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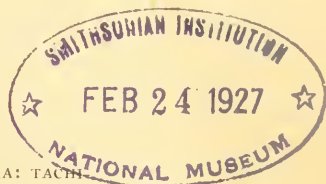
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No. 1

THE HEAD AND MOUTH PARTS OF THE CICADA.

BY R. E. SNODGRASS, *U. S. Bureau of Entomology.*

The presenting of one more paper on the head structures of the cicada is excusable on the claim that the paper contains new information which may help toward a final understanding of the morphology of the parts involved. The writer, for one thing, has reconsidered the evidence bearing on the status of the large, striated facial plate (fig. 1, *Clp*) which he formerly (1921) believed to be the "front," an idea based on a study of what appeared then to be the muscles of the pharynx. Muir and Kershaw (1911, 1911*a*) had previously given cogent reasons for believing the plate to be the clypeus, a view rather generally accepted. Just as the present paper, adopting Muir and Kershaw's interpretation, was first ready for the press, however, a paper appeared by Muir (1926) accepting the idea that the plate in question is the front, or a part of it. The evidence in favor of the older view, that the sclerite belongs to the clypeal region of the head, will be presented later, but it is derived in part from the belief that the sucking pump of the cicada is not the true pharynx, as it has always been called, but is a development of the mouth cavity. This, while significant in itself, if true, removes the chief objection to regarding as a clypeal sclerite the plate on which the pump muscles have their origin. Other considerations give positive evidence that it is such. In the cicada, the plate is evidently a *postclypeus* (figs. 1, 2, 3, *Clp*), the smaller, preoral plate below it being the *anteclypeus* (*clp*), and the free terminal piece the *labrum* (*Lm*). The true pharynx of the cicada appears to be the muscular sac (fig. 7, *Phy*) following the pump (*Pmp*), with its suspensory, or dilator, muscles distributed upon the frons, the vertex, and the tentorium.

Other points of interest described in this paper are found in the transformations of the mouth setæ during the change from nymph to adult, and in the shedding of a close-fitting cuticular sheath from each imaginal seta at the time of the molt to the adult, a feature heretofore unrecorded so far as known to the writer.

THE SKELETON OF THE HEAD.

In the head of the adult cicada (*Tibicina septendecim*) there are six regions clearly defined by external sutures. One of these covers that part of the head which bears the compound eyes,

the ocelli, and the antennæ (figs. 1, 2, *Ep*), and which is continued downward on the sides of the head as the long posterior lateral plates (*B*). Three sclerites form a median series on the facial aspect of the head: Uppermost is the large, bulging, transversely-striated postclypeus (*Clp*), prominent in the adult cicada and of even greater size in the nymph (fig. 3); below this is the smaller anteclypeus (*clp*) in front of the mouth region; and then comes the slender tapering labrum (*Lm*) that covers the bases of the setae where the latter enter the groove of the labium. Finally, on each side of the head, is the elongate, anterior lateral plate (*A*), interpolated between the postclypeus and the posterior lateral plate (*B*). This plate (*A*) terminates below in a bridge (fig. 2, *a*) that merges into the side of the hypopharynx (*Hph*). The posterior lateral plate (*B*), though continuous above in the adult with the dorsal parts of the cranium, will be more conveniently considered as a separate element of the head wall.

The homologies of the head plates and head regions of the Hemiptera still offer a difficult problem to the morphologist. The dorsal surface of the head of the adult cicada presents a broad, flat surface, deeply emarginate in front to receive the upper end of the striated facial plate. It is marked by a median suture behind the median ocellus, and by two lateral longitudinal grooves. In the nymph (fig. 3), however, a transverse suture extends laterally on each side from the anterior end of the median suture to behind the antennae. These transverse sutures cut off a narrow anterior sclerite (*Fr*) lying between the upper part of the striated facial plate and the principal part of the vertex. At the molt, the nymphal cuticula splits along both median and transverse sutures, opening thus a cleft having the form of a Y with the arms much flattened. These sutures of the cicada nymph, therefore, must be the epicranial suture of other insects, with its two divergent frontal branches. The median ocellus of the adult head forms beneath the small triangular area at the junction of the frontal sutures with the vertical suture, and the other two ocelli appear on the lateral areas of the vertex. It is scarcely to be doubted, therefore, that the anterior narrow, transverse sclerite of the top of the nymphal head is the *frons* (fig. 3, *Fr*), which in the adult fuses with the vertex. The narrow frontal sclerite of a cicada nymph is seen clearly in the exuvia, as illustrated by Berlese (1909, fig. 41) and by Comstock (1924, fig. 464). Remnants of the frontal sutures are to be seen in the adult cicada above and behind the bases of the antennæ, and in the Cercopidae a small frontal sclerite remains distinct from the vertex.

Of the three median facial sclerites, the large uppermost one (fig. 1, *Clp*) has been variously regarded as the "frons" and as the "clypeus." The present writer, in a former paper in these

Proceedings (1921), decided that this plate must be the front because the dilator muscles of the mouth pump, assumed to be the pharynx, have their origin upon it. Other writers, including Heymons (1889), for the same reason have given it the same designation, and this interpretation has recently been accepted by Muir (1926). However, a study of the pump, its musculature, and its relation to surrounding parts indicates, as will presently be shown, that the sucking organ of the Homoptera is a development more probably of the mouth cavity than of the true pharynx. Its dilator muscles, therefore, should be attached to the clypeus, since the principal dorsal muscles of the mouth cavity are thus attached in biting insects, and this is presumptive evidence that the sclerite of their origin in the Homoptera is likewise the clypeus, or a part of it. The striations characteristic of the plate in the cicada consist of a series of transverse grooves on each side, the lines accentuated by rows of short pale hairs. The dilator muscles of the mouth pump are attached internally on the spaces between the striæ. Aside from the evidence to be derived from the pump musculature, the fact that the uppermost facial plate lies before the frontal sutures would indicate that it belongs to the clypeus, and that it is no part of the true front. The term "pre-front" given to it by Berlese (1909) is therefore appropriate. Finally, the position of the anterior roots of the tentorial arms just below the bases of the antennæ in the groove bounding the striated plate, identifies this groove as the fronto-clypeal suture.

The identity of the second facial plate (fig. 1, *clp*) is not easy to determine in the cicada, but its preoral position suggests that it too is a clypeal sclerite. Muir and Kershaw (1911, 1911a) show examples in the Cercopidæ, Fulgoridæ, and Reduviidæ where it is not separated from the plate above it, and they state in a 21-day old embryo of *Pristhesancus* there is no line of demarcation between these two sclerites. The clypeus of the cicada and of other Homoptera having a similar facial development is, therefore, evidently divided into a dorsal postclypeus (figs. 1, 2, 3, *Clp*) and a ventral anteclypeus (*clp*). Muir (1926) leaves the homology of the lower clypeal plate in doubt, suggesting that it may be "the clypeus, clypeus plus labrum, or labrum." Its position relative to the mouth is not that of a labrum.

The third facial sclerite, which in the cicada is a narrow free terminal lobe (figs. 1-5, *Lm*) closing upon the mouth setæ in the base of the labial groove, was regarded by Marlatt (1895) as the "epipharynx," and has been so called by most subsequent students of the cicada. The writer, however, can see no reason why this piece is not the rudimentary *labrum*, since, as shown in a former paper (Snodgrass, 1921) it is an external sclerite, lying outside the mouth cavity, and has all the relations of a labrum to

the surrounding parts. Comstock (1924), though he follows Marlatt in calling this sclerite the "epipharynx" in the cicada, names the corresponding piece in the head of *Lethocerus*, one of the Belostomidæ, the labrum (Comstock, fig. 403).

The facial view of the head of a Psocid, as figured by Imms (1924, fig. 293), strikingly suggests the generalized pattern of the head sclerites of the Homoptera. The front, bearing the median ocellus, and extending laterally to the bases of the antennæ, is a narrow sclerite between the vertex and the large quadrate postclypeus. Below the latter comes the narrow anteclypeus, and then a broad free labrum. Imms, however, does not carry this interpretation over to the Homoptera, for in his illustration of the head of a Cercopid (fig. 332) he designates as "labrum" the sclerite that clearly corresponds with the anteclypeus in the Psocid.

The anterior lateral plate of the head (*lora*, *jugum*, *lamina mandibularis*) was interpreted by Muir and Kershaw (1911) as a posterior lobe of the clypeus, because of the articulation of an arm from the base of the mandibular seta with the upper part of its posterior margin. Muir (1926) has later concluded that it is the gena, or a part of the genal region of mandibulate insects, a view which appears to accord best with the known facts.

The upper end of the arm of the mandibular seta of the adult (fig. 5, *f*), which lies in the membranous groove between the two lateral head plates (fig. 2, *A, B*), is *not* the primitive articulation of the mandible with the cranium, for, in the nymphal head (fig. 4) the mandibular seta is directly continuous with the posterior ventral angle of plate *A*. The arm of the adult seta (fig. 5, *f*), which bears the protractor apodeme (*Pro*), is formed during the pro-imaginal period (fig. 6) from the posterior margin of plate *A* through a secondary membranization of the part of the plate just before it. In the fully formed adult (fig. 5), the arm retains a connection with plate *A* only by its upper end (not with the epicranial wall behind as indicated formerly by the writer, 1921, fig. 14), and remains continuous with the base of the mandibular seta below. It thus becomes a movable part of the protractor apparatus of the adult seta, but it is clearly not morphologically a part of the seta itself.

Though still it is true that the mandibular seta is attached to plate *A* in both nymph and adult, this fact can not be taken necessarily as evidence that plate *A* belongs to the clypeus. In many forms, as in the aphids, it does appear anatomically to be a lobe of the clypeus, but in the cicada a high internal ridge (fig. 8, *j*) separates it from the postclypeus. Its lower end is directly continuous by a bridge (figs. 2, 4, *a*) with the side wall of the hypopharynx, and this feature is strong evidence that the plate belongs to the mandibular segment of the head. It should, therefore, be the *gena*, or a part of the genal region. The

only embryological observation bearing directly on the nature of plate *A* is that of Heymons (1899) where he says the plate in its development is derived in part from the antennal segment and in part from the mandibular segment. The protractor muscles of the mandibular seta (fig. 5) arise from its inner face, and these muscles, Heymons says, are formed from mesoderm of the segment of the mandible. The position of the base of the mandibular seta at the posterior margin of the gena probably results, then, from the shifting which the mandibular rudiment undergoes in the early stages of its embryonic development.

The posterior plate (lamina maxillaris) on the side of the head (figs. 1, 2, 3, *B*) is continuous dorsally with the vertex in the adult by chitinous bridges before and behind the compound eye. Ventrally it ends externally in a free rounded lobe (*b*). Internal to the lobe, however, it bears a transverse piece which terminates in a free, tapering process (*c*) at the anterior inner angle. The ventral pieces from opposite sides meet along the midline beneath the bases of the mouth setæ, and their terminal processes are pressed close against the setæ where the latter issue from the head to enter the labial groove.

The lower parts of plate *B*, including the lobe (*b*) and the process (*c*), are said by Heymons and by Muir and Kershaw to be derived from the body of the maxilla, which, during an early embryonic stage, unites with the lateral part of the maxillary segment, while the rudiment of the seta, which is an inner maxillary lobe (lacinia ?) separates and sinks into the head. The main part of the maxillary plate is, therefore, probably the postgena. In the nymph (fig. 3) it is not continuous with the vertex behind the eyes, and its upper end is separated from the latter before the eyes. Evidently the entire plate can not be identified closely with any segmental region of the head. Its rear margin, in the adult, is inflected to form a plate-like apodeme at the posterior margin of the head, to which are attached muscles that move the head and the muscles of the labium. The posterior arm of the tentorium arises at the upper end of this apodeme, just above the anterior end of the lateral crevical sclerite (fig. 1, *d*). There are no occipital or hypostomal chitinizations in the head of the cicada behind the maxillary plates, the labium being suspended from the membrane of the neck without other support (fig. 2, *Lb*). The deep membranous fold separating the two lateral head plates of the adult (*A*, *B*) and in which is located the protractor arm of the mandible is of double origin, its posterior half being the suture between gena and postgena, its anterior half, as already shown, being the membranized posterior part of the nymphal mandibular plate (fig. 6, *A*).

The tentorium consists of a deflexed transverse bar passing through the middle of the posterior part of the head cavity just

below the pharynx (fig. 7, *Ten*), and of two horizontal arms (*ten*) springing from the cross bar at the sides of the pharynx and diverging forward to the suture behind the postclypeus (fig. 6, *ten*) at the upper end of plate *A*. The transverse bar represents the median tentorial bridge and the posterior arms, the roots of the latter being at the posterior margins of the maxillary plates just above the ends of the cervical sclerites (fig. 1, *d*). The lateral parts of the posterior arms are attached to the upper edges of the hypopharyngeal plates (fig. 7, *i*).

THE HYPOPHARYNX.

The hypopharynx of the cicada is a large median lobe between the lower ends of the mandibular plates (figs. 2, 4, 5, *Hphy*), connected with the latter by the bridge (*a*) on each side. The dorsal wall of the hypopharynx forms the floor of the mouth pump behind the mouth cleft (fig. 9). Its anterior end is produced into a short process, grooved along its dorsal surface (fig. 10, *Hphy*), that projects between the maxillary setæ where the latter diverge to enter the setal pouches. At the tip of the hypopharynx is the opening of the exit duct from the salivary pump (fig. 9, *SalO*). The lateral hypopharyngeal surfaces are continued upward and posteriorly as two wide, chitinous, wing-like plates (fig. 7, 8, *i*) that form the inner walls of two deep invaginations of the ventral side of the head, which contain the bases of the setæ, and constitute the setal pouches. The upper end of each hypopharyngeal plate is closely connected with the posterior arm of the tentorium (*Ten*), and its outer (posterior) edge is attached to the posterior marginal apodeme of the maxillary plate. Within the hypopharynx is the salivary pump (fig. 9, *SalP*), the outlet tube of which, as already noted, opens at the tip of the hypopharynx (*SalO*). The large flat muscles (*Mcl*) that operate the piston of the salivary pump are attached to the inner faces of the hypopharyngeal wing plates.

THE MOUTH PUMP AND THE PHARYNX.

The functional mouth of the cicada is the narrow median tube formed by the closure of the post-epipharyngeal surface upon the groove of the hypopharynx. The tube leads from the food channel of the maxillæ into the chamber of the mouth pump. The actual mouth, however, is a wide cleft extending upward on each side between the anteclypeus and the gena to the dorsal margin of the former. In the adult the mouth is best seen in the soft emerging imago (fig. 2, *Mth*), in which the lips may be widely opened. The mouth cleft opens into a highly specialized mouth cavity which constitutes the sucking pump (fig. 9, *Pmp*), the depressed roof of which is seen at *e* in Figures 2 and 10.

The strongly-chitinous walls of the mouth cavity, or chamber of the sucking pump (figs. 7, 9, *Pmp*), form an enlogate-oval capsule lying almost vertically in the lower part of the head. The lateral wall of the capsule is firmly braced externally to the ridge (*j*) between the postclypeus (*Clp*) and the mandibular plate (*A*). Below this ridge on each side, the walls of the chamber are split by the lateral ends of the mouth cleft (*Mth*), but the lips are ordinarily tightly closed and firmly held together by the rigidity of the surrounding parts of the head in the fully chitinized insect, whether nymph or adult. The only functional entrance into the pump chamber, therefore, is by way of the channel on the hypopharynx, which opens on the floor of the chamber near its anterior (ventral) end (fig. 9). The part of the floor behind the entrance is the dorsal surface of the hypopharynx. The exit from the pump is a small aperture at its dorsal (posterior) extremity opening into the muscular pharynx (*Phy*). The flexible roof (anterior wall) of the pump chamber is ordinarily deeply invaginated, almost obliterating the lumen of the chamber, and its median part constitutes the piston of the pump.

The mechanism of the mouth pump is simple: the up-stroke of the piston is produced by the contraction of muscles inserted on the median line of the roof; the down-stroke results from the elasticity of the edges of the roof, which makes the piston spring back into the cavity of the chamber when the muscles relax. The dilator muscles of the cicada pump appear to correspond with the dorsal dilators of the mouth cavity in other insects. There are two sets of these muscles in the cicada, one set forming most of the great mass of muscle fibers that fills the space within the postclypeal sclerite of the head, the other consisting of two slender muscles lying immediately above the others. The fibers of the first set are inserted pinnately in transverse laminae on a series of slender, tendon-like apodemes arising from a median ridge of the roof of the pump; they are attached distally to the entire inner surface of the postclypeus, each group having its origin on one of the slightly convex areas between the transverse grooves of this sclerite. The two slender muscles of the second dilator set arise from the posterior edge of the postclypeus and go downward and posteriorly to their insertions on the extreme upper (posterior) end of the pump roof. There are no special valves at the entrance and exit apertures of the mouth pump, the piston serving as both plunger and valves. During the up-stroke the anterior end of the roof ascends first, sucking the liquid from the mouth tube into the chamber while its posterior end keeps the exit closed; during the down-stroke the action is reversed, the anterior end descending first forces the liquid into the pharynx as it closes the mouth entrance.

The walls of the pump chamber are devoid of muscles other

than the dilators of the roof—evidence, in addition to that derived from the structural relationships, that the organ is not a part of the true pharynx. It is interesting to note that the principal part of the sucking apparatus of the larva of *Dytiscus* is also a mouth structure (Burgess 1883, Rungius 1911, Speyer 1920) with its highly developed dilator muscles attached to the clypeal region (prefrons) of the head. In the Lepidoptera, on the other hand, the case is quite different: here the sucking pump of the moth, though in position almost identical with that of the cicada, is clearly a development of the muscular pharynx of the caterpillar. Except for a median space below, its walls are covered with muscles, a thick band of dorsal transverse fibers sharply defining the beginning of the pharynx from the small mouth cavity. The dilator muscles go to the frons and the vertex, and the frontal ganglion is situated on the dorsal wall of the part of the pharynx that constitutes the pump.

The anatomical distinction between mouth cavity and pharynx was noted by Burgess (1883), who says: "The pharynx in insects should be defined as the muscular portion of the alimentary canal between the mouth and the œsophagus which is hung in the cranium by special suspensory muscles." General conclusions, however, can not be drawn until the subject is given more attention, and until wider comparative studies have been made on the anatomy of the head part of the alimentary canal and the distribution of its muscles.

The true pharynx of the cicada is a relatively small, dorso-ventrally flattened enlargement of the anterior part of the alimentary canal. It is situated between the brain and the sub-œsophageal ganglion, and rests upon the transverse bridge of the tentorium (fig. 7, *Phy*). Its narrowed anterior end descends to the upper extremity of the mouth pump; its posterior end continues into the œsophagus (*Æ*). The frontal ganglion lies upon the anterior part of its dorsal wall. In contrast to the pump, the walls of the pharynx are covered by a continuous muscle sheath consisting of transverse, longitudinal, and irregularly diagonal fibers. At least five pairs of dilator muscles are inserted upon the dorsal and lateral surfaces of the pharynx, besides a sixth pair attached on the end of the œsophagus. The first pair arises on the anterior margin of the frontal region of the epicranium, and is inserted medially on the anterior end of the pharynx. The second pair arises on the anterior arms of the tentorium and is inserted laterally on the pharynx just behind the circumœsophageal commissures from the brain. The third pair arises in the lateral grooves of the vertex and is inserted laterally on the posterior angles of the pharynx. The fourth pair arises on the posterior rim of the epicranium and is inserted medially on the posterior end of the pharynx. The fifth pharyngeal pair and the œsophageal pair arise on the posterior

arms of the tentorium, the first being inserted by wide bases laterally on the pharynx, the other on the œsophagus just behind the pharynx.

THE MOUTH PARTS.

The anatomy of the mouth parts in the adult cicada is now fairly well understood. The structure of the setæ and their relation to the neighboring parts of the head are the same in all Hemiptera, superficial differences being due to the different form and position of the head in different groups and to the development of a chitinized gular region behind the labial base in the Heteroptera. Some entomologists object to the term "seta," as applied to the mouth bristles, on the ground that the structures are not setæ. Consistency, however, ordinarily a virtue of first rank, may become sometimes of more bother than it is worth. No better term than "seta" has been suggested, and the organs in question are at least setiform outgrowths from the primitive mandibular and maxillary rudiments.

The essential agreement in the accounts of the development of the hemipteran mouth parts as given by Heymons (1899) and by Muir and Kershaw (1911, 1912) will allow us to discard all other ideas and speculations on the subject. According to these investigators the appendages of the gnathal segments appear in the usual form in the young hemipteran embryo. The mandible is from the first a simple structure and so remains. The first maxilla, however, soon develops an endite lobe, apparently the lacinia of other insects, which completely separates from the body of the appendage. Then the entire mandible, and the maxillary lobe sink into an invagination on the under surface of the head, where they elongate into club-shaped organs, from which, finally, by a secretion of chitin at their tips, are formed the respective setæ. The body of the maxilla, including the regions of the cardo, stipes, and palpus, fuses with the side wall of the head, forming the lower part (*b*) of the maxillary plate (figs. 1, 2, *B*) and its ventral horizontal lobe with the free terminal process (*c*). The insect mandible, as Heymons points out, is in any case only the basal segment and basal endite of an appendage; the mandible is, therefore, morphologically indivisible, and in the Hemiptera sinks into the head entire to be transformed into the mandibular seta. The maxillary seta, on the other hand, is a detached endite of the primitive appendage. This separation of the maxilla into parts that develop independently is paralleled in the Psocidæ and certain Mallophaga, where, apparently, detached lobes of the maxillæ form the maxillary rods of the mouth; but here the body of the appendage maintains its integrity, though it may become much reduced, and the mandible develops into a typical biting jaw.

The invaginations of the ventral head wall that contain the bases of the setæ become the setal pouches of the adult Hemipteron. In the cicada the pouches diverge dorsally and posteriorly against the outer surfaces of the hypopharyngeal wing plates (fig. 8, *i*), which constitute their inner walls, the lateral walls of the pouches being membranes reflected from the lower parts of the maxillary plates. (In figure 8 the left pouch of a nymph is exposed by the removal of most of plate *B* and the outer membranous wall.) Each pouch is somewhat subdivided dorsally to accommodate the two setæ, and its inner part is continued beyond the base of the maxillary seta (*2Set*) to the dorsal edge of the hypopharyngeal plate.

The mandibular seta, as already noted, is directly connected in the nymph with the lower, posterior angle of the mandibular sclerite (figs. 4, 8, *A*), but in the adult (fig. 5) it becomes detached from the body of this sclerite by the membranous separation of the entire posterior border of the sclerite during the transformation period (fig. 6). The bar (*f*) thus detached from the mandibular plate, but still continuous below with the setal base, now lies in the membranous groove between the mandibular and maxillary sclerites (fig. 2), and develops an internal plate which becomes the protractor apodeme of the mandibular seta (figs. 5, 6, *Pro*). The protractor muscles of the mandible extend downward and forward from the protractor apodeme to the inner face of the mandibular sclerite. The retractors consist of three muscles inserted on the upper end of a long arm extending dorsally from the posterior rim of the setal base. They are attached above to the lateral region of the vertex. The retractor arm of the mandible (fig. 8, *IRet*) lies in a fold of the membranous wall of the setal pouch; it is not, therefore, a true apodeme as first figured by the writer (1921, fig. 13, *IRap*).

The base of the maxillary seta lies somewhat deeper in the setal pouch than that of the mandible (fig. 8). It is connected with the outer, posterior wall of the pouch by a horizontal bar (*h*), itself a chitinization of the pouch wall, extending from the inner angle of the setal base toward the posterior edge of the maxillary plate. Here, in the nymph (fig. 8), the bar ends in the membranous outer wall of the pouch; in the adult, it is supported on a strong chitinization of the membrane extending upward from the inner face of the lower free part of the maxillary plate. The connection of the maxillary seta with the maxillary plate suggests the connection between the mandibular seta and the mandibular plate, but the relations are not analogous in the two cases; the mandible is attached to the outer wall of its supporting sclerite, the maxillary seta is attached to the outer wall of the setal pouch mesal to the maxillary sclerite. A connection between the setæ and their respective sclerites was

described by Marlatt (1895), but his figures do not show correctly the nature of their relations.

The motor equipment of the maxillary seta consists of protractor and retractor muscles with attachments similar to those of the mandibular muscles. The retractors arise on the vertex mesal to the mandibular retractors and are inserted on a short apodemal arm of the setal base (fig. 8, *2Ret*). The protractors consist of two sets of fibers: an outer set arises from the lower part of the inner face of the maxillary plate, and is inserted on the outer face of the basal apodeme of the seta; an inner set arises from the ventral, horizontal inflection of the lower edge of the maxillary plate, and is inserted on the horizontal bar (*h*) attached to the setal base. A few muscle fibers go from the basal apodeme of the maxilla downward and forward to the base of the mandible.

A comparison of the setal muscles of the Hemiptera with the muscles of the mandibles and maxillæ of biting insects shows that there can be little homology between them. The protractors of the mandibular seta certainly can not be the abductors of the mandible, since they move the seta only by tension on a flexible piece of the head wall attached to the seta. The retractors suggest the adductors in their origin on the head wall, but the setal arm on which they are inserted has no homology with an ordinary mandibular adductor apodeme. The two protractors of the maxillary seta may be the flexor and extensor of the lacinia; but no maxillary muscle to the vertex, corresponding with the retractor of the maxillary seta, is present in biting insects, except in those that have a similarly detached maxillary lobe. Evidently, then, the setal muscles of the Hemiptera, with the possible exception of the maxillary protractors, have been developed in response to the special needs of the setæ. Heymons (1909) mentions simply that they are formed from mesodermal strands of the mandibular and maxillary segments.

The shaft of the maxillary seta goes internal to that of the mandible against the side of the hypopharyngeal plate (fig. 8), and here its inner grooved surface slides upon a ridge (fig. 7, *ii*) on the side of the hypopharynx. The two maxillary setæ are thus guided past the tip of the hypopharynx, where, as they come together, their opposed faces are joined by interlocking grooves and ridges. The food channel between them is continuous with the mouth tube over the hypopharynx, and the ventral salivary channel probably meets the orifice of the salivary pump at the point of the hypopharynx.

