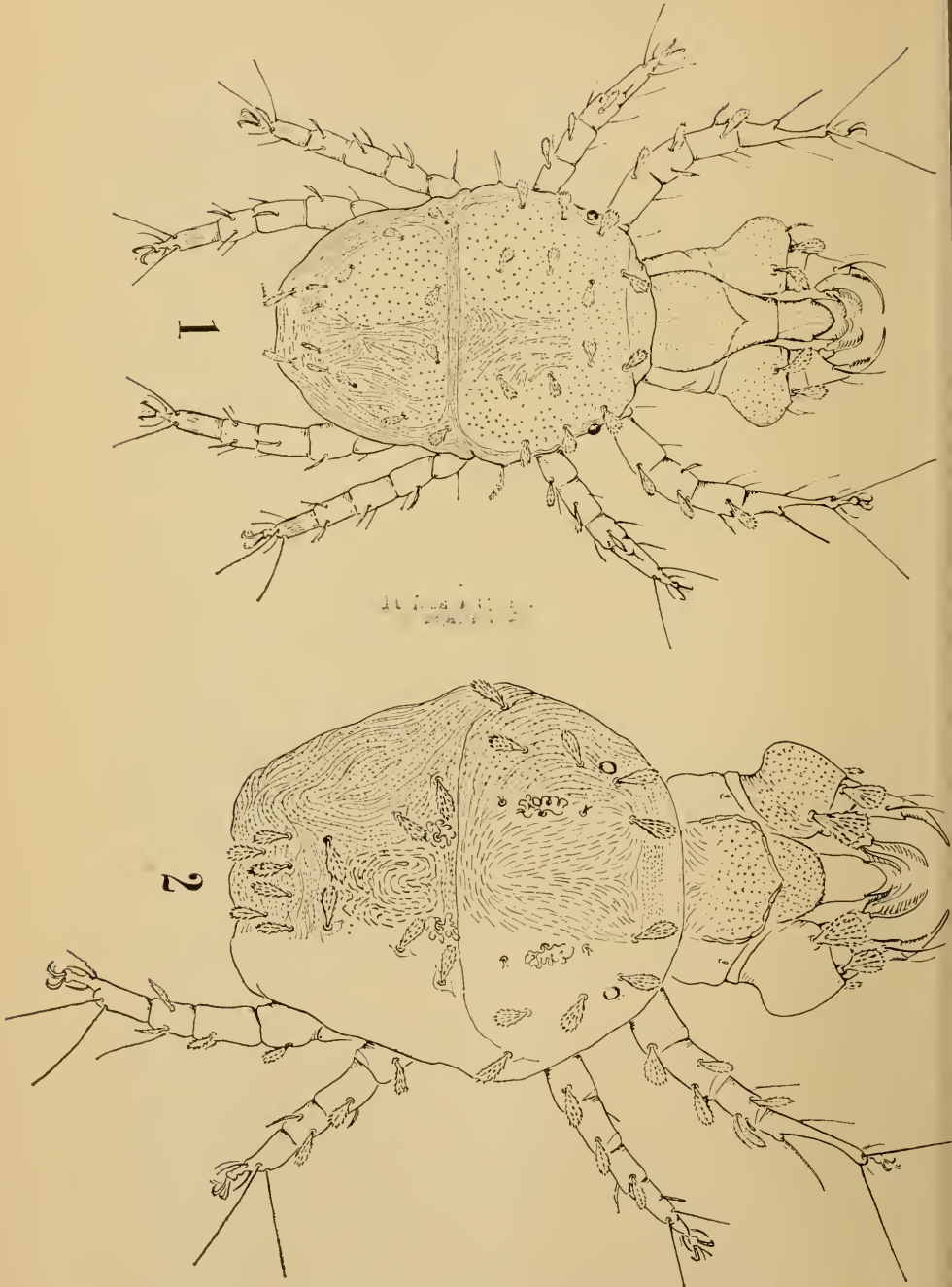
The female holotype, U. S. National Museum No. 2880, and two female paratypes were collected on *Acacia* sp., Kysenyi, Belgian Congo, May 12, 1955. Other specimens were collected on Australian pine, INEAC, Mulunga, May 18, 1955; avocado, Bumi, May 2, 1955; ornamental, Leopoldville, April 10, 1955; and *Berlinia* sp., Stanleyville, April 18, 1955. All collections were made by E. W. Baker.

***Paracheyletia volgini*, new species**

(Fig. 2)

This species is characterized by the dorsal setal pattern, the posteriorly elbowed palpal femur, and the large, broad, serrate palpal genual setae.

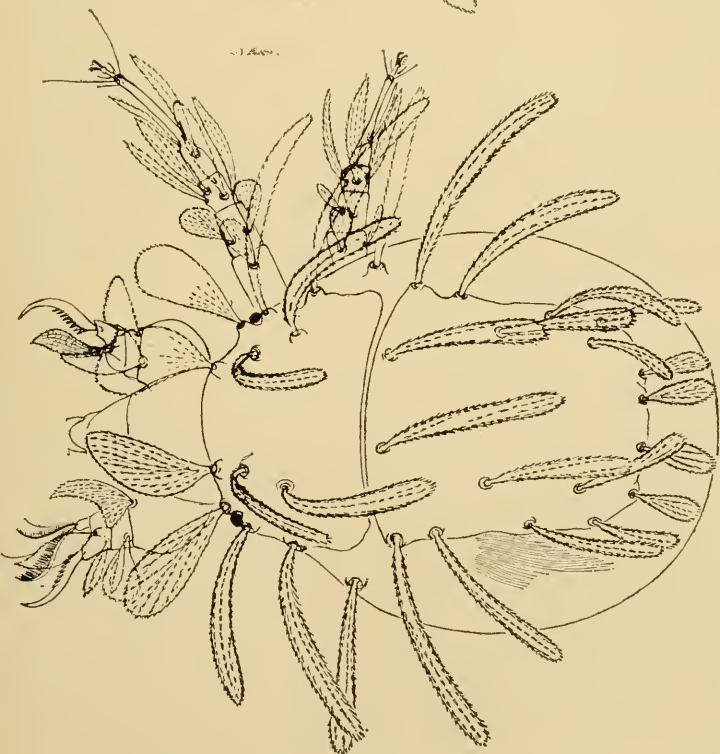
Female.—Gnathosoma broad; rostrum broadly rounded, strongly tuberculate; peritremes prominent; palpal femur broad, about as long as broad, strongly elbowed on outer posterior margin; dorsal femoral seta large, broad, serrate, slightly larger than similar seta on genu; other palpal setae typical for genus; palpal claw with five to six basal teeth. Propodosomal and hysterosomal shields not distinctly delineated, differentiated only by differences in body striae, that of the shields being short, strong, and without tubercles. Most dorsal body setae strong, broad, serrate; three pairs of propodosomal and one pair of hysterosomal setae of the staghorn type. All legs with large, lanceolate, serrate setae, those on leg IV as broad as those of other legs. Body $390\ \mu$ long by $230\ \mu$ wide.



Paracheyletia congensis, new species. Fig. 1, dorsal view of female. *Paracheyletia volgini*, new species. Fig. 2, dorsal view of female.



4



3

Paracheyletia woolfordi, new species. Fig. 3, dorsal view of female. *Eucheyletia reticulata*, new species. Fig. 4, dorsal view of female.

The female holotype, N. S. National Museum No. 2881, two female paratypes, and a nymph were collected on Australian pine, INEAC, Mulunga, Belgian Congo, May 18, 1955, by E. W. Baker.

This species differs from the preceding one in possessing dorso-central staghorn-like setae, and in having broken non-tuberculate striae dorsomedially on both propodosoma and hysterosoma.

Paracheyletia woolfordi, new species

(Fig. 3)

This species is readily recognized by the presence of the long, club-like dorsal body setae, and by the two pairs of broad, fan-like setae on the anterior of the propodosoma.

Female.—Gnathosoma short, broad, without distinctive pattern; peritremes inconspicuous; femur gently rounded, with large, broadly rounded, V shaped serrate seta; genu with broad dorsal serrate seta; tibia with strong, broadly lanceolate, serrate seta; palpal claw with eight tarsal teeth. Hysterosomal shield with anterior two pairs of setae broad, serrate; marginal and median setae serrate, long, strong, club-like. Humeral setae similar to dorsal setae. Hysterosomal shield with nine pairs of setae, the anterior setae long, strong, serrate; the setae gradually shorten and become broader posteriorly as figured. All dorsal leg setae strong, either long, lanceolate, or shorter and fan-like. Length of body 382 μ ; width 223 μ .

The female holotype, U. S. National Museum No. 2882, was collected on *Cycas revoluta*, Japan at Hawaii Quarantine, October 16, 1960, by H. A. Woolford. Six female paratypes were collected from *Citrus reticulata*, Japan at Hawaii Quarantine, October 10, 1960, by H. A. Woolford; one female paratype was collected from *Nephrolepis exaltata*, Tahiti at Hawaii Quarantine, January 29, 1961, by H. A. Woolford; and one female paratype was collected from citrus peel, Japan at Hawaii Quarantine, February 10, 1961, by H. A. Woolford.

Eucheyletia reticulata, new species

(Fig. 4)

This species is characterized by the broad squamiform dorsal setae, the leg setae, and the reticulate dorsal shields.

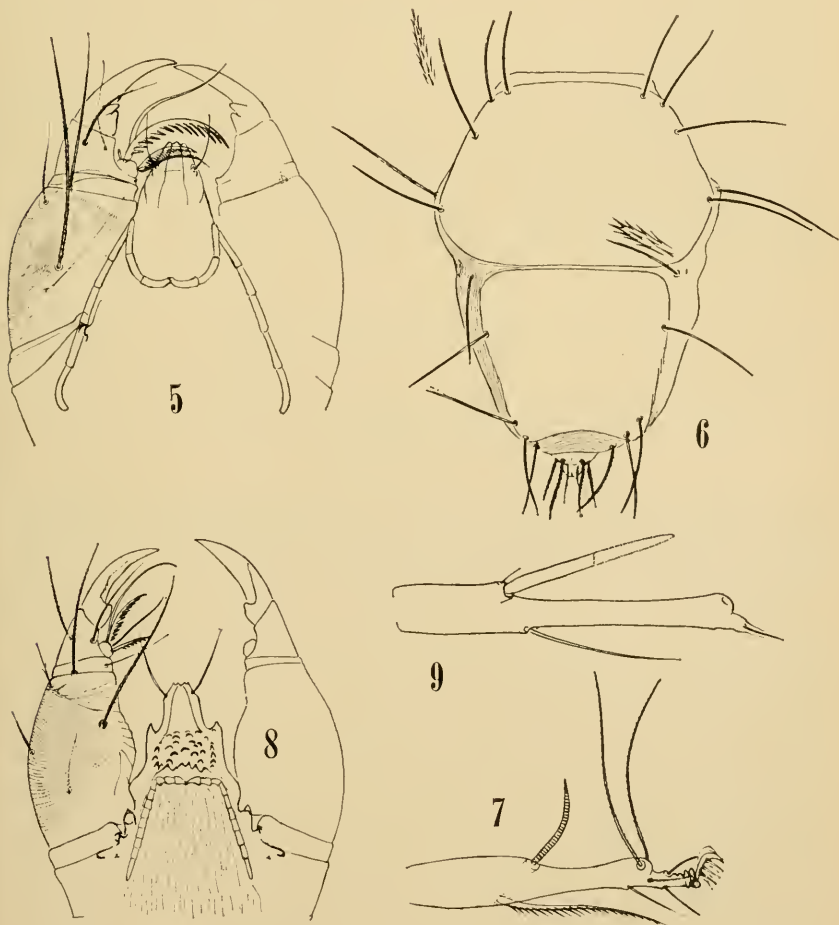
Female.—Gnathosoma broad; rostrum with dorsal reticulate pattern; peritremes slight, not obvious; palpal femur strongly elbowed, with dorsal reticulate pattern, with broadly expanded dorsal seta; dorsal seta of palpal genu broad; other palpal setae typical for genus. Palpal claw with three to four basal teeth. Propodosomal and hysterosomal shields with reticulate pattern; all dorsal body setae broadly squamiform, serrate. Propodosomal shield with four pairs of marginal setae and only one pair of dorsomedian setae; hysterosomal shield with eight pairs of broadly squamiform setae, the anterior marginal pair nearly off the shield. Dorsal setae of legs broad to narrowly lanceolate, as figured. Sensory rod of duplex setae of tarsus I long, slender, not reaching tip of tarsus; tactile seta almost twice as long as sensory setae, and nearly reaching tip of tarsus. Body 395 μ long by 223 μ wide.

The female holotype, U. S. National Museum No. 2883, was collected from *Oryza sativa*, Tahiti at Hawaii Quarantine, February 5, 1961, by H. A. Woolford.

***Cheyletus malayensis*, new species**

(Figs. 5-9)

This species is allied to *Cheyletus malaccensis* Oudemans in the general body facies and palpal claws, but is easily separated by the long dorsal body setae, and the strong tarsal sensory setae on tarsi I of both sexes.



Cheyletus malayensis, new species. Fig. 5, dorsal view of gnathosoma of female; fig. 6, dorsal view of female; fig. 7, tarsus I of female; fig. 8, dorsal view of gnathosoma of male; fig. 9, tarsus I of male.

Female.—Gnathosoma strong, longer than wide; rostrum with faint broken longitudinal striations; with prominent peritremes, each unit consisting of eight segments; palpal femur with long, slender pubescent dorsal seta and two short ventral setae; genu short, broader than long, with pubescent whip-like seta; other palpal setae typical for genus; palpal claw with two basal teeth similar to those of *Cheyletus malaccensis* Oudemans, the distal tooth finger-like, the proximal tooth long, flat. Dorsal shields covering much of body, without sculpturing. Propodosomal shield with four long, serrate setae; humeral setae longer than shield setae; hysterosoma with three pairs of setae similar to those on propodosomal shield. Leg setae typical; tarsus I with long, strong sensory seta. Length of body 600 μ ; width 300 μ .

Male.—Body setation similar to that of female. Palpus elongate, sculptured as figured. Tarsus I with large sensory seta (only a single male is available and this has the sensory seta broken as figured). Length of body 478 μ ; width 210 μ .

Type female, Bishop Museum, Honolulu, Hawaii, taken from nest of *Munia atricapilla*, Selangor Rantan Panjang, Malaya (5 miles north of Klang), 1960, by H. E. McClure. A female paratype, in the U. S. National Museum, taken from nest of *Munia striata* in the above locality, October 5, 1960, by H. E. McClure. A male paratype was taken from the nest of *Pycnonotus goiaver*, from the above locality, 1960, by H. E. McClure, and is in the Bishop Museum.

ALLYGIDIUS ATOMARIUS (FAB.), A NEW UNREPORTED SPECIES FOR NORTH AMERICA

(HOMOPTERA: CICADELLIDAE)

In a survey of the insects associated with grass and leguminous forage crops in New York in the summer of 1961, a common European leafhopper, *Allygidius atomarius* (Fab.), was collected for the first time in North America. This insect has been reported to injure chrysanthemums in Germany (Bodenheimer, 1921, Zeitschr. Pflanzenkr. 31(3-4): 97-100) and has been found to survive on bushes, shrubs and trees, such as oak, elm and alder, in Europe, North Africa and Caucasia (Fagel, 1949, Bul. Ann. Soc. Ent. Belg. 85: 144-153; Ribault, 1952, Faune de France 57: 207-211).

One specimen of *A. atomarius* was collected in early July in each of three western New York counties (Livingston, Monroe and Ontario) in fields composed predominantly of alfalfa and red clover. The extent of injury, if any, to forage grasses and legumes by this insect remains to be determined.

The authors are indebted to Dr. J. P. Kramer, U. S. Department of Agriculture, for identification of the specimens.

D. D. HARDEE, H. Y. FORSYTHE, JR., and GEORGE G. GYRISCO, *Cornell University, Ithaca, N. Y.*

TWO NEW FALSE SPIDER MITES FROM MEXICO AND A NEW DISTRIBUTION RECORD

(ACARINA: TENUIPALPIDAE)

DONALD DE LEON, *Route 2, Erwin, Tennessee*

The occurrence and range of mites of the family Tenuipalpidae in Mexico are poorly known. The addition of two new species and a new distribution record for *Aegyptobia macswaini* (P. & B.) contributes a bit to our knowledge of the family in this region.

Dr. E. W. Baker, U. S. Department of Agriculture, kindly compared specimens of *Aegyptobia macswaini* from San Blas with the type specimen in the U. S. National Museum.

The genus *Aegyptobia* is represented in Mexico by four species; the females may be separated by the characters given in the following key which has been adapted in part from Pritchard and Baker (1958):

- 1. Claws with strong distal hooks; dorsal setae strongly expanded 2
 Claws without distal hooks; dorsal setae slender 3
- 2. Propodosoma medially with anterior border deeply emarginate
 *vanus* (P. & B.)
 Propodosoma medially with anterior border evenly rounded
 *ceibae*, new species
- 3. Hysterosoma with longitudinal striae mediodorsad *macswaini* (P. & B.)
 Hysterosoma with transverse striae mediodorsad *glytus* (P. & B.)

***Aegyptobia ceibae*, new species**

(Fig. 1)

The female *Aegyptobia ceibae* resembles *A. vannus* (P. & B.) 1958, but differs most noticeably from that species in having much smaller dorsal setae, the propodosoma medially with the anterior border evenly rounded, and the dorsal surface of the body nearly smooth. The male and nymph are unknown.

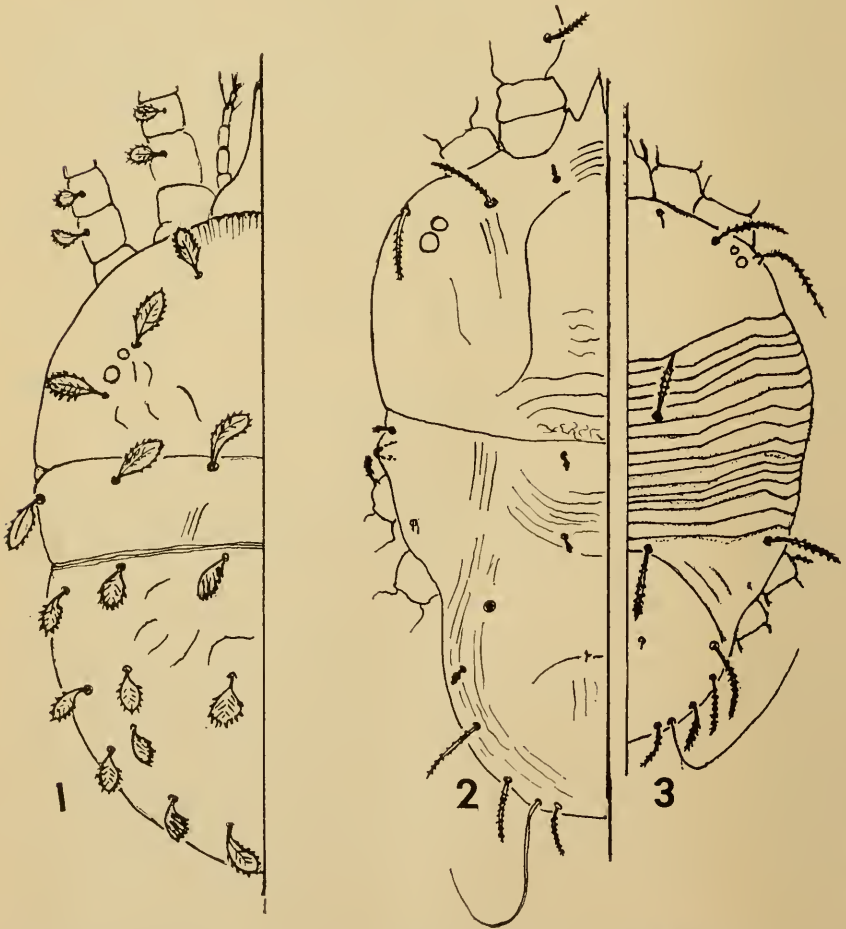
Female.—Body bright red, broadly oval, length (excluding rostrum) 237 microns, width 163 microns. Rostrum reaching from about distal end of genu I in one specimen to somewhat beyond distal end of tibia I in others; dorsum of body practically smooth, dorsal body setae broadly oval, serrate; Venter practically smooth except for folds bordering genital plate; anterior medioventrals longer than posterior pair; genital setae very narrowly lanceolate and apparently smooth. Segment 5 of palpus with 2 setae and a sensory rod, segment 4 with 2 setae, other segments bare; dorsal setae of femora I and II and genua I and II broadly oval, serrate; tarsi I and II each with a sensory rod reaching only to base of claws; claws with large hooks.

Holotype.—Female, Route 15 about 12 miles south of Guadalajara, Jalisco, March 13, 1957 (D. De Leon), on *Ceiba sp.* *Paratypes*.—3 females, other data same as for holotype.

Aegyptobia macswaini (Pritchard and Baker, 1952)

This species, known previously only from California, was collected April 1957 on *Pectis arenaria* growing along the beach at San Blas, Nayarit.