The three-segmented labium, which constitutes the sheath of the proboscis and holds the four setæ in a deep groove on its anterior surface, is suspended from the membranous "neck" between the cranium and the prothorax. A rod-like apodeme arises from the inner face of the groove in the basal segment

and projects dorsally between the nerve commissures from the head to the thoracic ganglia. A pair of protractor muscles is inserted on the upper end of the labial apodeme, and the two diverge downward and forward to their origins on the lower ends of the apodemes inflected from the posterior edges of the maxillary plates. The labial retractors arise on the upper ends of these maxillary plate apodemes and converge downward into the basal segment of the labium where they are inserted on the posterior labial wall. Intra-labial muscles go from the base of the labial apodeme to the base of the second segment; and a pair of fan-shaped muscles in the second segment are inserted on the base of the third segment. Those who have studied the development of the hemipteran mouth parts (Heymons, Muir and Kershaw) find that the appendages of the sixth head segment grow out as simple elongate lobes and unite to form the median labium, which then becomes three-segmented. Crampton (1921) regards the basal segment of the cicada labium as the mentum, the next segment as the palpigers, and the third as the fused palpi. It is evident that the muscles of the labium, as described above, furnish no clue to homologies with biting insects.

A study of the new setæ in the pro-imago, and the replacement of the nymphal setæ by the imaginal setæ furnishes some interesting information that suggests in certain ways the transformation processes of metamorphosis in holometabolous insects. Dissection of the head of the pro-imago just before the last nymphal molt reveals the four new setæ deeply buried within the head, where each is coiled in a retort-shaped membranous sac, from the neck of which the terminal part of the imaginal seta projects into the hollow base of the corresponding nymphal seta. This condition is most likely to be found at each molt in all Hemiptera, it is easily observed in transparent aphids and coccids, but the details apparently have never been closely studied. The base of the new seta is attached to the dorsal wall of its enclosing sac, and its lumen here communicates with the cavity of the head. The mandibular seta of the cicada makes a single loop in the upper part of the sac (fig. 6); the maxillary seta (fig. 11) is coiled twice. (In figures 6 and 11 the walls of the setal sacs are not shown.)

Ordinarily, when a new appendage is to be similar in form and size to the one it replaces, it is formed immediately within the cuticula of the old. With the mouth setæ of the Hemiptera, however, the new setæ obviously can not grow inside the old ones; for this reason they are produced within invaginations of the hypodermis immediately above the bases of the old setæ, their tips alone projecting into the latter. The setal sacs of the Hemiptera are thus analogous to the peripodal pouches of the imaginal appendages in holometabolous insects. The base of

each seta, in its displaced situation, retains its normal connection with the head wall—that of the mandibular seta (fig. 6) by means of a weakly chitinous prolongation (f') in the wall of its sac from the arm (f) bearing the protractor apodeme; that of the maxillary seta (fig. 11) by a similar elongation (h') from the bar (h) that unites it with the wall of the setal pouch. During the molt, the setal sacs contract, and the supporting arms of the setæ are quickly shortened to their normal lengths by an obliteration of the temporary extensions (fig. 6, f' , fig. 11, h') as the setæ uncoil and assume the positions of the nymphal setæ now being cast off.

The facts described above are easy to understand since they correspond with replacement processes in other insects; but another phenomenon which may be observed during the molt of any common cicada is more difficult to explain. As the imago extracts its head from the nymphal cuticula, four long white threads, similar in appearance to the tracheal linings, but attached within the hollow bases of the nymphal setæ, are seen to pull out from the setal pouches of the imago. These threads are not the imaginal setæ; they are delicate cuticular sheathes enclosing the setæ, and presently the latter are drawn out of them. The sheathes then shrivel and remain as a part of the exuviae. The setal sheathes may be seen in dissections of the pro-imago as film-like tubes about the setæ in the sacs, which apparently extend up to the bases of the setæ. During the molt the tips of the new setæ remain in the bases of the old until they are fully extended; then, as the imago farther retracts its head, the sheathes are apparently detached from the bases of the new setæ, allowing these setæ finally to be drawn out of them. The shedding of the setal sheathes during the molt is easily observed. The sheathes are evidently cuticular invaginations formed about the setæ, but an explanation of their true morphology must be left for a histological study of the early developmental stages of the setæ.

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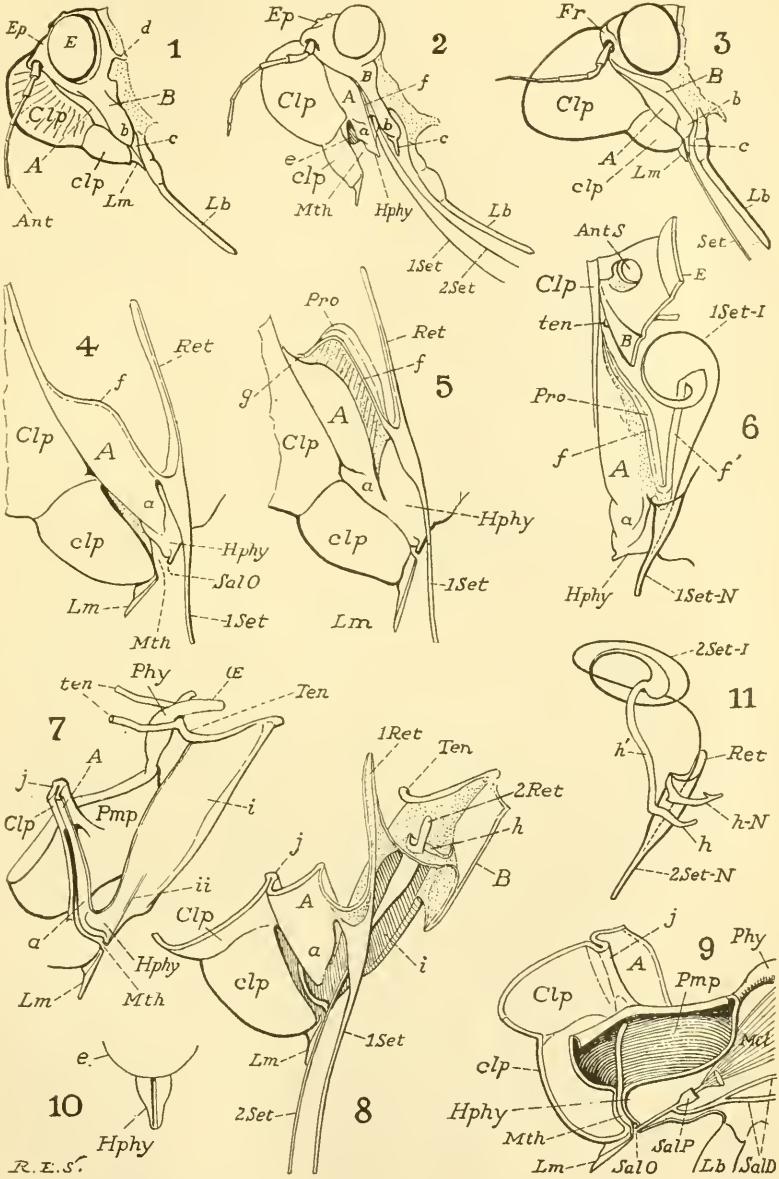
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EXPLANATION OF PLATE.

Symbols.

<i>A</i>	Anterior lateral head sclerite (lamina mandibularis), probably the gena.
<i>a</i>	Bridge from plate <i>A</i> to hypopharynx.
<i>Ant</i>	Antenna.
<i>AntS</i>	Antennal socket.
<i>B</i>	Posterior lateral head sclerite (lamina maxillaris).
<i>b</i>	Lower end of plate <i>B</i> .
<i>c</i>	Terminal lobe of plate <i>B</i> .
<i>Clp</i>	Postclypeus.
<i>clp</i>	Anteclypeus.
<i>d</i>	Cervical sclerite.
<i>E</i>	Compound eye.
<i>e</i>	Invaginated roof of mouth pump.
<i>Ep</i>	Epicranium.
<i>f</i>	Protractor arm of mandibular seta, detached in imago from posterior margin of plate <i>A</i> (figs. 4, 5, 6).
<i>f'</i>	Prolongation of mandibular protractor arm in pro-imago (fig. 6, <i>f'</i>) to base of mandibular seta in setal sac.
<i>Fr</i>	Frons.
<i>g</i>	Articulation of protractor arm of mandibular seta in adult (fig. 5) with upper end of mandibular plate (<i>A</i>).
<i>h</i>	Chitinous bar in wall of setal pouch from base of maxillary seta to outer wall of pouch reflected from lower margin of maxillary plate (<i>B</i>).
<i>h'</i>	Prolongation of <i>h</i> in pro-imago to base of maxillary seta in setal sac.
<i>h-N</i>	Maxillary bar <i>h</i> of nymph.
<i>Hphy</i>	Hypopharynx.
<i>i</i>	Hypopharyngeal plate forming inner wall of setal pouch.
<i>ii</i>	Maxillary ridge on hypopharyngeal plate.
<i>j</i>	Internal ridge between postclypeus (<i>Clp</i>) and mandibular plate (<i>A</i>).



R. E. S.

<i>Lb</i>	Labium.
<i>Lm</i>	Labrum.
<i>Mth</i>	Mouth.
<i>Œ</i>	Oesophagus.
<i>Phy</i>	Pharynx.
<i>Pmp</i>	Sucking pump of mouth.
<i>Pro</i>	Protractor apodeme of mandibular seta.
<i>Ret</i>	Retractor arm.
<i>1Ret</i>	Retractor arm of mandibular seta.
<i>2Ret</i>	Retractor arm of maxillary seta.
<i>SalD</i>	Salivary duct.
<i>SalO</i>	Salivary orifice at tip of hypopharynx.
<i>SalP</i>	Salivary pump.
<i>Set</i>	Mandibular or maxillary seta.
<i>1Set</i>	Mandibular seta.
<i>1Set-I</i>	Mandibular seta of imago.
<i>1Set-N</i>	Mandibular seta of nymph.
<i>2Set</i>	Maxillary seta.
<i>2Set-I</i>	Maxillary seta of imago.
<i>2Set-N</i>	Maxillary seta of nymph.
<i>Ten</i>	Posterior arm of tentorium.
<i>ten</i>	Anterior arm of tentorium.

(*Tibicina septendecim.*)

- Fig. 1. Lateral view of head of mature imago, showing mouth parts in normal position.
- Fig. 2. Same view of the soft head of an immature imago at time of molt, showing mouth parts artificially separated.
- Fig. 3. Head of a mature nymph.
- Fig. 4. The mouth region of head, and base of mandibular seta of mature nymph, showing the setal base continuous with posterior rim (*f*) of plate *A*.
- Fig. 5. Same parts in a mature imago, showing posterior rim (*f*) of plate *A* separated to form protractor arm of mandible.
- Fig. 6. Corresponding parts of immature imago, showing membranization of posterior part of plate *A*, by which the arm (*f*) becomes an independent sclerite. Imaginal mandibular seta (*1Set-I*) coiled in head, with tip in base of nymphal seta (*1Set-N*).
- Fig. 7. The mouth pump and pharynx of mature nymph with associated parts (muscles not shown, facial and lateral plates of head, *clp*, *A*, mostly removed).
- Fig. 8. Mouth region of nymph, showing plates removed in Fig. 7, also bases of setae in setal pouch, but with outer wall of pouch removed.
- Fig. 9. Longitudinal section through mouth pump and hypopharynx, seen from left, with interior view of head sclerites on right (roof and dilator muscles of mouth pump not shown).
- Fig. 10. Anterior end of hypopharynx (*Hphy*) showing median groove of its oral surface projecting beyond roof of pump (*e*).
- Fig. 11. The imaginal maxillary seta (*2Set-I*) coiled in head of immature imago (containing sac not shown), and base of corresponding nymphal seta (*2Set-N*).

A NEW SPECIES OF OEDEMATOCERA REARED FROM THE TROPICAL MIGRATORY LOCUST (DIPTERA).BY J. M. ALDRICH, *U. S. National Museum.*

The following species with several others attacking the same host are discussed in their economic relations in a paper soon to appear in the *Journal of Economic Entomology*.

***Oedematocera dampfi*, new species.**

Brownish-black, the palpi, proboscis, base of antennae, legs except tarsi and middle coxae, and large lateral abdominal spots yellow.

Male.—Front at narrowest .34 and .36 the headwith in the two best specimens, the eyes with nearly parallel orbits in front view, hence hardly farther apart at vibrissae; in profile the front is little prominent, the face distinctly receding, lower edge of head short. Parafrontal becoming silvery anteriorly, with two proclinate orbitals each side; the frontal stripe brown, about as wide before the ocelli as one parafrontal; parafacial bare, narrow, silvery, convex on front edge in profile; vibrissae at edge of mouth, facial ridges prominent and sharp, hairy one-fourth of the way to antennae; face deeply hollowed in middle; antennae large, third joint four times the second and almost reaching vibrissae; arista yellow at base, slender, not much longer than third antennal segment. Frontal bristles irregular in size, two upper reclinate, lowest at antennal insertion. Ocellars proclinate, divergent.

Thorax yellowish pollinose with four indistinct brown stripes subshining. Chaetotaxy: acrostichal 1, 2; dorsocentral 3, 3; humeral 2; posthumeral 1; presutural 1; notopleural 2; supraalar and intraalar 3 (the anterior small); postalar 2; sternopleural 2; scutellum with 3 lateral, 1 slender apical non-decussate, 1 discal far apart. Postscutellum prominent; prosternum bare.

Abdomen largely yellow on sides; first and second segments with one pair marginals, second and third with one pair discals, third with row of 8 marginals. Fifth segment with discal row and a few apicals. Genitalia small.

Middle tibia with one bristle on outer front side below middle; pulvilli small.

Wings yellowish, especially along veins; first vein bare, third with two or three hairs at base; bend of fourth vein rounded. First posterior cell open in costa only a little before extreme tip; hind crossvein rectangular to fifth vein.

Length, 5 mm.

Described from 6 males. All reared from the Tropical Migratory Locust, *Schistocerca paranensis* Fabricius. Two, including type, were reared at Cordoba, Mexico, by Dr. Alfons Dampf, Jan. 11, 1924; two were sent by Professor A. L. Herrera, of Mexico City; and two were reared in Guatemala and sent in by Mr. J. G. Salas, Director General of Agriculture in that country.

Type.—Male, Cat. No. 40,220 U. S. N. M.

This species differs from the type species of *Oedematocera*, *Hypostena flaveola* Coquillett, in that the latter has the front narrower in male, without orbitals; the male antennae considerably elongated; body color yellow except part of the tho-

racic dorsum. Both species have in common as the chief generic characters the deeply excavated face bounded by sharp parafacials, and the bare prosternum. I had identified *dampf* as *gilvipes* Coquillett, until Malloch observed and called to my attention the fact that *gilvipes* has one pair of small prosternal bristles. In *Tachinophyto floridensis* the prosternum has several hairs on each side, and the same is true of *Lixophaga variabilis* Coquillett. *Floridensis* has the male front broad and with orbitals, as in *dampf*, while it is narrow and has no orbitals in *variabilis*.

In an accompanying article Mr. C. T. Greene is describing and figuring the larva and puparium.

THE LARVA AND PUPARIUM OF OEDEMATOCERA DAMPFI ALDRICH (DIPTERA).

BY C. T. GREENE, *U. S. Bureau of Entomology.*

The following paper describes the larva and puparium of an interesting new parasite, which is described above by Dr. Aldrich. The material on which this description is based comes from the following localities: Cordoba, Mexico, January 11, 1924 (Dr. Alfons Dampf); Mexico City (Prof. A. L. Herrera); La Providencia, Siquinala, Guatemala (C. M. Rouillard).

Oedematocera dampfi Aldrich.

Larva.—Fig. a. Large, white, nearly cylindrical, tapering very slightly at the cephalic end; posterior spiracles round and conspicuously black; eleven segments in addition to the very small head, which is partly retracted; four anterior segments smooth, segmental lines feebly marked; segments five to eleven more distinctly defined; lateral fusiform areas distinct from segments four to ten; ventral fusiform areas distinct from segments four to eight and more feebly defined on segments nine to eleven; each side of the head, from in front, bears two small, chitinized, thimble-like papillae of a pale yellowish-brown color; hooklets small, black. Anterior spiracles (fig. b) small and composed of four nearly round yellowish brown, chitinized ringlets arranged in a slightly arcuate row. Posterior spiracles (fig. c), decidedly elevated, separated by a space equal to about one-half the width of one plate; button round, depressed and located in the center of the plate; numerous elongated areas with a rounded surface, radiate from the button; these surfaces increasing in width towards the outer edge of the plate; upon each surface is located the very narrow serpentine slit which is composed of numerous very small yellowish to red circlets. Spiracles located well above the horizontal axis. Anal opening small, fairly distinct and located in a depression slightly below the horizontal axis.

Length, 9–11 mm.; diameter, 2.5–3 mm.

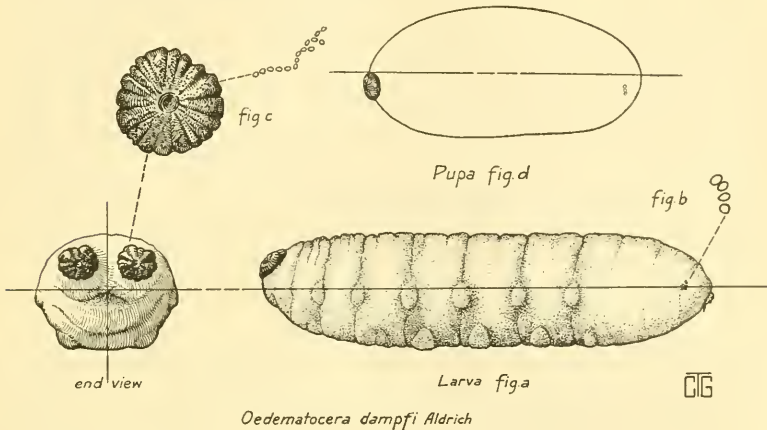
Described from 15 larvae.

Pupa.—Fig. d. Large, smooth, cylindrical, rounded on both ends; from a pale yellowish-red to a dark red color; ventral surface slightly flattened and the

dorsal surface broadly arched. Anterior spiracles small and not very conspicuous, located just below the horizontal axis. Posterior spiracles prominent and located below but touching the horizontal axis.

Length, 5-6.5 mm.; diameter, 2.25-3.5 mm.

Described from 10 puparia.



A NEW TIPHIA FROM KOREA (HYM.).

By S. A. ROHWER, Bureau of Entomology, U. S. Department of Agriculture.

In describing *Tiphia autumnalis* (Proc. Ent. Soc. Wash., Vol. 26, No. 4, 1924, pp. 88-89) I stated that Mr. Clausen records the species as ovipositing on *Anomala* and successfully attacking *Popillia japonica*. Subsequently Mr. King has informed me that this note should not refer to the species described as *autumnalis*, but to another species. The last two sentences of the third paragraph on page 89, referring to *autumnalis*, should therefore be transferred and referred to the species herein described. The number of specimens and the other information given for *autumnalis* are, however, correct.

***Tiphia koreana*, new species.**

Closely allied to *autumnalis* Rohwer but may be distinguished by having the punctures on the third, fourth and fifth tergites small, close and evenly distributed. The propodeal enclosure is about twice as long as its greatest width and truncate apically; the dorsal posterior margin of the posterior aspect of the propodeum three-sided; the punctures on the clypeus are smaller and the punctures on the frons are closer, usually separated by a distance equal to the width of the puncture.

Female.—Length, 11 mm. Anterior margin of the clypeus broadly produced

medianly, the apical margin of this produced portion truncate; anterior dorsal margin of the pronotum bounded by a distinct, complete carina; dorsal surface of the pronotum with distinct, separate punctures, posterior punctures elongate; lateral aspect of the pronotum transversely rugose below, smooth and polished above except on the anterior margin where it is punctured (the ruga nearest the top is prominent and at first glance gives the impression of an oblique groove); side of the propodeum with distinct, regular longitudinal striae except at the extreme lower base; posterior aspect of propodeum granular and in addition with irregular reticulations; first tergite without a transverse groove, with large, widely scattered, distinct punctures; punctures on the second tergite smaller and very widely separated except laterally; pygidium smooth apically, minutely, closely punctured basally, intermediate surface with irregular wrinkles; posterior basitarsus without longitudinal groove; second inter-cubitus gently curved. Black; head, thorax, legs, and abdomen basally, ventrally and apically with long, glistening white hairs; tergites three, four and five opaque, densely clothed with short black hairs; the base of the pygidium with a few black hairs; wings glistening, strongly smoky; venation black.

Type-locality.—Suigen, Korea.

Described from four (one type) females collected August 10, 1924, by K. Sato, labelled as parasites of *Anomala sieversi* and recorded under Clausen number 1853.

Type and Paratypes.—Cat. No. 40224 U. S. N. M.

The species is readily distinguished from the American forms by the dense, short, black, erect hair on the third to fifth tergites.

ANOTHER HOST OF PRISTOCERA ARMIFERA (SAY) (HYMENOPTERA: BETHYLIDAE).

BY WM. P. HAYES, *University of Illinois*.

Hyslop¹ has recorded the rearing of *Pristocera armifera* (Say) from a wireworm, *Limonioides agonus* (Say), collected near Brattleboro, Vermont, in July, 1915. He observed that the wireworm had an hymenopterous larva firmly affixed to its ventral surface. The host was active although the parasite was nearly one-third as long as its host and quite stout. The wireworm was placed in a rearing cage and on the following day the parasitic larva abandoned its host which it had reduced to a mere empty shell and attached itself to the venter of another wireworm. Attachment was made by inserting its mouthparts in the sternum of the third abdominal segment. Further description of both the larva and cocoon as well as some illustrations of the larva and adult are given by Hyslop. The larva began spinning its cocoon on July 29 and on August 30, thirty-three days after spinning, the adult emerged.

The references to the rearing of parasitic Hymenoptera from

¹Hyslop, J. A.—*Pristocera armifera* (Say) parasitic on *Limonioides agonus* (Say). Proc. Ent. Soc. Wash., Vol. 18, pp. 169-170, 1916. 1 pl.

Elateridae are rare and the few known cases are cited by Hyslop. Accordingly, it is of some interest to note the additional rearing of *Pristocera armifera* (Say) from another host in a different section of the country. While engaged in rearing wireworms at the Kansas State Agricultural Experiment Station at Manhattan, Kansas, the writer found on August 19, 1920, a dead wireworm in the corn plots of the Department of Entomology. It bore an external larval parasite whose head was inserted within the host on the ventral aspect near the middle of the body. All of the body fluids in the anterior region of the wireworm had been sucked out by the larva. The host and parasite were placed in a tin salve-box and held in the rearing-cave at the laboratory. Two days later, August 21, 1920, the parasite had spun a brown silken cocoon about ten millimeters long and three millimeters wide to which was attached the empty larval skin of the wireworm. On the supposition that this was a species of *Tiphia*, common parasite of white grubs, it was assumed that the adult would not emerge until the following season. Accordingly, the cocoon was not examined until November 11, 1920, when it was found that the adult had emerged some time previously. The specimen reared by Hyslop from Vermont spun its cocoon July 29, and the adult emerged August 30, thirty-three days later. Assuming that to be the approximate length of the pupal stage, in Kansas, the Kansas specimen probably emerged during the last week in September.

On February 21, 1921 (the following spring), in the same corn plots at a depth between six and twelve inches a similar cocoon was found from which the adult had emerged, but to which was attached, enmeshed in the silken threads, the larval exuviae of a wireworm, doubtfully referred to the genus *Melanotus*. In the case of the cocoon from which the adult was reared an exuvium was also attached to the loose threads. In Forbes' key to the genera of wireworms in his Eighteenth Report (p. 31) this larval exuvium runs clearly to *Drasterius* and fits well the description of *Drasterius elegans* (Fabr.) now known and listed in Leng's catalogue as *Aeolus elegans* (Fabr.).

The adult parasite was submitted to Mr. S. A. Rohwer of the United States National Museum, who kindly identified it as *Pristocera armifera* (Say) and to whom the author is indebted for the calling to his attention of the paper by Hyslop. In the Illinois State Laboratory of Natural History collection at Urbana there are eleven specimens of *Pristocera armifera* (Say) bearing the following data furnished by Dr. T. H. Frison: Acc. No. 17243 Carbondale, Ill., Aug. 21, 1891, general collection; Acc. No. 17212, "Insects about pine hills" (Well's place) Aldridge, Ill., Aug. 11, 1891; Acc. No. 7206, "Along road side" Fountain Bluff, Ill., Aug. 10, 1891; Acc. No. 10806, "In Woods," New Harmony, Ind., Aug. 2, 1886, Forbes' Coll.; Acc. No. 566 "Sweepings on Walker Hill A. M." Grand Tower, Ill., Aug. 25,

1889; Acc. No. 562, "Sweepings, Forest Park," St. Louis, Mo., Aug. 20, 1889, another with no data and four unaccessioned specimens collected Sept. 10, 1895, at Algonquin, Ill. The collection by Forbes from New Harmony, Ind., in 1886 is of interest since Say in his original description of the species says "inhabits Indiana," and in all probability New Harmony, Say's home, is probably the type locality, thus making Forbes' specimen a topotype.

**GRYLLUS DOMESTICUS LINN, AS A HOUSEHOLD PEST IN
ROCHESTER, N. Y. (ORTHOPTERA: GRYLLIDAE).**

By J. DOUGLAS HOOD, *University of Rochester.*

The house cricket is not a common insect in the experience of most entomologists. Introduced into America from Europe, probably with the earliest settlers, it has established itself in various parts of the country, though modern building construction leaves fewer suitable quarters than were found in the houses built during the past century. Fifty or more years ago, when our homes had more hidden crannies, Cyrus Thomas said that in southern Illinois it could "be found around the hearth at almost any time." But in 1910 there were in the collection of the Illinois State Laboratory of Natural History only a few Illinois specimens, from Tazewell, McLean, and Champaign, all of them from houses excepting one or two macropterous individuals which had flown to electric lights. Blatchley (*Orthoptera of Northeastern America*, p. 708; 1920) says that the species "probably occurs sparingly in most of the States east of the Rocky Mountains," but that until 1903 he had in his collection only three specimens, "taken from beneath rubbish in a gravel pit" in Indiana.

I have no reluctance, then, in confessing that the chirp of the house cricket was to me an unknown note until December, 1919, when two or three individuals, nothing daunted by the downstairs noises of a Chicago hotel, eluded my best efforts to effect their capture. Several years later it was a mild surprise to learn that every autumn the species is actually quite numerous in Rochester, New York, in the houses which margin an old stone quarry, now being filled with ashes and rubbish to form a city playground, on North Goodman Street. With the advent of cold weather they apparently leave the quarry—a habitat very similar to that from which Blatchley's specimens came—and enter the neighboring houses. Invariably, in October inquiries are made by owners and tenants as to some means of combating the pest. As many as a dozen crickets have been taken in one house in a single evening. One householder stated that her cat stalked them as it would mice, and fed upon them afterwards. Another related that when she returned with a dust pan to gather up a cricket which she had killed, she found three others making a meal from their silenced comrade.

Those who have been annoyed by the song of this cricket in their homes would fail to appreciate the feelings of one of our well-known entomologists who once prevented me from collecting a cricket which was singing in his office, because he said it was his only dependable companion in the long evenings of research. Though this cricket turned out to be merely a field cricket which had wandered indoors, the occurrence shows that the real hero of Dickens' *The Cricket on the Hearth* may still claim the genuine affection of even an economic entomologist.

Mr. A. N. Caudell has furnished the following list of States in which the above insect has been collected, the occurrences in States with an asterisk being as yet unrecorded in print:

Alabama	Louisiana*	New York
Connecticut	Maryland*	North Carolina
District of Columbia*	Massachusetts	Ohio
Georgia	Michigan	Oklahoma
Illinois	Minnesota	Pennsylvania
Indiana	Missouri	Tennessee
Kentucky	Nebraska	Texas
	New Jersey	

It has also been recorded from Canada and will undoubtedly be found in all the United States east of the Rocky Mountains.

A NEW CERAMBYCID BEETLE FROM COLOMBIA AND CENTRAL AMERICA (COLEOPTERA).

BY W. S. FISHER, *U. S. Bureau of Entomology.*

Among some material submitted for identification by C. C. Gowdey, Government Entomologist of Jamaica, was found the new species herein described. Since there is a good series of the same species in the U. S. National Museum collection, and Mr. Gowdey is anxious to have it named, it seems advisable to describe it at the present time.

Sphagoeme ochracea, new species.

Female.—Elongate and strongly flattened above, and not distinctly pubescent; uniformly ochraceous above and beneath except as follows: Tips of mandibles, underside of first antennal joint, entire second and third antennal joints, tibiae, and dorsal surface of femora black; the fourth to sixth antennal joints narrowly annulated at the apex, and the outer antennal joints and tarsi more or less fuscous.

Head very short and transverse in front, broadly, transversely depressed behind the epistoma, flat between the antennal tubercles, which are not elevated, and with a narrow, longitudinal groove between the tubercles, and the surface not distinctly punctured; eyes coarsely granulated, deeply emarginate, strongly convex, and separated from each other on the top by nearly two times the width of the emargination of the eyes in front. Antennae slender, and slightly longer than the body; first joint short, obconical, and vaguely arcuate; joints

three and four subequal in length; fifth joint slightly longer than the fourth, and the following joints gradually diminishing in length.

Pronotum slightly wider than long, base and apex about equal in width, and widest near the middle; sides strongly, arcuately rounded, and vaguely, narrowly constricted near the base and apical angles; surface slightly uneven, feebly flattened on disk, and indistinctly punctured. Scutellum about as long as wide, broadly rounded behind, and the surface longitudinally concave.

Elytra wider than pronotum at base, three times as long as wide, broadly rounded at humeral angles, and the sides parallel to near the apex, then arcuately narrowed to the tips, which are conjointly, broadly rounded; surface densely, coarsely punctate in the basal region, but the punctures becoming obsolete toward the apex, and clothed with a few erect hairs posteriorly.

Body beneath smooth, shining, and not distinctly punctate; abdomen sparsely clothed with long, inconspicuous hairs, and the last segment elongate, and subtruncate at the apex. Prosternal process narrow between the coxal cavities, and strongly declivous posteriorly. Middle tibiae angularly dilated near the apex.

Length, 11 mm.; width, 2.5 mm.

Male.—Differs from the female in having the antennae one-fourth longer than the body; pronotum coarsely but not deeply punctate toward the sides; prosternum coarsely, vaguely punctate, and more or less rugose, and the last abdominal segment transverse.

Type locality.—Cano Saddle, Gatun Lake, Canal Zone.

Other localities.—La Chorrera, Panama; Corazal, Paraiso, and Tabernilla, Canal Zone; Sevilla, Colombia.

Type, allotype, and paratypes.—Cat. No. 40204, United States National Museum. *Paratype*.—Collection of C. C. Gowdey.

Described from 15 specimens, 10 males and 5 females (one type), as follows: five examples collected at La Chorrera, Panama, May 10-14, 1912; one at Paraiso, Canal Zone, April 24, 1911, one at Tabernilla, Canal Zone, May, 1907, and two at Corazal, Canal Zone, April 27, 1911, all collected by August Busck; five examples from Cano Saddle, Gatun Lake, Canal Zone, May 8-14, 1923, collected by R. C. Shannon; and one example collected at Sevilla, Colombia, May 5, 1926, by C. C. Gowdey.

This species is closely allied to *Sphagoeme airivillii* Gounelle, but in that species the upper surface is finely pubescent, the antennae mostly black, the scutellum black, and the pronotum more or less ornamented with black or fuscous markings. The species is more or less variable, and the length varies from 7.5 to 11 millimeters in the examples examined. In some of these examples the pronotum is slightly darker than the elytra, the sides of the pronotum are more angularly expanded, and the tibiae and tarsi are more or less ochraceous. In a few of the examples each elytron is ornamented with a narrow fuscous vitta extending from the humeral angle to the apical third, and parallel to the lateral margin, and also with a small transverse spot of the same color near the apex.

NOTES AND NEWS ITEMS.

Existe-t-il plusieurs races de Reticulitermes lucifugus Rossi?
J. Feytaud, 1925. Rev. Zool. Agricole, No. 8, pp. 161-9,
illust. 4, August.

This is one of a series of articles by French, Italian and American writers on the appearance of races of subspecies in the termite genus *Reticulitermes*.

Feytaud states that many new species as well as new varieties or races of *Reticulitermes* have recently been described in the temperate zone of the Northern Hemisphere.

The question of biological races in which differentiate young of individuals apparently typical but with special habits, has already been considered, especially among the *Rhynchotus Homopteres*.

Marchal's work on *Chermes* and Börner on *Phylloxéras* are referred to as analogous.

In America, Banks and Snyder have described a large number of species, varieties and subspecies of *Reticulitermes*, among these, some of which are unquestionably valid, there are others which are closely related to one or the other of the more distinct species and it seems questionable whether they are not simple varieties of or identical with such species.

It is not remarkable that some of these species have been confused with the European *lucifugus* Rossi.

It has been believed that only *Caloterms flavicollis* Fabr. and *Reticulitermes lucifugus* Rossi occurred in Europe, and the name *R. flavipes* has become purely historical. *R. lucifugus* is considered as being distributed over a large part of the Mediterranean periphery. Recently Feytaud has proved indisputably that, in addition to biological differences, the species of *Reticulitermes (flavipes* Kollar) of LaRochelle, Rochefort, Saintonge, etc., is not the same morphologically as that occurring at Bordeaux and the Landes.

Feytaud concludes that there are at least two species of *Reticulitermes* in France, *R. flavipes* Kollar and *R. lucifugus* Rossi.

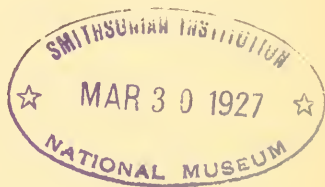
In the *flavipes* of France there are certain characters that vary from the typical, and in *lucifugus* of France there are important biological differences between the *lucifugus* of Italy. Hence the question of biological races.

Similar subspecies have been found in North America.

Feytaud believes that these races and biological differences are due to differences in locality or environment. Further studies will be made in both Europe and the United States.

Thomas E. Snyder.

PROCEEDINGS
 OF THE
 ENTOMOLOGICAL SOCIETY
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No. 2

A REVIEW OF PANS COPUS (COLEOPTERA: OTIORHYNCHIDAE).

By L. L. BUCHANAN.

Ground inhabiting weevils of various kinds form an important item in the diet of North American toads, an incidental fact brought to light during an extensive series of toad stomach examinations recently completed in the laboratory of the Biological Survey by Remington Kellogg. Among a number of rare or otherwise interesting beetles found in the stomachs were some nearly perfect specimens of the Otiorhynchid genus *Panscopus*, including examples of several undescribed species. The description of these, and of two additional new forms from the National Museum collections, together with a rearrangement of the entire genus, are the main points covered in the present paper. Types of the new species, all but one of which belong to Casey's subgenus *Nomidus*, are deposited in the National Museum.

The genus *Panscopus*, as limited here, is composite, including a number of species-groups which would be considered of generic rank if the feeble characters which are supposed to distinguish certain of the related Otiorhynchid genera, are taken as standards. For the present, however, all the species can be kept in a single group or genus whose principal characters will be: Each serial puncture of elytra closed by a large, rounded, striate scale; ocular lobes well developed; metepisternal suture fused for the greater part of its length (except in *Pseudopanscopus*); scrobes lateral¹ and directed toward lower part of eyes, the latter broadly acuminate below and not prominent; suberect vestiture consisting of setae or slender scales; femora unarmed, tarsi dilated, claws free. Any North American Otiorhynchid (north of Mexico) possessing the first and second of the characters enumerated can be placed with certainty in the present genus.²

Some general features which will not be repeated are: body densely scaly; vertex of head without suberect vestiture; prothorax more or less constricted apically; tibiae mucronate, hind

¹The scrobes are of the lateral type even though their apical portion, situated on the dilated alae, may be rather broadly visible from above.

²An apparent exception to this statement, *Agasphaerops nigra* of the Blosyrini, can be separated at once from any species of *Panscopus* by its visible metepisternal suture, sulcate beak, and small but protuberant eyes.

pair more feebly so, and with the fore and middle pair, at least, denticulate; first abdominal suture arcuate at middle.

External sexual differences are not remarkable. The ♀ is larger and stouter, with the elytral declivity less oblique and more nearly vertical in profile; the ♂ with basal segments of abdomen concave, the 5th ventral longer, more broadly rounded and sometimes medially impressed, the mucro of hind tibiae longer, and the elytral costae, when present, generally more sharply elevated. In the ♂♂ of at least 2 groups—*Nocheles* and *Panscopus maculosus*—the circlet of spinules on hind tibiae is more broadly interrupted opposite the articular cavity (corbels open). One feature, though not confined to *Panscopus* among Otiiorhynchids, perhaps deserves special mention. When both sexes of a species are present, the beak of the ♂ is observed to be somewhat longer and more slender than in the ♀, the reverse of this condition, though generally to a more pronounced degree, being the well-known rule among the longer beaked Curculionids. In the latter group the sexual dimorphism of the rostrum in many cases is known to be connected with biological needs, but in the present instance it seems more likely to be a mere corollary of the general elongation of the body and appendages in the male sex.

For convenience, one term—"recline"—is used in the keys to cover the slightly different degrees of inclination of those slender, spatulate elytral scales which rise above the dense general surface coating of flat, subcircular scales. As a rule, this reclinate vestiture is about twice as abundant on the elevated, or costate, as on the flat intervals, the discrepancy being most marked in species having the costae best developed. Most of the other key characters are explained by diagrammatic sketches.

Excluding *Panscopus sulcirostris* Pierce, which is a synonym of *Agasphaerops nigra* Horn,¹ the remaining 18 species are

¹The metepisternal suture in *nigra* is distinctly impressed, and exposed; it was thought to be, and described as, covered by the elytra in *sulcirostris*, and no doubt it was this misconception which led Dr. Pierce to assign his species to *Panscopus*. The underside of the type specimen of *sulcirostris* is so displaced by the pin that the relationships of the sternal side pieces appear to be as described; actually, however, the metepisternum is not covered by the elytra (and this was proved by manipulating a relaxed individual), nor is it fused with the sternum, its suture, consequently, being visible. The descriptions of *nigra* and *sulcirostris* disagree in a few minor points also, but an examination of the Horn lectotype at Philadelphia shows that the two are identical. In all, 4 specimens of *Agasphaerops nigra* have been seen,—the Horn example at Philadelphia, the Pierce type of *sulcirostris* in the National Museum, and two specimens in the Biological Survey collection (Lake Cushman, Washington, toad stomach 2201, and Columbia National Forest, Washington). Professor Wickham (Can. Ent., 52, 1920, p. 134) records it, under the name *sulcirostris*, from Vancouver Island, where both larvae and adults were found attacking *Lilium pardalinum*.

divisible into 7 groups or subgenera as follows:

- A. Metepisternal suture clearly defined for the greater part of its length, i. e., neither fused with metasternum nor covered by elytra (fig. 10); scrobes more broadly visible from above than usual; beak lightly, prothorax strongly, channeled along middle above; only the alternate elytral intervals with stout, suberect scales18.
- Aa. Metepisternum largely fused, its suture either completely obliterated, or defined for a short distance only near hind coxae (fig. 14); beak not channeled, except in *pallidus* in which species all the elytral intervals have slender reclinate scales.....1.
- 1. Both prothorax and elytra with conspicuous polished tubercles; beak carinate and longer than usual, the alae suddenly dilated; scape setose only, reaching a little past middle of eye; outer funicular segments elongate; scales pearly or greenish. Washington and Oregon. GROUP I. *PHYMATINUS* Lec. Includes only 1 species, *gemmatius* Lec.
- 1a. Prothorax often, elytra never, tuberculate.....2.
- 2. Basal margin of elytra more or less thickened and laterally protuberant, causing a sinuation of sides of elytra just behind the humeri (fig. 2); mentum with a setigerous puncture each side of middle near apex; 2d ventral segment of ♀ impressed across middle of basal half; beak broad, and separated from head by a strong depression; scape densely scaly, reaching at least to middle of eye. Eastern U. S. GROUP II—*PANSCOPUS* Schonherr; species 3, 4, and 4a.....3.
- 2a. Base of elytra not thickened or raised, sides behind humeri never sinuate; mentum without a pair of setigerous punctures near apex; 2d ventral of ♀ almost always flat across middle, sometimes declivous forward, but not distinctly impressed. Western U. S. (except *maculosus*).....5.
- 3. All dorsal intervals of elytra setose, more closely so on the alternate ones which are, as a rule, not so distinctly elevated; scape reaching half way across eye; 7th funicular segment as long as broad; beak shorter, its basal depression and median carina stronger; length, 7 mm., width, 3¼ mm. Northeastern U. S. and south to D. C. Only ♀♀ seen.....
erinaceus Say (*carinatus* Pierce).
- 3a. Alternate intervals more strongly elevated, setose, the others flat and without setae; scape reaching well past middle of eye; 7th funicular segment longer than broad. Southeastern U. S.....4.
- 4. Scape reaching posterior eye margin; body larger and stouter; declivity of ♀ less reflexed in profile; length, 9 mm., width, 4 2/3 mm. Va. 3 ♀♀.....
impressus Pierce.
- 4a. Scape reaching 2/3 way across eye; body smaller and narrower; length and width, 7 and 3¼ mm. respectively. N. C.....*alternatus* Schaeffer.
- 5. Scape thinly setose, not squamose, and reaching, or nearly so, upper posterior eye margin; mentum highly polished, not or indistinctly sculptured.
- 5a. Scape squamose, generally densely so, reaching only a little way past anterior eye margin; mentum dull, alutaceous or granulose; outer funicular segments transverse. Western U. S.9.

6. Abdomen with 5 segments in both sexes; scape slender, clubbed apically, and not quite attaining rear of eye; outer funicular segments elongate; depression between head and beak strong; metepisternal suture obliterated; elytral intervals even, slightly convex, each with a single row of rather long, inclined setae. GROUP III—Includes only *Panscopus maculosus* Blatchley.¹ Ky., Ohio, Mo. (U. S. N. M.); Ill. (Biol. Survey); Ind., N. Y. (Blatchley).
- 6a. Abdomen of ♀ with 4 segments (fig. 15); scape gradually stouter to apex and reaching posterior eye margin; outer funicular segments transverse; depression between head and beak feeble; metepisternal suture briefly visible opposite rear coxae; alae suddenly dilated. Pacific Coast. GROUP IV—*NOCHELES* Leconte (*Panscopidius* Pierce)²; species 7, 8, and 8a7.
7. Alternate elytral intervals elevated *torpidus* Leconte.
- 7a. All the intervals even8.
8. Vestiture dense *squamosus* Pierce.
- 8a. Vestiture sparse *dentipes* Pierce.
9. Intervals even in topography, either flat or feebly convex, each with a single or partly double row of rather long, inclined, bristling setae; inner edge of hind tibiae with some coarse setae or spines in addition to the usual hairs; depression between head and beak moderate. GROUP V. *NEOPANSCOPUS* Pierce; species 10 and 10a10.
- 9a. Alternate intervals elevated, generally quite conspicuously so, and with twice as many reclinate scales—not setae—as the flat intervals; color brown except in *pallidus*. GROUP VI—*NOMIDUS* Casey; species 11 to 17, inc.11.
10. Surface of elytra at humeri with a small swelling or umbone (between origins of 6th and 9th striae), the sides from here shortly and abruptly convergent to base; prothorax more or less rugose, some of the polished tubercles almost always showing through the vestiture, and with a variable, but always discernible, median channel on dorsum; color pale; beak, antennae, tarsi, and prothorax more slender. Pacific Coast, Nevada, Montana, North Dakota, Alberta *aequalis* Horn (*vestitus* Casey).
- 10a. Elytra not umbonate at humeri, the sides evenly rounded to base; pronotum even, densely covered with flat, mostly non-striate scales, and with a narrow median line devoid of setae but not impressed; no tubercles visible through the vestiture; color brown, with some whitish mottlings

¹Strictly, this species does not belong to any of the named subgenera; its characters, most of which are of a negative nature, seem to place it near *Panscopus*, sens. str., and *Nocheles*. I leave it as an aberrant member of the former group.

²A ♀ *Panscopidius dentipes* Pierce from the type locality (in collection Biol. Survey) has the remarkable 4-segmented abdomen characteristic of *Nocheles*, and as there are no other differences of importance between *Panscopidius* and *Nocheles*, the former must be sunk. The usual number of sutures are present on the inner abdominal surface of the ♀ *dentipes* mentioned above; externally, the 4th suture is obliterated, thus bringing about the 4-segmented appearance.

- which are more evident on flanks of prothorax, and on sides and declivity of elytra; beak shorter, nearly as thick at base as at apex. Placer Co., Calif. Only the ♀ type seen.....*squamifrons* Pierce.
11. Hind tibia bent backward so that its inner edge is longitudinally convex (fig. 5), this edge with some coarse brown or black spines in addition to the usual hairs; beak feebly convex above, not or very finely carinate, its basal depression never strong.....12.
- 11a. Hind tibia nearly straight, its inner edge much less convex and with fine hairs only (fig. 6); beak relatively stouter, flat or somewhat concave, distinctly carinate (except occasionally in *pallidus*), and with its basal depression stronger.....15.
12. Metepisternal suture obliterated; alternate (i. e., odd) elytral intervals elevated, and only these with any reclinate vestiture; outer funicular segments about as long as broad; serial punctures of elytra small, separated by about twice their own diameter; reclinate elytral scales short, closely appressed, inconspicuous, and arranged in a double row; declivity in profile (♀) slightly reflexed; length, 7½ to 8 mm. Calif. and Wash.....
abruptus Casey.
- 12a. Metepisternal suture briefly visible opposite rear coxae; all dorsal intervals with a few, at least, of the reclinate scales.....13.
13. Alternate intervals rather strongly elevated and with a dense triple row of the inclined squamae, the flat intervals with sparse, irregularly placed squamae; serial punctures larger and closer; a very fine carina generally visible on rostrum; outer funicular segments over ½ wider than long.....
schwarzi n. sp.
- 13a. Alternate intervals at most feebly elevated, their reclinate scales in a double row, those of the even intervals in a nearly regular single row; outer funicular segments less transverse.....14.
14. First segment of funicle subequal to 2d; mentum granulose and with a feeble median longitudinal carina in apical half; alternate intervals more or less elevated in entire length; prothorax shorter, with rugosities and median channel deep*rugicollis* n. sp.
- 14a. First funicular segment ¼ longer than 2d; mentum without median carina; alternate intervals not elevated except very feebly so near base and apex; prothorax longer, its upper surface more even; color paler, especially below*bufo* n. sp.
15. Alternate intervals elevated, only these with reclinate scales, even intervals flat; 7th funicular segment at least twice as broad as long; rostrum tricarinate, median one strong, lateral ones feeble.....17.
- 15a. All the intervals with reclinate scales; outer funicular segments less transverse, the 7th subtriangular in shape and but little broader than long16.
16. Color pale; lateral carinae of beak indistinct or absent; scape reaching ¼ way across eye; prothorax widest before middle, its median channel broad and deep; alternate intervals generally quite strongly elevated.....
pallidus n. sp.
- 16a. Color brown; beak tricarinate; scape barely passing anterior eye margin; prothorax widest at middle, the sides evenly rounded; alternate intervals broadly and feebly elevated.....*tricarinatus* n. sp.

17. Color very dark brown, nearly black; prothoracic rugosities and median channel deep. Alberta. Only the ♀ type seen.....*ovalis* Pierce.
 18. Alternate intervals elevated; tarsi and claws unusually small; color dark brown. GROUP VII—*PSEUDOPANSCOPUS* n. subgen.

***Panscopus (Nomidus) schwarzi*, new species.**

Length, $5\frac{1}{4}$ to $6\frac{1}{4}$ mm. Brown, more or less mottled with paler. Rostrum with traces of a very fine median carina visible through the vestiture. 7th funicular segment $1\frac{1}{2}$ times as broad as long. Pronotum feebly rugose and with a broad, rather shallow, median channel interrupted at middle. Elytral punctures separated by their own diameter, a little more or less.

Beak as long as prothorax, stout; alae strongly dilated; a very small punctiform to elongate fovea between the eyes, this sometimes obsolete. Nasal plate not punctured, subtriangular, sides curved, apex briefly produced backward on beak, the usual row of stiff hairs extending out over its elevated rim. Surface behind nasal plate transversely, arcuately impressed as usual, sparsely scaly and reticulately sculptured. Recline scales on beak numerous, brown and pale, longer and denser in a patch above eyes. Scrobes moderately arcuate in apical half, nearly straight posteriorly, practically evanescent half way along beak, but continued to eye as a barely perceptible, scale filled depression. Scape nearly straight, stout, gradually clavate, with dense scales and appressed setae; funicle longer than scape, stout, 1st and 2d segments elongate, subequal, outer segments progressively more transverse, the 7th $1\frac{1}{2}$ times as broad as long; club moderate, shorter than 1st + 2d segments of funicle, equal to 5th + 6th + 7th. Prothorax wider than long (1.9 mm. to 1.6 mm.), (2.6 mm. to 2.3 mm. in *abruptus*), slightly constricted at apex, sides evenly rounded in ♀ more nearly straight and more or less subangulate before middle in ♂, apex truncate and with a small emargination at middle, base broadly rounded, not thickened or prominent laterally, summits of some of the polished-black, punctate tubercles generally showing through the vestiture on dorsum; ocular lobes broad and rather strong. Elytra wider than prothorax (2.8 mm. to 1.9 mm.), humeri broadly, evenly rounded, sides straight and slightly converging to near apex; scutellum not entering wedge; sutural, 3d, 5th, and basal half of 7th intervals elevated, and each with an irregular double, partly triple, row of narrow reclinate scales similar to those on prothorax: flat intervals with a few reclinate scales irregularly disposed, but generally more evident near base. Tarsi well dilated, 1st segment of hind pair longer than 2d + 3d, 4th = 1st; claws moderate. Abdominal segment 2 nearly as long as 3d + 4th, 5th of ♀ flattened across apex.

Seven specimens, 4 ♀♀ and 3 ♂♂. Type, a ♀, $6\frac{1}{2}$ mm. long, dated "6.29." "Collection Hubbard and Schwarz."

Type locality.—Alta, Utah.

Type.—Cat. No. 28,914 U. S. N. M.

The ♂ is smaller and narrower, with the alternate intervals more strongly elevated and the ventral segments flatter.

Differs from *abruptus* in the much wider funicular segments,

feebler prothoracic rugosities, less curved hind tibiae, much larger and closer stria punctures, longer reclinate scales, etc. The smaller size, longer and more numerous reclinate scales, feebler prothoracic rugosities, etc., seem to clearly separate it from *rugicollis*.

Panscopus (Nomidus) rugicollis, new species.

Length, 7 mm. Dark brown with a slight coppery luster. Pronotum with narrow, rather deep median channel and deep rugosities. Strial punctures more widely spaced than in *schwarzi*, but closer than in *abruptus*, their scales conspicuously paler than the ground color.

Beak longer than prothorax (1.9 mm. to 1.7 mm.), upper surface with very feeble lateral sulci, a minute fovea between eyes. Nasal plate punctured. Prothorax transverse (2.2 mm. to 1.7 mm.), sides broadly, evenly rounded, basal margin slightly prominent. Some paler mottlings irregularly distributed on body above and below, and a lateral white line in basal half of prothorax.

Type locality.—Mt. Adams, Washington, 6,000' Jul. 3, '25. M. C. Lane, collector. 1 ♀ (type).

Type.—Cat. No. 28,915, U. S. N. M.

Panscopus (Nomidus) bufo, new species.

Length, 7 mm. Pale brown, with white mottlings along sides of prothorax and elytra, on declivity, and on under surface of beak and legs. Ventral surface, except prothoracic flanks, uniformly pale or nearly white. Compared to *rugicollis* this species has the beak similar, but with feebler basal depression, the prothorax more elongate, its sides more feebly rounded, and its dorsum with the median channel and lateral rugosities shallower. Elytra with the sutural and alternate intervals not elevated except at base and declivity, the reclinate scales a little longer and narrower than in *rugicollis*. Outer funicular segments moniliform and transverse. Abdomen narrower than in any of the other species, the 5th ventral, ♀, with a small median impression in apical half. Legs longer and more slender than usual, hind tibiae distinctly bent backward.

Type locality.—Round Valley, Inyo Co., Calif. The single ♀ type was taken from the stomach of *Bufo halophilus*, Biol. Survey No. 711.

Type.—Cat. No. 28,916 U. S. N. M.

Salient features.—Very feeble elytral costae, comparatively smooth pronotum, pale brown color.

Panscopus (Nomidus) pallidus, new species.