The genus *Tenuipalpus* is represented in Mexico by 19 species, including *uvae*, n. sp. The nymphs of some Mexican species, including *uvae*, have one or more pairs of the dorsocentral hysterosomal setae strongly developed; nymphs with comparable setal development have not yet been found in other regions.



Aegyptobia ceibae, n. sp. Fig. 1, dorsum of female. *Tenuipalpus uvae*, n. sp. Fig. 2, dorsum of female; fig. 3, dorsum of nymph.

Tenuipalpus uvae, new species

(Figs. 2 and 3)

The female *Tenuipalpus uvae* resembles *T. crescentiae* DeL. 1957, but differs from that species in having two setae on the anterior margin of genua I and II, the dorsolaterals filiform, and in other characters. The nymph is also distinctive. The male is unknown.

Female.—Body dark red, length 278 microns, width 165 microns. Dorsum of propodosoma and hysterosoma nearly smooth, with markings and setae as shown in figure 2; dorsolateral setae coarsely filiform, serrate, most of them between 20 and 38 microns long. Venter smooth, with one pair of anterior and one pair of posterior medioventral metapodosomals; all ventral setae smooth. Palpus apparently 2-segmented; genua I and II each with two setae on anterior margin and one seta on posterior margin, tarsi I and II each with a sensory rod and an overlying seta, coxa III and genu III each with a seta on anterior margin, genu IV bare.

Nymph.—Dorsal setae as shown in figure 3.

Holotype.—Female, San Blas, Nayarit, May 21, 1957 (D. De Leon), on a large tree (with pinnate leaves and small white flowers in racemes), called "uva" by the inhabitants. *Paratypes*.—6 females, 6 nymphs, other data same as for holotype.

The types of the two new species are in the author's collection.

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PUBLICATION DATES

The dates of publication of Vol. 64, No. 1, and Vol. 64, No. 2, were 1 May 1962 and 27 August 1962, respectively. The date of publication of Vol. 64, No. 3 will be found in Vol. 64, No. 4.

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**Memoir 5
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**A CLASSIFICATION OF THE SIPHONAPTERA OF
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by Phyllis Truth Johnson

The study of South American fleas was begun in 1879 when Weyenbergh published the first descriptions of species from that region, using specimens mounted on cardboard as was usual in that day. These fleas were restudied in balsam by Jordan and Rothschild in England shortly after the turn of the century, and from that time to the present day a large number of siphonapterologists, both in England and the Americas, have contributed to this study. Dr. Johnson's work is the first comprehensive taxonomic treatment of the fleas of the region, which comprises Trinidad and all of the continent and its coastal islands. The contemplated 275 page volume will be indispensable to the serious student of this important order of insects.

Memoir 5 opens with two discussions of morphological characters, one devoted to the terms used in the taxonomic section and the other to their taxonomic validity and possible phylogenetic significance. All the families, tribes and genera known to occur in South America are completely described and illustrated, and the species within each genus have been listed with host and locality data. Descriptions of 17 new species and two new subspecies bring the total number to 170. Keys to families, tribes, genera, and species are included. The discussion of each genus is terminated by a section giving the synonymies of the hosts concerned. The 114 plates are said to contain among the best illustrations of fleas currently available, and are grouped according to family. A section listing hosts, each with the fleas known to occur on it, recapitulates the host-flea information; sections dealing with references, systematic index and list of abbreviations close the volume.

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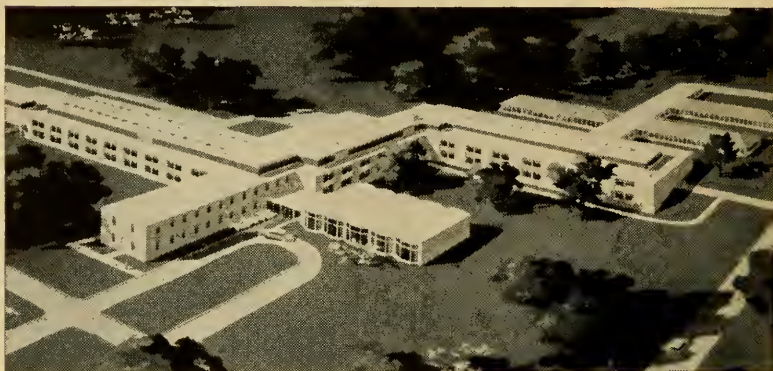


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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884

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Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are \$5.00; initiation fee is \$1.00 (U. S. currency).

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Published quarterly beginning with March by the Society at Washington, D. O. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are \$6.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

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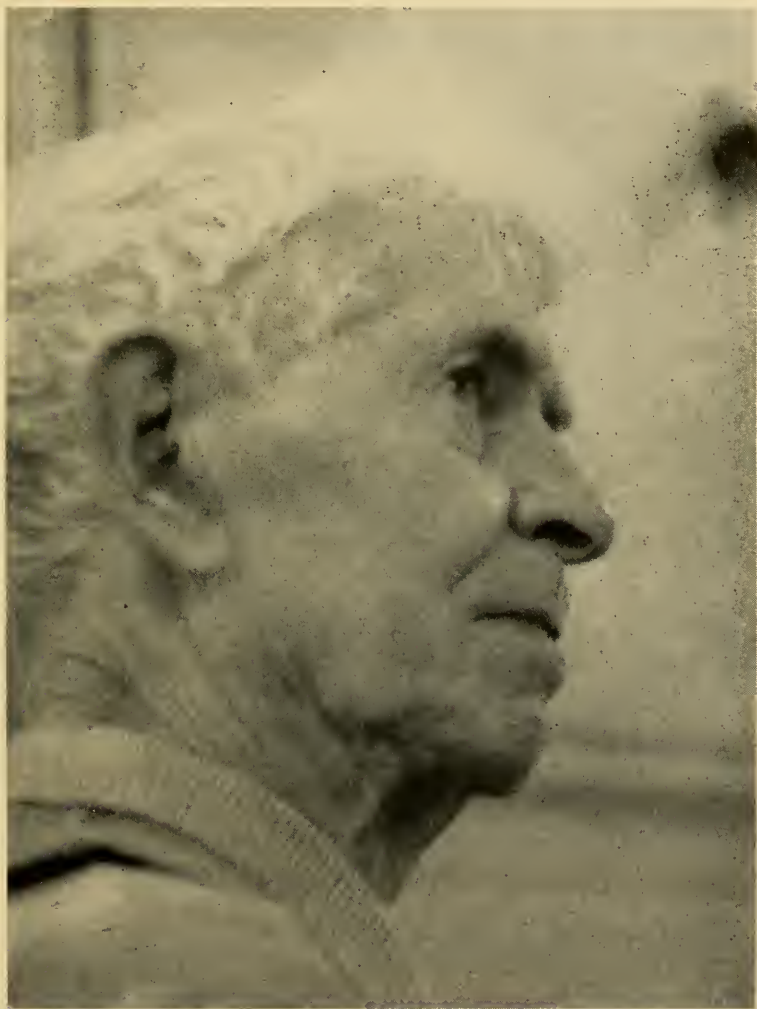
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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 64

DECEMBER, 1962

No. 4



ROBERT EVANS SNODGRASS
July 5, 1875-September 4, 1962

To his memory this
issue is proudly dedicated

EDITORIAL

In 1952 I was assigned a U. S. Department of Agriculture desk in the Smithsonian's Museum of Natural History to study flies. Passing through the halls of that building in the pursuit of my career brought me into almost daily contact with many people. One of them, Robert E. Snodgrass, will occupy my memory silently but elegantly until my own final day.

Specifically, the memory revolves about an obscure habit. He insisted upon carrying his coffee from the pouring place across a public hall to his desk 50 feet away. In itself not significant, this insistence included the filling of his cup to within one-eighth inch of the brim and thereupon boasting of not spilling a drop the whole way. The first time, I didn't believe him and followed every movement of that cup—not a drop was spilled! I thought he couldn't possibly do it a second time, but this came to pass, and a third, and a fourth, and indeed many in the months to come.

After much reflection I came to realize that this wonderful gift was but an outward sign of a deep, abiding inner tranquility. I also began to see other signs—his love of a good story, his ability to write without revision, his distaste of noise, his lack of the backward look so many men his age inherit, and his eagerness to become involved in a new adventure. The depth of his explanation of retromorphosis, avoided by most of us would-be systematists as somewhat *avant-garde*, is a small example of how my memory of a peaceful and seemingly inexhaustible spirit is enhanced.

I for one have taken him for a pattern, although I suspect the cloth is not made entirely whole!

The traits I have described above, and many others, have been cast in solid form by Dr. Ernestine B. Thurman in a fascinating biography (1959, Smithsonian Miscellaneous Collections, Vol. 137, pp. 1-22). The reader may also wish to consult her list of his writings complete to that date.¹

On Saturday, September 15, 1962, a memorial at the All Soul's Unitarian Church in Washington was conducted to mark his passing. The speakers at that service have kindly passed along their remarks for publication, and I am pleased to present them forthwith.

¹Editorial prerogative is exercised in making exception to the *inviolable* rule that only one of an author's papers appear in any issue. The two articles by Dr. Snodgrass in the present number of the *Proceedings* are believed to be the last of his works to see print.

Dr. John B. Schmitt, *New Jersey Agricultural Experiment Station, New Brunswick:*

Let it be said at once that it is folly to presume to review the work of Robert Evans Snodgrass in these few minutes. For one thing, he never really retired. After the age of 70, he continued to write, study, and work, and published 18 papers before he died. Moreover, he began his work in 1896, long before a good many of us were born. Many of his papers ran 100 to 150 and even more pages. Four of them were full-sized books filled with the wisdom and knowledge that he gave his life to learn. Yet some review is clearly in order. I shall attempt it. I have no hope of really accomplishing it.

His early work in 1896 was on the mouth parts of the bird louse, with which I suppose he became acquainted from his early interest in ornithology, but he soon turned to insect anatomy to study the thorax of insects. There followed four papers from 1903 to 1909 that clearly showed that this was no routine worker who followed the footsteps of others, but rather one who took issue with the themes of insect anatomy as they were then understood. Insect anatomy in those days was filled with phylogenetic speculation; that seemed to be the important thing; and the facts were very often twisted to serve that purpose. He had no patience with this. Rather, he said the facts were the important thing. Theorize when you can, but always go for the facts. At that time external morphology was the study of the surface features of the insect, as if anyone could study these features and ignore the musculature and details of functional structure underneath. He said this was the craziest kind of folly. His guide-points were thus early established. External features become significant only when the underlying structure is understood, and structure serves function.

In 1910 he published a monumental work on the anatomy of the honey bee. It was interesting to note that he went back to this subject for publication in 1925, in 1941, and in 1946. Here was his insistence on going back to the insect again and again and again, never satisfied until he was absolutely sure that he had all the facts.

In 1917, one of his "wander" years, he worked in Indiana and published a remarkable piece of work on the insects of that state, but he soon returned to the study of insect structure in itself. In 1921 he published a work on the 17-year cicada, studying its mouth-parts in great detail, and in 1924 on the anatomy and metamorphosis of the apple maggot. This was a series of papers culminating in a second book on the honey bee, which dealt particularly with insect metamorphosis.

Then from 1927 to 1937 came what I have long regarded to be "the giant steps." A series of eight papers on the morphology of insects, beginning with a study of the morphology and mechanisms of the insect thorax, followed by one on the insect head, and, in 1929,

by the thoracic mechanism of the grasshopper. Here he returned to the Carolina locust, *Dissosteira*, which was long one of his favorite subjects. In 1931, 1933, and 1935 appeared his three papers on the morphology of the insect abdomen, another in 1936, and finally in 1937 a monumental work on the genitalia of male insects.

I like to think of him as I knew him then and the simplicity of his equipment. His work table was a shelf supported on brackets by a window. The sunlight poured into the window. It was all he needed to see by, and the simplest of forceps and scissors served him better than the most remarkable devices we can get today for that purpose.

Also in this period appeared two great books by Robert Evans Snodgrass: In 1930, *Insects, Their Ways and Means of Living*, a most delightful book on just exactly what the title says, where with all humility he reported on insects with the closest kind of observation; and in 1935 a quite different book in many respects, his *Principles of Insect Morphology*, the first real textbook of insect morphology in the English language, and one which is still the definitive work in that subject.

In the next decade appeared five great papers in which he was turning more and more to phylogenetic speculation. In 1938, the evolution of the Annelida, Onychophora, and Arthropoda; in 1941, a most difficult subject, the male genitalia of the Hymenoptera; in 1942, the skeletal mechanisms and musculature of the honey-bee; in 1946 (I don't know how he ever did this one—I still marvel), the skeletal anatomy of fleas, possibly one of the most difficult subjects of insect structure ever undertaken. In 1948 he turned to help the students of the Arachnida with a work on the feeding apparatus of the Arachnida. There also appeared in this period two valuable papers to aid medical entomologists in dealing with the mouth parts of disease-carrying mites and other arthropods.

I cannot help but comment here upon his remarkable skill in selecting pertinent material from the works of others—vast bibliographic effort which culminated for all of us in the selection of just those little features of others' observations which applied to the subject at hand.

In 1952 there appeared a textbook of arthropod anatomy, which again bore out one of the lessons he insisted upon over and over again—that insects are first of all arthropods, and that we need to be familiar with arthropods other than insects in order to reach sound views on insect phylogeny.

In 1953 he turned to a subject which by now had reached the forefront as a result of studies on insect physiology, the study of insect metamorphosis, and here he found, so he told me, that people were working on insect metamorphosis with very little knowledge of what goes on in the insect during metamorphosis. So in 1953 we find his work on the metamorphosis of the fly's head. He picked up the work

on *Rhagoletis* he had done many years before, expanded it, added the new knowledge, and out came a magnificent piece of work.

In 1956 he turned to the metamorphosis of the Crustacea, a subject which had long been loaded with outworn phylogenetic speculation, and brought order to chaos. In 1959 he produced another delightful work on the anatomical life of the mosquito. In 1961 he wrote two more pieces, one on the caterpillar and the butterfly, the other on insect metamorphosis, in which he introduced the term "retromorphosis."

I would like to take note at this point that he was never satisfied with his earlier findings on insect structure and produced three revisionary papers: In 1957 a revised interpretation of male genitalia; in 1958, the evolution of arthropod mechanisms; and finally in 1960, facts and theories concerning the insect head.

Who could talk of the work of Robert E. Snodgrass and not mention his exquisite and precise skill as an illustrator, his capacity for finding just the right choice of words, and his pleasing yet discriminating style of writing. And who could forget those delightful Smithsonian Annual Reports with papers in the popular vein but still filled with entomological wisdom for all of us.

This is a very poor summary of the legacy of knowledge that he leaves us. Perhaps equally important is the legacy of principle—his firm belief that it is no crime to err in reporting the facts. The crime is to persist in error. That, he said, is inexcusable.

How are we going to perpetuate the memory of this great man? That is the question which I shall leave to the next speaker.

Dr. Ernestine B. Thurman, *National Institutes of Health, P.H.S., Bethesda, Md.:*

"Robert Evans Snodgrass died September 4, 1962." That single statement is all that Dr. Snodgrass considered to be necessary for announcing the occasion. When I asked him why, he replied in his usual quick manner, "All those who should know me, do." True. Though we, who have had the privilege of knowing him, wish to pay tribute to him and to his contributions to mankind. We have heard Dr. Schmitt's tribute to his remarkable contributions to the scientific world.

As an individual Robert Snodgrass was equally as remarkable. A writer, a critic, an artist, a sculptor, a philosopher, a traveler and explorer, a teacher and a source of inspiration for all scientists. Physically Dr. Snodgrass was remarkable. Some 20 years after retirement he was still physically fit and mentally alert, though he had become somewhat fragile. He continued his daily research at the Smithsonian Institution. He cared for his garden and the maintenance of his home. He continued to participate in social affairs and professional organizations. His conversations were spiced with his ready wit and clearly showed his intensive, almost fierce independence. He had strong convictions and the courage to maintain

them. As a youth he was expelled from the Methodist Church because of his stated belief in evolution. He then joined the Unitarian Church and remained a life-long member.

Because of his independence and ability to make his own interpretations, many were of the impression that he was not a religious man. On the contrary, he read the Bible studiously and he lived each day with completely unselfish devotion to his fellowman regardless of race or creed. I do not know of a single instance when he purposely was unkind or hurt a living thing.

Dr. Snodgrass was born in St. Louis, Missouri, on the 5th of July 1875, the eldest of three children. Before the age of eight he made scientific observations though at that time he could not interpret his observations. He was fascinated by the legs of grasshoppers which continued to kick after having been cut off by his father's lawnmower. Thus, was the beginning of the greatest entomologists of our generation.

The family moved to Wetmore, Kansas, where Robbie, as he was called then, learned taxidermy. This was his solution to owning a gun and being forbidden to shoot birds. He received parental permission to shoot a pair of each kind of bird for scientific study.

Thence, from Kansas to California and ultimately to Stanford University where Rob Snodgrass entered at the age of 20. After graduation there, Robert Snodgrass began to teach at the State College of Washington, Pullman. His brief appointment terminated mainly because of his love for playing jokes: He did not tell me the details but it had something to do with a bicycle being found in the girls' dormitory. From Pullman he returned to Stanford University. Fulfilling a responsibility there cost him his job. He had the duty of feeding silkworm larvae; hence, he stripped the leaves from the mulberry trees in front of the boys' dormitory. The trees inconsiderately died. Robert Snodgrass, ex-professor, now turned to art and sculpturing in San Francisco.

The chain of unexpected events continued: The 1906 earthquake directed his steps eastward to Washington, D. C., and Dr. L. O. Howard. After a few years with the U. S. Department of Agriculture; a carefree trip to England; a few years of being a freelance artist and selling cartoons to popular magazines in New York; a gay venture in selling paintings to farmers in Indiana; and two years of entomological work in Indiana; he returned to Washington, D. C., and the U. S. Department of Agriculture.

His days of carefree roaming were over: He met the lovely musician, Miss Ruth Mae Hansford, whom he married in 1924. As a result, he reported, he had a wife, two daughters, five grandchildren and real-estate taxes. Mrs. Snodgrass enhanced the beauty and gayety of his life and assisted him in his scientific endeavors. She encouraged his efforts and typed and edited his manuscripts. Dr. Snodgrass wrote quickly and easily, seldom having to rewrite anything.

He modestly explained that he did not want to impose upon Mrs. Snodgrass by having her retype the papers.

Dr. Snodgrass was an avid reader of an array of subjects. His favorite was about animals, particularly *The Wind in the Willows* by Grahame. One of his manuscripts deals with observations made through the eyes of a cockroach. One of his favorite poems was "The Nightingale and the Glow-worm" by Cowper. Let me quote two lines from that poem:

". . . For 'twas the self-same power divine
Taught you to sing and me to shine . . ."

Our cherished friend lived with a great deal of enthusiasm, a zest which never diminished. I do not know of a time in which he was bored nor of a situation which caused him to become bitter. He had some very strong dislikes: Barking dogs, radios, getting up in the morning, and nutmeg in apple pie. The only disappointments he ever mentioned to me were that his teeth remained solid only through his 84th year and that neither of his daughters followed in his scientific career. One daughter is following in his career as an artist. Many of us have benefited as sons and daughters by his careful guidance and his constructive criticisms. He gave generously of his time and talents in reviewing and editing manuscripts for students throughout the world. His contributions and correspondence were not limited by geographical nor political boundaries. Thus, the newly established Robert E. Snodgrass Memorial Fund will serve as a living memorial to this great man. The Fund, being administered by the Entomological Society of America, will support future students of entomology who probably will not have had the privilege of knowing Dr. Snodgrass personally.

On Monday, September 3rd, Dr. Snodgrass had spent the day at home, quietly smoking his pipe as he wrote on his new book. In the evening he completed his usual tasks around the home and enjoyed the early hours with his family before settling down at his desk for his customary three or four hours of writing on his manuscript for a new book on insect morphology. Sometime during the early morning hours, probably just at sunrise, as he slept peacefully, God touched him and he continued to sleep. We are consoled because his departure was as he wanted it, quiet, painless and without a lengthy period of infirmity.

Not so long ago, Dr. Snodgrass and I were philosophizing about the Hereafter. He expressed a desire to study the musculature of the angels in order to learn the mechanism of their flight. At that time I thought of the verse from St. John, ". . . in my Father's House are many mansions . . ." In one of those mansions, Dr. Snodgrass may well be embarking upon investigations with a new subject, rapidly and accurately sketching with a pencil in each hand, and interpreting his observations on the mechanism of the flight of angels.

I promised Dr. Snodgrass that there would be no emotional scenes, no morbid obituaries, no mourning when he ceased to live on earth; there would be a prayer of thanksgiving in the heart of each of us for the privilege of having known him and for the riches which he had added to our lives. One of the many friends who have written to Mrs. Snodgrass wrote, "The qualities for which this great man was admired and loved are imperishable." Let me close by quoting Dr. Snodgrass.