Length, 5½ to 6½ mm. Cinereous, more or less mottled with brown, thus resembling *aequalis* in color. Beak a little longer than prothorax, broader, flatter, and more distinctly set off from head than in the preceding 3 species. Upper surface of beak more or less impressed, and generally with a fine but

distinct median carina. Pronotum with deep rugosities and a broad, deep, median channel interrupted at middle. Strial punctures rather closer than ordinary, some of them being separated by less than their own diameter.

Beak with its upper surface ranging from slightly to broadly and moderately deeply depressed along middle, more deeply so in apical half, and with feeble lateral carinae sometimes showing through the vestiture; alae strongly dilated. Scape stout, funicle distinctly longer than scape, the 1st and 2d segments longer and subequal (or 2d slightly the longer), 3d to 6th moniliform, 7th subtriangular, abruptly longer and wider than 6th, club short and stout; scrobes nearly evanescent about middle of beak, but continued on to eye as a shallow, sparsely scaly sulcus, this posterior prolongation of scrobe more distinct than in any of the preceding species. Prothorax transverse (9 to 7, about), sides moderately rounded, ♀, or nearly straight, ♂, rather strongly diverging from base and apex to widest point before middle, apex truncate, usually distinctly constricted, base broadly rounded, not thickened or prominent; median channel stronger in apical half; prothoracic rugosities deep, but less coarse and more regular than in *rugicollis*, a few of the punctured tubercles often showing through the vestiture, the scales round and distinctly striate; reclinate scales pale; ocular lobes strong. Alternate elytral intervals generally conspicuously elevated, these with a double, or partly triple, row of slender recumbent squamae, even intervals with a single row of squamae which are more widely spaced, being separated by their own length or more. Abdomen broader, and tarsi a little shorter, than usual.

Salient characters.—Regularity of recumbent scales on even intervals; close-set strial punctures; broad, sulcate beak; pale color.

Thirty-six specimens, ♂♂ and ♀♀, studied. Type, a ♀, 6¼ mm. long, labeled "Kalso, B. C., 23.6, R. C. Currie, coll."

Type locality.—Kalso, B. C.

Other localities.—Ainsworth, B. C.; Big Fork, Montana; Clark's Fork, Idaho (*Bufo boreas*, Biol. Survey, No. 516).

Type.—Cat. No. 28,913 U. S. N. M.

The variations noted affect these parts: Rostrum, in the strength of its median carina, which in rare cases may not be discernible through the scales, and in the occasional presence of feeble lateral carinae; pronotal channel, which is generally deep, but in a few cases obsolete in basal half; elytral costae, which are very feeble in 1 or 2 of the ♀♀ seen. The brown mottlings also vary, but as a rule are more evident on sides and declivity of elytra. This species appears to be common, and probably will be found in collections mixed with *Neopanscopus aequalis*.

***Panscopus (Nomidus) tricarinatus*, new species.**

Length, 5½ mm. (♂ type). Brown with some white mottlings along sides of prothorax and elytra, spots at base of beak, and on under surface of head and femora. Beak almost as long as prothorax, tricarinate and quadrisulcate above,

median carina rather coarse, the outer pair of sulci and carinae feeble. Scrobes feebly arcuate, and extended on to eye as a scale-filled silcus which is better marked even than in *pallidus*. Reclinate scales on beak rather sparse, denser in patch above eye; scape thick and heavy, just reaching front eye margin; funicle longer than scape, first and 2d funicular segments equal, 4th to 6th moniliform and transverse, 7th considerably larger and more subtriangular in shape. Prothorax more elongate than in *pallidus*, sides evenly rounded, dorsal median channel narrow and feeble, interrupted at middle, the rugosities evident but not coarse or deep, a few points of the shiny black surface chitin showing through; eyes rather small; ocular lobes strong. Elytra elongate, odd intervals broadly and feebly elevated, and a little wider than the even, former with double, latter with single, irregular row of slender appressed scales; serial punctures larger and more superficial than usual, and lacking the clean-cut appearance. Hind tibiae feebly dilated apically; anterior femora stouter, posterior longer. The concavity at base of abdomen (σ) is deep on first segment and extends on to anterior half of 2d also; in σ *pallidus* this concavity is shallower, and confined to the 1st abdominal segment. Only the σ type seen.

Type locality.—Hood River Rapids, Parkdale, Oregon; July 30, 1921, M. C. Lane, coll.

Type.—Cat. No. 28,912 U. S. N. M.

Salient features.—Tricarinate beak; feeble elytral costae; shallow stria punctures. The rostral carinae are about as coarse as in *ovalis* Pierce.

PSEUDOPANSCOPUS, new subgenus.

Body robust. Beak stout, basal depression strong, alae feebly and gradually dilated; nasal plate narrowly triangular, distinct; eyes nearly flat; scrobes pinching in upper surface of beak before middle; scape reaching to middle of eye; ocular lobes broad, rather feeble. Scutellum invisible. Legs moderate; tibiae nearly straight, only slightly dilated at apex, mucronate, the hind pair minutely so and with the cirlet of spinules broadly interrupted opposite articular cavity; articular surface small; claws smaller than usual. Metasternum short, episternum narrow, mesepisternum not in contact with elytra; first abdominal suture broadly angulate.

Genotype.—*Panscopus* (*Pseudopanscopus*) *costatus*.

Panscopus (*Pseudopanscopus*) *costatus*, new species.

Length of the single ♀ type, 7 mm. Color brown with an obscure coppery tinge. Suberect scales stout. Beak as long as prothorax, width at apex to width at base, 4 to 3.5. (Average in *Nomidus* is 4 to 3.) Beak in profile rather strongly arched above and below, thickest point a little in front of middle, feebly channeled along middle above. Nasal plate dull, not punctured. Scrobes arcuate (about as in *alternatus*), practically evanescent at basal 1/3 of beak, apical half more broadly exposed from above than in any other species, distinctly converging from near tip to point of flexure, which is before middle, thus constricting upper surface of beak, which is here just $\frac{1}{2}$ its width at apex;

scape straight, gradually thickened apically, densely scaly, funicle a little longer than scape, 1st and 2d segments longer, 1st longer than 2d, 3d to 7th transverse and unusually uniform in size; club elongate-oval, shorter than 1st + 2d funicular segments, nearly as long as 5th + 6th + 7th. Beak with a few suberect scales, head without any except a conspicuous tuft of longer ones above eye. Prothorax transverse (2.25 mm. to 1.87 mm.), sides feebly rounded, widest a little before middle, apex with a slight constriction and nearly squarely truncate, base rounded; antero-ventral margin between ocular lobes conspicuously thickened or "rolled"; pronotum with a broad, moderately deep median channel a little narrower in basal half, surface coarsely rugose, the stout suberect scales attached at the summits of the elevations. Elytra more than 1/3 wider than prothorax (3.59 mm. to 2.28 mm.), sides from behind humeri nearly straight and converging to near apex; base deeply emarginate. Sutural, 3d, 5th, and basal part of 7th intervals elevated and with an irregular double row of stout, erect, pale and dark scales, the other intervals flat and without erect vestiture, declivity in profile reflexed; stria punctures small, separated by 2 to 3 times their diameter. Scales of under surface dense and larger than above. Abdomen shorter than usual, 2d segment a little shorter, 5th longer, than 3d + 4th, the 5th feebly convex. Legs rather short; articular surface small, nearly as broad as long, the articular cavity taking up 1/2 to 1/3 its length; tarsi short, well dilated, 2d segment almost as broad as 1st or 3d.

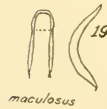
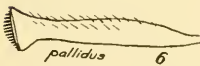
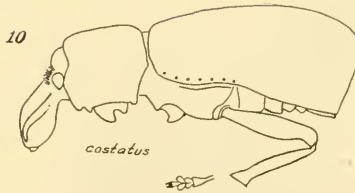
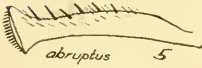
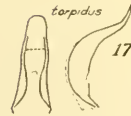
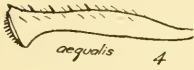
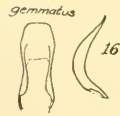
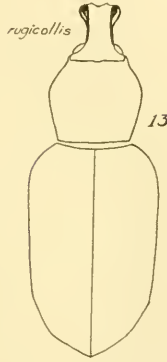
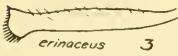
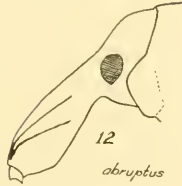
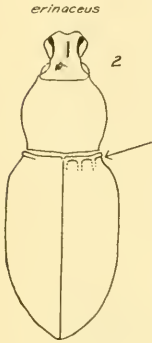
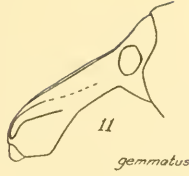
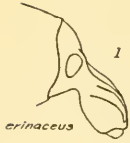
Distinguished by the constricted upper surface of beak, very stout erect scales, more strongly convergent sides of elytra, feebly dilated tibiae and small claws. The scaly covering is denser, and the erect scales stouter, than in any other species. Superficially resembles *ovalis* Pierce.

Type locality.—Chilliwack, B. C. A single ♀ from stomach of *Bufo boreas*, Biol. Survey No. 461.

Type.—Cat. No. 28,917 U. S. N. M.

LIST OF SUBGENERA AND SPECIES OF PANS COPUS SCHÖNHERR.

<i>Phymatimus</i> Leconte	<i>Neopanscopus</i> Pierce
<i>gemmatus</i> Leconte	<i>aequalis</i> Horn
<i>Panscopus</i> Schönherr (sens. str.)	(syn. <i>vestitus</i> Casey)
<i>erinaceus</i> Say	<i>squamifrons</i> Pierce
(syn. <i>carinatus</i> Pierce)	<i>Nomidus</i> Casey
<i>impressus</i> Pierce	<i>abruptus</i> Casey
<i>alternatus</i> Schaeffer	<i>schwarzi</i> n. sp.
<i>maculosus</i> Blatchley (?)	<i>rugicollis</i> n. sp.
<i>Nocheles</i> Leconte	<i>bufo</i> n. sp.
(syn. <i>Panscopidius</i> Pierce)	<i>pallidus</i> n. sp.
<i>torpidus</i> Leconte	<i>tricarinatus</i> n. sp.
<i>squamosus</i> Pierce'	<i>ovalis</i> Pierce
<i>dentipes</i> Pierce	<i>Pseudopanscopus</i> n. subgen.
	<i>costatus</i> n. sp.



EXPLANATION OF PLATE.

- Fig. 1. *Panscopus erinaceus*.
 Fig. 2. Dorsal view of *erinaceus*, showing sinuation of sides of elytra behind humeri.
 Figs. 3, 4, 5, and 6. Hind tibia, ♀, of *Panscopus erinaceus*, *Neopanscopus aequalis*, *Nomidus abruptus*, and *N. pallidus*, respectively.
 Fig. 7. Mentum of *erinaceus*, showing pair of setigerous punctures.
 Figs. 8, 9, and 10. *Pseudopanscopus costatus*.
 Fig. 11. *Phymatinus gemmatus*.
 Fig. 12. *Nomidus abruptus*.
 Fig. 13. *Nomidus rugicollis*.
 Fig. 14. Side view of metasternum to show metepisternal suture briefly visible opposite rear coxae.
 Fig. 15. *Nocheles dentipes*, showing the 4-segmented abdomen of ♀, with dotted line to indicate internal position of the externally obliterated 4th suture.
 Figs. 16, 17, 18, and 19. Median lobe of male genitalia (dorsal and lateral views) of *gemmaus*, *torpidus*, *pallidus*, and *maculosus*, respectively.

OLFACTORY RESPONSE OF THE JAPANESE BEETLE.
(POPILLIA JAPONICA NEWM.)¹

By E. AVERY RICHMOND, *Agent,² U. S. Department of Agriculture.*

Early experiments on the control of the Japanese beetle showed that this insect was repelled from foliage sprayed with any of the standard arsenical poisons. Hadley, 1922, noted that "practically all the standard poisons in common use are more or less repellent." Considerable effort was made to find a substitute for arsenate of lead which would be readily eaten by the beetles and at the same time be sufficiently toxic to result in effective control. No substitute was found and it became a problem of treating the arsenate of lead in a manner which would mask the repellent factor to such a degree that the beetles would feed on it readily. This problem has been studied for several years and the development of a coated arsenate of lead is one of the results.

Another means, which suggested itself, was that of finding a compound with an odor attractive to the beetles and capable of being mixed and applied with the arsenical spray. In this way beetles would be drawn to the sprayed foliage. Inasmuch as it was not known just what stimulus or combination of stimuli was causing repugnancy in the case of arsenate of lead, it was a

¹Contribution No. 26 from the Japanese Beetle Laboratory, Riverton, N. J.

²These chemotropic studies were originally initiated by Loren B. Smith, who began them in 1922 with the assistance of T. H. Frison, and their operation has since been directed by the former. During 1923 F. J. Brinley conducted the investigations.

question whether the repellency could best be overcome by attractive odor, color, taste or a change in the physical constitution of the arsenical spray.

The material included in this paper is merely a general review of the situation but will be followed by a larger and more comprehensive treatise.

PRELIMINARY RESULTS OBTAINED IN 1922 AND 1923.

Since the beetles were known to have favored food-plants and were strongly attracted to ripening fruit, thus suggesting that odors influence the feeding of the beetles, tests were made of various odorous compounds and chemicals during the summer of 1922. To ascertain whether the beetles could be attracted by an odor, a number of essential oils were tested by spraying them on the foliage of both infested and non-infested plants. The results indicated that sassafras, hemlock, mustard, lemon oils and iso-amyl valerate were somewhat attractive to the beetle. Certain other oils appeared to be neutral in their effect upon the beetle, while still another group appeared to be somewhat repellent.

More detailed experiments were conducted during 1923 and a large number of compounds were studied. During this season various oils and chemicals were combined with a sweetened bran mixture. Such baits were placed in small cans holding about 175 grams. These cans, which had been perforated, were then suspended from the limbs of trees in various orchards. Not only was a series of essential oils tested but the various constituents of sassafras and certain other oils, which appeared to be attractive, were tested in an endeavor to find the attractive agent. Among the oils sassafras and clove were easily the leaders, while of the constituents, ethyl alcohol, geraniol and eugenol proved to be the most important and in the order named. The active principle in sassafras oil was believed to be either geraniol or eugenol, although the former is apparently present only in the leaf oil. It was also clearly demonstrated that the intensity of the odor was an important factor to be considered in this respect.

During the season of 1924 experiments were continued in much greater detail and a large amount of data was collected. Detailed studies were made with particular reference to those environmental factors which appeared to influence the chemotropic response of the beetle.

The adult is exceedingly susceptible to the influence of color, odor, temperature, humidity and light. Whether these factors act as stimuli or depressants depends largely upon their combination and the force which each exerts upon the insect at any given time. For instance it has been found that an odor may be repellent, neutral or attractive to the beetles de-

pending upon the temperature-humidity relationship. Therefore, before the chemotropic response can be determined quantitatively or conclusions drawn from such data, all factors must be taken into consideration.

In attempting to determine the influence of the several odors upon the beetle many difficulties arise, even under the most favorable conditions, and, unless the greatest care is taken to control all influencing factors, the data obtained are likely to be inaccurate and extremely misleading. In view of this it was felt that, while laboratory experiments on confined beetles might give certain useful indications, the most accurate results in the preliminary work would be obtained when the various experiments were performed under outdoor conditions. Field work, however, is naturally limited by the duration of beetle activity.

MORE EXTENDED RESULTS OBTAINED IN 1924.

At the beginning of the summer of 1924 it seemed advisable to consider the problems relative to the beetle's response under two main phases of observation, namely, chemotropism and phototropism. The consideration of the latter tropism is omitted in this paper while the former is treated briefly herein with particular reference only to the principal attractants.

The chemotropic project resolved itself into the following problems:

1. To determine which of several *oils* are attractive, neutral or repellent to the Japanese beetle.
2. To determine which of several *organic chemicals* are attractive, neutral or repellent to the Japanese beetle.
3. To determine the most satisfactory *bait-carrier* to use as a base for the oils and chemicals of problems 1 and 2.
4. To determine indications of attraction or repellency of various oils and chemicals in *emulsified forms, suspensions or solutions*, by means of *sprays*.
5. To devise a *more satisfactory method* of determining, in the field, the relative chemotropism of the Japanese beetle with a view of discovering a primary attractive or repellent odor.
6. *Physiological and ecological conditions* influencing chemotropic response.

The main experiments were conducted in two orchards, one of which was planted to "Wild Goose" and Newman plums. The other contained both early and late varieties of apple and peach trees and these, in general, were arranged in alternate rows. Neither of these plantings had been cultivated for several years. The conditions of these orchards were charted very carefully with respect to the ecological surroundings. The

baits were prepared in the laboratory. In the field the materials were suspended in perforated tins, each containing 100 grams of the mixture.¹ Five bait-cans, placed at various points in the orchard, were used in each experiment. The beetles, which gathered on the baits, were collected in large cyanide jars (12" museum jars) and were then transferred to 5-ounce bottles in which they were stored. Six collections from each can were made daily, except Sunday, and at the following hours: 9, 10, 11 A. M., 12:30, 1:30, and 2:30 P. M. (Standard Time). Four different bait-carriers were used, essentially similar to the bran mixture referred to above under the 1923 results. Nearly seventy essential oils and chemicals were tested in this manner.

The report for 1923 showed that the daily average of beetles, collected from a natural sassafras oil (5.71%) bait, was 123.5, whereas clove oil (0.57%), next in value, gave only 44.5. In 1924 the average number of beetles, collected during the entire period of an experiment with natural sassafras oil (2.85%), was 5.3 per observation. The attraction of clove oil (0.28%) was practically 0, the second in value for this year proving to be ginger oil (0.57%) with an average of 0.8. Imitation sassafras oil gave entirely negative results. According to an analysis made by manufacturing chemists the natural sassafras oil contains 0.5% eugenol but no geraniol. Natural sassafras oil was essentially the only oil experimented with which showed value as an attractant, and in 1923 this excelled any other oil or chemical.

Since past experiments showed that natural sassafras and clove oils clearly outdistance any other oils in attractive value, it was deemed advisable to investigate the principal constituents of these oils. The most important are geraniol, eugenol, citral, phellandrene, linalool, safrol and pinene. Special endeavor was made to run all of these chemicals at the same time and under identical field conditions in order to find, if possible, the one which was most valuable. Excellent correlation of the experiments was thus attained. Among the constituents tested, geraniol at any strength appeared the most attractive to the Japanese beetle. Over a period of 13 selected days the results, using various strengths of geraniol as well as eugenol (0.25%), were as follows:

TABLE 1. RELATIVE VALUE OF THE DIFFERENT STRENGTHS OF GERANIOL AND EUGENOL.

<i>% Geraniol</i>	<i>% Eugenol</i>	<i>No. of Beetles</i>
10.0	5,407
5.0	3,749
2.5	3,288
0.25	1,973
.....	0.25	1,309

¹The amount of mixture thus varied from that used in 1923.

It can be seen from Table 1 that the 10.0% geraniol attracted the most beetles. However, if the collections are figured on a 1% basis, it will be noted that the lower strengths give increasingly better returns. The collections from the six leading chemicals, viewed from different angles, are listed in Table 2.

TABLE 2. RELATIVE VALUE OF THE SIX LEADING CHEMICALS.

<i>Chemicals</i>	<i>Strength</i>	<i>Total no. of beetles collected during an entire test of each chemical</i>	<i>Largest no. of beetles collected from any one bait-can during any one observation</i>	<i>Highest average no. of beetles per observation collected any one day from each chemical</i>	<i>Average no. of beetles collected per observation during entire test of each chemical</i>
Geraniol.....	5.0%	10,071	211	80.4	21.7
Eugenol.....	0.25%	1,562	101	13.0	2.7
Citronellal.....	1.0 %	1,214	71	16.6	3.7
Citral.....	0.5 %	1,034	119	13.0	3.3
Citronellol.....	1.0 %	620	50	13.5	1.9
Diphenyl Ether.....	1.0 %	146	1.2	0.3

The data included in this table definitely establish the superiority of geraniol in all cases. The collection of 211 beetles from a single bait-can of geraniol (5.0%) on July 31 is remarkable, as is also the attraction of over 10,000 beetles by this same chemical during its entire test. Consider the significance of an average collection of 21.7 beetles from each observation over a period of three weeks of varying weather conditions. Citronellal with 3.7 beetles was second in value.

The experiments with emulsions were preliminary and results simply gave indications of what might be expected in the future. All percentages of geraniol emulsion lead the field here as well as in the other phases of the problem. When cloths (1 foot square) were dipped in a 10% emulsion of geraniol and suspended in the orchards the true value of geraniol as an attractant was demonstrated. Beetles were drawn in as if by a magnet and collections revealed the presence of approximately 13,000 beetles on only 12 cloths, over a period of 5 successive days (July 28 to August 1, inclusive). The collections were made at half hour intervals, the beetles having been removed after each observation. Various other emulsions of oils or chemicals were used but none has in any way approached such attraction.

FURTHER RESULTS OBTAINED IN 1925 AND 1926.

The organization of the personnel and general methods of procedure were greatly improved during these years. Instead of the cyanide jars, ordinary milk bottles were used and new methods of collecting materially shortened the time devoted to the collections. If the beetles, present on the bait-can, were not too numerous a count was merely made and no storage of beetles was therefore necessary. Weather bureau units were established at each experimental orchard, thus obtaining climatological data in connection with the collection.

Inasmuch as several attractants, more especially geraniol and eugenol, had been discovered, the next step was naturally the practical application of such odors. This problem was approached by the use of various types of traps which had been gradually evolved since 1924; incorporation of these chemicals in different sprays including emulsions, suspensions and solutions; and their impregnation in dusts such as kieselguhr, lime, talc, flour and poison-baits.

The bait-can tests of the preceding years were continued with emphasis placed on untried essential oils and chemicals; materials tested in the past but under unfavorable weather conditions; combinations of the attractants; and the value of the different grades of geraniol and eugenol. The knowledge of such factors should aid in lowering the cost of the material. Attempts were made to find a simpler and better method of experimentation on account of the expenditure of time and money encountered in such operations.

It became advisable to stress the question of repellency, particularly because of the damage sustained by early peaches, and extensive investigations were made in an attempt to locate a method of attack. The several leads afforded included the oils and chemicals which proved neutral or repellent in past experiments or had been tested during unfavorable weather conditions; constituents of plants upon which the beetle does not feed to any appreciable extent; odors objectionable to man; poisonous substances, including proteins and alkaloids; and dusts.

The search for a more satisfactory bait-carrier was continued as well as the study pertaining to the effect of the different odors as regards sex.

The results of these two seasons have not been thoroughly worked over so only a brief mention of some of the basic facts have been included. Several oils proved attractive but not enough to be considered important. As regards the relative value of the different grades of geraniol there developed some confusion. In 1925 it appeared that the weakest grades apparently gave the best attraction. In 1926 a geraniol for soaps

definitely led the field while pure (83%) ran in second place together with geraniol "S" (55%).

Using the combination of geraniol and eugenol, the second best attractive agent, the amount of geraniol can be materially reduced and only 0.25% eugenol is necessary. The most satisfactory bait-carrier, together with these odors, was satisfactorily used in connection with a cylindrical bait-trap. This bait-trap, although not perfect by any means, clearly demonstrated its value in the reduction of beetles within a given area. Over 13,000 beetles were collected by a single trap over a period of about 8 hours. An attempt was made to control an orchard with these traps, but the beetles arrived too rapidly to be caught before causing foliage injury. It was planned to move the trap just outside the limits of an orchard, but this experiment was prevented by an unusual rainy spell. The efficiency of the traps was materially improved by the addition of a large wash-tub half filled with water and placed directly beneath the trap. Data obtained suggests that these bait-traps are at least 50% efficient.

The addition of geraniol, 1 to 1,000, to the usual arsenate of lead spray proved exceedingly efficacious in attracting the beetles, but the main difficulty seemed to be that the odor dissipated too rapidly. A geraniol emulsion was successfully used in connection with the newly developed oleoresin of pyrethrum spray. No entirely satisfactory poison bait has been discovered although lead chloride, sodium arsenite, sodium arsenate and Paris green produced a fairly high kill. The beetles fed readily on crushed apples treated with lead arsenate and a much better kill was attained than was the case when the lead chloride was used. Geraniol, which was used as a check bait, is toxic to the beetle and it may be that no poison need be added.

The consideration of possible repellents has been extremely extensive and over 250 tests have been conducted. The materials used have been classified as regards their degree of repellency. The most outstanding substances are copper resinate, guaiac wood oil and oil of tar. Kieselguhr and talc were very satisfactory as carriers and doubtless increase the degree of repellency.

BRIEF DESCRIPTION OF GERANIOL.

According to various authors, geraniol and its esters were discovered in 1871, by Jacobson in *Palmarosa* or Turkish geranium oil. Geraniol is isomeric with linalool. It is a pale yellow oily liquid and possesses a pleasant geranium-like odor. Its specific gravity is 0.8812, its melting point—15° C. and its boiling point 230° C. This constituent is soluble in alcohol

and ether but insoluble in water. It may be derived from oils of geranium, citronella or palmarosa by forming a double compound with calcium chloride. Geraniol ($C_{10}H_{18}O$) is an unsaturated alcohol, belonging to a class of compounds known as terpenes. It has its derivation from higher hydro-carbons of the ethylene series.

The presence of geraniol in apple was demonstrated by Power and Chestnut, 1922, and it is also found in appreciable quantities in geranium oil, citronella oil and sassafras leaf oil. It is reported that the oxidation of this oil not only causes an alteration of its physical constituents but also effects the aroma by imparting to it a lemon-like odor. This property modifies the rose-like odor which distinguishes freshly prepared geraniol. Just what change actually occurs in the composition of geraniol, when it is used in the field, is problematic. In spite of this fact there is evidently no marked loss in its attractive value during the exposure of the alcohol to the weather. Experiments with this chemical in baits were conducted for over a month and it still maintained its effectiveness. Material kept indoors since August, 1924, still retains a definite attractive odor.

CONCLUSIONS.

Geraniol is clearly the primary attractant of the Japanese beetle but its combination with eugenol materially lowers the cost and increases its effectiveness. During the summer of 1924 over 65,000 beetles were actually collected from the bait-can experiments. Nearly 50,000 of these beetles were present on geraniol baits alone. The results of experimentation in 1925 and 1926 were in keeping with these remarks, but, inasmuch as more extensive tests were conducted, the number of beetles collected was proportionately greater. The activities of the adult varied with temperature, humidity and vapor pressure. Females are attracted approximately one-third more frequently than males when geraniol and most other chemicals are employed. Molasses has only a slight attractive value. Satisfactory traps have been evolved and it seems possible that they will have considerable value in reducing the numbers of beetles in a given orchard. Bran retains odors over long periods if protected from the rain. Geraniol has been satisfactorily incorporated in poison sprays although its odor is not retained for a long enough period. To this end experiments on the absorption of this chemical on charcoal, clays, etc., are under way. The value of geraniol, when used in connection with a contact spray, has been demonstrated. Eugenol, citral, citronellol and citronellal follow geraniol as attractive agents.

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SOME REMARKS ON QUESTIONABLE TYPES.

By CHARLES W. JOHNSON, *Boston Society of Natural History.*

In the Canadian Entomologist for December, 1926, Mr. C. H. Curran erects some peculiar types for *Comantella falliei* Back, which he calls "Lectoholotype" and "Lectoallotype." Now a lectotype is a cotype chosen to take the place which in other cases a holotype occupies. Many do not recognize lectotypes.

A cotype by another name
To them's a cotype just the same,
And it is nothing more.

As to the specimen designated a "Lectoallotype," it was not one of the specimens studied by Dr. Back. Both of these are still in my collection and labeled by him, "Cotypes *C. falliei*." The locality Montclair, Calif., in Dr. Back's paper should have read Montclair, Col. The specimen was collected by Mr. E. J. Oslar.

In this connection there is another matter I wish to mention. In *Psyche* for October, 1924 (mailed Nov. 7). Mr. C. H. Curran described five new Syrphidae. *Microdon pseudoglobosus*, *M. conflictus*, *M. ocellaris*, *M. manitobensis* and *Cerioides proxima*. No holotypes were designated, therefore all the specimens mentioned in that paper are cotypes. In the Kansas University Science Bulletin, Vol. 15, Dec. 1924 (issued Dec. 1, 1925), the above mentioned species were again described as new, with no reference to the paper in *Psyche*. Holotypes were selected for all the species, except *M. manitobensis*, together with allotypes and paratypes.

Under *Microdon pseudoglobosus*, the first specimen mentioned in *Psyche* is made the holotype, and is said to be in the University of Kansas Museum, but further on he says: "The holotype is in the museum of the Bureau of Plant Industry, Harrisburg, Pa." A number of additional specimens are included under paratypes, but the cotypes of the first paper from Chittenden, Vt., and Cape May, N. J., are not cited.

Under *M. conflictus*, the first specimen mentioned in *Psyche* is also made the holotype. There are also a number of additional specimens not recorded in the first paper, but the cotypes from Washington, Mass., and Bar Harbor, Me., are not cited.

Under *M. ocellaris* the first specimen mentioned in *Psyche* is again made the holotype and all of the other cotypes cited, with no additional records.

Under *M. manitobensis* in the first paper the author says: "Fifteen specimens of both sexes, Megantic, Que., Capen, Me., Oquossoc, Me., Southwest Harbor, Me., Elmboro, Sask., Ottawa, Ont.; several specimens Manitoba." In the second paper he

says: "Described from thirty specimens of both sexes from Manitoba, Saskatchewan, British Columbia, Ontario, Quebec and Maine" * * * "The types are in the Canadian National Collection, Ottawa; Kansas University Museum; Bureau of Plant Industry, Harrisburg, Pa.; and the collections of C. B. D. Garrett, Dr. A. J. Hunter, and the author." Note that the cotypes from Capen, Oquossoc and Southwest Harbor, Maine, are not mentioned.

Under *Ceriodes proxima* the first specimen mentioned in Psyche is made the holotype but the cotypes from Bennington, Vt.; Megantic, Que.; Boncher, Sask.; Vernon, B. C., are not cited.

Having been largely responsible for the publication of the paper in Psyche, as I wished at the time to add the species to my New England list of Diptera, I have hesitated to criticize the second paper, for it is far from a pleasant task. By omitting a reference to the first paper and changing the character of the types, the second paper is very misleading and will cause trouble in the future as to the date of publication of the above species and the true standing and location of the types. Only the specimens mentioned in the first paper are types, and as no holotypes were made at the time they are all cotypes. Holotypes could not be made in the second paper and the additional specimens under paratypes have no standing as types. The specimens selected as holotypes might be considered lectotypes, but not being thus designated this is questionable. Of the above cotypes those from New England are in the collection of the Boston Society of Natural History and the one from Cape May, N. J., is in the writer's collection. The species of *Microdon* were all returned as paratypes and the *Ceriodes proxima* as a "metatype" although not recorded as such in the second paper. A specimen of *M. conflictus* from Westville, N. J., in my collection was returned marked "paratype," but is not recorded in either paper.

The rules governing the making of types are so explicit that this muddle seems uncalled for. There is no rule covering lectotypes, and only in the case of a composite species does it seem necessary to select one. Therefore the promiscuous making of lectotypes seems very objectionable, because no one has the right to deliberately lessen the value of specimens in the possession of others.

ON THE CHARACTERISTICS OF THE OCCIPUT OF THE
DIPTERA.

BY RAYMOND C. SHANNON, *Instituto Bacteriologico, Departamento Nacional de Higiene, Buenos Aires.*

The characteristics of the posterior surface of the head in the Diptera are very little used for purposes of classification and as a rule, when so used, are chiefly confined to the occipital ciliation (*Dolichopodidae*, *Syrphidae*, etc.). In a recent publication of the writer's (*Proc. Ent. Soc. Washington, 1926, Vol. 28, p. 130*) he differentiated *Lucilla elongata* from its near allies by the fact that it possesses stiff black setae on the back of the head whereas its allies possess pale soft pile.

It is obvious that the development of the anterior portion of the thorax should affect the development of the head and vice versa. There is an excellent illustration of this fact in the family *Syrphidae* in which the back of the head of the *Syrphinae* so closely surrounds the anterior portion of the thorax that it has caused the mesonotal pilosity to cease abruptly behind the humeral calli and intervening region. This particular characteristic has proven one of the most clear-cut in the family, and sets the *Syrphinae* off as a well defined group from the remaining subfamilies.

In recent work on the *Muscidae* and *Calliphoridae* of Argentina the writer has found that certain groups may be clearly defined by the absence or presence of pile or setae on the epicephalon and the arrangement of the same. The writer's material is limited and he is therefore unable to thoroughly test the value of the character. But in this large and complicated group, which has undergone such radical revisions during the last thirty years, all possible characters of value should be pressed into service and these few notes are offered with the hope that interest in this direction may be stimulated. Practically all Muscoids have a few setae on the upper portion of the epicephalon, so this part is left out of the present discussion.

The epicephalon of the *Tachinidae*, *Dexiidae* and *Rutilliinae* (in the material at hand) is bare.

In the *Sarcophagidae* and *Calliphoridae* there are two small patches of pale yellow pile on the lower margin of the epicephalon. In the *Wohlfartiinae* and *Metopiinae* (*Sarcophagidae*) the pile is black and more hair-like.

In the *Muscinae* and *Phaoniinae* there are two patches of small bristles on the lower portion. In *Stomoxys* the bristles are very minute and scattered. In the *Faniinae* the bristles are arranged in two parallel rows, one on each side and close to the lateral margins. In *Pegomyia* (*Anthomyiinae*) the bristles are arranged in an arc on the lower portion of the epicephalon and in *Anthomyia pluvialis* they are arranged in two patches as

in the Muscinae and Phaoniinae. In *Scatophaga* there is a transverse uninterrupted patch of yellow pile.

The shape of the epicephalon shows strong differences in different groups. In the Muscoid Diptera the sides are more or less parallel. In the Eristalinae and Volucellinae it is triangular, the apex being directed towards the occipital foramen. In the Syrphinae, it is considerably reduced and the sutures are more or less vestigial.

The vestiture of the paracephalic plates also show marked differences between different groups.

A NEW SUBSPECIES OF *PAPILIO PAEON* (LEPID.).

BY THEO. D. A. COCKERELL

Papilio paeon escomeli, new subspecies.

Male.—Differs from *P. paeon* Boisvd. in having the yellow markings slightly darker. Hind wing: the tails narrower, the postmedial spots much broader. Hind wings below with the grayish lunules following the red band, reduced so the outer yellow space is much broader; the marginal black lunules much narrower and shorter, the vein in tail irrorated with pale yellow

Expanse.—98 mm

Habitat.—Cotahuasi, Arequipa, Peru. The specimen from Arequipa collected by Dr. Escomel in whose honor the species is named.

Type Cat. No. 33,185, U. S. N. M.

EDITORIAL.

Parentheses in Nomenclature.—The device of putting parentheses about a specific name when associated with any but its original generic consort was a good one, in the earlier stages of its vogue. Now, however, that shifts in nomenclature have been so numerous that in certain lists nearly every specific name is parenthetical, the usefulness of the device is greatly diminished. For the sake of economy and efficiency we usually abbreviate or dispense with a thing so universal that it may be assumed in practically all cases. Such action should be taken with regard to specific name parentheses unless some rejuvenation and improvement of the idea is deemed preferable. For instance we might adopt a character, say brackets [] for a secondary enclosure of a name originally described in a tribe to which it did not belong; if a mistake in subfamily assignment also was made we could politely indicate the condition by adding question marks ??; an error as to family, occasioning greater surprise, could be fittingly denoted by exclamation points, !!; beyond this we would suggest only asterisks, ** (order wrong) and dashes, — (phylum missed) for the sake of their customary profane significance. Thus the proposal of a name in such a way as to commit all of the aforesaid nomenclatorial crimes would demand a final appearance something like this: *Erratus* — *! ? [(*elegans*)] ? ! * — A. Tyro. Is it not beautifully obvious how easily we can add to the charming complexity of nomenclature?

—*W. L. McAtee.*



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No. 3

A NEW GENUS AND SPECIES OF COLEOPTERA FROM A TERMITE
NEST IN COSTA RICA (FAMILY ANOBIIDAE).

By W. S. FISHER, *United States Bureau of Entomology.*

NEVERMANNIA, new genus.

Body oval, moderately elongate, strongly convex, and glabrous. Head not excavated beneath; eyes moderately large, and feebly, arcuately emarginate; clypeal suture deeply impressed. Last joint of maxillary palpi elongate securiform, and the outer margin slightly oblique; last joint of labial palpi broadly triangular, and the apex transversely truncate; mentum transverse and trapeziform. Antennae 11-jointed; first joint large and elongate; second much smaller and subglobular; joints three to eight narrow and very small, the third as long as wide, and the fourth to eighth compact, and about as wide as long; ninth to eleventh forming a broad club slightly longer than all the preceding joints united; ninth joint about twice as long as wide, and nearly as long as the following two joints united; tenth joint as long as wide, and slightly narrowed toward the base; eleventh joint slightly elongate-oval. Pronotum evenly convex, and the lateral margins straight. Elytra without striae. Prosternum short, flat, deeply abruptly depressed at middle, and not produced behind into two long processes. Anterior coxae widely separated. Metasternum flat, without a longitudinal groove at middle, but deeply excavated in front for the reception of the antennae. Legs received in depressions while in repose; tibiae not compressed; tarsi short, the first joint as long as wide, joints two to four strongly transverse and very compact, and the terminal joint slightly longer than the first joint.

Genotype.—*Nevermannia dorcatomoides*, new species.

This genus closely resembles *Dorcatoma* Herbst. It differs, however, from that genus in having the antennae eleven jointed, prosternum not concave or produced behind into two long, slender, horn-like processes, and the metasternum deeply excavated in front for the reception of the antennae. The genus seems to be allied to *Coelostethus* LeConte, as both genera have the metasternum deeply excavated for the reception of the antennae in repose, and according to Dr. Böving, the larvae show also remarkable similarities. The adults, however, do not resemble *Coelostethus* in appearance, and the genus differs from *Nevermannia* in a number of respects, of which the following are the most important: mandibles acutely carinate on the upper surface; metasternum longitudinally sulcate; abdominal segments connate at the middle; legs free in repose, and the upper surface stria-punctate and pubescent.

This genus is named in honor of Ferd. Nevermann, who has collected many interesting species of coleoptera in Costa Rica.

Nevermannia dorcatomoides, new species.

Uniformly black above, legs and body beneath vaguely rufous, and the tarsi

and antennae slightly paler. Head finely, densely punctate, and the punctures nearly confluent; eyes moderately large and separated from each other on the front by two times their vertical diameter; last two joints of each antenna turned at right angle to the ninth joint, and their sides fitting tightly together for their reception into the excavation in the metasternum. Pronotum one-half wider than long, distinctly narrower at apex than at base, and widest at base; lateral margins narrow, and only visible from above near the posterior angles; anterior margin broadly rounded; base strongly, angularly produced in front of the scutellum; disk strongly, evenly convex, and the surface coarsely, densely, uniformly punctate, the punctures separated from each other by once their own diameters. Scutellum small, and slightly longer than wide. Elytra three times as long as the pronotum, the sides feebly, arcuately rounded from the humeral angles to apical third, then strongly, arcuately narrowed to the apex; surface slightly more sparsely punctured than the pronotum, the punctures separated from each other by from one to two times their own diameters.

Abdomen beneath deeply, coarsely punctate, the punctures separated from each other by from one to two times their own diameters; suture between the first and second segments nearly straight, the other sutures strongly arcuate; first, second, third, and fifth segments nearly equal in width, the fourth segment about one-half as wide as the third.

Length, 2 mm.; width, 1.2 mm.

Type locality.—Hamburg Farm, Costa Rica.

Type.—Cat. No. 40123, United States National Museum.

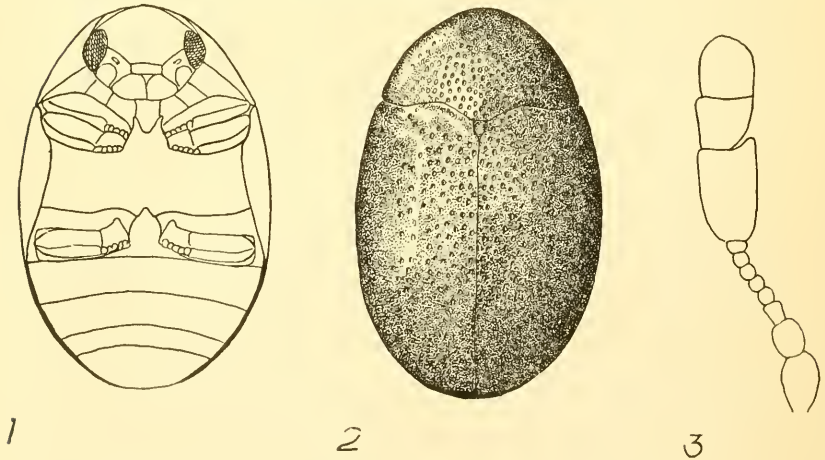


Fig. 1.—Ventral view of adult Fig 2.—Dorsal view of adult. Fig. 3.—Antenna.

This beautiful little species is described from a single specimen, probably a female, collected at Hamburg Farm, which is situated on the Raventazon River, about midway between Siquires and the coast, in Costa Rica, in a termite nest on August 27, 1925, by Ferd. Nevermann.

The drawings have been made by Miss E. T. Armstrong.

THE LARVA OF NEVERMANNIA DORCATOMOIDES FISHER WITH
COMMENTS ON THE CLASSIFICATION OF THE ANOBIIDAE
ACCORDING TO THEIR LARVAE (COLEOPTERA:
ANOBIIDAE).

BY ADAM G. BÖVING, *U. S. Bureau of Entomology.*

INTRODUCTORY REMARKS.

The material from which the following description of the mature larva of *Nevermannia dorcatomoides* Fisher is made was collected together with a single imago from the nest of a termite [not determined] by Mr. Ferd. Nevermann, Hamburg Farm, Costa Rica, August 27, 1925. It consisted of three specimens preserved in alcohol and was sent by Mr. Nevermann to Dr. T. E. Snyder, Bureau of Entomology, as a gift. Mr. W. S. Fisher, Bureau of Entomology, examined the imago, found that it represents a new genus and species of Anobiidae and has described and named this genus and species in the preceding article (p. 50).

The larvae have been associated with the imago found together with them in the same termite's nest, for the reason that no other imagines or larvae of Anobiidae were found in the nest, that the larvae represent a new generic type as does the imago, that they are mature, ready to pupate and therefore probably belong to the same generation as the imago, and because they correspond to the imago in size. However, the association of the larvae with the imago has not been definitely proved by rearing.

Of the three given specimens of the larvae, one specimen is kept in alcohol and from this the habitus figure is made; two specimens were dissected and the parts placed in Canada balsam on six permanent slides, now incorporated in the slides collection of the National Museum.

DESCRIPTION OF MATURE LARVA.

(Plate 3.)

(U. S. Nat. Mus., one vial with one specimen marked: "In termite's nest. Hamburg Farm, Costa Rica, Aug. 27, 1925—Nevermann coll. et. ded.—Type specimen.")

General aspect.

The larva (Fig. 7) is about 6 mm. long, subcylindrical, rather elongate and longitudinally curved, with the transversely strongly arched terga much larger than the more flattened pleurae and sternal parts. The head is protracted, almost globular, slightly longer than wide. The thorax is nearly twice as high as the head and a little higher than most of the abdominal segments; the legs have the length and development normal for Anobiid-larvae and are not much larger than the maxillae. Prothorax has no transverse tergal pleads,

mesothorax and metathorax each two tergal pleads representing prescutum and scuto-scutellum with prescutum much longer in the sagittal middle line than scuto-scutellum, the first to eighth abdominal segments each a prescutum and a scuto-scutellum but with both of the pleads large and of equal length in the sagittal middle line, those of the seventh and the eighth segments somewhat longer and flatter than the rest; ninth abdominal segment is small, subconical, about as long as one of the prescutal areas of the middle abdominal segments, indistinctly pleaded and laterally on each side provided with a round cushion-like epipleural lobe; tenth abdominal segment (Fig. 11) is flat, ventrally covering the greater part of the ninth segment. In front of the transverse and small anal opening is a large anal lobe, on the inside supported by an oval chitinous frame and on the outside bipartite by a longitudinal median furrow extending forward from the anal opening. The intestine behind the malpighian tubes consists of an anterior wide and curled portion (γ_1 , Fig. 11) followed by a narrow, more straight posterior portion (γ_2 , Fig. 11) which opens in the anus. An epipleural area is found in all the segments except the tenth; in prothorax it is represented merely by a small triangular pre-epipleural and post-epipleural division, but in mesothorax and metathorax the median epipleural division is not entirely replaced by or fused with the tergal alar area and on the first eight abdominal segments all three epipleural divisions are well developed. The hypopleural and sternal areas are simple and no intersegmental connecting areas or "cunei" are visible.

The larva is whitish with only a few structures darkly chitinized, particularly the mandibles, the epistomal and the hypostomal margins and the tips of the claws. On each side of prothorax the alar area is marked with a somewhat P-like, slightly chitinized impression.

Well developed setae are present on the headcapsule and mouthparts; long, soft and pale whitish hairs are arranged in a transverse series on each of the two tergal pleads of the segments but are particularly densely set on the ventral areas of thorax, the tibiae of the legs, the epipleural and hypopleural lobes of the abdomen and the ninth abdominal segment.

Hook-shaped and backward directed asperities are present in a single transverse series of eight on each side of the prescutum of metathorax and the prescuta of the first six abdominal segments, and also in a single transverse series of four on each side of the prescutum of the seventh abdominal segment; none on the eighth and none on the prescutal region of the ninth, but a single series of about five hooks is found on each of the epipleural lobes of the latter segment, all pointing toward the forward facing anal segment; the two anal cushions are entirely naked.

The spiracles (Fig. 7) are small, lateral, all of the same size and present in mesothorax and the first eight abdominal segments; the pre-epipleural area in which the mesothoracic spiracle is seated is separated from the anterior margin of prothorax by a distance somewhat longer than the entire length of one of the legs.

Anatomical details.

Head capsule (Fig. 3) generally lightly chitinized, with epicranial median suture and the frontal sutures effaced; epistoma (Fig. 2) between the dorsal

articulations of the mandibles, well chitinized, band shaped, with the sagittal length about one-fifth of its entire width; cranial setae, the epistomal excluded, about a score in number, different in size; the epistomal setae (epi Fig. 2) numerous and varying in size.

Ocellus obliterated with no trace left.

Antenna (Figs. 1 and 2) attached to a large dome-shaped basal membrane (abm) extending from a circular hole in the chitin at the end of epistoma. The antenna itself reduced to a fleshy knob (j) with a large, elongate, conical tactile appendix (ta) that has substituted the lacking apical joint.¹

Clypeus (Fig. 2) transverse, about four times as wide as long; no setae.

Labium (Fig. 2) transverse, anterior margin slightly convex, corners rounded, medianly about as long as clypeus and approximately as wide as long; setae long; arranged in a transverse series with six present on each side. Posterior labial horns (h) and hind margin of labrum between the horns covered above by clypeus and below by epipharynx; horns comparatively short, slightly S-shaped, strongly converging, forming an imaginary angle of about 120°; hind margin with posterior convexity.

Epipharynx (Fig. 1) on each side with (1) four stout, short, spindle-shaped setae arranged in an oblique inwardly and posteriorly directed series extending from the anterior margin to about the middle of epipharynx, (2) a group of about six moderately long setae occupying the antero-lateral corner of epipharynx, (3) a group of about ten, mostly long and thin setae in the interspace between the two converging series of short, stout setae.

Mandible (Figs. 5 and 6) strong with broad basis and heavy articulations, viewed from the top trilateral with excavated inner side; dorsal edge of inner side (Fig. 6) carrying one tooth closely behind the apex and a tuft of hairs near the basis of the mandible, ventral edge of inner side (Fig. 5) carrying a large round process closely behind apex. No molar part. About six setae placed dorso-externally.

Maxilla (Figs. 4 and 8) with well-developed cardo and stipes; cardo naked, stipes carrying half a dozen setae. Maxillary mala (ma) large, on dorsal side toward the buccal cavity entire, on ventral side divided by a styliform chitinous prolongation from stipes (sty Fig. 4) into two lobules of different size, inner lobule (i) being only about one-third as large as outer lobule (o); dorsally (Fig. 8), along the anterior and the free lateral edges, mala armed with a single

¹In Kemner's paper in Swedish, quoted in the bibliography, is found on pp. 8-10 a very instructive discussion with four figures illustrating the gradual reduction of the apical antennal joint in the larvae of the Anobiidae. He shows that in *Ptilinus* and *Dendrobium pertinax* a well-developed apical joint is present besides a large tactile appendix on top of a large basal joint; the apical joint is still seen in *Xestobium* but much reduced, and a large tactile appendix occupies the usual place of the apical joint; in *Anobium striatum* the apical joint is represented merely by a ring-shaped spot with one well-developed club-shaped and two minute setae, and the large tactile appendix has the character of an apical joint as in *Xestobium*. In *Nevermannia* every trace of an apical joint has disappeared and not even a well-developed club-shaped seta is found.

series of about half a dozen strong, spindle-shaped, spine-like setae; ventrally (Fig. 4) along the entire free edge, inner lobule armed with a single series of half a score of short, rather thin, stiff setae, all alike, and ventially (Fig. 4), irregularly distributed over most of the surface, outer lobule armed with about a dozen, mostly long and thin setae. Maxillary palpus three-jointed, gradually tapering forward, projecting in front of mala by about half the length of the apical joint; basal joint (1 Fig. 4) cylindrical, about as wide as long, carrying three small setae; second joint (2 Fig. 4) same form as the basal joint but only about two-thirds as large, with two small setae; apical joint (3 Fig. 4) long and slender, about twice as long and half as wide as basal joint, minute tactile papillae on the tip, no setae.

Subfacial area (sm and mt Fig. 4) large, slightly divided into a posterior submentum (sm) and anterior mentum (mt), no distinct maxillary articulating area and no gula; mentum armed anteriorly on each side with four small setae, submentum naked.

Labium (Fig. 4) rather large. Eulabium (eu) posteriorly rounded, limited by a narrow postlabial chitinization (ch) of a shape intermediate between capital letters U and V; half a dozen setae irregularly placed anteriorly on each side. Labial palpus two-jointed, about as long and of the same general shape as the two terminal joints of the maxillary palpus; apical joint with one large (ap) and many minute tactile papillae on the tip. Ligula (li) well developed, subconical, with about four setae on each side.

Hypopharynx (Fig. 8) fleshy, minutely papillose, consisting of (1) a posterior and central portion, the hypopharynx proper (hyp), without any setae and (2) an anterior portion, glossa (gl), with a minute setula on each side.

Leg (Fig. 6) four-jointed, trochanter lacking or fused with femur. Coxa (co) large, bulgy, soft skinned, having an obliquely placed, narrow chitinous frame facing toward femur and dorsally articulating with a process from a small hypopleural chitinization (hc). Femur (fe) retractile into the framed part of coxa, as long as the frame and armed with about five long setae. Tibia (ti) as long as femur and half as thick, beset with numerous long setae. Claw (ta) long, strong, pointed, slightly S-carved, heavily chitinized at the end and carrying a single seta.

Spiracle (Fig. 10) with a smooth open ring-shaped mouthpiece (o) which has a minute thickening (s) located where an open spout-like prolongation occurs in the larvae of other Anobiid genera. Closing apparatus (cla) short-armed and separated from the mouthpiece by an atrium (atr) shaped like a dilated portion of a trachea and provided with many spinulose taenidia (t).

COMMENTS ON THE CLASSIFICATION OF THE ANOBIIDAE.

The difficulties often met with in the attempts of determining the nearest relatives of a new larval type and of placing it accordingly are well illustrated by the experiences encountered in the efforts to decide on the taxonomic position of the present larva of the new genus *Nevermannia*.

The classification of the larvae of the Anobiidae has not been dealt with in modern taxonomic literature in a comprehensive

way, except to some extent in the very important contributions of the Swedish entomologist, N. A. Kemner (1915 and 1916), and the Finnish entomologist, Uuno Saalas (1923). But these papers deal only with the larvae of Swedish and Finnish species representing comparatively few genera, namely, *Ernobius*, *Anobium*, *Dendrobium*, *Xestobium*, *Dorcatoma* and *Ptilinus*, and even if it is true that both authors with keen foresight have emphasized characters which have proven to be of fundamental importance for the separating of other Anobiid genera and even of a tribe (*Ptilinini*), yet the aim of their descriptions and keys is primarily the specific determination of their larvae. Consequently most of the characters considered seem to be of subordinate value for the general separation of the Anobiid genera and especially for their arrangement into larger groups of tribal rank.