"Adversity is seldom dull. The things we do in this world do not count for half so much as those that happen. I would not exchange the unexpected in my life for all that I've achieved through efforts of my own. The events we set in motion by preconceived design take us along conventional routes that we expect will lead on to success, while those that fate ordains create all the diversity and give all the excitement that make it worthwhile to live."

THE SNODGRASS MEMORIAL FUND

It is widely recognized that a university education, even for deserving students, is becoming more and more difficult to attain. Increased costs of delivering an education have resulted in higher university fees and increased costs of living have not lessened the burden on those seeking higher learning. To the end that these obstacles not block entirely the progress of promising students in entomology, the Snodgrass Memorial Fund has been established.

Administered by the Entomological Society of America under the supervision of Mr. Robert H. Nelson, its Executive Secretary, the fund is deposited in its own account and at the present writing amounts to about \$250.00. When the fund has grown effectively, an appropriate decision will be made about its investment.

Donations in response to this appeal for funds can be made by cash, check or money order and can be sent or given to any of the three persons listed below:

Mrs. R. E. Snodgrass

3706 13th St., N.W. Washington, D. C.

Dr. Ernestine B. Thurman

5617 Sonoma Road, Bethesda, Maryland

Mr. R. H. Nelson

Executive Secretary, Entomological Society of America
4603 Calvert Road, College Park, Maryland

MEDITATIONS OF A COCKROACH

Translated from the *Blattan*R. E. SNODGRASS, *Washington, D. C.*

Those large two-legged human animals with whom I live call my kind "cockroaches," but this is just their phonetic way of pronouncing the Spanish word *cucaracha* , which means neither "cock" nor "roach." Some make it worse by calling us simply "roaches," but a *roach*, since the days of Isaac Walton at least, has been a kind of fish, and we of course have no relation to fishes. This is just one example of the human disregard of nomenclatural errors.

My family name is *Blattidae*, and I belong to the species scientifically called *Blattella germanica*, though I am not German. My ancestors came to Europe from Africa, and perhaps first settled in Germany. A Swede called Linnaeus then gave them the name *germanica*, which by their silly rules of nomenclature cannot be changed. From Europe we came to America on ship along with the human migrants, and now we are spread all over this country. We did not take to the fields and woods, since we preferred the shelter of the human's houses, which we found were usually warm and comfortable the year around, furnished with plenty of food and water, and contained places of easy concealment just suited to our retiring habits.

Our life in houses, however, has not always been agreeable, because the human species is a cruel animal and resents our intrusion, though we do no harm and usually try to keep out of sight. United States cockroaches, living in houses, seldom if ever bite their hosts, as do the blood-thirsty bed bugs, fleas, and mosquitoes. From the tropics, however, come reports of cockroaches biting sleeping persons, especially children, which cannot be denied, but we should not all be condemned for the misdeeds of a few. Some humans are said to *eat* cockroaches, and in earlier times cockroaches dried or powdered were widely prescribed as a cure for various human diseases. Now we are accused of carrying numerous kinds of viruses, bacteria, and other disease germs, which we get from association with the humans, and so we are set down as a menace to the public health. Yet I have heard of no authentic record of any human getting a disease from one of us.

In one respect we have a common tie with the humans, which is that we both like the same kinds of food. They, however, keep their food supplies mostly in tight containers or in the refrigerator, so what little we consume is generally crumbs found on the kitchen floor, in unswept corners, on the pantry shelves, about the sink, or scraps left by the house cat or the dog. In cleaning this up, therefore, we are really contributing to the sanitary condition of the kitchen. Yet, so unreasoning is prejudice, that every effort is made to exterminate us—we are swatted and poisoned without mercy.

Personally, I have lived safely a long time with the family of my present residence. At times some of them have swatted at me, but I have been too alert for them, and I make it a point wherever I go always to remember where the nearest crack or hole is into which I

can dash for safety. The best rule for cockroaches of any species is to remain in concealment during the day and come out only at night when the lights are turned off.

During the latter part of my mature life I have been much interested in observing the ways of the humans—comparing their habits with ours, and in noting how differently we are made. Though we both have organs for doing the same things, it is surprising how different they are. The humans are really four-legged animals, but they are practically bipeds because they stand on end and walk only with their hind legs. The fore legs, or arms as they call them, swing freely about and are used mostly for grasping and holding things. How much better is our way of walking or running on all six of our legs, with our body in a horizontal position. If something happens to one of our legs we still have five others to go on; the biped is crippled if one leg should be injured. The young humans at first go on all fours, showing that this is nature's way of locomotion; when later they start to walk upright they frequently have bad falls. The habit of standing up on the hind legs was started by the apes, and no insect has imitated them. Members of my species can walk up a vertical glass surface, which is something no human can possibly do, though neither can some cockroaches.

The adult human, with his head way up in the air, has to use his arms to bring food up to his mouth. With us, our mouth is always forward where it comes into direct contact with any food we encounter, which can at once be consumed. Our young ones are able to find their own food and eat it as soon as they are hatched and begin running around. The young human for a long time after birth must be fed by its parents.

The human head has a queer look to us cockroaches because as insects we are accustomed to associate a pair of antennae with the face. Antennae are indeed most convenient and useful things to have, especially long, slender, highly flexible and movable ones like ours. They give us a very delicate sense of touch at a distance, and contain our organs of smell. Some insects can hear with their antennae. If the human wants to touch or feel something at a distance he has to reach out with his fore legs; we retain complete use of our legs for walking or running, and by waving our antennae about we know what is immediately ahead without bumping into it.

The humans probably have better eyesight for seeing objects with their two small eyes on the front of the head, but our large, convex lateral eyes give us instant recognition of movement. For this reason we are adept at avoiding swatters or attacks by birds, since any moving object is always to be suspected of being dangerous.

It is particularly interesting to see how different the feeding organs of the humans are from ours, though we both eat the same food. We have a pair of strong, toothed jaws, or *mandibles*, that work side-ways in biting or chewing the food. They are mostly covered by a broad upper lip, or *labrum*. Behind the mandibles is a second pair

of organs, called *maxillae*, that work back and forth and are used for bringing food back to the jaws. Below or behind these parts is a broad, flat under lip, or *labium*. All these active feeding organs are *outside* the mouth, as is also a median tongue like structure known as the *hypopharynx*. The labrum and the labium enclose the other parts in a preoral food cavity. Between the base of the hypopharynx and the front wall of the cavity is a special food pocket, the *cibarium*, in which the masticated food from the mandibles is deposited before being taken into the mouth. Our taste organs are located in the preoral cavity, so we can taste our food before it is taken into the mouth. Moreover, our salivary glands open over the base of the labium, and the saliva is mixed with the food in the preoral cavity. Our food, therefore, when taken into the mouth is all ready to be swallowed.

The mouth of the human is a transverse opening on the lower part of the face, and leads directly into a mouth cavity. The jaws, two in number, one above, the other below, are entirely enclosed in the mouth cavity and the lower jaw works up and down against the stationary upper jaw. Each jaw is armed with a long row of teeth, but the teeth are set into sockets of the jaw bones. The teeth, therefore, often become loose, or break off, and are particularly subject to decay, producing such pain that they have to be pulled out and replaced with artificial teeth. One old man in my human family has lost all his teeth, and has a bad time with a false set that will not stay in place while he eats. I am certainly glad that I am a cockroach with solid teeth on my jaws. In all my life I have never heard of a cockroach losing a tooth or of complaining of having a toothache.

Again, consider the differences in the ways we breathe. The human animal breathes through two little holes on a thing that sticks out on the front of his face called a nose. From these apertures a passage leads to his throat cavity. On the floor of the throat is a single opening into a tube that runs down through the neck and branches into a pair of spongy sacs in the thorax known as lungs. Blood circulates through the lungs and takes up the oxygen from the inhaled air. The blood is then conveyed through a vessel to the heart, from which it is finally pumped through branching arteries all over the body. The returning veins carry the waste carbon dioxide back to the lungs, from which it is expelled through the nose.

With such a complex breathing system, it is not surprising that the human is subject to all kinds of respiratory troubles, such as sneezing, colds in the head, bronchitis, tuberculosis and cancer of the lungs. We cockroaches and other insects, by contrast, have our breathing holes distributed along the sides of the body, as many as ten pairs of them. From these spiracles finely branching air tubes go to all internal parts of the body and deliver oxygen directly to where it is needed. How much simpler and efficient is this plan than the complex human system! We insects are practically free from respiratory troubles. The human always carries with him a small rag, called a handkerchief, used principally for wiping his nose. Our spiracles need no such attention.

The human organs for perceiving smells inside the nose, are easily affected by inflammation of the nose cavity. Ours are carried on the antennae, where they are at all times freely exposed to the air, which probably accounts for the keen sense of odor perception many insects possess. The antennae of some insects bear also organs of hearing. Probably the human ear inside the head is a better organ than ours, but since we make no sounds we have little use for hearing. The males of some of our relatives, such as the crickets and katydids, make a lot of noise by scraping their wings together, called singing, to please the females, which have ears on their front legs. By contrast, the voice organ of the human animal is inside his throat, and he has to open his mouth to be heard.

Insects have one great advantage over the humans in that most of them have wings and are able to fly. Though the humans have no vestiges of wings, it seems that they would like to have wings, for I have sometimes heard them say they expect to have wings after they die. They believe they are going to be resurrected as winged creatures called angels, suggesting that they must envy us while alive.

Our wings are entirely different from the wings of any other flying animals. They grow out from the sides of the back of the thorax while we are young and are ready for use when we become adults. In some insects during the juvenile stages they are concealed in pockets of the skin. At maturity we are fully capable of flight without any instruction or practice. The birds and the bats have acquired their wings by a reconstruction of their front legs into flying organs, and thereby they have lost the use of these legs for anything else. We insects, on the contrary, have kept all six of our legs for walking or running, and have wings in addition, most species having two pairs but some only one pair, and only a few are wingless. The humans in order to fly have made what they call "flying machines," which are really air ships, since they "fly" by whirling propellers and not by wings. These machines make an awful noise, and frequently have accidents that kill a lot of people. Nothing like this ever happens to us; our only air casualties result from flying into bright lights at night, which are too attractive to some insects. Most cockroaches have wings, though they do not fly much. Members of my species have well-developed wings, but we have practically given up flying.

Another funny thing about the humans is that they wear artificial clothes, which they are all the time taking off and putting on again. Now, with us insects our clothes grow on us. When one suit gets too tight during our growing season, another grows beneath it, and we discard the old one. The clothes we have at maturity last the rest of our lives. Our clothes, by their colors and markings, are distinctive of our species. The humans wear different kinds of clothes, but underneath they are all pretty much alike, except that you can nearly always tell the sex of an individual by the style of the clothes.

We cockroaches are a quiet lot. We have no voice, and no need for one, nor do we have sound-making implements as do the crickets, katydids, and cicadas. On the contrary, the humans in the house are

often distracting with their loud talking, quarreling, and constant shouting at the young ones, which themselves are always making some kind of unnecessary noise. As if all this were not enough, they have noise-making machines that they keep going for hours at a time. Since we like quietude we are lucky that our hearing is poor. We do not envy the family life of the humans we live with and avoid them as much as possible by coming out of our retreats mostly at night when the kitchen is dark and deserted. While we have good eyesight, we do not need our eyes in the dark, except to tell us when the light is suddenly snapped on, which means that a human has entered the room and is likely to make trouble for us.

Socially we are individualists, but we get along perfectly well with one another. We are not gregarious by nature, but sometimes a crowd of us may assemble at one place attracted by favorable conditions such as protection, warmth, or an abundance of food. We have no rules of conduct because we know by instinct what is proper behavior for a cockroach. We have no marriage laws or ceremonies. A congenial pair may mate at any time by mutual consent, and they may separate without recourse to a court of law. Our matrimonial freedom we owe to the fact that our young are hatched directly from eggs, and need no care or attention from their parents. By this common-sense arrangement there are no illegitimate children, and it is conducive to rapid multiplication of the species.

A cockroach female discharges her eggs into a chamber at the end of the abdomen. Here the eggs are enclosed in a capsule formed by the secretion of glands. Most species carry the capsule, or ootheca, projecting from the end of the body until the eggs are ready to hatch, or deposit it in a safe place. Some, however, store the capsule in a large pouch of the end chamber and keep them there until the eggs hatch. In this case it appears that the female is giving birth to live young, but the hatching of eggs in an open pouch is in no way comparable to the birth of live young by animals that do not lay eggs. I myself have actually seen newly-born mice, miserable little things, blind, utterly helpless, and dependent on their mother for care and feeding. This is an awful way to be born, and I am told it is the same with the humans, who, moreover, must give years of attention to their offspring. How much simpler and easier it is to lay an egg than to give birth to a live, squirming infant. Ugh! Again I am thankful that I am a cockroach.

Since all of us animals have to do the same things in order to live, that is, we must eat, breathe, avoid danger, and reproduce our kind, it seem strange that different animals have been endowed with such different ways and means of performing these few necessary functions. They call it "evolution" and "survival of the fittest," but we insects are the most populous and diversified inhabitants of the earth, and our ancestry goes back at least 300 million years. But I am only a cockroach, and cannot understand what satisfaction the human animals get from their complex ways of life. Probably they do not realize how simple and satisfactory is the life of a cockroach.

SUTURE OR SULCUS?R. E. SNODGRASS, *Washington, D. C.*

The question of usage raised by these two words is a general one. Should scientific terms mean what they say by their derivation, or may they be mere labels for facts to be used for descriptive purposes without regard to their linguistic origins?

The term *suture* as commonly used in entomology is given to any external groove of the insect skeleton. Yet the name comes from the Latin *sutura* meaning a seam, derived from the verb *suo*, to sew. Literally, therefore, the only true anatomical sutures should be those made by surgeons. In vertebrate anatomical terminology, however, the zig-zag lines of union between centers of ossification in the skull have long been called "sutures." Since these lines suggest a coarse stitching between the bones, this nonfactual usage of the term can be condoned as figurative. These so-called sutures are at least lines of union.

When the early entomologists, being familiar with their vertebrate anatomy, then carried the term "suture" over to the grooves on the insect cranium and other parts of the skeleton, they applied the word to features that in no sense, figurative or otherwise, should be called sutures. Most of the surface grooves of the insects are linear inflections of the cuticle that give strength to the body wall along lines of mechanical stress, as has been well shown by Strenger in her studies of the insect head (1942, 1950, 1952), though she still calls the grooves *Nähte* (German for sutures). In other cases the inner ridges give attachment to muscles, as the antecostae of the segmental plates and the phragmata of the thorax. Rarely a groove marks a line of union between sclerites. The cuticular ingrowths of the body wall constitute the so-called endoskeleton of the insect, which is functionally comparable to the framework of a wooden house. In the building of the insect, however, the wall is put up first, and the framework is then formed by infoldings of the wall where needed to give extra strength.

Well-known examples of body-wall strengthening by cuticular inflections are the internal ridges of the thoracic pleura. These ridges brace the pleural walls first for the support of the legs, and then in the wing-bearing segments for the support of the wings. Clearly it is an absurdity to call the ridge-forming grooves of the thoracic pleura the pleural "sutures," as if they are lines of union between the episterna and the epimera. The same is true of the head grooves that are formed along lines of stress in the cranial wall. An exception is the so-called "epicranial suture," which is now recognized to be a preformed line of weakness in the immature head where the cuticle will split at ecdysis (see Snodgrass, 1947).

It has been argued that if we discredit the use of a vertebrate term for an insect structure on the basis of non-homology, we should have to re-name all the parts of the insect, since there can be no homology of insect parts with those of vertebrates. This contention, however, overlooks the fact that terms, which only by priority are vertebrate

names, are given to anatomical parts of insects and other invertebrates on the basis of functional identity, or in some cases of analogy. A food tract extending through the body, for example, is literally an *alimentary canal* in any animal. A locomotor organ for progress on solid surfaces is functionally a *leg* regardless of its origin or structure. An organ of flight is a *wing*, whether of an insect, a bird, a bat, an angel, or the devil. Similarly a head is a *head* on an animal, a nail, or a pin. A respiratory tube may be a *trachea* in an insect as well as in a vertebrate. An organ for aquatic respiration by any animal is a *gill*. A blood-pumping organ is a *heart* wherever it occurs. The vertebrate names given to the segments of an insect's leg are cases of naming parts by analogy.

The term *suture* does not come in this category of vertebrate names that can be applied to insect parts either on a functional basis or one on analogy. An anatomical suture can be only a line of union between parts originally separate. The ridge-forming grooves of the insect skeleton have no relation whatever to anything properly called a suture. The term "suture," therefore, should be discarded from entomological terminology, except where it may be correctly used. Fortunately we have an easy substitute in the familiar word *sulcus* (pl. *sulci*), which is Latin for *furrow*, or *groove*. Since both "suture" and "sulcus" have an initial *S*, if this letter has stood for "suture" on published drawings, the same will stand for "sulcus."

To persist in the use of "suture" for the ridge-forming grooves of the insect skeleton not only perpetuates a nomenclatural error, but it disregards the mechanical significance of the grooves. Students learn the superficial facts of insect anatomy, probably accepting "sutures" as lines of union between sclerites, and get little or no understanding of why the insect is made as it is. Learning definitions is a large part of elementary anatomical education. Definitions, therefore, should meet their responsibilities.

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THE REALITY OF STERNITES IN THE MESOTHORAX
OF HYMENOPTERA

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Surface sternal plates are not supposed to occur in the mesothorax of Hymenoptera according to a theory that was advanced by Ferris in 1940 and which has been widely accepted since then with few dissensions (Ferris, 1940). The most noteworthy dissenter is Snodgrass. He has not made any concessions to the Ferris theory. (Snodgrass, 1942, p. 48 and 1956, pp. 88-90.) Photographic evidence is presented here to show that external sternites do occur in the mesothorax of some Hymenoptera. In a systematic paper attention was directed to *Astymachus japonicus* How. and *Scelioencyrtus mymaricoides* Comp., Rao, Kaur., as having structural peculiarities that might prove instructive to expert anatomists in tracing the evolution of the thorax in the Encyrtidae (Compere, Rao, and Kaur, 1960). This was an understatement. One need not be an expert anatomist to realize that these insects do more than this. They prove that the Ferris theory and the modifications of this theory by others concerning the morphology of the thorax in the Hymenoptera are untenable; that facts of anatomy have been forced to fit untenable theories; that evolution in the Hymenoptera does not follow a simple uniform basic pattern; that patterns may move in one direction and sometimes in another direction; that sclerites, ridges, sulci, and clefts may come into existence on stationary, pre-existing, substrates; that it is a mistake to assume that morphological regions necessarily follow shifts in the sclerotization.

Snodgrass regards the muscle connections as providing good permanent landmarks and what seems to be the most decisive evidence against the Ferris theory. In the honey bee (Snodgrass, 1956, fig. 49) the large tergo-sternal wing muscles of the mesothorax are not carried off by the sternum, which is supposed to migrate and invaginate according to the Ferris theory. It is hardly to be supposed that a migrating sternum should pass its muscles to an invading pleuron.

Nothing has been written above that is new or that has not been expressed or implied by Snodgrass in one place or another in his publications but in different words or communicated in letters.

Astymachus japonicus and *Scelioencyrtus mymaricoides* are not typical of the Encyrtidae, and may not fall in this family in a perfected classification. These two genera are so distantly related that they may not even belong in the same family. They resemble typical Encyrtidae in having large mesopleura with inner side walls and sterno-pleural ridges.² Aside from thoracic characters there is

²These are the ridges which extend lengthwise from the lateral coxal articulations to the anterior margin of the mesopectus and to which Snodgrass applied the name sterno-pleural (Snodgrass, 1910, p. 80, and pl. 9, fig. 4). In this article sterno-pleural is restored to the ridges to which this name was applied in 1910 by Snodgrass.

little similarity between the typical Encyrtidae on the one side and *A. japonicus* and *S. mymaricoides* on the other side. The latter are highly specialized for crawling between the sheaths and culms of graminaceous plants for hosts living between closely appressed surfaces. The encyrtid parasites are paper thin and weakly sclerotized. In life the bodies may even be compressible. There is a correlation here between structure and habit giving support to the idea that the insect skeleton may be moulded by the mechanical needs of each kind of insect.³ Generalizations have been made about the thorax in the Hymenoptera with little or no regard for the Chalcidoidea—in some cases as if this important superfamily did not exist. Yet the Chalcidoidea is a major group by any standard. The species exist in enormous numbers and present an almost kaleidoscopic array of mesothoracic patterns which do not conform to the basic plans that have been laid down for the Hymenoptera.

In typical Encyrtidae the region of the mesoplectus between the sternopleural ridges is occupied by a large composite sclerite, while in *Astymachus japonicus* and *Scelioencyrtus mymaricoides* the corresponding region is occupied by two pairs of sclerites. It is evident that the regions between the sterno-pleural ridges are stationary and identical morphologically. It requires too great a stretch of imagination to believe otherwise.