As far as non-described but well determined larval material concerns available for comparison, the National Museum possesses a useful collection of larvae representing most of the European and American genera. But much preliminary work had to be done, such as the preparation of slides exhibiting various kinds of anatomical details and the making of notes and drawings recording these, before the relationship between the genera represented could be considered.

This, however, has been accomplished and as a result the following brief characterizations have been written of what are considered as the main divisions or "tribes," and a key has been constructed for the determination of the genera examined. In the key the supposed relationship between the genera is expressed by the sequence in which they are given.

A perusal of these tribal characterizations and the generic key will show that the larva of the genus *Nevermannia* distinctly belongs in the tribe here named as Anobiini, and in this tribe probably will have to be placed nearest to the genus *Sitodrepa*. It differs, however, from the latter genus in several characters, one of which is the presence in *Nevermannia*, but not in *Sitodrepa*, of a round tubercle ventrally at the basis of the apical tooth of the mandible. The development of this tubercle is unusual among the Anobiini, but occurs also in the three genera *Trypopyty*, *Priobium* and *Coelostethus*.

In the complex of families connected with the *Anobiidae*, namely, the *Ptinidae*, *Bostrichidae*, *Psoidae* and *Lyctidae* the *Anobiidae* and the *Ptinidae* are most closely related. Jointly they are characterized by having the head subglobular and protracted from the thorax, the mouthparts directed downward, no more than one ocellus developed on each side, antenna very short, one- or two-jointed with a large tactile appendix from the basal joint, the mandible simple and apically pointed, never provided with a dorsal pseudo-molar process and a fleshy pros-

theca as found in the *Psoidae* or with a rounded, gouge-like apex; the abdominal segments are not divided dorsally into three large transverse folds as in the *Bostrichidae*; a small indistinct median tergal fold may sometimes be seen but usually there are only two transverse folds; the last abdominal spiracle is not larger and longer than the rest, as is the case in the *Lytidae*, but all abdominal spiracles are of the same size and often provided with a remarkable, open, spout-like prolongation from the peritreme. The main character by which the *Anobiidae* and *Ptinidae* are separated, is found in the position of the thoracic spiracle which in the *Anobiidae* is located a considerable distance from the anterior margin of prothorax, but in the *Ptinidae* on the anterior margin.

The larvae representing the genera of the *Anobiidae* belong to several distinctly different types, some of which are more deviating from the great bulk of the *Anobiid* genera than the *Ptinidae*. Probably a separation of the *Anobiidae* into at least three new families would be logical or, mutatis mutandis, the *Ptinidae* should be incorporated as a mere tribe in a family *Anobiidae*, sensu lato. The main divisions, here regarded and named as tribes, into which the *Anobiidae* genera have been arranged according to their larvae, are: *Hedobiini*, *Ptilineurini*, *Xestobiini*, *Lasiodermini*, *Anobiini*, *Vrilettini*, *Xyletinini*, *Coenocarini* and *Ptilinini*. These tribes can briefly be characterized as follows:

Tribes.

(1) *Hedobiini*: Epipharynx densely covered with long hairs and lacking any median or paramedian chitinous marks. Maxillary mala simple. (Including the genus *Hedobia*.)

(2) *Ptilineurini*: Epipharynx as in the *Hedobiini*. Maxillary mala bilobed, inner lobule much smaller than outer lobule. Underside of tibia of anterior legs densely beset with short stout spines. Spiracles large, ring-shaped and without spout-like prolongations. (Including the genus *Ptilineurus*.)

(3) *Xestobiini*: Epipharynx with two posteriorly converging short series of about five strong spine-like setae; no median or paramedian chitinous marks. Maxillary mala bilobed, inner lobule much smaller than outer lobule and carrying only a single, strong terminal spine. (Including the genera *Xestobium* and *Ozognathus*.)

(4) *Lasiodermini*: Epipharynx as in *Xestobiini*. Maxillary mala bilobed; inner lobule much smaller than outer lobule and carrying more than one seta. Claws short and strongly curved, empodium present. (Including the genera *Lasioderma* and *Petalium*.)

(5) *Anobiini*: Epipharynx as in *Xestobiini* and *Lasiodermini*. Maxillary mala as in *Lasiodermini*. No empodium. (Including the genera *Catorama*, *Protheca*(?), *Anobium*, *Hadrobregmus*, *Microbregma*(?), *Trypopytus*, *Coelosthus*, *Dendrobium*, *Priobium*, *Sitodrepa* and *Nevermannia*.)

(6) *Vrilettini*: Epipharynx with a pair of elongate groups of about twenty

or more hairs or short spines and near the anterior margin with a pair of paramedian chitinous marks. Maxillary mala bilobed, inner lobule much smaller than outer lobule. (Including the genus *Vriletta*.)

(7) *Xyletinini*: Epipharynx as in *Vriletini*. Maxillary mala bilobed; inner lobule as large or larger than outer lobule. (Including the genera *Ernobius*, *Xyletinus*, *Oligomerus*, *Nicobium* and *Trichodesma*.)

(8) *Caenocarini*: Epipharynx with a pair of elongate groups of more than twenty short spines and antero-medially with a single, spinose mark. Maxillary inner lobule at least as large as outer lobule. Mandible with a low and long molar part. (Including the genera *Eutylistes*, *Dorcatoma* and *Caenocara*.)

(9) *Ptilinini*: Epipharynx with a pair of short series of about four long setae and postero-medially with a single large, round, chitinous mark. Maxillary mala simple. Labium posteriorly limited by a post-labial chitinization as long as wide, posteriorly pointed and reversely arrow-shaped. (Including the genus *Ptilinus*.)

The genera distributed in the tribes above are determined by the following key:

Genera.

1. Labium posteriorly more or less rounded; post labial chitinization narrow and U-shaped or lacking.....2.
- Labium posteriorly pointed; postlabial chitinization reversely arrow-shaped, as long as wide.....23.
2. Maxillary mala simple; epipharynx densely covered with long hairs and lacking a single median or a pair of paramedian chitinous marks....*Hedobia*.
Maxillary mala divided into two lobules; armature of epipharynx diverse.....3.
3. Underside of tibia of first leg densely beset with short spines; epipharynx as in *Hedobia*.....*Ptilineurus*.
Underside of tibia of first leg not densely spinose; epipharynx not as in *Hedobia*.....4.
4. Epipharynx with a pair of posteriorly converging series of about five stout, short, often hooked setae, antero-medially with or without a tuft of hairs but always without chitinous marks. Maxillary inner lobule always smaller than outer lobule.....5.
- Epipharynx with a pair of elongate groups of about twenty or more hairs or short spines, anteriorly with a single median or a pair of paramedian chitinous marks. Maxillary inner lobule usually of the same size as outer lobule.....15.
5. Inner lobule of maxillary mala carrying a single spine-like seta.....6.
Inner lobule carrying more than a single seta.....7.
6. Anterior tergal fold of most of the abdominal segments armed with numerous, short, hook-shaped asperities.....*Xestobium*.
Anterior tergal fold of abdominal segments carrying long, soft hair, but no asperities.....*Ozognathus*.
7. Empodium present; claw short and strongly curved. Anterior tergal fold of abdominal segments with many long hairs and without or with a few additional granuliform asperities; inner margin of mandible compressed and semicircular.....*Lasioderma* and *Petalium*.

- Empodium absent. Claw often long and straight; anterior tergal fold of most abdominal segments with numerous dark granuliform asperities and without or with a few additional hairs..... 8.
8. Tergal asperities arranged in transverse patches with about three to five or more asperities in the sagittal middle line of most of the abdominal segments..... 9.
- Tergal asperities in a distinctly single or in one to two irregular transverse series..... 14.
9. Spiracles large, the thoracic being two to three times as long as the claw, or of moderate size but then with a lateral open spout-like prolongation as long as or longer than the spiracle. Claw short, about as long as width of tibia..... 10.
- Spiracles of moderate size, about as long as claw or shorter, spout-like prolongation only indicated or entirely lacking..... 11.
10. Spiracles large, without distinct spout; mandible with one (*Catorama*) or two (*Protheca*) lateral teeth on dorsal edge of inner face; tergal asperities strong and hook-shaped..... *Catorama* and probably *Protheca* (of which only a cast skin is available).
- Spiracles of moderate size but with long spout; mandible with three lateral teeth on dorsal edge of inner face..... *Anobium*.
11. Prothorax large, on each side bearing a rod-like slightly curved chitinized impression; tergal asperities arranged in several series; mandible with three (*Hadrobregmus*) or two (*Microbregma*) lateral teeth but without a round projection at basis of apical tooth..... *Hadrobregmus* and possibly *Microbregma* (of which only a cast skin is available).
- Prothorax without chitinous rod-like impression; mandible with a round projection ventrally at basis of the apical tooth; two to three lateral teeth..... 12.
12. Tergal asperities arranged in about four irregular transverse series on the first five abdominal segments..... *Trypopytis*.
- Tergal asperities in transverse patches with three asperities along the sagittal middle line on the first six abdominal segments..... 13.
13. Tergal patches broad band-like, with asperities in about three transverse series laterally. Tibia about three to four times as long as claw..... *Coelostethus* (= *Dendrobium*).
- Tergal patches rapidly attenuating, with asperities in one or two transverse series laterally. Tibia about twice as long as claw..... *Priobium*.
14. Mandible with two lateral teeth on dorsal inner edge, apical tooth without tubercle ventrally at basis; epipharynx with three serial setae on each side; maxillary inner lobule with three long, thick apical spines; first eight abdominal segments with one to two transverse series of dorsal asperities..... *Sitodrepa*.
- Mandible with one lateral tooth on dorsal inner edge, apical tooth with a large round tubercle ventrally at basis; epipharynx with four serial setae on each side; maxillary inner lobule with a single series of about ten setae along the entire inner margin; first seven abdominal segments with a distinctly single transverse series of dorsal asperities..... *Nevermannia*.
15. Maxillary inner lobule smaller than outer lobule. Epipharynx near an-

- terior margin with a pair of paramedian chitinous marks; mandible laterally on inner side straight and shaped like the edge of an ax; tergal asperities arranged in about three irregular transverse rows.....
Vrilella.
- Maxillary inner lobe as large or larger than outer lobe.....16.
16. Epipharynx anteriorly with a pair of paramedian chitinous marks; spiracles with a short spout; mandible without molar part.....17.
- Epipharynx anteriorly with a single median, spinose mark; spiracles varying in type; mandible with a low, long molar part.....21.
17. Labrum about twice as broad as long; with posterior horns styliform and slender and hind margin straight; mandible with one tooth on ventral inner edge immediately behind apical tooth.....*Ernobius*.
- Labrum about as wide as long, with posterior horns irregularly shaped, often shoe-like.....18.
18. Hind margin of labrum straight; tergal asperities in about two transverse rows.....19.
- Hind margin of labrum curved, inverted U-shaped; tergal asperities in about four transverse series.....20.
19. Posterior horns of labrum rather long, curved and not shoe-shaped.....
Xyletinus.
- Posterior horns of labrum short, distinctly shoe-shaped.....*Oligomerus*.
20. Posterior tergal fold beset with long, soft hairs.....*Nicobium*.
- Posterior tergal fold densely beset with short, spine-like, thin hairs.....
Trichodesma.
21. Spiracles provided with a large, oval cribriform plate. Legs of normal length.....*Eutylistes*.
- Spiracles without cribriform plate.....22.
22. Legs of normal length.....*Dorcatoma*.
- Legs short and conical, not more than twice as long as wide. Mandible with a setose, transverse ridge above ventral condyle, inner edge finely serrate.....*Caenocara*.
23. Epipharynx with a large postero-median chitinous mark; labrum with comparatively few but long, strong setae; mandible with inner edge convex and strongly projecting; maxillary mala simple without inner lobule. Spiracles very large, annular, without spout.....*Ptilinus*.

The larvae on which the above given tribal characterizations and generic key are based are present in the U. S. National Museum, and the material is partly preserved in alcohol, partly placed on permanent slides. The species examined are the following: *Hedobia imperialis* Linnaeus; *Ptilineurus marmoratus* Reitter; *Xestobium rufo-villosum* Degeer; *Ozognathus cornutus* (Le Conte); *Lasioderma serricornis* (Fabricius); *Petalium seriatum* Fall; *Catorama punctatum* (LeConte), *C. nigrifulum* (LeConte); *C. grande* Fall, *C. tabaci* Guérin, *C. herbarium* Gorham (St. Salvador), *C. grave* (LeConte); *Protheca hispida* LeConte; *Anobium striatum* Olivier; *Hadrobregmus carinatus* (Say), *H.*

umbrosus Fall; *Microbregma emarginatum* (Duftschmid); *Trypopytys sericeus* (Say); *Priobium eichhoffi* Seidlitz; *Coelostethus notatus* (Say); *Dendrobium pertinax* Linnaeus; *Sitodrepa panicea* (Linnaeus); *Nevermannia dorcatomoides* Fisher; *Vriletta expansa* LeConte; *Ernobius punctulatus* (LeConte), *E. pallitarsis* Fall, *E. granulatus* LeConte, *E. abietinus* Gyllenhal, *E. mollis* Linnaeus; *Xyletinus fucatus* LeConte; *Oligomerus sericans* (Melsheimer); *Nicobium castaneum* Olivier; *Trichodesma klagesi* Fall; *Eutylistus facilis* Fall; *Dorcatoma dresdensis* Herbst, *D. setulosum* LeConte; *Caenocara oculata* (Say); *Ptilinus ruficornis* Say, *P. basalis* LeConte, *P. pectinicornis* Linnaeus, *P. fuscus* Geoffroy.

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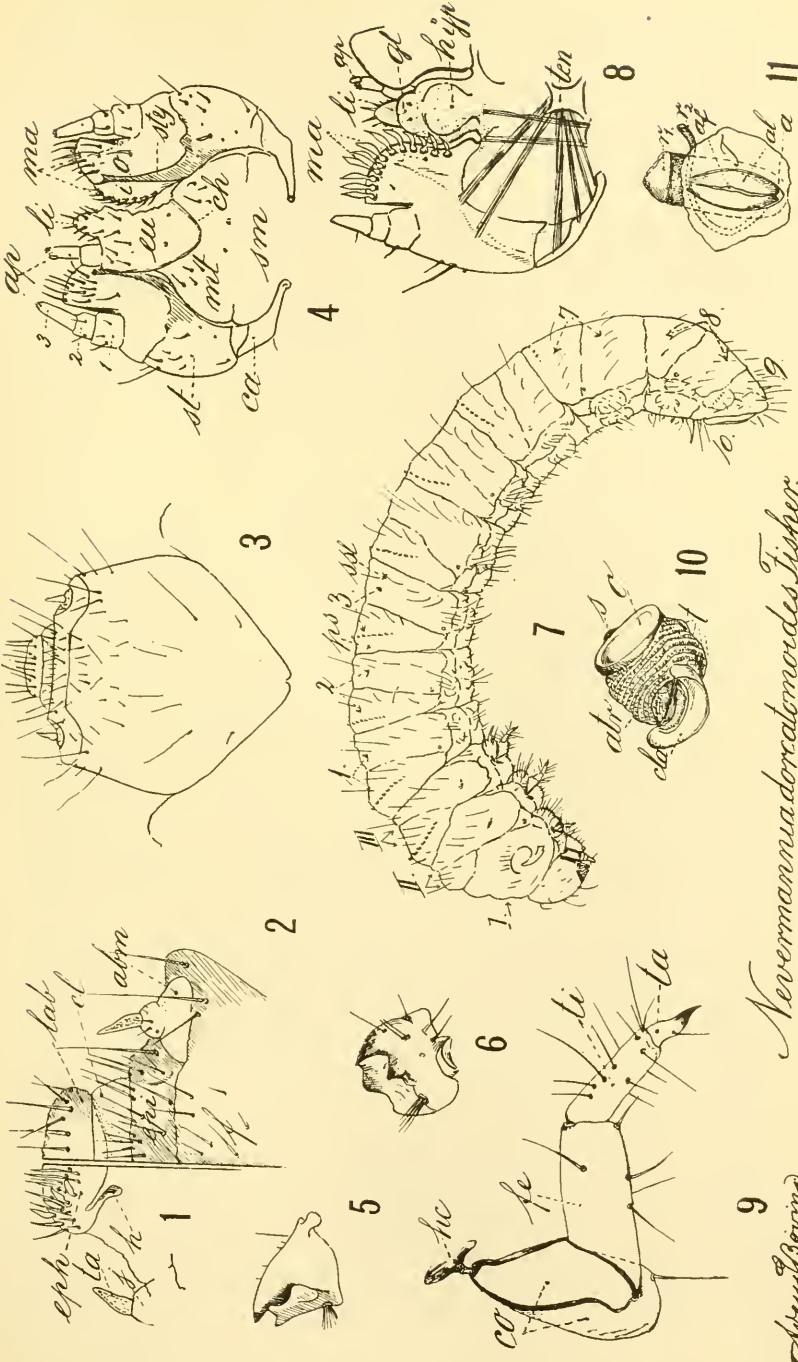
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1923. Die Fichtenkäfer Finnlands. II Spezieller Teil 2 und Larvenbestimmungstabelle; Annales academiae scientiarum Fennicae. Ser. A. Tom. XXII. No. 1. Helsinki 1923. (Characterizations of Anobiid-larvae, key to the following species: *Ernobius explanatus* Mann, *Ernobius abietis* Fabr., *Anobium* (*Dendrobium*) *pertinax* Lin., *Anobium thomsoni* Kraatz, *Anobium rufipes* Fabr., *Anobium striatum* Oliv., *Anobium emarginatum* Duft., *Dorcatoma dresdensis* Herbst; on pp. 189-230 and 723-726 a complete list of literature.)

TRAGARDH, JVAR.

1924. Trägnagare-Studier. Meddelandan från Statens Skogsförsöksan-

¹The paper by J. W. Munro was unknown to me until my article was in proof.—A. G. B.



Nevermannia doradomoides Fisher.

Abner Borning
del.

stalt. Hafte 21. Nr. 8. (Biology of six Swedish species of genus *Ernobia*; list of literature.)

EXPLANATION OF PLATE.

(Drawings by the author.)

1. Epipharynx and antenna: eph, epipharynx; h, epipharyngeal horn; j, the only antennal joint; ta, tactile appendix.
2. Labrum, clypeus, epistoma and antenna: abm, basal membrane of antenna; cl, clypeus; epi, epistoma; f, frons; lab, labrum.
3. Head capsule: dorsal view.
4. Ventral mouthparts, ventral view: ap, apical papilla of labial palpus; ca, cardo; ch, postlabial chitinization; eu, eulabium; i, inner lobule of maxillary mala, li, ligula; ma, maxillary mala; mt, mentum; o, outer lobule of maxillary mala; sm, submentum; st, stipes maxillaris; sty, stylus maxillaris; 1, 2, 3, the three joints of maxillary palpus.
5. Left mandible, ventral view.
6. Right mandible, dorsal view.
7. Larva, habitus from the side: ps, pre-scutum; ssl, scuto-scutellum; I-III, thoracic segments; 1-10, abdominal segments.
8. Ventral mouthparts, buccal view: ap, apical papilla of labial palpus; gl, glossa; hyp, hypopharynx; li, ligula; ma, mala; ten, tentorium.
9. Mesothoracic left leg: co, coxa; fe, femur; hc, hypopleural chitinization; ta, claw; ti, tibia.
10. Abdominal spiracle: atr, atrium; cla, closing apparatus with two short arms; o, mouthpiece of spiracle; s, thickening of frame; t, taenidium.
11. Tenth abdominal segment: a, anal opening; af, median fold extending forward from anal opening; al, lobe in front of anus; r¹, anterior wide portion of rectum; r², posterior narrow portion of rectum ending with anus; T, tenth abdominal segment.

Jan. 3, 1927.

A. G. B.

AN ANIMAL CENSUS OF TWO PASTURES AND A MEADOW IN
NORTHERN NEW YORK.¹

BY GEORGE N. WOLCOTT.

A census of the insects and other small invertebrates from one hundred square feet of grassland on Merrimac fine sandy loam, near Barneveld, New York, was made between April and October, 1919, by collecting all those found in one square foot each day. A strong pail, thirteen and one-quarter inches in diameter (which covers an area of one square foot), with handle attached to the bottom and a hole with screw cover in the center of the bottom, but with a sharp cutting edge around the top, was the only special apparatus used. Armed with this pail, a large knife, forceps, hand-lens, ether, cyanide jar and newspapers, one was ready to begin operations. The pail was

¹(Summary of a thesis presented in partial fulfillment of the requirements for a doctorate degree granted in June, 1925, by Cornell University.)

placed swiftly over the selected area with the weight of the investigator on top, to force the cutting edges of the pail through the vegetation and into the soil. The knife was used for cutting around the outside of the pail so that it would sink deeper into the soil, to a depth of three or four inches. Ether was then introduced through the hole in the bottom—now uppermost—of the inverted pail during the temporary removal of the screw cover. The vegetation for several inches around the pail was cleared away, so as to clearly mark the area when the pail was removed, the pail taken up, and all the animals that it had covered were collected to a depth of a foot in the soil.

A total of 6,843 invertebrates were collected from the hundred square feet. Of the more important scavenger invertebrates, there were 111 earthworms, 125 snails or slugs, nearly half of which were *Vallonia excentrica* Sterki, 123 sowbugs, *Porcellio rathkei* Brandt., and 623 millipedes, 612 of which were *Julus caeruleocinctus* Wood. 470 spiders, half of them very small Erigonids, and 94 *Pirata minutus*, but including quite a number of larger species, and 174 mites, most of them *Allorhombium* spp., or Gamasid nymphs, and often attached to the host insect, were collected.

The 93 springtails, *Tomocerus flavescens* Tullberg, which feed on decaying organic matter and fungi, were as insignificant in size as the 74 thrips, *Heliothrips graminis* Hood, that were found on daisy flowers. But the 69 grasshoppers, of nine species, and the 127 crickets, *Gryllus assimilis* Fabr., and *Nemobius vittatus* Harris, formed a fifth, by weight, of all the insects. Of the 121 Hemiptera, nearly half were *Geocoris uliginosus limbatus* Stal, a small insect of uncertain habits, but reputed to be predaceous. Over half of the 61 froghoppers were *Philaenus spumarius* Linn., notable because it was the only general pest of weeds noted. 1027 leafhoppers (or 447,371 per acre) were collected, of fourteen species. Of these, nearly half were *Acucephalus striatus* Linn., one-sixth *Acucephalus albifrons* Linn., and a tenth each *Xestocephalus pulicarius* Van D., and *Agallia 4-punctata* Provancher. But despite the numerical abundance of the leafhoppers, they formed, even where most abundant, only a twelfth by weight of all insects, and only a fortieth in the pasture with the scantiest vegetation. About half of the 124 aphids were aerial in habit; most of the subterranean ones were attended by a single species of ant, *Lasius aphidicola* Walsh.

66 Noctuid larvae, in numbers formed two-fifths of all the Lepidoptera collected, and by bulk a much larger part. It is estimated that the most abundant species, *Feltia venerabilis* Walker, devoured nearly half of all the white clover eaten by all the insects specifically feeding on this plant.

The 22 Threviid larvae and the 15 maggots of the crane-fly, *Pachyrhina ferruginea* Fabr., occurring most often in the soil

of the pastures, and the 42 larvae of the clover-seed midge, *Dasyneura leguminicola* Lintner, were possibly the most important of the 222 Diptera collected.

17 species of Carabid beetles and over 22 species of Staphylinids were found in the grassland, besides 83 Elaterid larvae or adults, mostly *Melanotus* sp., and 25 Cantharids, mostly larvae of *Telephorus bilineatus* Say. Only one-twenty-fourth of the 623 beetles (excepting the Curculionidae) collected are definitely known to be harmful to the grass or clover, the others being beneficial or neutral, or in the case of the wireworms, dependent on attending circumstances as to their status. However, the 25 members of the Coleopterous genus *Lachnosterna*, which numerically were such a small fraction, by weight constitute half of the beetle population. Of the beneficial beetles, 177 were of a small black Chrysomelid, *Phaedon aeruginosus* Suffrian, which here fed on *Veronica*, a pretty little pasture weed.

Of the 515 Curculionidae, or weevils, most were species with subterranean larvae, and included many specimens of *Sitona hispidulus* Fabr., and *Sitona flavescens* Marsham, the adults of which feed on clover. There were 53 individuals of the larger clover-leaf beetle, *Hypera punctata* Fabr., besides 23 *Phytonomus* spp., and 19 specimens of *Tychius picirostris* Fabr., which also, both as larva and adult, feeds on clover. In one of the pastures the white clover eaten by these Curculionids and the clover cutworms amounted to a third as much as the cows ate, and if to this is added what other insects with less specialized feeding habits may have eaten, it totals half of what the cows ate. In the other pasture, where there were fewer cows, and more grasshoppers and crickets, it is estimated that the insects ate as much of the available clover as the cows did.

7 *Ophion bilineatus* Say, a parasite of the Noctuid cutworms, and 1 *Tiphia transversa* Say, were the largest of the 40 Hymenoptera, exclusive of the ants. In point of numbers, 1,782 for the hundred square feet, the ants exceeded any other form of animal life. The common ants were *Brachymyrmex depilis* Emery, *Myrmica emeryana* Forel and *Lasius americanus* Emery, and being either largely or entirely scavengers, their occurrence in such large numbers was possible only because of their small size.

The robin, *Merula migratoria* Linn., was twice as abundant in these grasslands as all the other birds combined. A comparison of what it ate forty years ago in Illinois, as determined by Prof. S. A. Forbes, and what was available for the insect portion of its food in the meadow-pasture area in New York, shows in the general outline, a most striking similarity. It indicates that the robin eats every insect of reasonable size that is present in the closely grazed pastures that are its preferred

hunting grounds. The exceptions were the Carabid and Histerid beetles, of which it ate vastly more, and the Elaterids, of which it ate many less, in proportion to the other insects present at Barneveld.

To determine how much of the economic grasses and clovers the larger or more abundant phytophagous insects noted in the pastures were eating, it became necessary to conduct feeding experiments, the results of which have previously been published. Expressing these data in terms of the weight of the insects themselves made possible direct comparisons with what the cows were obtaining from the pastures. Surprisingly enough, it was found that where there were few cows in the pasture, the insects ate more of the grasses and clovers than the cows did. Indeed, the cows obtained a larger share of the pasturage only when they kept the pasture so short that it afforded scanty protection for the crickets, grasshoppers and leafhoppers, and was more attractive to the robins, who foraged there in greater numbers and further reduced the number of insects.