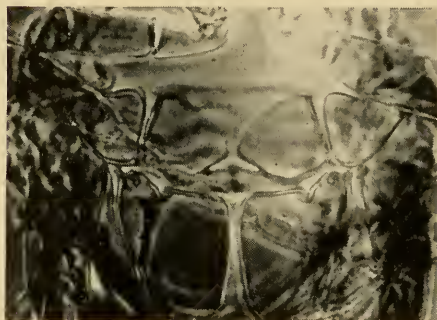
The photographs of *Astymachus japonicus* and *Scelioencyrtus mymaricoides* show the two pairs of sclerites on the venter of the mesoplectus between the sternopleural ridges. It is not exaggerating much to state that these sclerites bear identification labels with the name *furcasternite* on the inner pair and *laterosternite* on the outer pair. There is no median furca. The widely separated apophyses are carried on the lateral margins of the inner pair of sclerites and attach to the pleura distally. These apophyses are evidently homologous with the furcal arms of typical Encyrtids, therefore the sclerites on which they rest are identified as *furcasternites*. There is a striking similarity between the *furcasternites* in the Hymenoptera and the sternites associated with the first pair of legs in the symphylian, *Scutigrella immaculata* (Newb.). In the latter the long sternal apophyses are carried on the lateral margins of the sternites.

Presumably, objections will be raised to identifying sclerites in the Hymenoptera as sternites. It is clearly evident that the sternites in the Hymenoptera did not come into existence in the same way as those in the Blattidae. In the latter the sternites came into existence by the partial desclerotization of a pre-existing sclerotized sternum (Snodgrass, 1935, pp. 170-171, fig. 94). In the Hymenoptera the sternites appear to have come into existence by sclerotization on a pre-existing membranous substrate. This poses several questions. Is a membranous sternum antecedent to a sclerotized sternum in insects or *vice versa*? Should the same name or different names be applied

³This is not my idea but that of Snodgrass. It was contained in a personal letter under date of August 2, 1961.



A



B



C

Fig. 1.—Surface sternal plates in the mesothorax of Hymenoptera. Fig. A, *Astymachus japonicus* Howard; fig. B, *Scelioencyrtus mymaricoides* Compere, Rao, Kaur; fig. C, *Encyrtus fuliginosus* Compere. A and B cleared stained specimens photographed at 160X. C cleared specimen photographed at relatively low magnification with different equipment.

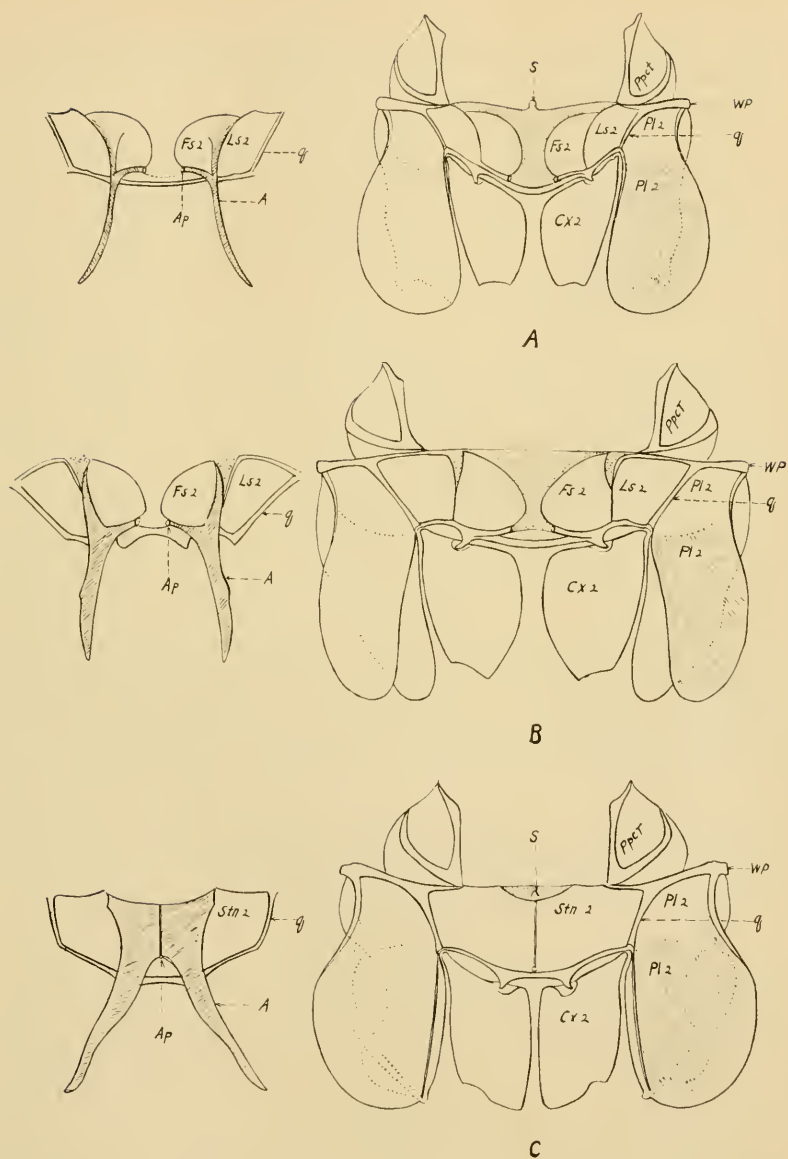


Fig. 2.—Simplified drawings of specimens shown photographically in fig. 1. The inner walls of the mesopleura and the sternal apophyses shown separately in A, B, and C. Explanation of the lettering: *A*, apophysis; *Ap*, apophyseal pit; *Cx*, coxa; *Fs*, furcasternites; *Ls*, laterosternite; *Ppct*, prepectus; *Pl*, pleuron; *S*, spina; *Stn*, sternum; *q*, sterno-pleural ridge; *WP*, wing process.

to corresponding sclerites which have the same relative positions, proportions, and values but which came into existence by different processes?

The photographs do not show that the lateral margins of the *furcasternites* which carry the apophyses are raised slightly above the membranous substrate. This can be seen when the specimens are viewed at oblique angles. The widely separated apophyseal pits show clearly in the photograph of *Scelioencyrtus mymaricoides* but not in that of *Astymachus japonicus*, although the pits are present in the latter. The apophyses which arise from these pits presumably attach to the *furcasternites* secondarily.

Prior to studying *Astymachus japonicus* and *Scelioencyrtus mymaricoides* I took for granted that in the Chalcidoidea a spina was a cardinal landmark of identifying the venter of the prepectus when the latter is membranous as in the Encyrtidae and Eupelmidae. However, in *A. japonicus* the spina appears to be located anteriorly on the midline of the mesopectus, and in *S. mymaricoides* there is no spina on either the prepectus or mesopectus.

In the great majority of the Chalcidoidea examined by me only one apophyseal pit can be seen and this is located posteriorly on the midline of the mesopectus. In *Ophclosia crawfordi* Riley, an anomalous Chalcidoid now classified under the Pteromalidae, two microscopic pits can be seen close together in a small depression. This is not evidence that one apophyseal pit is indicative of primitiveness. Yet Ferris (1940, p. 88) reasoned that since in the majority of insects, probably 95 percent or more, the two apophyseal pits are close together on the midline therefore this is the more primitive position. Some of the widely accepted theories are based on reasoning no more sound than this.

No new theories have been presented in this article, for according to Snodgrass (1958, p. 26) arthropod morphology is overburdened with theories, and *Astymachus japonicus* and *Scelioencyrtus mymaricoides* attest to the soundness of this assertion.

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**NOTES ON HABITS OF TWO BLOODSUCKING BUGS, TRIATOMA
DISPAR LENT, 1950, AND ERATYRUS CUSPIDATUS STÅL, 1859**
(HEMIPTERA: REDUVIIDAE)

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***Triatoma dispar* Lent**

In July, 1950, while carrying out studies on arboreal, day-flying, forest mosquitoes on the slopes of Cerro Campana in Panama, we noted the presence of a two-toed sloth, *Choloepus hoffmani*, on a crotch some 65 ft. above the forest floor and about 20 ft. above a platform where we had stationed a mosquito collector. This sloth was reported present on the same crotch during the following month until it was finally captured and bled for yellow fever immunological studies. About a week after the sloth was removed from the crotch, seven fifth-instar triatomine nymphs were captured by the mosquito collector while attempting to feed on him. On the following days additional nymphs were taken and the collector noted that the insects were crawling down from the crotch formerly occupied by the sloth. Close examination of the crotch revealed the presence of five adult triatomines and many nymphs of all stages, some of which were partly engorged.

Subsequently, in November, 1950, at Bijao, on the slopes of Chiriqui volcano, Republic of Panama, three additional nymphs of the same species were taken from a crotch of a tree where a two-toed sloth was resting about 45 ft. above the forest floor. In June, 1958 a single adult female was captured while attempting to feed during the day on a mosquito collector on a 60 foot platform in the Cerro Azul area, about 20 miles east of Panama City.

Dr. Herman Lent of the Instituto Oswaldo Cruz, Brazil, determined one female and two nymphs from our material as *Triatoma dispar* Lent 1950. It is, according to Dr. Lent, the species erroneously reported by Champion (1889) and Usinger (1944) as *Triatoma venosa* Stal.

Evidently *Triatoma dispar* is highly arboreal in habits. The fact that it was found twice associated with *Choloepus hoffmani* may indicate a predilection for this edentate, although its collection at human bait suggests that it may have a wider host range among arboreal mammals.

***Eratyrus cuspidatus* Stål**

This bloodsucking bug is apparently seldom taken, and little is known of its habits. Neiva and Lent (1941) gave the distribution as Colombia, Venezuela and Panama, and Usinger (1944) recorded it only from Panama. Specimens have been found infected with trypanosomes in Venezuela and in Panama (Dunn 1934).

Specimens in the collection at Gorgas Memorial Laboratory, aside from 3 nymphs and 1 adult, the progeny of Dunn's specimen, are all

adults taken attracted to light, as follows: 2 ♂, Barro Colorado Id., C. Z., 25, 27 July 1960; 1 ♂, Madden Dam, C. Z., 20 Apr. 1960; 1 ♀, Almirante, Bocas del Toro Prov., 5 Sept. 1951; 1 ♂, Esquintla, Guatemala, 20 Apr. 1945. This last is smaller and paler than the Panama specimens.

On 30 June 1962, two last-instar nymphs of what were suspected to be *Eratyrus*, were taken in the crevices of a piece of old termite nest and under a small board lying on the concrete floor of the instrument platform of an abandoned artillery-range tower. This tower (one of two on a ridge back of the Caribbean coast in the Fort Sherman reservation, Canal Zone), is an enclosed concrete structure about 80 feet high, surmounted by an observation-instrument platform, roofed over but open on all sides. A small colony of bats, species not determined, had been established for some years in a space just beneath the platform near the hole through the center of the floor which gave access to the instrument emplacement. No bird's nests or evidence of the presence of other animals were noted, and the construction of the tower is such that the only animals likely to make use of its top, and only, room, are bats or birds. The top of the tower rises slightly above the surrounding essentially virgin forest, which was left for concealment when the towers were built.

Through the kind cooperation of Mr. B. S. Holderman, H. M. C., U. S. N., of the Navy unit attached to this laboratory, who fed the nymphs successfully on mice, one of the two nymphs transformed to an adult *Eratyrus cuspidatus* about 10 Aug. 1962. Both specimens are being held alive with the hope that they may be used to establish a colony. Neither specimen was infected with trypanosomes.

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ANNOUNCEMENT

Short scientific articles not exceeding one printed page, with or without illustrations, are welcome and usually will be published promptly. See previous recent issue for format.—Ed.

A SECOND SPECIES OF ICHNEUMONIDAE BELONGING TO
SCOLOMUS TOWNES

(HYMENOPTERA)

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The genus *Scolomus* was described by Townes and Townes (1949, pp. 420-421, Pl. V, fig. 43) for a single male from "Chubut, Patagonia" which they named *Scolomus viridis*. A male specimen recently received from Miss Eteheverry C., Instituto Pedagógico, Santiago, Chile, represents a new species, the second one, in *Scolomus* and is described below. Like the type species this is pea green and black. A true green color is rare in the Ichneumonidae, even in iridescent specimens, and all the species with green coloring known to me are from the Neotropical region.

***Scolomus magellanicus*, new species**

(Figs. 1, 2)

Holotype.—Male, El Ganso, Magellanes, Chile, February 14, 1952 (Maria Eteheverry C.); U. S. National Museum, Type No. 65905. Length: 10 mm.; head and thorax 4 mm.; abdomen 6 mm.; forewing 8.5 mm.; antennae broken but evidently nearly as long as body.

Head.—Slightly narrower than the thorax; temples long and strongly but roundly sloping; the eye, viewed dorsally, not more than three-fourths the length of the temple; ocelli large, the lateral ocelli more distant from each other than from margin of compound eye; face nearly as broad as long but appearing longer; clypeus a little less than twice as broad as long (8.5:5) only indistinctly separated from face and with anterior border emarginate medially; malar space approximately $1\frac{1}{2}$ times as long as basal width of mandible; mandibles rather small and somewhat concealed by clypeus, and apically about one-half basal width, teeth not clearly visible but apparently more or less blunt; apex of labrum visible; palpi not unusual. Head, except impunctate vertex, with fine, dense punctures, those of face medially less dense and of clypeus less fine and more sparse in apical half; longer of two broken antennae with 26 remaining flagellar segments without tyloids; occipital carina incomplete, not reaching either base of mandible or hypostomal carina.

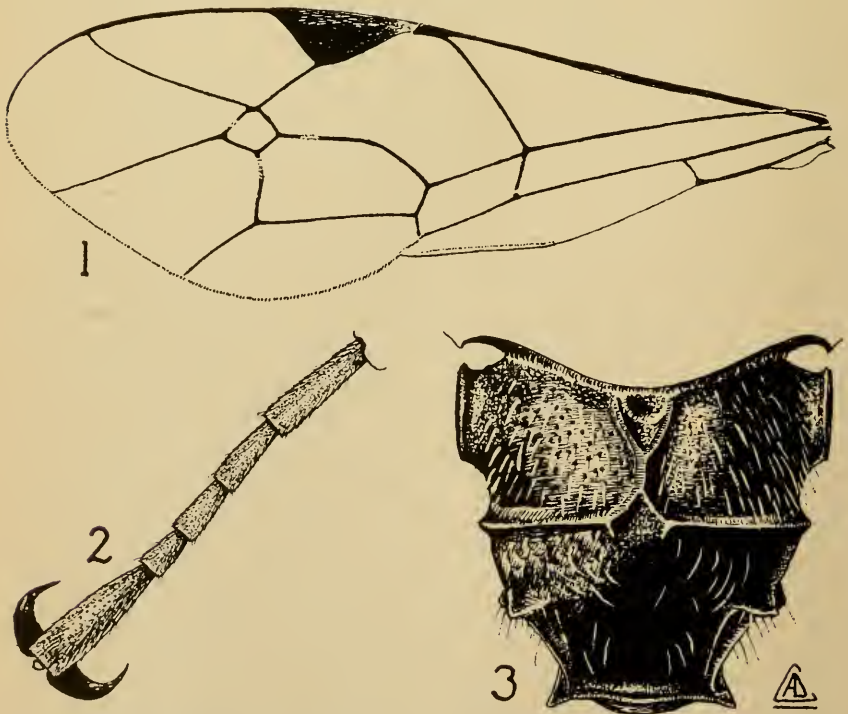
Thorax.—Scutum densely, finely, and evenly punctate, no notaulices; no epomia on propleurum; tegular ridge with backward-projecting spine; propleurum, and mesopleurum dorsally and ventrally, densely, finely punctate, mesopleurum elsewhere more sparsely so, with speculum smooth and shining; scutellum and postscutellum strongly elevated; propodeum (fig. 3) with basal median longitudinal carinae elevated and converging posteriorly, not extending beyond elevated basal transverse carina, dorso-lateral longitudinal carinae strong, explanate above spiracles, elevated at intersection with basal transverse carina, and continuing on to form apophyses in apical third of propodeum, the apical transverse carina missing between apophyses. Legs slender with stout tarsal segments, the fifth or claw segment of fore- and middle legs longer and stouter than basitarsus, in hind legs only stouter; claws large, strongly curved or bent, that of middle tarsus especially so (fig. 2); apex of front tibia with a small tooth on outer side. Wings slightly

infumate; venation unusual in there being two anal cells in forewing, the basal cell bordered posteriorly by a distinct anal vein that runs along hind margin of wing, except at extreme base (fig. 1), to transverse anal vein which is more distinct in left forewing than in the right where it becomes a little fuzzy medially.

Abdomen.—Shining, impunctate, long, slender, and club-shaped; petiole slender with spiracles slightly before the middle and with deep lateral grooves reaching from base to spiracles causing petiole to be so narrowed above grooves that ventrolateral areas visible when viewed dorsally (as in Mesochorinae and *Opheltes*); postpetiole fully as long as second abdominal segment, a little longer than third.

Head, thorax, and abdominal segments beyond the third black or blackish, with clypeus and tarsi more castaneous; antennae brownish with faint greenish-blue iridescence; legs (except tarsi) and first three segments of abdomen green, that of the middle and anterior legs a more yellowish green.

Comparison of the types of the two species of *Scolomus* shows that *S. magellanicus* differs from *viridis* in having: A longer and proportionately narrower petiole and postpetiole; longer legs, with femora



Scolomus magellanicus, new species. Fig. 1, forewing; fig. 2, middle tarsus; fig. 3, propodeum.

proportionately less stout and claws larger and heavier but less strongly bent; face narrower and clypeus apically emarginate; areola (fig. 3) lacking (present in *viridis* although open behind); converging median dorsal carinae forming a triangle basally, dorso-lateral carinae sharper and more explanate above spiracles; wings more hyaline with a crossvein in the small cell (this is only suggested in *viridis*) and with anal vein reaching crossvein; spine on tegular ridge not as widely extended.

Townes placed *Scolomus* in the subfamily Tryphoninae, tribe Tryphonini, and remarked that despite its many aberrant characters it was closely related to (*Dyspetus* Thomson) = *Dyspetes* Foerster. What the affinities of the genus are I cannot say without seeing the female. Certainly *magellanicus* shows less resemblance to *Dyspetes* than does *viridis*.

LITERATURE CITED

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BOOK REVIEW

- SILENT SPRING**, by Rachael Carson. September, 1962. Houghton Mifflin Co., Boston. 368 pages.

Rachel Carson, noted as a superb writer for her *The Sea Around Us*, has written *Silent Spring* with her enviable skill. In alarm and anger she arouses her readers by picturing a birdless spring of the future. The indiscriminate use of chemicals against insects and rodents has killed wild life; no birds sing, no animals roam the forests, no fish swim the streams; the vegetation is brown and dead.

Silent Spring has been selected for October by the Book-of-the Month Club. The SATURDAY REVIEW (October 6th issue) poll of book reviewers give it 25 votes out of 44.

The publisher's publicity sheets state that 90 percent of the letters addressed to the author are favorable, that Justice William O. Douglas writes that a Bill of Rights is needed against the 20th Century poisoners of the human race, and that advance printings amounting to 100,000 copies already have been ordered.

Despite all of this favorable publicity, Miss Carson presents a one-sided and over-emphasized picture of the problem; her attack on the integrity of some scientists is unwarranted. Articles in *Time*, September 28, and by L. L. Baldwin in *Science*, September 28, point out in detail some of these errors.

Pesticides used properly constitute no threat to the public. Less than 5 percent of all of the area of the United States is treated annually. 613 million acres of the 640 million acres of Federal forest land have never been treated. Birds sometimes leave areas because nesting sites have been destroyed, or for other environmental reasons.

While other methods of insect control are being investigated, chemical insecticides are still necessary to protect our food supplies.

The National Academy of Sciences is sponsoring a program in which a panel of outstanding scientists, representing both the users of chemicals and the protectors of wild life, is studying their interrelationship. Two publications have been issued, a third is in preparation.

Miss Carson deserves praise for attracting attention to the mis-use of chemicals. However, the values conferred on many by the use of chemicals far out-weighs any losses which may have been suffered.

THOMAS E. SNYDER, *Washington, D. C.*

**HYDRACARINID MITES PARASITIC ON THE MOSQUITO, *CULEX*
*TARSALIS COQUILLET***
(ACARINA and DIPTERA: CULICIDAE)

On August 31, 1961, the author collected a female *Culex tarsalis* Coq. heavily parasitized with mites. This specimen was taken 5½ miles north of Thistle, Utah Co., Utah, resting in an abandoned cellar. Subsequent examination revealed 29 immature hydracarina mites attached to the abdomen of this specimen. The female became active prior to capture and did not appear to be inconvenienced by the presence of the mites. Occurrence of larval mites on the adults of mosquitoes and other aquatic Diptera has been reported previously by various authors. While larger numbers of mites have been encountered on other Diptera, record of such a heavy infestation on mosquitoes is not known to the author. Mites were found on the dorsal and lateral sides of the first seven abdominal segments. They were all attached to the intersegmental membranes. The majority were dorsal in position. Identification of immature hydracarinid mites to species is extremely difficult and often impossible to accomplish with the existing literature. However, these immature forms were identified by Mr. C. D. Jorgensen, Brigham Young University, Radiation Ecology Project, Mercury, Nevada, as belonging to the genus *Piona*. This genus of mites is rather common in northern waters. This specimen was collected as part of a study project of Rocky Mountain mosquitoes supported by a PHS research grant, E-4121, from The National Institutes of Health, Public Health Service.