The pastures examined were not exceptional or abnormal, but a fair average of those present for miles around, yet the grasses and clovers constituted only a third of the total vegetation, the other two-thirds being weeds, over half of which the cows would not eat. The insects feeding on the weeds constituted only a third as many as those feeding on the grasses and clovers, and most of them were insignificant in size.

The insects specifically feeding on the distinctive meadow plants of economic value, the orchard grass and red clover, which did not grow in the pastures, were so scarce it seems fair to assume that lack of soil fertility was apparently the limiting factor preventing their crowding out the weeds. The single mowing of the meadow removed only a small portion of the plant tissue produced, and here the plant scavengers, the millipedes, sowbugs, snails and slugs, flourished in greatest abundance.

The results obtained are somewhat tentative and preliminary to serve as a basis for outlining any specific measure for improving the ordinary agricultural practices in the handling of pastures and meadows, but when the amount and seriousness of losses to the farmer can be clearly demonstrated, the problem of the elimination of such losses can be more intelligently attacked and a solution discovered.

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**TWO EUROPEAN SAWFLIES OF THE GENUS EMPHYTINA
FOUND IN THE UNITED STATES (HYM.).**

By S. A. ROHWER, *Bureau of Entomology, Washington, D. C.*

A study of specimens of certain sawflies of the genus *Emphytina* establishes the fact that at least two species of this genus occur in both Europe and North America. The names assigned to these two forms are different in the two countries and the following notes on synonymy indicate the names which should be suppressed.

Both of the species discussed in this note are associated with cultivated plants. *Emphytina tener* pupates in the end of pruned twigs of apple and other plants and *E. pallipes* feed in the larval stage on the leaves of violet.

Emphytina tener (Fallén).

Tenthredo tener FALLÉN, Svensk. Vet-Akad. Handl., vol. 29, 1808, p. 109, n. 44.

Allantus (Emphytina) tener FALLÉN, ENSLIN, Deutsch. Ent. Zeit., 1914, Beiheft, p. 238.

Simplemphytus pacificus MACGILLIVRAY, Can. Ent., vol. 46, 1914, p. 363.

Emphytina vanduzeei ROHWER, Proc. U. S. Nat. Mus., vol. 49, 1915, p. 205.

The above synonymy is based on a study of European specimens determined as *tener* Fallén by Konow and Enslin, on specimens of *pacificus* MacGillivray from the type-locality, and on the type of *vanduzeei* Rohwer. In connection with this study specimens from the following localities have also been examined: New Haven, Connecticut, May 29, 1916, B. H. Walden; Hartford, Connecticut, May 9, 1916, I. N. Gabrielson; Lynn, Massachusetts, May 27, 1920; Lexington, Massachusetts, July 27, 1919; Linglestown, Pennsylvania, June 14, 1920, J. N. Knull; Columbus, Ohio, April 9, 1920, A. E. Miller; Madison, Wisconsin, specimens obtained from Manetti Rose stock from Europe, April 10, 1923; Seattle, Washington, August 25, 1923, C. V. Piper, "dead on bean leaves."

Emphytina pallipes (Spinola).

Tenthredo pallipes SPINOLA, Insect. Ligur. vol. 2, 1808, p. 19.

Emphytus pallidipes (Spinola) DALLA TORRE, Cat. Hymen., vol. 1, 1894, p. 119.

Emphytus grossulariae (Klug), KONOW, Genera Insectorum, fasc. 29, 1905, p. 106.

Allantus (Emphytina) pallipes (Spinola) ENSLIN, Die Tenthredinoidea Mitteleuropas, Deutsch. Entom. Zeit. 1914, Beiheft, p. 238.

Emphytus pallipes PROVANCHER, Nat. Can., vol. 10, 1878, p. 66; Fauna entom. Canada, Hymen., 1883, p. 192—CRESSON, Trans. Amer. Ent. Soc., vol. 8, 1880, p. 38.—KONOW, Genera Insectorum, fas. 29, 1905, p. 106. (not Spinola).

Emphytus canadensis KIRBY, List Hymen. Brit. Mus., vol. 1, 1882, p. 204 (new name for *pallipes* Provancher not Spinola).—CRESSON, Synop. Hymen.

Amer., Trans. Amer. Ent. Soc., 1887, p. 160.—DALLA TORRE, Cat. Hymen., vol. 1, 1894, p. 114.—CHITTENDEN, Bull. 27, n. s. Bur. Ent. U. S. Dept. Agric., 1901, pp. 26-35, figs. 7 and 8.

Ametastegia (Emphytina) canadensis (Kirby) ROHWER, Proc. U. S. Nat. Mus., vol. 41, 1911, p. 402, figs. 7 and 8.

Recently Dr. James Waterson of the British Museum forwarded three specimens of a species of *Emphytina* which were collected in England. In transmitting these specimens Waterson stated that the larva of this species feeds on violet and that he could find no salient differences between it and the published account of *Emphytina canadensis*. He added that the species, "runs down to *E. pallipes*, Spin., a species which for a long time, under the name *grossulariae* Kl. was supposed to be a pest of gooseberry."

These specimens are *Emphytina canadensis* (Kirby) as treated by me in 1911 and agree in saw characters with the specimens reared by Dyar from larvae feeding on the leaves of *Viola tricolor*, the saw of which is illustrated in figure 7. When I examined Provancher's type of *pallipes* in 1915 I noted that it agreed with my 1911 treatment of *canadensis* but failed to note which form of saw the type had.

A comparison of specimens of *canadensis* with specimens from Germany determined by Konow as *grossulariae* failed to reveal any differences except in the color of the legs. The specimens from Germany have the legs entirely pale except the bases of the coxae while the specimens of *canadensis* agree with the specimens from England (forwarded by Waterson) in having the apices of the hind femora, tibiae and the tarsi more or less blackish. Enslin indicates that there is some variation in the color of the legs, and since no other differences exist there is no doubt that the American and European specimens represent the same species.

The above synonymy gives the more important American references but does not include all of the European literature or synonymy as this has been given by Enslin and others.

ON THE SYNONYMY OF A LEAF MINING SAWFLY.

By S. A. ROHWER, Bureau of Entomology, Washington, D. C.

The following note synonymizing *Metallus bethunei* MacGillivray with *Metallus rubi* Forbes will be useful to students of insects injurious to blackberries.

Metallus rubi Forbes

Metallus rubi FORBES, 14th Rept. State Entom. Illinois, for 1884, 1885, p. 87, pl. 9, fig. 7.—MACGILLIVRAY, Ann. Ent. Soc. Amer., vol. 2, no. 4, 1910, pp. 268-269; Conn. Geol. Nat. Hist. Survey, Bull. 22 (1916), 1917, p. 160.—YUASA, Ill. Bio. Monographs, vol. 7, 1922, p. 99.

- Fenusa rubi* (Forbes) CRESSON, Synops Hymen. N. America, 1887, p. 160.—
DALLA TORRE, Catol. Hymen., vol. 1, 1894, p. 157.—KONOW, Gen. In-
sectorum, fasc. 29, 1905, p. 90.
- Scolioneura capitalis* (Norton) HOUGHTON (in part), Entom. News, vol. 19,
1908, pp. 212-216.
- Metallus bethunei* MACGILLIVRAY, Can. Ent., vol. 46, 1914, p. 366; Conn. Geol.
Nat. Hist. Survey, Bull. 22 (1916), 1917, p. 160.—YUASA, Ill. Biol. Mono-
graphs, vol. 7, 1922, p. 99. (The larva here described probably does not
belong to *bethunei*.)

Recently Derril M. Daniel of the New York Agricultural Experiment Station forwarded a number of specimens of sawflies belonging to the genus *Metallus* for identification. These all belong to the group which MacGillivray has divided into two species, *rubi* and *bethunei*, on differences in the foveolation of the head and the shape of the outline of the sheath. One lot of six specimens collected June 25, 1923, at Jordan, Ontario, by W. A. Ross, exhibited considerable variation in the foveolation of the head. Some specimens had the median fovea large while in others it was small. Some specimens had the postocellar and interocellar furrows as described for *bethunei* while others agreed with the description of *rubi*. There was no correlation in these differences. The shape of the outline of the sheath was also somewhat variable and these variations could not be associated with the differences in foveolation of the head. It seemed from a study of this lot of specimens that the differences between *bethunei* and *rubi* that were pointed out by MacGillivray were variable. An examination of other specimens in the collection of the National Museum supported this view. At my request Dr. T. H. Frison examined the types of *rubi* and *bethunei* and failed to find any differences other than those set forth by MacGillivray. He forwarded to the National Collection a male and female paratype of *bethunei* and these have been compared with specimens determined as *rubi* by MacGillivray. No characters by which the series of specimens can be separated into species were found and it seems fairly certain that the name *bethunei* was proposed for individual variants. *Metallus be-bethunei* MacGillivray is considered a synonym of *Metallus rubi* Forbes.

Yuasa, in studying the larvae of species belonging to the genus *Metallus*, found what appear to be fairly satisfactory differences between specimens he called *bethunei* and specimens labeled *rubi*. If the larvae studied by Yuasa were correctly associated with correctly identified adults it would seem as though the larvae have a wider range of variation than do the adults. Derrill Daniel reports (in letter dated Jan. 19, 1927) that larvae from Vineland, Ontario, associated with adults of *M. bethunei* agree with larvae from Fredonia, New York, associated with

adults of *M. rubi*; and that both lots of larvae agree with both Forbes' and Yuasa's descriptions of the larvae of *rubi* and do not agree in any particular with the characters used by Yuasa for *bethunei*. The material studied by Daniel ranged from second or third instar to fully matured specimens.

It seems fairly certain that the larva described by Yuasa as *Metallus bethunei* is based on a misidentification.

A NOTE ON THE COLEOPTEROUS GENUS *ASERICA* (MELOLONTHINAE).

BY GILBERT J. ARROW, *Assistant Keeper, Dept. of Entomology, British Museum.*

An outbreak of the Japanese beetle I described in 1913 as *Autoserica castanea* having recently occurred in the New York district, the suggestion has been made that the species might be identical with that named *Serica japonica* by Motschulsky in 1860. As the correct designation of the insect has become of special importance, the types of *S. japonica* Mots. and *S. orientalis* Mots. have been sent to me for comparison by the kindness of Mr. B. Kuzin, of the Zoological Museum, University of Moscow. The former proves to belong to a species quite distinct from *A. castanea* Arrow.

Serica japonica was named by Lewis as the type of his genus *Aserica* in 1895, but the specimens so identified by him, which are now in the British Museum collection, do not belong to the species, appearing to be that later described by Brenske as *Autoserica secreta*. Lewis referred to *Aserica*, with "a considerable number of species hitherto included in *Serica*," *Serica japonica* and *orientalis*, of Motschulsky. The insect which he referred to by the latter name is correctly identified, whereas Brenske's *S. orientalis* appears to me to be the true *S. japonica* Mots., the latter having a third tooth to the front tibia, which is absent in *S. orientalis*.

In his Revision of the Sericini, in 1897, Brenske has placed the supposed type-species of *Aserica*, *japonica*, Mots., in his genus *Autoserica*, which, being later in date by two years, should obviously not have been renamed, and proposed (p. 377) to treat *Aserica* as a subgenus of *Autoserica*, distinguished by the possession of 10-jointed antennae, but this procedure is of course not admissible. Moreover, he points out on p. 433 that the antennae in the species called *japonica* may be composed of nine or ten joints, or even both on different sides of the same insect.

Brenske has designated no type-species of *Autoserica* and it will be convenient to select his second species, *piceorufa*, Fairm., of which he had an actual type-specimen before him. Lewis

believed this species to be identical with the type-species of *Aserica*, but Brenske remarks that though closely similar they are not identical. It is probable, however, that his *japonica* is neither the *japonica* of Motschulsky nor that of Lewis. As to the propriety of sinking *Autoserica* as a synonym of *Aserica* it seems that there can be no dispute. The primary distinctive feature of the genus is found in the shortness and broadness of the hind tibia. This is very strongly marked in *A. secreta*, Brsk., *piceorufa*, Fairm., and *castanea*, Arrow, but is absent in *japonica*, Mots., which must therefore be left in the genus *Serica*.

The type-species of *Aserica*, now to be called *A. secreta*, Brsk., is larger than either *Serica japonica* or *Aserica castanea*, with which it has been confused. It is similar in colour to the former and generally darker than the latter. The clypeus is much more coarsely punctured, and tumid in the middle but without any indication of a longitudinal carina, and the front margin is more strongly elevated.

The synonymy of the species here referred to is as follows:

- ASERICA*, Lewis, Ann. Mag. Nat. Hist. (6), **16**, 1895, p. 394.
Autoserica, Brenske, Berl. Ent. Zeitschr., 1897, p. 377.
castanea, Arrow, Ann. Mag. Nat. Hist. (8), **12**, 1913, p. 398.
secreta, Brsk, op. cit., p. 431.
japonica, Lewis, nec Mots., op. cit., p. 395.
SERICA, Macl., Horae Ent., **1**, 1819, p. 146.
japonica, Mots., Etudes Ent., 1860, p. 15.
orientalis, Brsk, nec Mots., op. cit., p. 429.
orientalis, Mots., op. cit.
salebrosa, Brsk., op. cit., p. 428.
orientalis, Lewis, nec Mots., op. cit.

CICADIDAE OF THE VICINITY OF WASHINGTON, D. C.

BY W. L. McATEE.

In view of Mr. Wm. T. Davis' annotated list of the cicadas of Virginia which includes every species known from the District of Columbia region, and gives keys for their identification, the present list is made as brief as practicable. In keeping with this policy the bibliography contains only the few titles needed to supplement the references in the Davis list, and in C. L. Marlatt's very comprehensive work on the periodical cicada. It is appreciatively recorded also that practically all of the specimens upon which the present paper is based have been identified by Mr. Davis. One of the species here listed (*Melampsalta calliope*) may be of only accidental occurrence, but the fact that three others of the eleven species catalogued are known

from only one definite record each would seem to indicate that these forms may have long drawn out life histories and occur by "broods," after the manner of the periodical cicada, with the difference that only one "brood" of each may be present in this region, so that seasons when adults occur may be few and far between.

TIBICEN Latreille.

T. pruinosa var. *winnemanna* Davis.—Described from Plummers Id., Md., in the vicinity of which it is common and from which most of the specimens thus far known have been collected. It has been taken also at Great Falls, Va., and Washington, D. C. The season for adults extends from July 12 to October 10; the species has been taken in copula August 22 and September 4; rarely it is attracted to light.

T. linnei De Geer.—A rather uncommon species that has been collected from August 25 to October 10; generally distributed. P. I.

T. canicularis Hains.—Plummers Id., Md., August 29, 1905, D. H. Clemons; one specimen labelled only D. C.

T. davisii Smith and Grossbeck.—Cabin John Bridge, Md., August 23, 1914, V. Roberts.

T. chloromera Walker.—This insect is abundant apparently every year; the season during which adults have been collected has as its extreme dates, June 4 and October 17; it has been captured in copula July 27 and Sept. 6. P. I.

T. similis Smith and Grossbeck.—Arlington, Va., one specimen.

T. lycicen De Geer.—The variety *englehardti* Davis, the typical variety, and intermediate forms occur sparingly; dates of collection range from June 15 to September 15; rarely comes to light. P. I.

T. auletes Germar.—D. C. (only), August 22, 1886, T. Pergande; Cleveland Park, D. C., August 28, 1906, August 28, 1908, E. A. Preble; Anacostia, D. C., October 1, 1915, C. M. Eskridge; Hyattsville, Md., August 20, 1918 (teneral), E. Wells; Four-mile Run, Va., September 1, 1913, A. Wetmore; Viresco, Va., August 26, 1914, C. R. Shoemaker.

CICADA Linnaeus

C. hierglyphica Say.—This cicada is known locally only from the vicinity of Great Falls, where it occurs on both sides of the Potomac River. It may be heard among the pine trees it frequents much more easily than collected; dates of collected specimens range from June 24 to July 12.

MAGICICADA Davis.

M. septendecim Linnaeus.—The seeker for information of

almost any sort about this species should consult Marlatt's extensive work, from which we learn that six distinct broods of the 17-year race are known from our region. The interesting life-history of this species, its song and other features are fully treated in the same publication, supplemented by others mentioned in the bibliography. Local records show the presence of adults in various brood years from April 1 to June 11. Apparently some individuals may develop more rapidly, or lag behind their broods, yielding records for the year preceding or succeeding general emergence of their brood. The small form, *cassinii* Fisher, called variously a race, variety, or species by different authorities, occurs here. P. I.

MELAMPALTA Kolenati.

M. calliope Walker.—Near Dead Run, Va., July 9, 1915, H. S. Barber.

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BARBER, H. S.

Eggs of *Cicada lyricen* De Geer.

Proc. Ent. Soc. Wash., 14 (1912) No. 4, Jan. 1913, pp. 210-211.

A female from Plummers Id., Md., in captivity laid eggs in masses of 12-13 in incisions in a dry hickory twig.

DAVIS, Wm. T.

A new cicada [Homop.] from Plummers Island, Maryland.

Bul. Brooklyn Ent. Soc. VIII, No. 1, Oct. 1912, pp. 2-4.

Cicada winnemanna sp. n. Plummers Id., Md., July 12 to Sept. 24. Notes on song.

Notes on some cicadas from the Eastern and Central United States with a description of a new variety of *Cicada pruinosa*.

Journ. N. Y. Ent. Soc. 23, No. 1, March 1915, pp. 1-10, Pls. 1-2.

Cicada auletes Germar., D. C. p. 3; *Cicada pruinosa* var. *winnemanna* Davis Plummers Id., Md., p. 10, Pl. 2, fig. 4.

An annotated list of the cicadas of Virginia with description of a new species.

Journ. N. Y. Ent. Soc. 30, No. 1, March, 1922, pp. 36-52, Pl. 4.

Records four species and one variety from the D. C. region.

HEIDEMANN, OTTO.

[Capture of *Tettigia hieroglyphica* Say].

Proc. Ent. Soc. Wash., VII, No. 4 (1905) 1906, pp. 191-192.

MARLATT, C. L.

The Periodical Cicada.

Bul. 71, U. S. Bureau of Entomology, 1907, 181 pp., 6 Pls., 68 figs.

Digest of literature and very full bibliography.

McATEE, W. L.

Abundance of periodical cicadas diverting attacks of birds from cultivated fruits.

The Auk, 37, No. 1, Jan. 1920, pp. 144-145.

The periodical cicada, 1919, brief notes for the District of Columbia region.

Proc. Ent. Soc. Wash., Vol. 23, No. 9, Dec. 1921, pp. 211-213.

Contains references to previous articles on the same brood by H. A. Allard and R. A. St. George.

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PROCEEDINGS OF THE
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No. 4

NEW SPECIES OF LEPIDOPTERA FROM SOUTH AMERICA.

By W. SCHAUS, *Bureau of Entomology.*

RHOPALOCERA.

Family RIODINIDAE.

Calydna hemis, new species.

Body fuscous; abdomen with some lateral white scaling, also white ventrally with fuscous irrorations. Wings fuscous, shaped as in *C. caprina* Hew., cilia white on curves. Fore wing: a postmedial ochraceous orange band from submedian to vein 3, above 3 a small spot slightly outset from which a faint line extends upward; a small tawny spot below vein 2 edged with black. Hind wing with an irregular postmedial tawny band not extending above vein 6, nor reaching inner margin. Wings below white thickly striated with coarse fuscous striae. Fore wing: small black antemedial spots in and below cell, similar medial spots, and a black line before the orange yellow band; postmedial space suffused with brown. Hind wing: antemedial black spots on costa and below cell at vein 2; postmedial space whiter owing to fewer striae; the tawny markings not present; a fuscous patch at apex.

Expanse 27 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33187, U. S. N. M.

HETEROCERA.

Family AMATIDAE.

Mesotheu zenobia, new species.

Male.—Palpi yellow; frons white; vertex black with white line between antennae; collar and thorax fuscous, the former crossed by a Naples yellow line, the latter with a similar lateral line expanding on metathorax. Abdomen fuscous at base with subdorsal triangular Naples yellow spots, otherwise dorsally iridescent deep neutral gray with black segmental lines; underneath cream color with fine black segmental lines; legs Naples yellow, the fore and mid tibiae fuscous. Wings hyaline faintly pale brown, the termen finely and cilia fuscous; veins black; a Naples yellow line above subcostal of fore wing, and a similar short streak at base of inner margin.

Expanse 20 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33188, U. S. N. M.

In another specimen segment 6 of abdomen is dorsally Naples yellow.

Holophaea erharda, new species.

Female.—Body black. Fore wing dark silky green, the veins black. Hind wing duller, the costa suffused with brownish olive.
Expanse 28–32 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33189, U. S. N. M.

Family ARCTIIDAE.

Hemihyalea camposi, new species.

Male.—Antennae wood brown. Palpi and head ocher red; some white scales between antennae. Collar and thorax buckthorn brown; a broad white band on front of collar and shoulders. Abdomen above geranium pink, the two last segments with grayish segmental lines, the anal claspers with white and salmon color hairs. Throat and femora ocher red; fore legs mouse gray fringed with white; mid and hind legs white; mid tarsi mouse gray. Wings hyaline, white. Fore wing: costa and base of inner margin light pinkish cinnamon; cilia light pinkish cinnamon tipped with cinnamon drab.

Expanse 60 mm.

Habitat.—Azogues, Ecuador.

Type.—Cat. No. 33190, U. S. N. M.

Named for Prof. Campos, who discovered the species.

Amastus aphraates, new species.

Male.—Palpi crimson above, light drab laterally. Head and thorax raw sienna, the tegulae dorsally fringed with light drab. Abdomen cinnamon buff, the long dorsal hairs buff pink. Thorax below vinaceous tawny, the tibiae and tarsi white. Fore wing semihyaline irrorated with vinaceous fawn, the margins well scaled, fawn color; veins fawn color slightly darker on discocellular; a subterminal light vinaceous fawn line. Hind wings semihyaline white, the inner margin suffused with light vinaceous fawn.

Expanse 51 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 33191, U. S. N. M.

Amastus ferrera, new species.

Female.—Head and body saccardo's umber; thorax and metathorax with tufts of jasper pink hairs, those on metathorax becoming drab and reaching middle of abdomen, the latter having drab segmental lines; some sublateral red spots. Hairs below eyes and on fore legs brick red. Fore wing sayal brown defined by fine black lines; an antemedial broad, outcurved black line, its outer edge dentate, lunular; double medial and postmedial, outcurved on costa, then inbent, filled in with drab, a similar double outer line, its outer

edge incurved on interspaces; subterminal line drab, dentate. Hind wing semihyaline suffused with avellaneous, more thickly scaled on termen; a darker line on discocellular.

Expanse 47 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 33192, U. S. N. M.

Near *A. maculicincta* Hamps.

Halisidota ramona, new species.

Female.—Head and thorax avellaneous; third joint of palpi black. Abdomen above cinnamon buff; body below avellaneous. Fore wing avellaneous, the inner margin narrowly fuscous; three broad transverse darker bands with slightly darker edges, the antemedial almost vertical, the medial slightly inbent, the postmedial still more inbent, suffusing at costa with a terminal wood brown shade which becomes narrower at vein 2, expanding very slightly at tornus. Hind wing white, the outer half faintly suffused with pale orange yellow, more pronounced on inner margin.

Expanse 60 mm.

Habitat.—Santa Catharina, Brazil.

Type.—Cat. No. 33193, U. S. N. M.

Halisidota mailula, new species.

Male.—Antennae moderately pectinated. Head and thorax vinaceous buff; palpi wood brown; metathorax and base of abdomen whitish buff, the abdomen otherwise dorsally ochraceous buff. Fore wing light buff irrorated with light drab; a small hair brown streak on discocellular between veins 3 and 4; a very fine wavy hair brown postmedial line outcurved beyond cell, closely followed by short double vertical streaks on interspaces; a more remote series of small inangled lines on interspaces; termen with fine oval lines on interspaces, some of them broken. Hind wing white; a few drab points at apex and terminally between veins 2 and 3; a short hair brown streak on termen below vein 6. Underside similar, the markings a little less pronounced.

Expanse 40 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 33194, U. S. N. M.

Halisidota pohli, new species.

Male.—Antennae shortly pectinated. Palpi light buff; a hair brown streak laterally near upper edge downbent at tip of second joint to front; the third joint hair brown in front. Head, thorax and long dorsal hairs on abdomen yellow ocher; abdomen dorsally light drab. Body underneath whitish buff. Fore wing warm buff, the interspaces beyond cell light buff, the veins warm buff; some scattered drab scales, suffusing and forming an inbent antemedial line; a similar postmedial line irregular and outcurved close to cell, joined by a similar subterminal shade from costa to vein 6, then forming a vague dentate

warm buff line; marginal inangled hair brown lines on interspaces. Hind wing white, the inner margin suffused with maize yellow.

Expanse 45 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 33195, U. S. N. M.

Can be placed next to *H. eudolobata* Hamps.

***Calidota hadesia*, new species.**

Male.—Head and body black; an orange point behind antenna, and a smaller point near shoulder; abdomen with large lateral, and smaller sublateral orange yellow spots. Fore wing black. Hind wing white from within cell to near inner margin and to just beyond middle, otherwise black.

Expanse 67 mm.

Habitat.—Molinas, Paraguay.

Type.—Cat. No. 33196, U. S. N. M.

Allied to *C. leucocorypha* Dogn., which has a creamy white vertex, and the yellow lateral spots almost meeting dorsally.

***Acyclania schadei*, new species.**

Male.—Head and body black. Palpi below, hair around eyes, on femora, at base of abdomen laterally, and anal hair light coral red; some white hairs on head, and long white hairs on fore and mid tibiae; collar and tegulae largely overlaid with broad light grayish olive scales, suffused with roseate. Fore wing dark grayish olive irrorated with black scales; orbicular and reniform edged with white, both surmounted by white patches on costa, the reniform divided into three spots by white; vague double antemedial and postmedial black lines somewhat macular; veins towards termen grayish; a deep marginal dentate line, angled at each interspace and at tips of veins cutting a double white terminal line. Hind wing black; a double white terminal line interrupted by veins.

Expanse 45 mm.

Habitat.—Molinasque, Paraguay.

Type.—Cat. No. 33197, U. S. N. M.