JAY H. LINAM, *Department of Zoology and Entomology, University of Utah, Salt Lake City.*

**SOMATOCHLORA MARGARITA, A NEW SPECIES OF DRAGONFLY
FROM EASTERN TEXAS**

(ODONATA: CORDULIIDAE)

THOMAS W. DONNELLY, *Dept. of Geology, Rice University, Houston, Texas*

In late May and early June, 1961, several males and females of a new species of *Somatochlora* were taken in the vicinity of Cleveland, Texas. The discovery of this new species raises to five the number of species in the *Somatochlora filosa* group (which includes *filosa* (Hagen), *provocans* Calvert, *ozarkensis* Bird, and *calverti* Williamson and Gloyd and also extends the range of the genus southwestward into eastern Texas.

***Somatochlora margarita*, n. sp.**

Holotype male.—*Head*. Labium and labrum pale yellow, the latter margined with dark brown and with an obscure median dark spot; anteclypeus pale; postclypeus pale with two dark punctae (clypealsinus); lower margin and sides of frons pale; upper part of frons metallic green with two pale yellow spots on the dorsum; vertex metallic violet-green with pale anterior margin; occiput dark with dark hairs; rear of head black with short pale hairs.

Thorax.—Prothorax dark brown, paler on sides; front and hind lobes pale. Pterothorax dark brown with greenish iridescence, paler laterally, yellow as follows: anterior half of mid-dorsal carina, spot on mesepisternum (about 1.5 mm. long), stripe on mesepimeron (about 5 mm. long and 1.5 mm. wide, with upper end rounded, lower end narrowed, and posterior border slightly sinuous), a small stripe below metastigma adjacent to metinfraepisternum, stripe on metepimeron (maximum width 1.5 mm.) which extends ventrally to unite with the stripe on the opposite side, and the antealar sinuses and interalar areas.

Wings.—Hyaline, membranule smoky brown, costae yellow, other veins and stigma dark brown.

Legs.—Dark, coxae pale postero-ventrally; anterior trochanter pale; postero-mesal surface of femora paler proximally; front and middle femora with two and hind femur with six rows of denticles posteriorly, the mesal row in each case terminating in a prominent tooth; front and middle tibiae with two rows of from 6 to 10 black spines; tarsal claws with a large inner tooth.

Abdomen.—Segments 1 and 2 dark brown, 3 to 10 dark metallic green, pale yellow as follows: on segment 1 the postero-lateral edge and a smaller dorsolateral stripe; on 2 a large subtriangular patch anterior to the transverse carina, a smaller patch on the posterior half of the genital lobe, two subtriangular postero-dorsal spots, and a pale line along the transverse carina; the intersegmental area between 2 and 3; on 3 a conspicuous antero-lateral triangular spot and the antero-ventral margins of the tergo; on 4 to 8 obscure antero-lateral pale spots. Appendages brownish-black.

Appendages.—The superior appendage is longer than 9 + 10, moderately angulated in lateral view, with a prominent lateral shelf along the basal half. In dorsal view the appendages are nearly parallel sided but converge evenly from the mid point to the tips, which then diverge slightly. The inferior appendage is triangular and typical for the *filosa* group.

Variation among the type series.—The pale dorsal spots of the frons are absent in two of the six males but are well developed in the other four. The vertex varies from almost completely dark to almost completely pale according to the extent of the anterior pale color. The pale spot on the mesepisternum is nearly absent in one specimen and varies from 0.75 to 2.5 mm. in length in the others, extending in the palest case to the anterior border of the pleura. The pale stripe of the mesepimeron varies from 0.75 to 1.5 mm. in width, and is narrowed at the upper end in one specimen only (similar to *ozarkensis*). The pale stripe below the metastigma is nearly absent in one specimen. The pale stripe of the metepimeron varies from 1.0 to 1.5 mm. in maximum width. Two specimens lack the obscure antero-lateral pale spot on abdominal segment 4, and three specimens (not including the holotype) have the ventral margins of 9 and 10 obscurely pale. Three specimens (not including the holotype) have an obscure postero-dorsal pale spot on 10 and a fourth has a vivid pale spot here. The holotype specimen represents the mean of the series for extent of pale color generally, except that it has the broadest pale metepimeral stripe of the six.

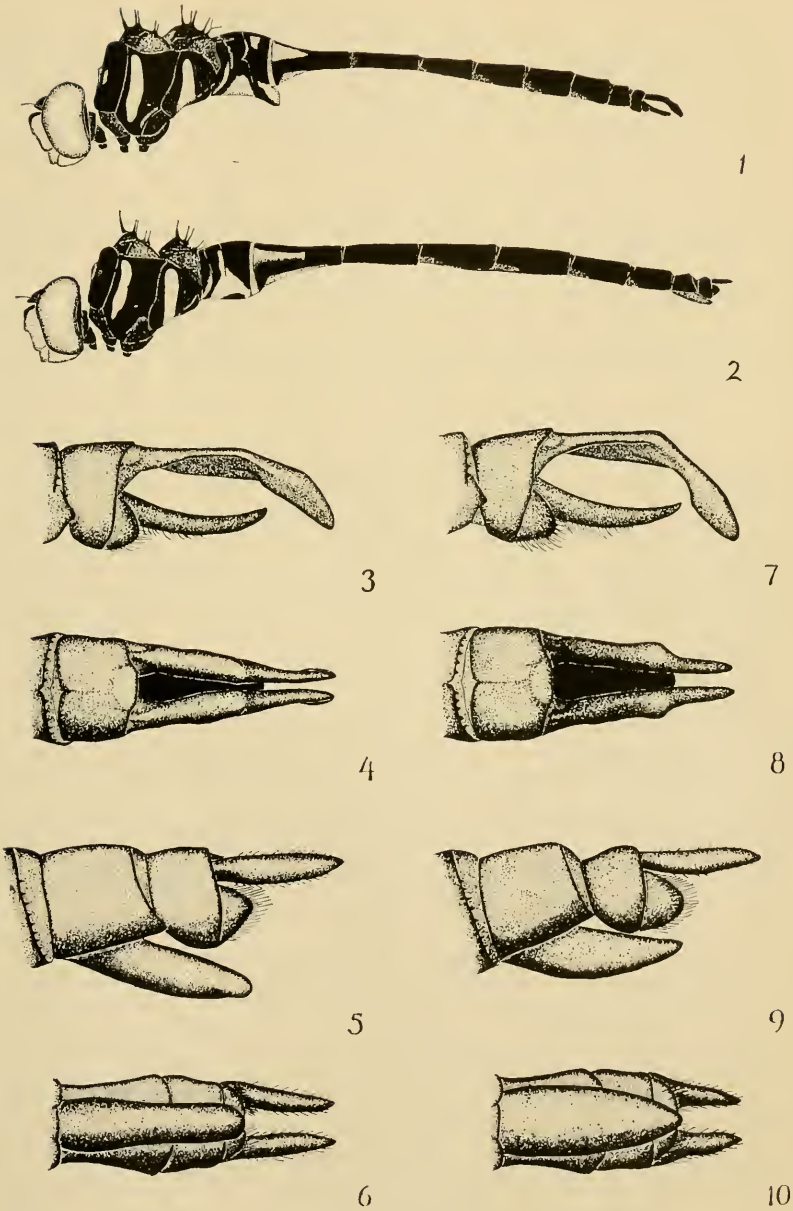
Allotype female.—Coloration as in the male, differing as noted below: pale spot on mesepisternum smaller; pale lateral stripes of the thorax more narrow; pale color on abdominal segment 2 consisting of a broad triangular patch narrowing upward and extending dorsally as a narrow yellow stripe that does not meet its fellow of the opposite side dorsally, and a very obscure pair of postero-dorsal pale spots. The remainder of the abdomen dark with basal pale markings more obscure than in the male.

Appendages and vulvar lamina.—The appendages are parallel sided with sharp tips and are typical for the group. The vulvar lamina is parallel sided in both ventral and lateral view, and it appears slightly pinched in ventral view. The tip is broadly rounded in both views.

Variation among the females.—The three females show little variation of note, except for size (discussed below). One female lacks the mesepisternal pale spot and one (not the same) has the pale color of segment 1 reduced.

Venation.—The six male specimens average 8 antenodals in the fore wings (varying from 7 to 9), 5 antenodals in the hind wings (one additional half-vein in one wing), 5 postnodals in the fore wings (4 to 6), 7 postnodals in the hind wings (6 to 9), 11 cells between M1 and M1a in the fore wings (8 to 16), 12 cells in this space in the hind wings (10 to 16), 3 cells bordering the triangles in both wings (2 cells in one fore wing and in two hind wings). Two of the males have only 2 cell rows in the fore wings from the triangle to the hind margin of the wing, one has an imperfect 3rd row in one wing, one has a 3rd a few cells long in both wings, and two (including the holotype) have imperfect 3rd rows in both wings. All specimens have 2 cell rows for only a short length behind the triangles in the hind wings. All specimens have subtriangles of 3 cells in the fore wings and 1 cell in the hind wings, and all have one vein behind the stigma.

The three female specimens average 8 antenodals in the fore wings (varying from 7 to 8), 5 antenodals in the hind wings (no variation). Half the fore wings contain 5 postnodals and half 6. The specimens average 7 postnodals in the hind wings (6 to 8), 15 cells between M1 and M1a in the fore wings (13 to 19), 15



Somatochlora margarita, figs. 1-6; *S. ozarkensis*, figs. 7-10. Figs. 1 and 2, color patterns of male and female; figs. 3 and 7, lateral view of male appendage; figs. 4 and 8, dorsal view of male appendages; figs. 5 and 9, lateral view of female appendages; figs. 6 and 10, ventral view of female appendages.

cells in this space in the hind wings (13 to 17), 3 cells bordering the triangles in both wings (one fore wing and two hind wings have 2). The allotype female has 2 cell rows between the triangle and the hind margin of the fore wings, with a well-developed 3rd row. The other two females have more imperfectly developed 3rd rows. All females have 2 cell rows in this space in the hind wings for a distance of only a few cells, as in the males. Triangles and subtriangles as in the males.

Measurements.—Abdomen without appendages: male, average 33 mm. (31.5 to 34 mm., holotype 33.5 mm.); female 36 to 41 mm. (allotype 41 mm.). Hind wing: male, average 35 mm. (32 to 36 mm., holotype 36 mm.); female, 34.5 to 37 mm. (allotype 37 mm.). Hind femur: male, average 7.5 mm. (7 to 8 mm.); female 8 mm. (7.5 to 8 mm.). Ratio of apical width to length on male segment 5: average about $3/5$, varying from $1/2$ to $2/3$. Appendages of male 3.5 mm. long, longer than 9 + 10. Appendages of female 2 mm. long. Stigma 2.5 mm. long.

Related species.—This species belongs to the distinctively southern group of *Somatochlora* mentioned above. The following discussion of relationships is based on descriptions published by Walker (1925), Bird (1933), and Williamson and Gloyd (1933), and on examination of two specimens of *S. ozarkensis* from Oklahoma. Because of convergences in certain characters, I feel that it is no longer useful to modify Walker's excellent key to the genus; instead I will attempt to discuss the variation in more general terms.

Somatochlora margarita is very slightly smaller than the other species, although all of the species are similar in size. *Margarita* is generally paler than the others, but *calverti* (based on only two males) appears to have larger pale spots on the mesepisternum and on the dorsum of 10. Only *margarita* appears to have obscure pale basal markings on segments 4 to 8 of the abdomen. Although no dorsal pale spots on the frons were reported for *ozarkensis* in the original description, they are present in the topotype male (but not the female) I examined. They are absent in *provocans* and *calverti* but rather consistently present in *margarita*.

The shapes of the male superior appendages are distinctive for each species, those of *filosa* differing so much that further comparisons with that species have not been made. In lateral view *provocans* has the least angulated appendage (about 30°), *margarita* the next (35°), *ozarkensis* 40° and *calverti* 50° . In dorsal view the appendages of *margarita* are nearly straight, those of *ozarkensis* are knobbed midway to the end, those of *calverti* are excavated apically and divergent at the tips, and those of *provocans* are strongly angulated as well as knobbed. Only *calverti* lacks the prominent lateral marginal shelf along the basal half of the superior appendage.

The vulvar laminae of *provocans* and *margarita* are very similar and without having studied actual specimens of the former I will not attempt to distinguish them. That of *ozarkensis* is broader and

more rounded in both ventral and lateral view, and is more pointed at the tip. The female of *calverti* is unknown.

The new species *margarita* is probably closest to *ozarkensis*, but is easily distinguished from that species by the shape of the male appendages, the vulvar lamina of the female, and the color pattern of both sexes.

Material examined.—Holotype male: Big Creek, 5 miles south south-east of the Double Lake Recreation Area, Sam Houston National Forest, San Jacinto County, Texas, collected 30 May, 1961. The remainder of the specimens were collected at the same locality on 28 May, 30 May, 4 June, and 11 June. The actual locality was along a dirt road which crossed the creek in a pine woods, and no specimens were taken along the stream. A male of *S. ozarkensis* from Wilburton, Latimer County, Oklahoma, and a female from the Ouachita National Forest, LeFlore County, Oklahoma, both collected during 1934 by A. E. Pritchard, were examined.

The holotype male and the allotype female have been deposited in the collection at the University of Florida. A paratype male and female are in the Williamson collection in Ann Arbor, another male is in the collection of the Royal Ontario Museum in Toronto, and another male is in the collection of the Academy of Natural Sciences, Philadelphia. The remaining paratypes will remain in the author's collection.

Habits.—*Somatochlora margarita* was found flying along a dirt road in the pine woods of the Sam Houston National Forest in eastern Texas. The country is low and gently rolling here, and the streams are clear, sandy, and not conspicuously colored by tannin. Most of the specimens were netted while flying rather high above the road; indeed I was forced to catch the majority of them with a long-handled net while I stood on the roof of a pickup truck! The technique was to drive slowly along the road until a hawking *Somatochlora* was seen, and then to climb out onto the roof and attempt to net the dragonfly. A few specimens (mostly females) were taken while they flew closer to the ground. All of the specimens were taken early in the morning or late in the afternoon; at mid-day no *Somatochlora* were seen at all.

Flying with the new species were *Somatochlora linearis* (Hagen), *Macromia georgina* (Selys), *Cordulegaster obliquus* (Say), *Libellula necdhami* Westfall, and *Tramea onusta* Hagen. The nearby stream with its incredibly rich Odonate fauna (about forty species, largely gomphines, aeschnines, and cordulines) is the probable breeding site for this species, but no nymphs were found.

ACKNOWLEDGEMENTS

It is a pleasure to acknowledge the loan of specimens of *Somatochlora ozarkensis* by Minter Westfall. The new species is named for

Miss Margaret Stevenson, a delightful companion of my wife and myself on all of our collecting trips during the spring of 1961, and a very great help to us during the bizarre maneuvers which were required in order to net this most elusive and beautiful insect.

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A NEW SPECIES OF MALLOPHAGA FROM NEW GUINEA

K. C. EMERSON, *Stillwater, Oklahoma*

In a small collection of Mallophaga received for determination from the Bernice P. Bishop Museum was a series from a New Guinea Wallaby which apparently represents a new species. That form is herewith described and illustrated.

Heterodoxus maai, new species

Holotype male.—General shape and chaetotaxy as shown in figure 1. Male genitalia, minus genital sac, as shown in figure 3. The male genital sac is without heavy spines found in *Heterodoxus longitarsus* (Piaget, 1880) as illustrated by Werneck (1941). Thoracic sternal plates with fewer setae, and the abdominal sternites with more setae than in *Heterodoxus forcipatus* (Mjöberg, 1919) as illustrated by Werneck (1948). The heavy spines on the prothorax are not found on *Heterodoxus spiniger* (Enderlein, 1909). In addition to differences in chaetotaxy, the male genitalia are distinctive. Total length, 3.47 mm.

Allotype female.—General shape and chaetotaxy, except for terminal abdominal segments, as in the male. Terminal abdominal segments as shown in figure 2. Total length, 3.45 mm.

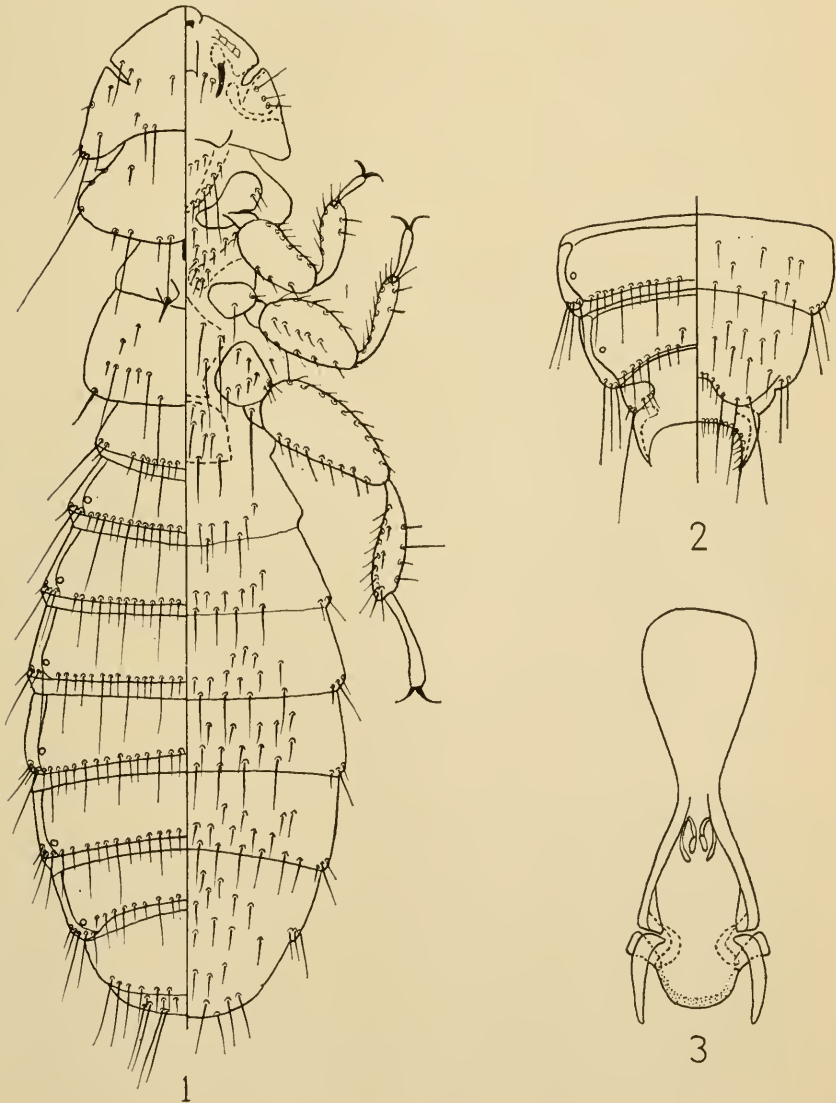
Type host.—*Dorcopsis veterum* (Lesson, 1826).

Type material.—Holotype male, allotype female and paratypes of both sexes collected by T. C. Maa at Eramboe, Netherlands New Guinea on November 2, 1960. The Bernice P. Bishop Museum number is TMP 2052. The host skin is presently in the American Museum of Natural History (AMNH 193156) and was identified by H. M. Van Deusen.

Discussion.—This species is unusual in that it is the only known species of *Heterodoxus* with the antennae completely concealed inside lateral indentations. The dorsal and ventral surfaces of these indentations are of equal expansion. This is the first record of Mallophaga from this genus of host.

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 (Philopteridae e parte de Trichodectidae). Rio de Janeiro.



Heterodoxus maui, n. sp. Fig. 1, dorsal-ventral view of holotype male; fig. 2, dorsal-ventral view of terminal abdominal segments of allotype female; fig. 3, male genitalia. All figures are drawn to the same scale.

BOOK REVIEWS

THE CHRYSOMELIDAE (COLEOPTERA) OF CHINA AND KOREA.

PART 1, by J. L. Gressitt and S. Kimoto. Pacific Insects Monograph 1A, published by Bernice P. Bishop Museum, Hawaii, 1961. 299 pp., 77 figs. Paper covers price \$4.00 or £Stg 1/9/-.

This is the first of a new series of monographs designed to supplement the quarterly journal "Pacific Insects"; others will appear at irregular intervals.

In this first part of their monograph, Gressitt and Kimoto deal with 691 species, belonging to 12 of the 17 subfamilies to be treated. The layout is highly systematized, and includes full synonymies and indications of holotype locations. Keys are provided at all levels of classification. The illustrations, by Dorothy Rainwater, Kimoto and others, are of the very high standard that one has come to expect in papers emanating from the Bishop Museum. The monograph was printed in Japan.

Apart from extensive new distribution records, the monograph introduces many new synonymies and new combinations, while 65 new species are described. With two exceptions, no additional descriptive information is given concerning previously-described species. Although a high proportion of such species have been dealt with in fairly recent revisionary papers, many of these references are in rather inaccessible journals. The keys appear well devised and are of the type, much appreciated by the user, that can be worked in either direction. Some species from Taiwan, eastern Siberia, and north Vietnam are included in the keys; the inclusion of species from Taiwan is a little puzzling, as the authors refer to their preparation of a separate paper on the chrysomelid fauna of that island.

The authors have carried out a very large and difficult task with distinction, and the first part of their monograph represents a major contribution to our understanding of a little-known fauna, besides setting a high standard for the new series.—P. B. CARNE, *Division of Entomology, C.S.I.R.O., Canberra, Australia.*

ENTOMOLOGIA MEDICA. 1° Vol. By Oswaldo P. Forattini. Dept. Parasitologia, Fac. Hig. e Saúde Publ. São Paulo. 662 pp. illus. 1962 (in Portuguese).

Nearly half of this volume is devoted to introductory material and a discussion of arthropods, insects, Diptera, and Culicidae. The remainder treats the Anophelini, particularly the Neotropical species, in detail. There is a long chapter on malaria and an appendix on the techniques of studying *Anopheles*. The volume is very well organized, contains a wealth of information, and is well illustrated and indexed. It will serve as a valuable text and handbook for medical entomologists and public health workers and it is to be hoped that it will soon be succeeded by volumes treating other medically important arthropods.

—ALAN STONE, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

DESCRIPTIONS OF TWO NEW SOUTH AMERICAN COCKROACHES
BELONGING TO THE GENUS *XESTOBLATTA*
(ORTHOPTERA: EPILAMPRIDAE)

ISOLDA ROCHA E SILVA ALBUQUERQUE¹, *Museu Nacional, Rio de Janeiro, Brazil*

In the present paper I describe two new species of *Xestoblatta* Hebard from the collection of the United States National Museum. I wish to thank Dr. Ashley B. Gurney for the opportunity to study this collection, for the facilities during my visit, and for personal advice and assistance.

Xestoblatta tingomariensis, sp. n.
(Figs. 1-5)

The present species is readily distinguished by its distinctive pronotal color pattern. It is apparently very close to *X. ecuadorana* Gurney and *X. zetecki* Gurney on the bases of genitalia and dorsal specialization of abdomen.

Type ♂: Tingo Maria, Peru, Feb. 14, 1950, at light, H. A. Allard (U. S. National Museum Type No. 65793).

Size small for the genus. Head projecting but little cephalad of the pronotum. Interocular space, at vertex, slightly narrower than distance between ocellar spots and two thirds the width between antennal sockets. Ocellar spots distinct. Maxillary palpi with penultimate segment shorter than ultimate, this subequal to antepenultimate. Pronotum as characteristic of the genus, convex, greatest width meso-caudad; caudal margin obtuse-angulate produced, with rounded apex. Tegmina and wings fully developed, the former with 12-radial sectors (10 anterior and 2 apical), some of them subdivided, and one posterior branch of radius inserted medially. Media vein with two branches, the anterior branch forked once. The posterior branch of cubitus vein has about five apical rami. Seven anal veins. Wings having three rami of R1, about nine ramified radial sectors. Radius vein with one posterior branch. Media simple. Cubitus with two branches that go to the margin and one that goes to the first plical area. Intercalated triangle distinct. Abdomen with sixth tergum broadly emarginate, overlapping seventh tergum, this with transverse oval pit; eighth and ninth strongly transverse. Supra-anal plate with intereereal portion moderately produced with a distinct, broad, F-shaped emargination at apex. Cerci with eight segments. Subgenital plate asymmetrical with right stylus curved, longer than left, which is minute. Ventrocephalic margin of femur I with a row of long spines which decrease in size distad and terminate in three elongate spines. Pulvilli, arolia and tarsal claws moderately developed.

Allotype ♀: Divisoria, Peru (about 80 miles s.w. of Rio Ueuyali at Pucallpa), 1600 meters elev., Aug. 18, 1947, J. M. Schunke.

This sex differs from the male in the following features: Form broader and interocular space slightly wider; supra-anal plate triangularly produced between

¹This work was done while studying in the United States under a grant from the Guggenheim Memorial Foundation.

cereal bases, with rounded and bilobate apex; subgenital plate simple, free margin rounded and broadly convex.

General coloration ochraceous tawny. Head with two spots below antennal area and clypeus dark brown. Ocellar spots whitish. Antennae with two proximal segments of the pale color, remainder brown. Pronotum broadly margined with ochraceous tawny, narrowest cephalad. Mesal portion of pronotum ochraceous buff, with a brown suffusion at caudal margin, produced cephalad on the sides, nearly reuniting cephalad. Tegmina cinnamon brown, translucent paler along costal margin. Wings transparent with costal area infuscated. Abdomen fuscous, each sternite with latero-distal brown spots. Legs pale with flecks of prouts brown at bases of spines. Coxae I with a brown spot at base and another near apex. Coxa II and III with four dark brown spots; one at base, two near lateral margins (about one third the distance from base) and one near apex. Femur I with a brown spot at base.

Total length: ♂ and ♀, 19-20 mm.; length of pronotum: ♂ 3.3, ♀ 3.5; width, ♂ and ♀ 5; length of tegmina, ♂ 16; ♀ 15; width, ♂ and ♀ 4.

There are three male paratypes, all collected "in jungle" at Tingo Maria, Peru, by Dr. Allard, two of them on Feb. 14, 1950, the third one on Feb. 12, 1950.

***Xestoblatta bananae*, n. sp.**

(Figs. 6-11)

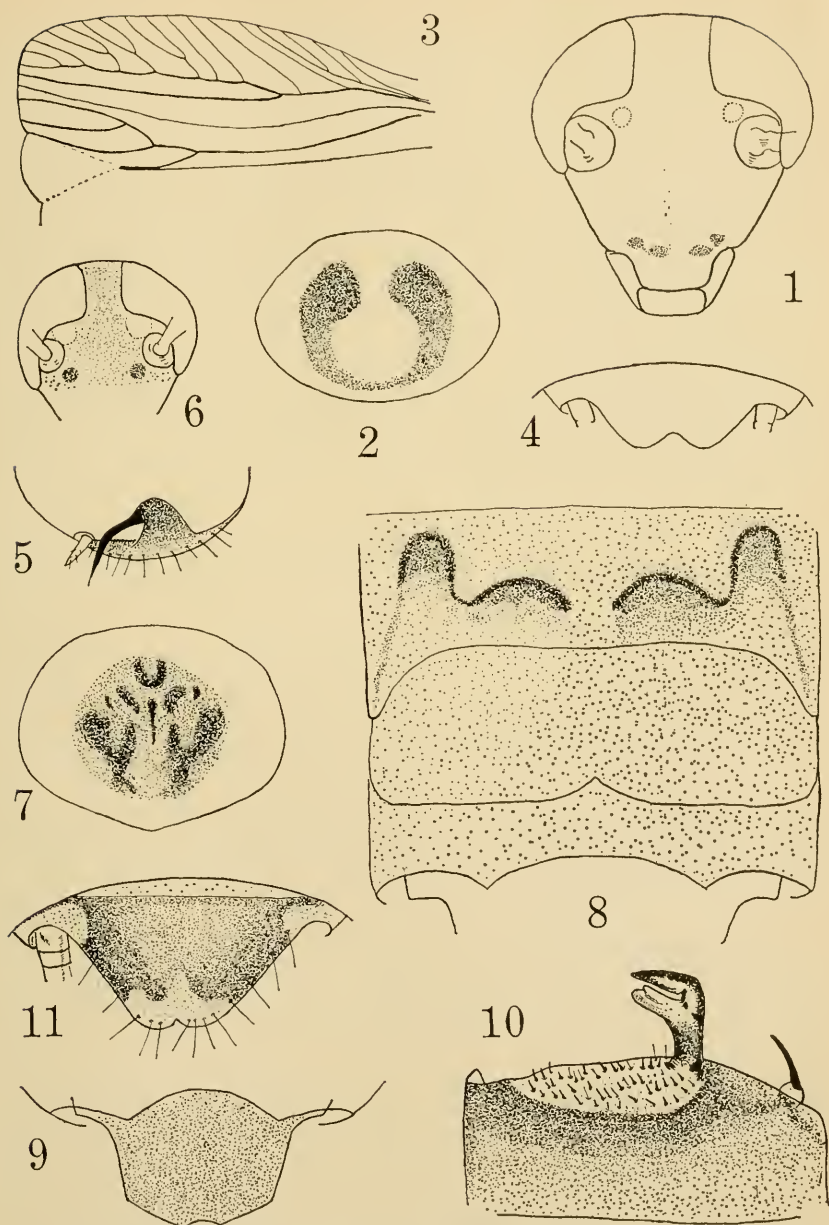
This species in general appearance resembles *X. ecuadorana* Gurney, differing in the very distinctive male genitalia and dorsal abdominal specialization.

Type ♂: Intercepted in plant quarantine from Ecuador, at San Diego, Calif., April 14, 1953, with bananas, through R. F. Wilkey (U. S. National Museum Type No. 65794).

Size medium for the genus. Head projecting but little cephalad of the pronotum. Interocular space equal to very slightly over half the distance between antennal sockets, lateral margins of interocular space nearly parallel. Ocellar spots distinct. Pronotum as characteristic of the genus, convex, greatest width meso-caudad; caudal margin obtuse angulate produced, with rounded apex. Tegmina and wings fully developed, the former with 11 radial sectors (10 anterior and 2 apical) some of them subdivided. Media with two forked branches. Cubitus with one forked anterior branch and three posterior ones. Seven anal veins. Wings having R1 forked medially. Seven radial sectors (6 anterior and one apical). Media simple. Cubitus with 6 rami that go to the margin and 4 that go to the first plical area. Intercalated triangle distinct. Abdomen specialized as in fig. 8. Supra-anal plate produced between cerci and slightly bilobate. Subgenital plate asymmetrical as shown in figure 10. Ventro-cephalic margin of femur I with a row of long spines which decrease in size distad and terminate in three elongate spines. Pulvillus, arolia and tarsal claws moderately developed.

Allotype ♀.—Intercepted in plant quarantine from Ecuador, in California, March 30, 1953.

This sex differs from the male in the following features: Size slightly longer, form broader, and interocular space wider; supra-anal plate triangularly pro-



Xestoblatta tingomariensis, n. sp., holotype. Fig. 1, head; fig. 2, pronotum; fig. 3, portion of wing; fig. 4, supra-anal plate; fig. 5, apex of subgenital plate, posterior view. *Xestoblatta bananae*, n. sp. (figs. 6-10 from holotype, fig. 11 from allotype). Fig. 6, head; fig. 7, pronotum; fig. 8, dorsum of specialized portion of abdomen; fig. 9, supra-anal plate; fig. 10, subgenital plate; fig. 11, supra-anal plate.

duced between cerci, with a distinct and bilobate emargination; cerci with 14 segments; subgenital plate broad, with free margin rounded and convex.

General coloration: ochraceous tawny. Head ochraceous buff, deepest on vertex and interantennal space. Ocellar spots whitish. Antennae with two proximal segments of the pale color, remainder brown. Pronotum margined with ochraceous tawny, this narrowest cephalad, disk with brown patches on each side of mesal area, as shown in Figure 7. Tegmina translucent cinnamon brown. Wings infuscate and transparent. Abdomen ochraceous tawny, each sternum with latero-distal brown spots. Legs ochraceous buff with flecks of prouts brown at bases of spines. Dorsal margin and apices of tibiae dark brown. Coxae with a brown spot near lateral margin. Pulvilli whitish. Arolia and tarsal claws cinnamon brown.

Total length: ♂♂ and ♀ 26 mm.; length of pronotum ♂ 4; ♀ 5; width: ♂ 6; ♀ 7; length of tegmina: ♂ 21; ♀ 22; width: ♂ 5; ♀ 5.7.

There are three female paratypes, as follows, all intercepted by plant quarantine inspectors examining bananas from Ecuador: San Diego, Calif., March 30, 1953; Brownsville, Tex., April 26, 1952; New Orleans, La., Feb. 16, 1955.

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- Gurney, A. B. 1939. A revision of the Neotropical genus *Xestoblatta* Hebard. (Orthoptera-Blattidae-Pseudomopinae). Proc. Ent. Soc. Wash. 41(4): 97-128, pl. 13-17.

DROSOPHILA MELINA, NOM. NOV.

(DIPTERA: DROSOPHILIDAE)

It has recently come to my attention that the name *Drosophila gilva* Wheeler and Takada is a junior homonym, being preoccupied by *Drosophila gilva* Burla. To replace the rejected homonym, I am proposing the new name:

Drosophila (Drosophila) melina Wheeler, nom. nov.

= *Drosophila gilva* Wheeler and Takada 1962, in Wheeler, Takada and Brneic 1962, Studies in Genetics II. Univ. Texas Publ. 6205:407. Nee *Drosophila (Hirtodrosophila) gilva* Burla 1956, Mitt. Zool. Mus. Berlin 32 (2):263.

The type locality of *D. melina* is St. Lucia, B.W.I.; other known localities are: Almirante, Bocas del Toro Pr., Panama; Popayan, Colombia (30 km. north); Villavicencio, Colombia (3 miles west). Type specimens are located in the U. S. National Museum, the collection of the California Academy of Sciences, and the *Drosophila* Type and Reference Collection of the Genetics Foundation, The University of Texas, Austin.

MARSHALL R. WHEELER, *Department of Zoology, The University of Texas, Austin.*

TWO NEW SPECIES OF LAELASPIS MITES

(ACARINA: LAELAPTIDAE)¹PRESTON E. HUNTER and ROBERT DAVIS,² *University of Georgia, Athens*

A review of the genus *Laelaspis*, family Laelaptidae (Hunter, 1961), included a list of the known species of mites in this genus. The present paper describes two new species of *Laelaspis* mites from material which was not available for inclusion in the above publication. This brings the total number of species listed in the genus to 17, six of which have been recorded from North America.

The body setae appear to bear the most distinguishing and easily recognized characteristics for separating closely related species of *Laelaspis*. In instances where gross morphological features appear to be very similar, quick and consistent separation can be made by checking two or three specific body setae. The setal characteristics found to be the most important are the type (spinose, simple, lanceolate, etc.) and length of the median and marginal dorsal setae, and the type and length of the ventral body setae.

Laelaspis bakeri, new species

(Figs. 1, 2)

Both sexes may be recognized by having long, spiny dorsal plate and ventral body setae and except for length these setae are similar in appearance; the seta enlarges above its base before tapering to a spined point. The setae on the ventral body plates are also long, especially on the female. The striation patterns of the ventral plates are distinct.

Female.—Rounded, 650 μ long, 570 μ wide. Distinct scale-like reticulations on dorsal plate (fig. 1A); dorsal plate setae slightly enlarged above base, long (up to 120 μ) and bearing 3-5 pairs of minute spines on terminal one third. *Ventral surface*. Sternal plate 135 μ long on midline, 150 μ at widest point between coxae II and III; margins thickened, reticulations limited to anterior half; anterior margin of sternal plate with shallow indentation posterior to base of tritosternum; sternal setae long, second and third pair about as long as shortest length of sternal plate; position of sternal pores and setae as illustrated (fig. 1B). Metasternal setae arise from well developed metasternal plates. Genitoventral plate 345 μ long on midline from posterior margin of sternal plate, 280 μ at greatest width behind coxae IV; striations as illustrated (fig. 1B); genital setae long, arise from surface of genitoventral plate; first pair of ventral plate setae arise from margin of and attach to genitoventral plate, second and third pair arise from integument at margin of genitoventral plate. Metapodal plates

¹Journal Paper No. 159 of the College Experiment Station of the University of Georgia College of Agriculture Experiment Stations.

²Assistant Professor and graduate student, respectively; Department of Entomology.

elongate, lateral of first pair ventral plate setae. A single parapodal plate on each side lateral of coxae III, IV, and the posterior half of coxa II; plate enlarges posteriolaterally of coxa IV. Peritremal plate extends posteriorly almost

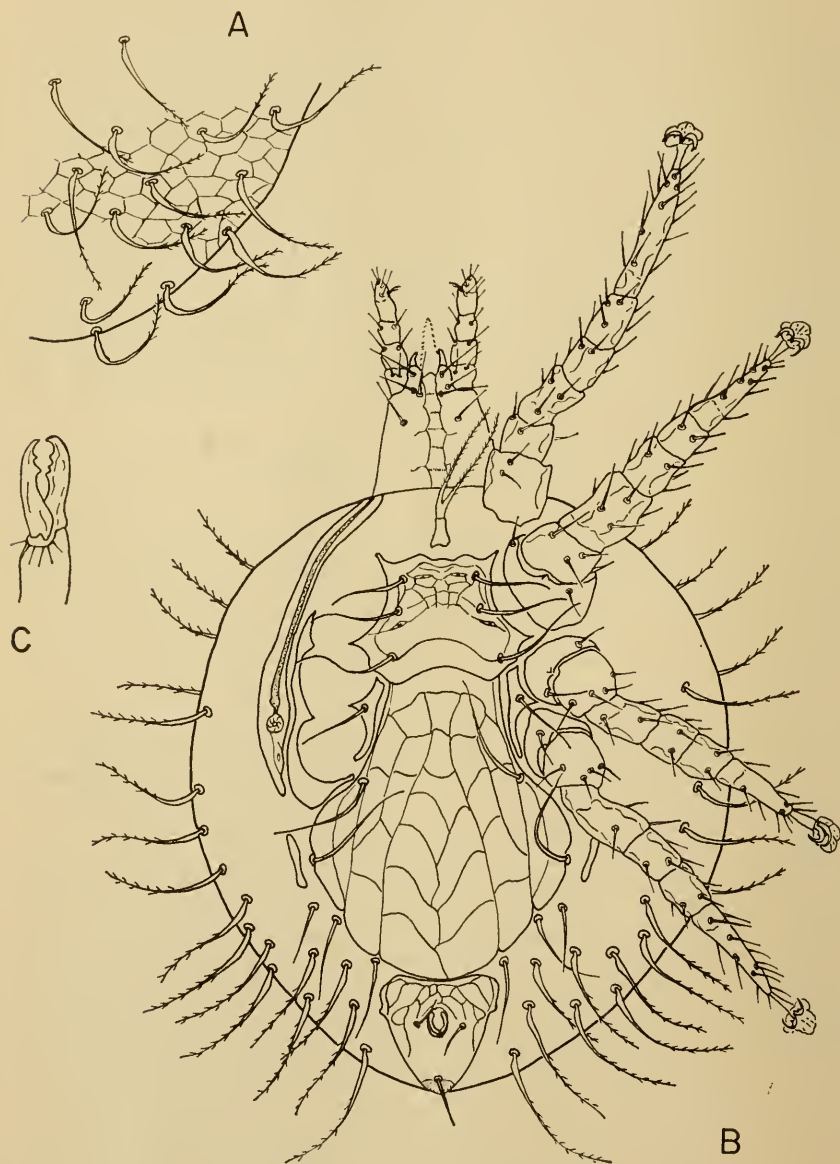


Fig. 1, *Laelaspis bakeri*, n. sp., female. A, posterior portion of dorsal plate; B, ventral view; C, chelicera.

to hind margin of parapodal plate; with a small circle on surface approximately half way between stigmata and posterior end of plate. Anal plate $125\ \mu$ long, $130\ \mu$ wide; small lateral projection on margin of plate just anterior to anal

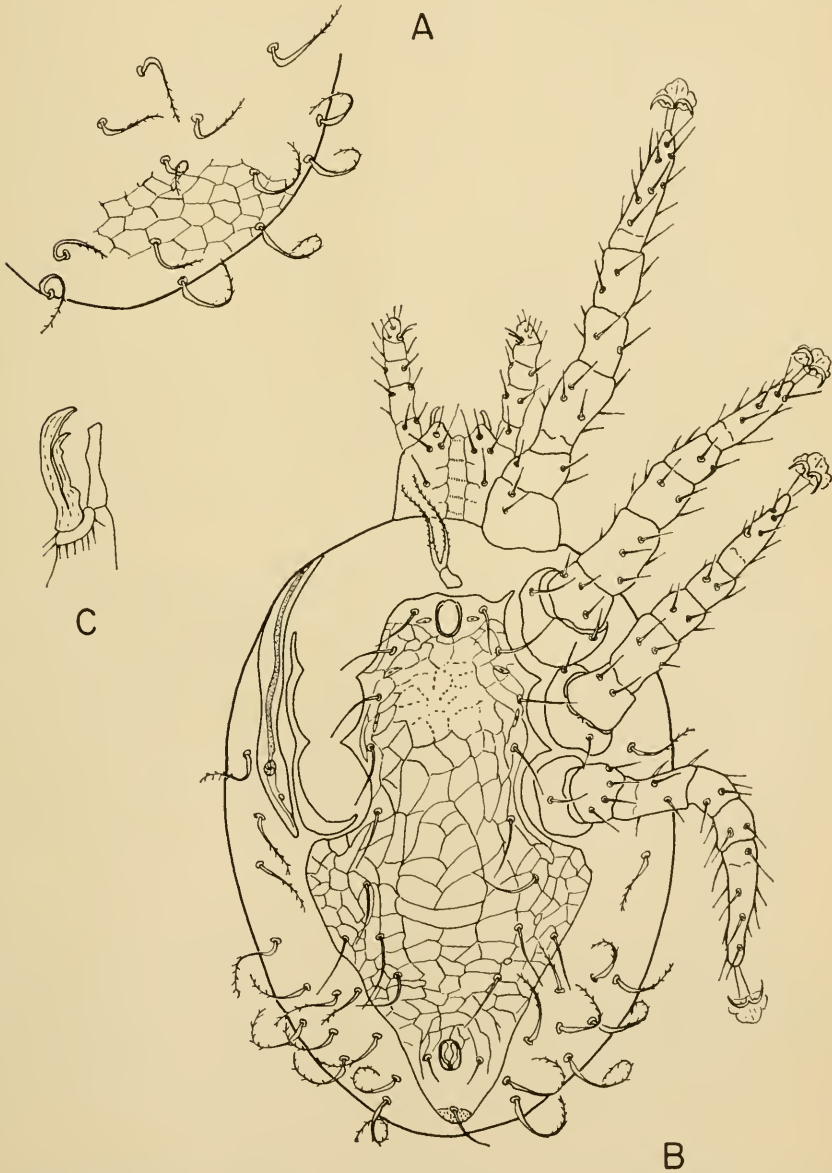


Fig. 2, *Laetaspis bakeri*, n. sp., male. A, posterior portion of dorsal plate; B, ventral view; C, chelicera.

opening; distinct reticulation pattern as illustrated; position and relative length of anal plate setae shown in fig. 1B. Ventral body setae arise from integument, long (up to $150\ \mu$), with minute spines, especially on anterior margin of setae; setae slightly enlarged above base as in dorsal plate setae. *Legs* II more robust than others; all tarsi with well developed claws; sclerotization of legs as illustrated. Lengths, including claws and coxae, as follows: leg I, $425\ \mu$; leg II, $390\ \mu$; leg III, $360\ \mu$; and leg IV, $440\ \mu$. *Gnathosoma* shows no specific modification; chelicerae strongly chelate, digits of about equal length, both with teeth (fig. 1C).

Male.—Smaller and with more oval body shape than female; $500\ \mu$ long, $375\ \mu$ wide. Dorsal plate reticulations and setae (fig. 1A) like that of female; dorsal setae up to $65\ \mu$ long. *Ventral surface*. Holoventral plate $435\ \mu$ long, $150\ \mu$ wide between coxae II and III; $230\ \mu$ wide behind coxae IV; nine pairs of setae in addition to the three anal setae, arise from this plate. Location of sternal pores and setae as shown in fig. 2B; reticulations as illustrated, becoming somewhat indistinct between coxae III. In the specimen illustrated one anterior corner of sternal plate was missing. Single parapodal plate on each side, but posterio-laterally of coxae IV not enlarging as much as in female. Peritremal plate as in female. Ventral body setae spined (fig. 2B) up to $85\ \mu$ long. *Legs* II noticeably more robust than others; measurements including claws and coxae as follows: leg I, $380\ \mu$; leg II, $310\ \mu$; leg III, $290\ \mu$; and leg IV, $358\ \mu$ long. *Gnathosoma* without distinct modification; chelicerae chelate (fig. 2C), the movable digit being slightly shorter than the fixed digit, only movable digit with teeth. A strong, digitlike spermatodaetyl is present laterally of the movable digit and extends slightly beyond the end of the fixed digit.

This species was described from 13 females and 1 male all with the following collection data: "Livingston Co., Michigan, April 27, 1956; with *Myrmica fracticornis*, colr. P. Kannooski." Six nymphs were also included in the series of specimens. The female holotype and four paratypes, and the male allotype will be deposited in the U. S. National Museum. Three female paratypes will be deposited with the Institute of Acarology, Wooster, Ohio. The remaining paratypes will be retained in the Department of Entomology collection University of Georgia.

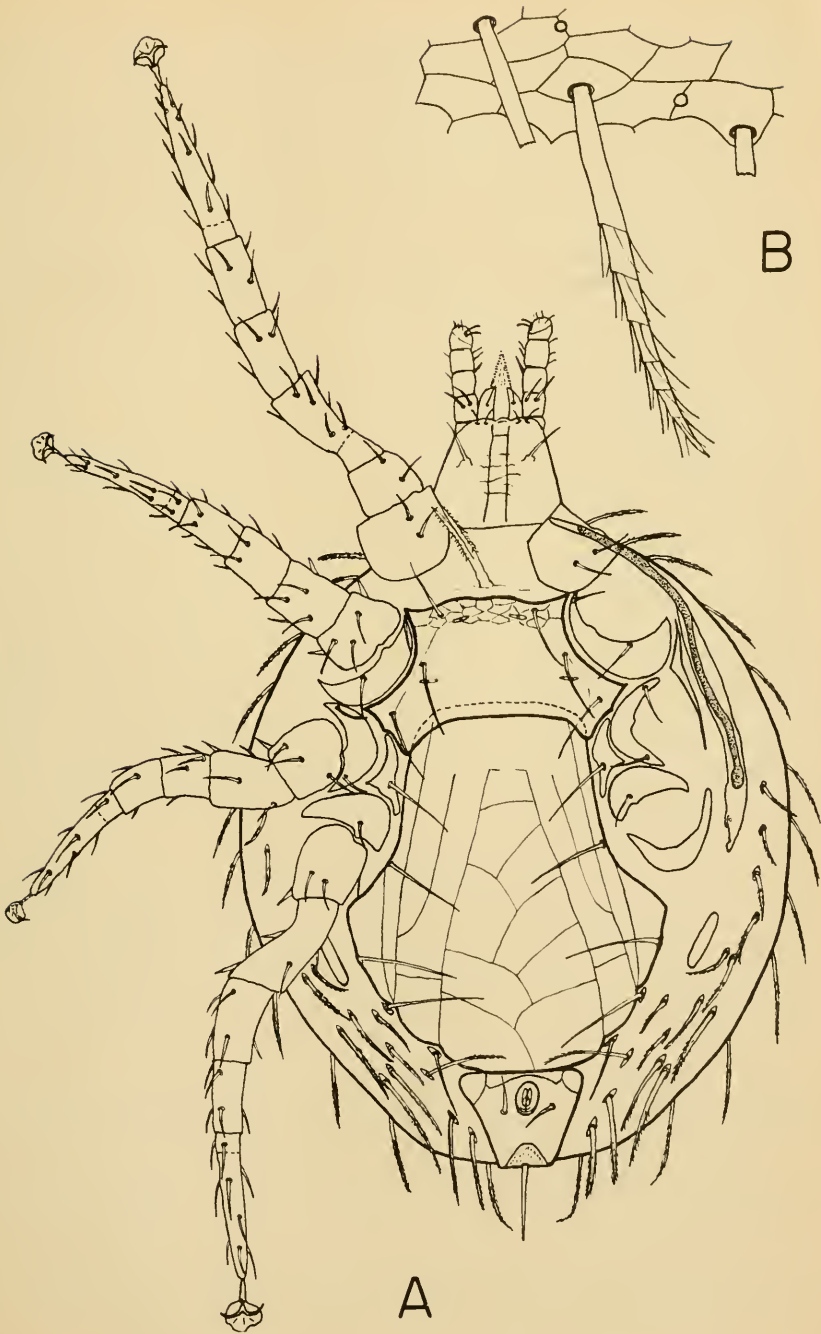
This species was named for Dr. Edward W. Baker who has given us much valuable help in our work.

***Laclaspis pauli*, new species**

(Fig. 3)

Only the female is known. The female is distinct in having long, spiny, dorsal and dorsal marginal setae, spiny ventral body setae which arise from small individual platelets, a very narrow peritremal plate, and the presence of two parapodal plates on each side. The markings of the sternal and genitoventral plates are also distinct.

Fig. 3, *Laclaspis pauli*, n. sp., female. A, ventral view; B, portion of dorsal plate with seta.



Body oval, 530 μ long and 430 μ wide. Dorsum covered by dorsal plate; reticulations on the plate form a scale-like pattern (Fig. 3B); dorsal setae spined, up to 70 μ long on the middle of the dorsum, dorsal marginal setae up to 100 μ long. *Ventral surface.* Sternal plate distinctly wider than long, 200 μ wide and 120 μ long at its largest dimensions; anterior lateral corners not prolonged into narrow points; only lightly notched at base of tritosternum; reticulations mainly restricted to area even with, and anterior to, the first pair of sternal pores; position of the sternal setae and pores are as shown (fig. 3A). Metasternal setae arise from well-developed metasternal plates. Genitoventral plate 295 μ long on midline from posterior margin of sternal plate, 240 μ wide behind coxa IV; striations as shown (fig. 3A). This species shows fewer cross striae compared to many *Laelaspis* species. The genital and first ventral plate setae arise from the surface of the plate; the second and third pairs of ventral plate setae arise from small individual plates at the margin of the genitoventral plate. Anal plate measures 80 μ long and 100 μ wide; bears a few transverse striations on anterior part; unpaired posterior seta much heavier and over twice as long as the paired setae. Metapodal plate rectangular-shaped, well sclerotized. Peritremal plate narrow, forward of coxae II only as wide as the peritreme; ends posteriorly in a small knob-like process at the posterior margin of coxa IV; a small circle is present on the plate between the stigmata and the posterior end of the peritremal plate. Two parapodal plates are present on each side lateral of the coxae; the anterior plate narrow, extending from the middle of coxa II to near the posterior edge of coxa III; posterior plate wider, extending behind and lateral of coxa IV. Fifteen pairs of spinose ventral body setae are present posterior to leg III; each seta arises from a small platelet in the integument; position and relative length of the setae are shown in fig. 3A. *Legs* well developed; claws and caruncles are present on all tarsi; sclerotization very light or absent on the segments of the legs; legs including claws and coxae measure as follows: leg I, 490 μ ; II, 320 μ ; III, 345 μ ; and IV, 450 μ long. *Gnathosoma.* Chelicerae chelate, both digits well-developed and sclerotized; small pilus dentilis present on the fixed digit; fixed digit has three teeth and the movable digit two teeth.

This species was described from five specimens all with the following collection data: Morgan Co., Ga.; May 19, 1960; J. J. Paul, Collector; from ground litter around nest of ant, *Crematogaster* sp. The holotype and two paratypes will be deposited in the collection of the U. S. National Museum. The remaining two paratypes will be retained in the collection of the Department of Entomology, University of Georgia.

REFERENCE

- Hunter, Preston E., 1961. The Genus *Laelaspis* with description of three new species. Ann. Ent. Soc. Amer. 54:672-683.

DESIGN FOR A MALAISE TRAP

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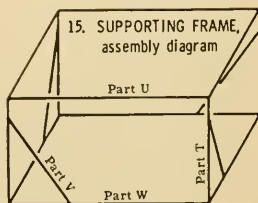
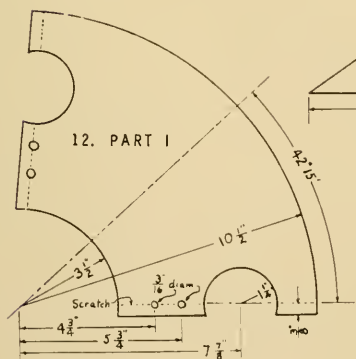
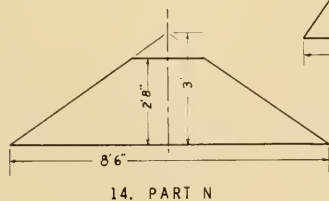
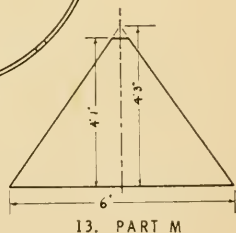
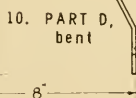
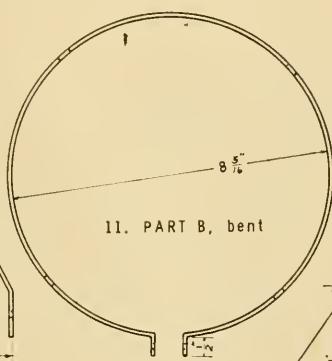
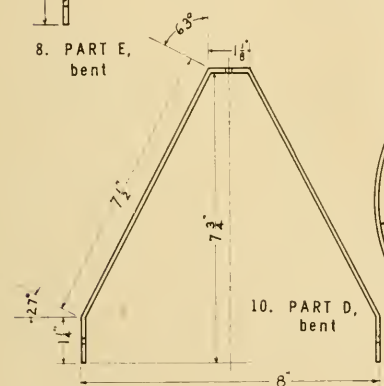
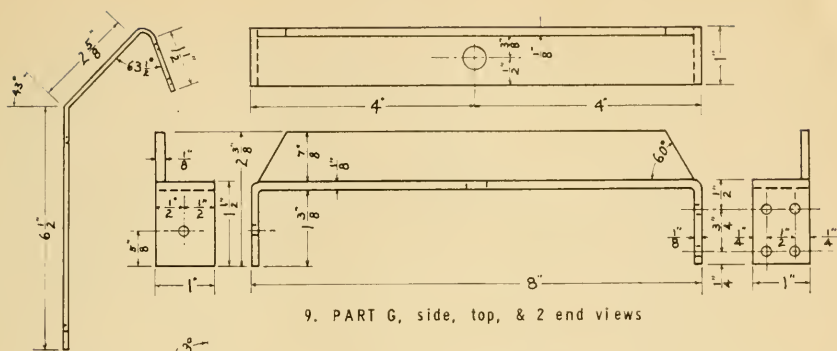
In 1937, Dr. René Malaise of Stockholm published an account of a novel insect trap, with construction plans (*Ent. Tidskrift* 58: 148-160). The trap was a tent-like structure of fine netting, into which flying insects would wander, and their natural tendency to work upwards when trying to escape would eventually pass them into a collecting apparatus at the top of the trap. This type of trap merits more development and use than it has had. The design and construction details presented below describe a model used by the author since 1959. An example of the model was exhibited at the Annual Meeting of the Entomological Society of America at Detroit, in December, 1959. Since then there have been many requests for plans of the trap, which resulted finally in the preparation of this paper.

It should be understood that the Malaise trap is capable of endless modification for convenience of construction, and for adaptation to particular types of insects and particular habitats. The design below is presented with some hesitation, as its publication might tend to freeze the model at this stage of development rather than encourage further experimentation with it. This model was developed for catching *Ichneumonidae*, for which it works very well. It also catches all other kinds of actively flying insects, particularly *Diptera*, *Hymenoptera*, and *Lepidoptera*. The types of insects caught depend to a large extent on where the trap is set. Modifications of its size, shape, baffle arrangement, and collecting assembly would influence the quantity and relative proportions of various species collected, and the color of the trap would also have some effect. All these factors need further experimentation. The present trap measures six feet square and almost eight feet high.

Plans for another type of Malaise trap have been published by Gressitt and Gressitt (1962, *Pacific Insects* 4: 87-90). In comparison with the design described below, this model is much more portable and easier to make, but is possibly less efficient for some kinds of insects. The Gressitt design is basically a good one and merits further development. It could probably be improved by making more upward slope along the top edge into the collecting chambers at each side, reduction of the expanse of the trap but not of the side and top baffles, use of a more transparent type of netting, and elimination of the darkened areas in the collecting cones caused by doubling of the netting where it is tied to the plastic collectors. A greater capacity for the plastic collecting chambers would also be of advantage.

The Malaise trap can be to students of flying insects what the Berlese funnel has been to students of soil arthropods. It will gather

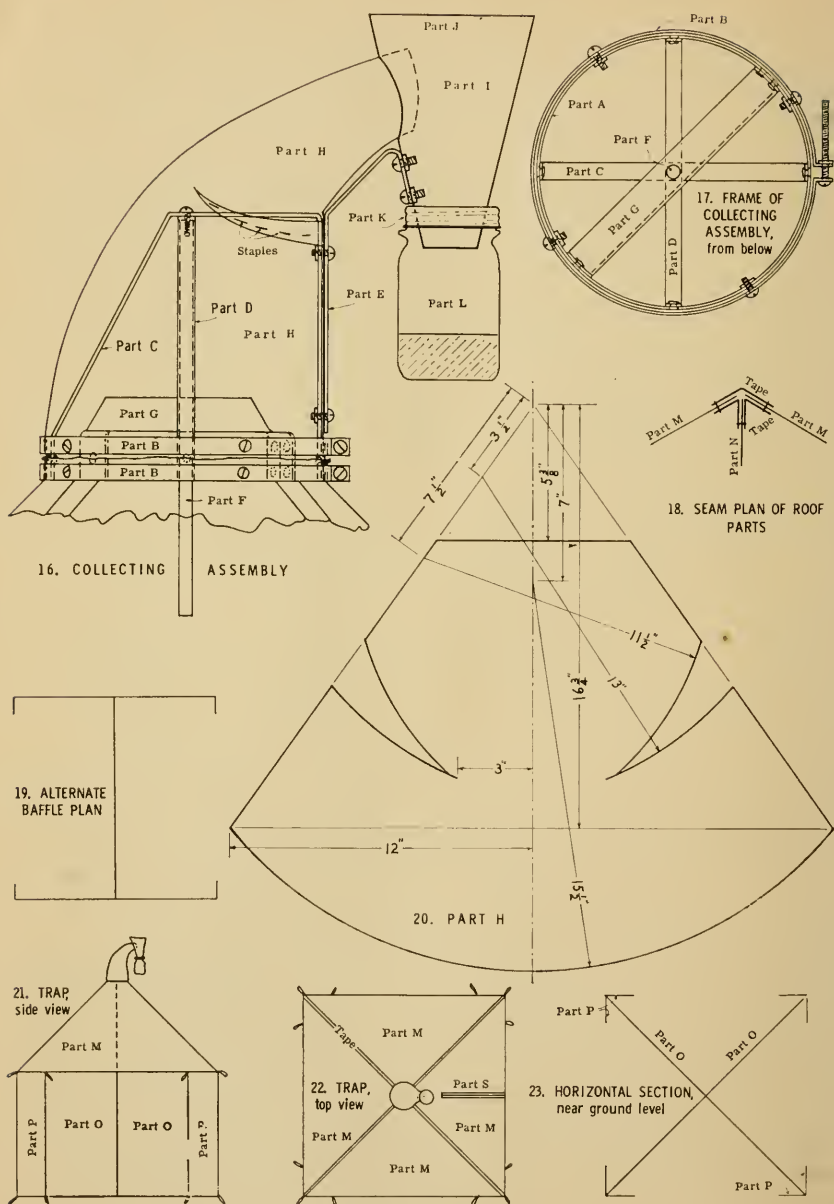
¹This paper is an incidental result of research supported by the Dow Chemical Company, National Institutes of Health, and National Science Foundation.



MATERIALS LIST

Dry goods.—

White netting 49 inches wide, 4 yards long; another piece 32 inches wide and 3 yards long. The netting should be strong, and with 18 to 30 mesh per linear inch. Probably the best material is saran. Saran netting is available from



Chicopee Manufacturing Corporation, Cornelia, Georgia, as their material no. 1828-000, 36 inches wide, at about 29¢ per running foot. This being narrower than 49 inches, some piecing will be required. Another possible material is daeron. Nylon is not good because it rots rapidly in sunlight, and a trap made

of this is good for only one or two seasons of use. In his original design Malaise found cotton bobinet satisfactory.

Black or very dark colored netting, 42 inches wide, $5\frac{1}{2}$ yards long. This should be similar to the white netting but black instead of white. A dark olive-green saran netting is sold by the above company as their material no. 1828-002, 36 inches wide, about 27¢ per running foot.

Black muslin cloth, 2 pieces 10 inches wide, $8\frac{1}{2}$ feet long.

White or colored binding tape, 1 inch wide, 25 yards.

Zipper, approximately 30" long.

Cotton thread, no. 50, one large spool.

Cord, $\frac{1}{8}$ to $\frac{3}{16}$ inch diameter, 28 inches.

Cord, any strong cord, 4 yards.

Hardware.—

Aluminum strips, $\frac{1}{8}$ " thick.

$1\frac{1}{4}$ " wide, $25\frac{1}{4}$ " long; 1 piece

$\frac{3}{4}$ " wide, $11\frac{1}{8}$ " long, 1 piece

$\frac{1}{2}$ " wide, 27" long; 2 pieces

$\frac{1}{2}$ " wide, $21\frac{7}{8}$ " long; 1 piece

$\frac{1}{2}$ " wide, $18\frac{5}{8}$ " long; 1 piece

Angle iron, 1 inch on each side, $\frac{1}{8}$ " thick, 1 piece $10\frac{1}{2}$ " long.

Iron rod, $\frac{3}{8}$ " diameter, $11\frac{1}{2}$ " long.

Stove bolts, $\frac{3}{16}$ " diameter, $\frac{1}{2}$ " long; 13 pieces, with 12 nuts.

Stove bolts, $\frac{3}{16}$ " diameter, $2\frac{1}{2}$ " long; 26 pieces, with nuts.

Galvanized wire screening, about 18 mesh to linear inch, 1 piece 18" x 24".

Aluminum rivets with beveled heads for countersinking, $\frac{3}{16}$ " diameter, $\frac{3}{8}$ " long; 9 pieces.

Heavy gauge staples for stapling machine, about $\frac{3}{8}$ " wide and $\frac{1}{4}$ " long; 20 pieces.

Softwood (pine, fir, or spruce).—

8 pieces $\frac{3}{4}$ " x $\frac{3}{4}$ " x 50". These can be sawn from a $\frac{3}{4}$ " board $7\frac{1}{2}$ " wide and 50" long, if there is no wastage to avoid knots.

4 pieces $\frac{3}{4}$ " x $\frac{3}{4}$ " x $76\frac{1}{2}$ ". These can be sawn from a $\frac{3}{4}$ " board $3\frac{3}{4}$ " wide and $76\frac{1}{2}$ " long, if there is no wastage to avoid knots.

4 pieces $\frac{3}{4}$ " x $1\frac{1}{4}$ " x $76\frac{1}{2}$ ". These can be sawn from a $\frac{3}{4}$ " board $5\frac{1}{2}$ " wide and $76\frac{1}{2}$ " long, if there is no wastage to avoid knots.

1 piece $1\frac{1}{8}$ " x $1\frac{1}{8}$ " x 82". This can be sawn from $1\frac{3}{4}$ " x $3\frac{3}{4}$ " stock.

Miscellaneous.—

Clear cellulose acetate plastic sheet, 0.05 inch thick. One piece 9" x 15" and 1 piece $5\frac{1}{4}$ " x $5\frac{1}{4}$ ". Probably other kinds of clear plastic would also be satisfactory.

Acetone (ethyl ketone), 3 oz. If another kind of plastic, not soluble in acetone, is used, substitute a solvent for the plastic employed.

Rust proofing paint primer, 2 oz.

Screw-cap jar, pint size, $2\frac{3}{8}$ " mouth diameter, either empty if alcohol is to be used in running the trap or made into a cyanide jar if cyanide is to be used.

Metal screw cap for the above jar with a $2\text{-}\frac{3}{16}$ " hole in the top of the cap (such jar caps are now standard for home canning).

Note: Cost of all materials at present prices is about \$28.00.

TOOLS LIST

Sewing machine, medium-sized sewing needle, scissors, package of straight pins, soft crayon, yard stick (or ruler), protractor, hack saw, drill with twist bits $\frac{1}{8}$ ", $\frac{3}{16}$ " and $\frac{3}{8}$ " for metal and $\frac{1}{4}$ " for wood, screw-tapping set for making $\frac{3}{16}$ " stove bolt thread (female), center punch, hammer, metal vise, bench saw if wood pieces are to be sawn from boards, tin snips, scroll saw, pocket knife, 3 small c-clamps, screwdriver, small paint brush, brace and $\frac{1}{2}$ " wood bit, and sheet of medium fine sandpaper.

PARTS LIST (1 piece each, unless noted otherwise)

- A. Aluminum strip $\frac{1}{8}$ " x $1\frac{1}{4}$ " x $25\frac{1}{4}$ ". Drill $\frac{3}{16}$ " holes as in figure 1. Counter-sink 9 of the holes (with $\frac{3}{8}$ " bit) as shown in figure 1 to receive heads of rivets. Then bend into a complete circle as shown in figure 17.
 - B. Aluminum strip $\frac{1}{8}$ " x $\frac{1}{2}$ " x 27 ". Drill $\frac{3}{16}$ " holes as in figure 2. The slots $\frac{3}{16}$ " x $\frac{3}{8}$ " may be made by drilling adjacent holes and then cutting out the metal between. Turn $\frac{1}{2}$ " ends 90° and bend the remainder into a circle as in figure 11. 2 pieces.
 - C. Aluminum strip $\frac{1}{8}$ " x $\frac{1}{2}$ " x $21\frac{1}{8}$ " long. Drill $\frac{3}{16}$ " holes as in figure 3 and bend as in figure 7.
 - D. Aluminum strip $\frac{1}{8}$ " x $\frac{1}{2}$ " x $18\frac{5}{8}$ " long. Drill $\frac{3}{16}$ " holes as in figure 4 and bend as in figure 10.
 - E. Aluminum strip $\frac{1}{8}$ " x $\frac{3}{4}$ " x $11\frac{3}{4}$ ". Drill $\frac{3}{16}$ " holes as in figure 5 and bend as in figure 8.
 - F. Iron bar, $\frac{3}{8}$ " diameter, $11\frac{1}{2}$ " long. Drill hole $\frac{1}{2}$ " deep in one end with $\frac{1}{8}$ " bit, then tap it with a female $\frac{3}{16}$ " stove bolt thread. See figure 6.
 - G. Angle iron, 1 inch on each side, $\frac{1}{8}$ " thick, $10\frac{1}{2}$ " long. Cut, bend and drill as in figure 9. The central hole is $\frac{3}{8}$ ", to receive the $\frac{3}{8}$ " iron bar (part F). The other holes are $\frac{3}{16}$ ".
 - H. Galvanized screening. Cut to shape shown in figure 20. Make the pattern first with paper, lay the pattern on the screening, and cut with tin snips.
 - I. Cellulose acetate sheet, 0.05 inch thick. Cut to shape shown in figure 12. This can best be done by first drawing the pattern on paper, and laying the plastic over the paper for copying. Mark the plastic with scratches, using a sharp nail against a ruler for straight lines and the point of dividers for the arcs. Make the scratch near each outside edge as shown in the drawing, mark the outside edges $\frac{3}{8}$ " from these scratches, and mark the centers of the $\frac{3}{16}$ " holes. Cut the straight lines of the outline, and the outside curve with tin snips. Cut the inside curves close to their scratches with a scroll saw and trim up to the scratches with a pocket knife. Drill the $\frac{3}{16}$ " holes with a metal drill. Save the plastic trimmings and soak some of them in acetone to make a glue for assembling the plastic parts.
- After cutting is completed, soak the plastic in almost boiling water to soften it and work it into as nearly perfect a cone as possible (see figure 16), with the two submarginal scratches exactly overlapping.
- J. Cellulose acetate sheet, 0.05" thick. 1 piece $5\frac{1}{4}$ " x $5\frac{1}{4}$ ".
 - K. Top of jar lid. See materials list.
 - L. Pint jar. See materials list.
 - M. Top panel for trap. White netting (preferably saran). Cut to shape as in

- figure 13. The length of the material should be parallel to the 6 foot edge.
4 pieces.
- N. Top baffles for trap. White netting (preferably saran), Cut to shape as in figure 14. The length of the material should be parallel to the 8½ ft. edge.
2 pieces.
- O. Bottom baffles for trap. Black netting (preferably saran). Cut pieces 8½ ft. x 42". 2 pieces.
- P. Side baffles for trap. Black netting (preferably saran). Cut pieces 20" x 42".
4 pieces.
- R. Bottom skirt for trap. Black muslin. Cut pieces 8½ ft. x 10". 2 pieces.
- S. Zipper, about 30" long.
- T. Softwood ¾" x ¾" x 50". Uprights for supporting frame. Bore ¼" holes at ¾" from first end and at both 1½" and 7¼" from second end. Then turn stick 90° and bore ¼" holes at 2" from first end and at both ¾" and 6" from second end. 4 pieces.
- U. Softwood ¾" x ¾" x 50". Braces for supporting frames. Bore ¼" hole at ¾" from each end. 4 pieces.
- V. Softwood ¾" x ¾" x 76½". Top rails for supporting frame. Bore ¼" holes at ¾" from each end. 4 pieces.
- W. Softwood ¾" x 1¼" x 76½". Bottom rails for supporting frame. Bore ¼" holes at ¾" and at 25" from each end. 4 pieces.
- X. Softwood 1⅛" x 1⅛" x 82". Center pole. Bore ½" hole in the center of one end, to a depth of 7".

Assembly

First, give all iron parts (part F, G, K, and stove bolts) a coat of rust proofing paint primer and put aside to dry. On the nuts and bolts the coat should be thin, so as not to gum the threads too much.

Supporting frame: Using 3/16" x 2½" stove bolts, bolt together parts T, U, V, and W in the pattern shown in figure 15. This makes a cubical wooden frame within which the trap netting can be tied for support and stretching.

Collecting assembly. The collecting assembly is a metal, screen, and plastic cage and funnel at the top of the trap as in figure 21. Figure 16 shows the assembly in detail and figure 17 shows the metal framework from underneath view. Besides its collecting function, this assembly holds up the center peak of the trap and is in turn supported by the center pole. For construction, rivet together parts A, C, D, and G as in figures 16 and 17, using 3/16" aluminum rivets, ⅜" long. Next place part H on this framework, bending it into the shape of a bent-over cone as shown in figure 16. Fasten the overlapping edges with heavy wire staples from a stapling machine by inserting the prongs manually through the meshes of the screen and manually clinching the ends. Then fasten the screen cone to the metal frame by lapping its lower edge ½" over the circular band (part A) and bolting a circular strap (part B) over this, as in figure 16. Next bolt on part E as in figure 16.

The plastic cone is made from parts I, J, and K. Overlap the edges of part I so that the holes in each edge and the submarginal scratches exactly overlap, smear between the overlapped edges with glue made by dissolving plastic scraps in acetone, and clamp the edges into place between wood strips ½" wide, held

with e-clamps. When the glue has hardened, take off the clamps, lay a sheet of medium fine sandpaper on a flat surface, and rub the wider mouth of the plastic cone over the sandpaper till the edges are even and beveled to a single plane. Then smear these edges with the plastic glue and invert and center the cone over the plastic square (part J). Place with the square piece down on a flat surface, balance a weight on the top of the cone, and leave till the glue is hard. Trim the overlapping edges of the plastic square (part J) with tin snips, pocket knife, and sandpaper. Place the metal screw cap (part K) over the small end of the cone as in figure 16. Then place thick glue made of the plastic dissolved in acetone over the joint between the jar lid and the plastic cone, both top and bottom sides. Screw the pint jar (part L) into the jar lid to press away excess glue, remove the jar, and let the glue harden. Now bolt the cone to piece E on the assembly. The opening of the screen cone should be adjusted to fit as closely as possible to the edges of the hole in the side of the plastic cone. If there are any gaps through which insects could escape, plug them by stuffing in a pledget of cotton. Lastly, pass the iron bar (part F) through the center hole in part G and bolt it at the top as in figure 16.

Netting. Sew the zipper (part S) into the center line of one of the top panels (part M), as shown in figure 22, and slit the panel along the zipper so it will open. Sew together edges of all four of top panels (parts M) as shown in figure 22. Use binding tape on top and bottom of each seam as diagrammed in figure 18, one tape on top and two on the bottom. If the netting is stretchable, it will be necessary to pin or baste it to the tapes before sewing. The two bottom tapes are left with one edge free for later insertion of part N. When the top panels are sewn together a four-sided pyramid with a hole at the center results. Put the center hole over a cushion or a wad of cloth to fill it out, center the ring made by part B over the hole, and with a soft crayon mark an $8\frac{1}{4}$ " circle on the netting, inside the ring. With seissors cut from the center opening out to this crayon-marked ring all around the circle at intervals of about 1". With a piece of cord $\frac{1}{8}$ " to $3/16$ " in diameter and 28" long make a circle of $8\frac{1}{4}$ " diameter by circling the outside of piece B in the collecting assembly with the string, and sewing the overlapped ends together with needle and thread. Place this circle of cord on the crayon mark on the center of the four top panels, turn the tabs just cut back over the cord, pin them in place with straight pins, and stitch them down with the sewing machine. After removal of the pins this makes a circular opening with a corded edge for attachment of the trap to the bottom of the collecting assembly. Next, cut twelve 6" lengths of binding tape and fasten them as loops to the four corners of the assembled parts and at ten inches from each corner, as in figure 22.

Pass the hole in the top of the trap top over the lower part of the circular strap (part A) of the collecting assembly. Rotate the collecting assembly till its plastic cone is directly over the zipper that has been sewn into one of the panels, and then with a circular strap (part B) bolt and clamp the netting to the collecting assembly. The edge of the corded circle should lie in the $\frac{1}{4}$ " crack between the upper and lower clamps (parts B).

Take the trap as thus far assembled to the assembled supporting frame (figure 15). Using strong cord tie the trap by its corner loops of binding tape to the four top corners of the supporting frame, the collecting assembly topside.

From beneath, slip the hole in the end of the center pole (part X) over the central iron bar in the collecting assembly and raise the pole to a vertical position. This stretches the netting into a pyramidal roof. Adjust the netting within the frame till all sides are smooth and tight.

Take both of the top baffle pieces (parts N) and sew them together on their midlines. Pin the top baffles into the stretched roof, placing the long oblique edge of the pieces between the free edges of the binding tapes sewed to the underside of the junctures of the top panels. Adjust the pinning until the baffles are smoothly stretched to each outer corner. Then take the netting out of the supporting frame, take the collecting apparatus off of the netting, and sew the baffles into place where they have been pinned. The baffles need to be pinned into place in the above routine before sewing, if a smooth job is to result.

Sew the two bottom baffle pieces (parts O) together along their midlengths. Match these baffles with the top baffles at their sewn midlines and pin and then stitch the top and bottom baffles together along their respective lower and upper edges.

Crease the four side baffle pieces (parts P), lengthwise along their middles, and place and pin each with its middle creases over the outer edges of the bottom baffles (parts O), one at each of the trap corners. Sew along the pinned creases to attach the side to the bottom baffles, as in figure 23. Next sew the upper edges of the side baffles to the adjacent edges of pieces M. Cut 12 pieces of binding tape each 6" long and sew them as loops to the lower corners of the side baffle pieces as in figure 21. These are for stretching and tying down the lower corners of the trap.

Sew the bottom skirt pieces (parts R) to the lower edges of the bottom baffle. These pieces hang loose from the bottom of the trap. They are not shown in the figures. Lastly, reattach the netting to the collecting assembly, as was done for pinning in the baffles, placing the iron pin (part F) in the same baffle corner as previously.

The design is for a trap with two baffles crossed in the middle. Another good baffle design, better for some situations, is two side baffles and one across the middle, as in figure 19. Directions for this are not given, but how to make it should be obvious.

OPERATION

The trap is designed for portability. Setting it up or taking it down requires about 30 minutes (after practice). The supporting frame collapses into two bundles of sticks and the rest of the trap can be folded into a box approximately 12" x 12" x 24". The pint jar on the collecting assembly is the final resting place of the insects caught. It can be filled about 10% to 50% full of alcohol (70% to 95%) for killing and preserving the insects or can be fixed as a cyanide jar. Alcohol has the advantage that the specimens will be safe for several days if the trap cannot be emptied daily, and because leakage of rain into the jar does not cause trouble. (Rain could be entirely kept out, however, with a small plastic shield around the collecting cone.) Alcohol is preferred for most insects and is usable for all, including Lepidoptera. Malaise used ethyl acetate for a killing agent in his original design. The fumigant was in a small bottle in the bottom of the collector and was dispersed by a wick. Ethyl acetate should work very

well in the present trap design, except that it will dissolve cellulose acetate plastic. If this killing agent is used, a plastic insoluble in ethyl acetate should be substituted.

It is not always necessary to use the supporting frame, as the trap can be stretched between bushes or stakes, but the frame is a great convenience and makes a tidy set-up. When in place the trap should be securely tied down with a strong cord at each corner, or heavy rocks placed on the lower rails of the frame. Otherwise a gust of wind will tip it over. The zipper in the roof of the trap is for easier access to the collecting jar. Without opening the zipper, the jar is a long reach for a short person.

Placing the trap is all-important. Among trees and bushes in a rich moist area is best for a good catch, but sometimes the collector will want to set it in less likely places to see what occurs in the more rigorous habitats. Malaise (1957, Ent. Tidskr. 58: 148-160) gives some pertinent pointers on placing traps. The side of the trap with the zipper and jar should be towards the side with the most light, or in open country probably toward the southwest. The trap is best emptied daily if alcohol is used, every few hours if cyanide is used.

Early in the season, while insects are flying low because the warmest air is near the ground, or when set in short vegetation, the above trap model is too high for efficient collecting. For such conditions a lower trap can be made or this same trap can be set lower, only half way up in its supporting frame, and the center pole either sawed off or its lower end put in a hole.

For Ichneumonidae, four traps can equal the efforts of one good collector, but the average collector is bested by a single trap and no collector works all day every day, as a trap does. In southern Michigan, 6,000 ichneumonids is the expected season's catch for a trap at a moderately good site. Ichneumonids make up about 5% of the total catch. More than half are Diptera.

SOCIETY MEETINGS

708th Regular Meeting, May 3, 1962.—The 708th regular meeting of the Society was called to order by the President, H. H. Shepard, on May 3, 1962 at 8 p.m. in Room 43 of the U. S. National Museum. Thirty-two members and 14 guests were present. Minutes of the previous meeting were approved.

Three candidates to membership were announced: *Leonard W. Trager, Jr.*, *Jay Linam*, and *C. Jacot Gullarmod*. Two candidates were accepted to membership: *Andrew T. Hessel* and *David Shriver*.

W. E. Bickley reported that the date of the annual picnic has been changed to June 16, 1962, at the Log Lodge from 2 to 6 p.m.

A letter from Howard B. Owens, Director of the Prince Georges County Science Fair Committee, was read by H. H. Shepard, suggesting that the Society publish a brochure pointing out the advantages of using insects for projects in the Science Fairs. The suggestion was referred to the executive committee for action.

H. H. Shepard passed around a circular picked up at the OPEDA Science Fair.

J. H. Fales reported on the capture of three species of skippers by certain non-web spinning spiders. On August 25, 1960, *Misumena vatia* (Clerk) (all spider determinations by R. E. Crabill), a crabspider of the family Thomisidae, was collected by J. H. Fales at Breezy Point, Calvert County, Maryland; it was feeding on a specimen of *Poanes viator*. On August 30, 1961, another crabspider, *Misumenooides formosipes* (Walcenaer), was taken on Joe Pye Weed at Hallowing Point, also in Calvert County, Maryland; it was feeding on a specimen of *Epargyreus clarus*. A jumping spider (Family Salticidae) of the genus *Paraphidippus* was collected by W. D. Field on August 30, 1961 also at Hallowing Point; it was feeding on a specimen of *Aneylocephala numitor*.

Dr. Thomas Eisner of Cornell University gave a lecture on "Defense mechanism of Arthropods." He surveyed the various arthropods possessing defensive secretions telling of their chemical nature and effectiveness against predators. The talk was illustrated by slides and a live exhibit of a whip scorpion in action.

Three area science fair contestants discussed their projects: *Linda Nathanson*—"The behavior of *Blatella germanica* in a maze"; *Ronald Knipling*—"Oxygen consumption of the cockroach"; and *Marilyn Richmond*—"Heredity of fruit-flies."

After the introduction of visitors the meeting was adjourned at 10 p.m.—OLIVER S. FLINT, JR., *Recording Secretary*.

709th Meeting, June 16, 1962.—The annual picnic was held jointly with the Insecticide Society of Washington at the Log Lodge, Agricultural Research Center, Beltsville, Maryland, on June 16, 1962.—OLIVER S. FLINT, JR., *Recording Secretary*.

PUBLICATION DATE

The date of publication of Vol. 64, No. 3, of the *Proceedings* was 17 October 1962. The date of publication of Vol. 64, No. 4 will be found in Vol. 65, No. 1.

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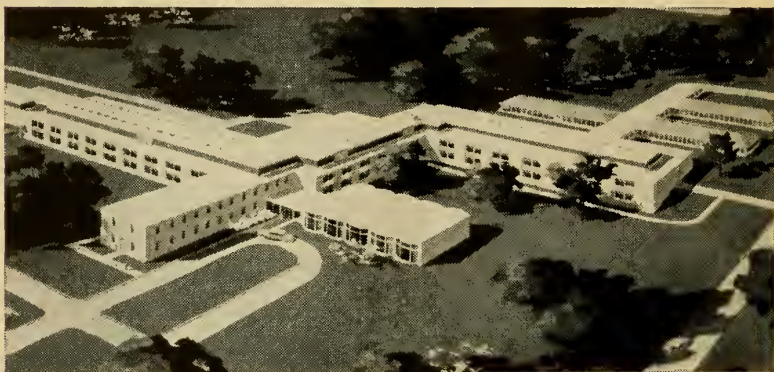
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