Allied to *A. tenebrosa* Dogn. but smaller and darker.

Family SATURNIIDAE.

***Hylesia sorana*, new species.**

Male.—Head and thorax cinnamon drab. Abdomen above black, the anal hairs cinnamon buff. Body below cinnamon buff; tarsi hair brown. Fore wing avellaneous suffused with vinaceous fawn; antemedial line faint, slightly darker, outbent from costa; outer line rather fine, light brownish olive, very slightly curved at costa, then straight to inner margin at two-thirds from base, the space beyond to termen slightly tinged with olivaceous; subterminal line sinuous light vinaceous fawn, a darker shade at discocellular. Hind wing vinaceous fawn almost entirely suffused with drab; a postmedial dark grayish

olive, slightly curved line, and traces of a narrow subterminal dark shade. Wings below mostly light pinkish cinnamon with a dark outer line.

Expanse 37 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 33198, U. S. N. M.

Hylesia munonia, new species.

Male.—Head and collar dark vinaceous brown. Thorax dark grayish brown mottled with ochraceous tawny hairs. Abdomen cinnamon. Tarsi and tibiae hair brown. Fore wing dark vinaceous drab, the costa beyond middle light vinaceous drab, and a similar broad subterminal shade reaching termen below vein 4 to tornus; some white hairs on costa antemedially, and traces of a light buff broken and irregular line; some light vinaceous drab scaling above a diffuse dark patch over the discocellular and some light scaling before the outer line, chiefly on inner margin; outer line slightly incurved, mars brown, outwardly edged with tawny olive. Hind wing: costa and terminal area light brownish drab; discal area fawn color largely covered with dark vinaceous drab hairs; a dark double line at discocellular; postmedial line dark slightly curved at costa; a subterminal dark shade. Fore wing below cinnamon drab, the terminal area and inner margin light drab; a dark outer line. Hind wing below light ochraceous salmon, the veins fawn color; a fawn color outer line.

Expanse 40 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 38199, U. S. N. M.

Not like any described species.

Family GEOMETRIDAE.

Berberodes pohli, new species.

Male.—Frons and shaft of antennae cinnamon brown; vertex and collar dresden brown; abdomen dorsally white at base, then pinkish buff; a hair brown patch on anal segment; lateral tufts pinkish buff and silvery white. Wings iridescent white, the lines and striae on terminal area vinaceous buff. Fore wing: costa cinnamon brown shading to yellow ocher at apex; lines fine vertical; the antemedial from median to inner margin, the medial from costa, the postmedial formed by disconnected striae. Hind wing: no antemedial line, the medial and postmedial slightly curved; inner margin suffused with light buff and with silvery white scales.

Expanse 28 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 33200, U. S. N. M.

Described from a male and a female.

Berberodes serraria, new species.

Female.—Head morocco red with two white points on each side of frons; body white with dorsal black points on abdomen, a sublateral point on second

segment, and black irrorations towards anal segments. Wings iridescent white; deep mouse gray striae partly with black points on terminal area; medial and postmedial black points on veins in sinuous formation. Fore wing: costa deep chrome with black striae; antemedial points on veins; cilia of both wings pale orange yellow. Wings below white, the termen dark mouse gray, preceded by a few striae.

Expanse 26 mm.

Habitat.—Alto da Serra, São Paulo, Brazil.

Type.—Cat. No. 33201, U. S. N. M.

Pyrinia sabasia, new species.

Female.—Body warm buff. Wings maize yellow thickly striated with ochraceous salmon, the cilia russet. Fore wing: base and termen still more thickly striated; lines ochraceous tawny, the antemedial outangled below costa inwardly edged with white scales from costa to median vein, the postmedial from a little before apex outangled to termen at vein 7, then inbent, russet, inwardly shaded with ochraceous tawny, outwardly edged with silvery white scales; an ochraceous tawny line on discocellular. Hind wing: a straight line like postmedial of fore wing to inner margin just below middle. Wings below orange buff, the lines and striae mahogany red. Fore wing with costa and termen partly light orange yellow, the inner margin whitish; hind wing with a russet shade at apex.

Expanse 28 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 33202, U. S. N. M.

Bronchelia funeraria, new species.

Male.—Body drab; some white hairs on frons, across collar, on metathorax and basal segments of abdomen. Wings benzo brown, suffused with fuscous, chiefly on termen and before the lunules of the subterminal line, which is smoky white, lunular, clear white between veins 3 and 4 of both wings. Fore wing: an oblique black subbasal streak below cell; antemedial line lunular, whitish, edged outwardly by a black streak on inner margin; some white scaling on medial area, and beyond postmedial, chiefly above vein 5; a fine black streak on discocellular; postmedial line fine, fuscous, lunular, outbent from costa to vein 5, then incurved, outwardly edged with whitish, and white points on veins; cilia spotted with white. Hind wing: some white scales at base of inner margin; postmedial line almost medial, lunular at costa, below vein 6 minutely dentate preceded by small black streaks; a black shade on discocellular, some white scaling beyond it between veins 6 and 7; a terminal black line; cilia tipped with white. Wings below grayish drab with some white striae and traces of whitish lines.

Expanse 60 mm.

Habitat.—Villa Rica, Paraguay.

Type.—Cat. No. 33203, U. S. N. M.

***Alcis attracta*, new species.**

Female.—Body pale vinaceous buff; palpi laterally fuscous; head and collar in front mottled with black and wood brown; abdomen with a few dark scales, the anal segment with dark mottling. Wings whitish suffused with light pinkish cinnamon with numerous fuscous striae. Fore wing: black costal spots at origin of veins; the lines indistinct, diffuse, formed by suffusions of striae; antemedial double, slightly outcurved; medial line forming diffuse spots in and below cell; a well marked black spot on discocellular; postmedial line macular, with more distinct spots at veins 6, 3, below 2, and on inner margin; a large fuscous space to termen from below vein 3 to costa, slightly mottled with sayal brown; a black spot on inner margin before tornus, and some thicker striae on termen above tornus; an interrupted terminal black line. Hind wing more evenly striated; a faint medial line from cell to inner margin; a faint discal point. Wings below with fainter striae; discal points well marked; a marginal black fascia with on fore wing a pale terminal spot from below vein 3 to vein 4, also a similar small apical spot; on hind wing with marginal fascia narrower, from apex to vein 3.

Expanse 30 mm.

Habitat.—Alto da Serra, São Paulo, Brazil.

Type.—Cat. No. 33204, U. S. N. M.

***Melanolophia eucheria*, new species.**

Female.—Body and wings pale olive buff; antennae with fuscous rings; palpi with a lateral fuscous spot; collar dark olive buff edged with fuscous posteriorly; abdomen with some dorsal drab shading and irrorations; legs with fuscous transverse streaks. Fore wing: a few scattered drab gray and fuscous irrorations; costa buffish with numerous fuscous striae forming antemedial, medial, postmedial and subterminal spots; an antemedial diffuse narrow pinkish cinnamon vertical shade; a fuscous point at end of cell; postmedial line very fine, wavy, somewhat broken, inbent from costa to middle of inner margin, outwardly shaded with pinkish cinnamon, broadest between subcostal and vein 6, and between veins 5 and 3, below median fold by a fuscous patch; subterminal line fuscous, punctiform, followed by a fuscous black patch from vein 6 to below vein 5; otherwise shaded in places with pinkish cinnamon; small terminal fuscous lunules on interspaces; cilia fuscous at patch. Hind wing: the light drab and fuscous striae more numerous; traces of a very fine antemedial line; a postmedial pinkish cinnamon shade, surmounted by a fine black lunule on inner margin; similar shading on outer margin mottled with the fuscous striae. Wings underneath cream buff irrorated with deep neutral gray; dark points on discocellulars, and a marginal blackish band, widest on fore wing between veins 4 and 6. Fore wing: a faint postmedial line from below vein 6; the apex whitish.

Expanse 40 mm.

Habitat.—Alto da Serra, São Paulo, Brazil.

Type.—Cat. No. 33205, U. S. N. M.

Conspicuous by the absence of any well-defined lines on hind wing.

Bryoptera phileas, new species.

Male.—Body white; palpi laterally velvety black; a transverse hair brown shade on collar; abdomen dorsally with segmental drab gray lines; fore legs irrorated with drab gray; fore and mid tarsi hair brown with whitish rings; throat and hair below eyes velvety black. Wings white. Fore wings: costa tinged with pale gray and with hair brown striae; veins mostly light ochraceous buff expanding into spots beyond subterminal line; a few black scales at base on costa and below cell; antemedial line finely wavy, thicker on costa, vertical; a median black streak on costa continued as a very fine and faint line across cell; postmedial line fine, black, partly broken, vertical, incurved below subcostal, outcurved around cell and incurved near middle at submedian where it is preceded by a curved black streak; it is followed from costa by a broad light ochraceous buff shade, except between veins 4 and 6 where it is replaced by a grayish olive spot irrorated with black; subterminal line fine, black, lunular; the interspaces beyond light grayish olive, but darker shaded on either side of vein 5; terminal black lunules on interspaces. Hind wing: some grayish olive irrorations on basal area and on costa; a broad fuscous black fascia across cell to inner margin below middle; a black point on discocellular; postmedial line as on fore wing, followed by a black spot between veins 4 and 6, and a downturned heavy streak before inner margin; subterminal line and terminal lunules as on fore wing; veins terminally light ochraceous buff. Wings below white slightly suffused with light buff; a broad subterminal blackish band, narrower on hind wing.

Expanse 33 mm.

Habitat.—Alto da Serra, São Paulo, Brazil.

Type.—Cat. No. 33206, U. S. N. M.

Thyrinteina schadeana, new species.

Female.—Body and wings white irrorated with fuscous scales; the wings faintly suffused with drab, the outer line nearer to termen than in *T. arnobia* Cram.; discocellular spots on both wings oval, strongly outlined with black, underside with black discal spots on both wings.

Expanse 45 mm.

Habitat.—San Bernardino, Paraguay.

Type.—Cat. No. 33207, U. S. N. M.

What I consider the male from Argentina has the fore wing much narrower than *arnobia*, and black discal spots on underside of both wings.

Cidariophanes protertia, new species.

Female.—Palpi light buff mottled with drab; frons drab gray; vertex white, with a few brownish scales; collar and thorax mottled white, drab, and fuscous; abdomen above with two basal segments cinnamon, otherwise white, partly suffused with cinnamon buff, light drab and a few black scales, the large dorsal tufts chestnut brown. Body below white finely irrorated with drab gray. Fore wing whitish, largely suffused with orange citrine and darker striae; base

fuscous limited by a broad white line, outbent from costa, bluntly angled and inbent just above median; a fine black line before middle of wing, outangled in cell, and on submedian fold, inangled on median and submedian veins; a black anullus on discocellular filled in with dark grayish olive scales; post-medial line fine, black, excurved and outbent, angled at vein 4, with a vertical lunule to vein 3, then inbent and excurved between veins; a subterminal triangular fuscous spot on costa with a downbent branch to vein 5, the whole rather broadly edged with white; some whitish subterminal markings between vein 3 and tornus. Hind wing whitish drab with fine hair brown striae; a small discal spot; some small postmedial spots, and a narrow subterminal dark shade. Wings below whitish buff with hair brown striae; hind wing with a short angled line from discocellular spot.

Expanse 45 mm.

Habitat.—Tarague, Santa Catharina, Brazil.

Type.—Cat. No. 33208, U. S. N. M.

Nearest *C. muscosa* Dognin.

***Physocleora marcia*, new species.**

Male.—Palpi fuscous black. Frons fuscous. Vertex and collar brownish; thorax and abdomen tilleul buff irrorated with black, the latter with segments 3 and 4 dorsally black. Wings tilleul buff, the medial space white; a few black irrorations; terminal line black, lunular, expanding at middle of interspaces; black points on discocellulars. Fore wing: lines black, the antemedial and medial outcurved from costa to median fold, then outbent, the latter crossing the discocellular; postmedial line outcurved from costa to below vein 5, again to median fold, then outbent; outwardly followed by a wood brown shade forming a darker patch between veins 4 and 5; a subterminal whitish shade, partly edged outwardly with black; margin diffusely wood brown; costal margin wood brown with black spots at origin of veins. Hind wing: antemedial and medial lines slightly outcurved, the space beyond avellaneous with a diffuse whitish subterminal shade. Fore wing below diffusely hair brown; base, inner margin, a postmedial fascia to vein 2, and terminal streaks above veins whitish. Hind wing below whitish, the lines as above, some scattered hair brown striae; termen narrowly hair brown.

Expanse 19 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 33209, U. S. N. M.

Somewhat like *P. tascaria* Schs. but darker with more prominent lines.

***Physocleora? santosia*, new species.**

Male.—Palpi long, porrect. Body tilleul buff; palpi with lateral dark scaling near tip; frons hair brown; drab irrorations on thorax; third segment of abdomen above hair brown. Wings tilleul buff with some hair brown irrorations; a fine terminal black line expanding into spots on interspaces. Fore wing: costa olive buff with black spots at origin of veins, and black striae between them; subterminal and medial lines extremely fine and rather indistinct; post-

medial line punctiform followed by some small clusters of pale cinnamon scales; an incomplete dentate subterminal white line, preceded by clusters of black scales from costa to vein 5, and on inner margin; some fainter black clusters follow this line. Hind wing: traces of subbasal, antemedial and medial wavy lines, the latter preceded by a black point on discocellular, and followed by pale cinnamon shading; a faint subterminal whitish line with dark clusters of scales from costa to below vein 6. Fore wing below tiller buff, almost entirely suffused with hair brown; a pale shade beyond cell and before postmedial which is formed by short dark streaks on veins; some pale mottling on termen. Hind wing below tiller buff with only a few hair brown irrorations; a small antemedial spot on costa, and one on discocellular; traces of dark subterminal shading from costa to below vein 6.

Expanse 17 mm.

Habitat.—Alto da Serra, São Paulo, Brazil.

Type.—Cat. No. 33210, U. S. N. M.

In appearance like *P. enana* Dogn., which is a true *Physoleora* with upturned palpi.

Cambogia paulona, new species.

Male.—Body pale orange yellow; frons salmon buff; abdomen with segmental tawny lines. Wings pale orange yellow; fore wing crossed by eight russet vinaceous lines, partly macular and irrorated with silver scales, the lines almost evenly spaced; a terminal punctiform line. Hind wings crossed by six lines.

Expanse 16 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 33211, U. S. N. M.

Is nearest to *C. anguinata* Warr. but paler, the lines much finer.

A NEW GENUS AND FIVE NEW SPECIES OF SYRPHIDAE FROM AUSTRALIA (DIPTERA).

BY RAYMOND C. SHANNON, *U. S. Bureau of Entomology.*

In a small collection of Australian Syrphidae, some contained in the National Museum Collection and some borrowed from the British Museum through the courtesy of Major E. E. Austen and F. W. Edwards, the writer found one genus and several species new to science. Descriptions of these new forms are given below. Two other genera new to Australia are also represented in the collection, and re-descriptions of these are likewise given.

Genus *PSILOTA* Meigen.

Two species of *Psilota* are at hand (British Museum Collection) one of which was previously described by G. F. Hill as *Psilota cyanea*. This name is preoccupied, as has been pointed out by Curran (*P. cyanea* Brunetti, India) who substituted

the name *victoria* in its stead. This species is easily recognized by its shining blue color and the apical projections on the lower, inner side of the hind femur and the small basal projection on the hind tibia.

The second species is very easily distinguished from the first by its darker color and simple hind legs. Two other species have been described from Australia, *femoralis* Schiner and *viridis* Macquart, while *coerulea* Macquart was described from Tasmania. The present species is nearly black, thereby differing in color from the above three, and the simple hind leg with very slightly swollen femur further distinguishes it from *femoralis* and *coerulea*. The hind femur is not mentioned in the description of *viridis*. However, this species is stated to be greenish blue.

***Psilota nigra*, new species.**

Female.—Frons of moderate width, entirely shining black (without silvery pollen) short, pale pilose; eyes short pilose; antenna moderate, dark brown; face shining black, epistoma moderately projecting; scutellum but little broader than long; femora very dark brown, tibiae and tarsi somewhat lighter; hind femur very slightly swollen, an inconspicuous keel on lower side, otherwise simple; hind tibiae simple; abdomen bluish black. Length 5.5 mm. Wing 5 mm.

Type locality.—South Australia.

Type.—In British Museum.

Genus **GRAPTOMYZA** Wiedemann.

Graptomyza Wiedemann, Nova Dipt. Gen., 1820, p. 16.

Genotype.—*G. ventralis* Wiedemann.

The occurrence of this genus in Australia is of unusual interest as it is the first record for the subfamily Volucellinae in the antipodes. The genus may be readily recognized by the presence of distinct thoracic bristles; face downwardly produced and pilose; discal crossvein placed well before the middle of the discal cell; the apical (i. e. the distal portion) and the posterior crossvein rectangular; and the flattened area on the disc of the scutellum.

***Graptomyza antipoda*, new species.**

A rather small, yellowish species marked with a distinct black "W" on the mesonotum and black abdominal spots.

Female.—Inner eye margins straight, from the vertex to the lowermost point; subquadrate, a little broader than long, black across vertex, yellow on lower two-thirds; antennae yellow, apical upper corner of third joint darkened; third joint large, three times as long as broad; arista pectinate, the rays only on the

basal two-thirds of upper side; face yellow, a darkened median stripe, tubercle merely suggested; epistoma moderately produced; thorax entirely yellow save for a well formed black mark in the form of a "W" on posterior half of mesonotum; thorax with nine pairs of well-developed black bristles arranged on each side as follows: Two on notopleura, one supraalar; three postalar; a pair on hind margin of mesonotum; a pair on apex of scutellum; one mesopleura; femora yellow, tibiae and tarsi brownish; hind tibia with a patch of short black bristles on outer side near the middle; abdomen rather broadly rounded, yellow, tergites two, three and four with a pair of black spots on the apical corners and each of these tergites faintly marked with brown in the middle; wings hyaline; squamae white, halteres yellow. Length 5 mm.; wing 4.5 mm.

Type locality.—Cairns, New Queensland (taken on window, J. F. Illingsworth).

Type.—Cat. No. 28786, U. S. N. M.

***Eumerus superbus*, new species.**

Three specimens, received through the Federal Horticultural Board, are at hand representing a most unusually marked species of *Eumerus*. The specimens were reared from a *Macrozamia* cone, shipped from Australia. They are not in very good condition, the antennae are lost in all three specimens, but because it is such an exceptionally well marked species, it can be easily recognized.

A fairly large species with frontal and scutellar tufts of stiff black hairs and wings spotted very similar to those of the Ortalidae.

Male and female.—Front nearly as broad in the male as in the female; ocellar region very large, equalling half the length of the front, inflated, shining bluish black and bearing a patch of stiff erect black hairs; ocelli well advanced of the hind occipital margin, the anterior ocellus much farther removed from the other two than they are from each other; a narrow brownish pollinose cross band below ocellar region which is followed by a large opaque black region clothed with black and golden hairs; between this region and the antennae is a yellow brown cross band clothed with pale yellow hairs; first two antennal joints of normal size, silvery pollinose and pilose; upper half of face yellowish, covered with silvery pollen, whitish pilose, lower half darkened, with yellowish hairs medianly and black hairs on the sides; mesonotum velvety black with a silvery pollinose pattern, black pilose, the notopleurae and hind margin golden pilose; scutellum black with a large tuft of dense, stiff, and erect black hairs; fore and mid femora black, fore and mid tibiae black, yellowish basally and apically; fore tarsus yellow; mid tarsi yellow with conspicuous silvery white pile; hind femur greatly enlarged, shining black, yellow apically, with a row of rather widely set black spines on lower margin, hind tibia greatly thickened, in the male with silvery white pile; hind tarsus reddish yellow, in the male with dense, flattened silvery white pile; abdomen variegated with silvery pollen and pile, and yellow and black pile; wings hyaline on basal half; stigma

bright yellow; apical half of wing mottled with dark splotches and spots; third vein nearly straight; squamae and halteres whitish, plumula black.

Length 11 mm.; wing 7 mm.

One male, two females, each with puparium.

Type locality.—Australia (reared from a *Macrozamia* cone received through the Federal Horticultural Board, 1925).

Type (male), *allotype* (female), and *paratype* (female).—Cat. No. 28787, U. S. N. M.

Genus **MICRODON** Meigen.

Microdon Meigen, in Illig. Magaz. f. Ins., vol. 2, 1803, p. 83.

Genotype.—*Microdon mutabilis* (Linnaeus).

Seven names have been proposed for the species of *Microdon* of Australia but only three species are recognized by Hardy in his paper. Two species described by Knab and Malloch, the types in the U. S. National Museum, *Microdon brachycerus* and *M. daveyi*, have been placed as synonyms of *vittatus* and *variegata* respectively. The latter species, however, proves to be quite distinct from *variegata*.

Microdon daveyi Knab and Malloch.

Microdon daveyi Knab and Malloch, Trans. Roy. Soc. S. Austr., vol. 36, 1912, p. 233.

This species is smaller than *variegata*, the abdomen is much more predominantly black and shorter and the appendix on the third vein occurs at the middle of the discal cell, while in *variegata* it is beyond the middle.

An additional species, new, has recently come to hand, and is here described.

Microdon iridomyrmex, new species.

A small blackish species with the legs largely reddish brown, which was reared from the nest of *Iridomyrmex rufo-niger* Lowne by Mr. J. Clark.

Female.—Nearest related to *Microdon vittatus* Macquart but distinct in a number of respects. The front is very broad, the eye correspondingly smaller, the latter noticeably the smaller in area and subquadrate; pile on the front black, that on the lower half appressed and directed upwards; antennae black, rather short and stout; first joint fairly long, the second short, the third longer than combined length of first and second; arista unusually short and stout, shorter than length of third joint; face black, equal in width to the front, pale pilose; femora reddish yellow with black bases; tibiae reddish yellow basally, darkening beyond; tarsi black; wings hyaline; third vein without appendix; thorax black, largely black pilose; abdomen black, black and pale pile intermixed; halteres and squamae white. Length 9 mm.; wing 5.5 mm.

Two females.

Type locality.—Beverly, W. Australia (J. Clark).

Type.—In British Museum.

Each specimen has a puparium mounted with it. A specimen of *M. vittatus* likewise has a puparium, and this shows marked differences from that of *iridomyrmex*. The latter has four longitudinal straight rows of rather large granulose spots. The puparium of *vittatus* is distinctly broader and has eight rows of irregularly placed and much smaller granulose spots.

MALOMETASTERNUM, new genus.

The species for which this genus is erected probably is very closely related to the Australian species placed in the genus *Criorhina* and also to Walker's genus and species *Deineches nigrofulva*. The head and venation in all of these species is very similar to the *Criorhina* type, but the pilosity of the body is not woolly as in *Criorhina* and therefore should not be considered under that genus. The writer would suggest that *nudi-ventris* Macquart and *spadix* Hardy belong to *Deineches*.

The present species is apparently quite distinct from the above named species in that it possesses on the hind femur a distinct preapical saw-tooth projection and a pair of scutellar tubercles which are not mentioned in the descriptions of the others.

Generic diagnosis.—Based on the male. Eyes holoptic; arista with dorsal basal arista; face projecting downwards, concave between antennae and the prominent facial tubercle; thorax inconspicuously pilose; scutellum three times as broad as long with a pair of widely spaced dorsal tubercles; hind metasternum and hind coxae with long, white and woolly pile; hind coxae greatly enlarged; hind femur greatly enlarged with a prominent preapical and ventral saw-tooth projection (similar to that in *Tropidia*); discal crossvein joining discal cell well beyond its middle; and apical crossvein with a somewhat rounded basal angle, nearly in line with posterior crossvein.

Malometasternum scutellaris, new species.

Male.—A rather large species; ocellar triangle elongate, white pollinose frontal triangle rather small, white pollinose; face entirely white pollinose in front, the jowls shining black; femora and tibiae brownish, hind tibia more yellow; fore and mid tarsi whitish, hind tarsi bright yellow; wings faintly infuscated; abdomen deep brown, apical half of fourth tergite bright reddish yellow.

Type locality.—Townsville, New Queensland (1909, F. P. Dodd).

Type.—In British Museum.

Dissoptera pollinosa Edwards.

Dissoptera pollinosa Edwards, Proc. Zool. Soc. Lond., vol. 20, 1916, p. 410.

This genus and species, originally recorded from New Guinea, is represented in the material at hand by a single female. At first glance the species resembles the genus *Syrphus*. However, it is a close ally of *Eristalis* but may be easily separated therefrom by the straight face, in profile, and yellow scale-like vestiture of the front and mesonotum, that on the face being tomentose. The abdomen has a pair of large (very large on the second) yellow spots at anterior corners of each tergite, fifth tergite entirely yellow.

Length 9 mm.; wing 7 mm.

Cairns, New Queensland (on window, J. F. Illingsworth).

NOTES ON INSECT INHABITANTS OF BIRD HOUSES.

By W. L. McATEE.

DESCRIPTIONS OF A NEW GENUS AND THREE NEW SPECIES OF DIPTERA.

By J. R. MALLOCH.

In an effort to increase the bird enemies of nut weevils at the experimental chestnut orchard of the Bureau of Plant Industry at Bell, Md., 47 bird boxes were erected there by the Biological Survey in April, 1926. These were inhabited by a variety of tenants of which insects were by no means the least interesting.

Ordinary paper wasps (*Polistes*) built nests in 24 of the bird houses but three of these nests were subsequently torn up by house wrens and in one case incorporated into the nest of the bird. One box was occupied by a colony of yellowjackets (*Vespula*) and one by bumble-bees (*Bremus*) the latter using the nest of an earlier interloper, a deer mouse (*Peromyscus*) in building their own. In these instances the occupants of the houses were either birds or insects, never both together. In another series of cases, however, namely, the boxes in which birds reared or attempted to rear broods, insect occupation was concurrent with that of the birds. The insects (and mites) concerned included parasites of the birds, and scavengers in the nest which themselves attracted other parasites and predators.

Information on the insect occupants of the scavenger and parasite classes is based entirely on laboratory examination of the contents of the bird boxes collected Sept. 23, 1926, probably a month subsequent to the time any of the houses were occupied by birds. Identifications in groups they specialize upon were kindly made by J. R. Malloch and L. L. Buchanan of the

Biological Survey, and August Busck, H. E. Ewing, A. B. Gahan, Chas. T. Greene and S. A. Rohwer of the Bureau of Entomology, and Nathan Banks of the Museum of Comparative Zoology. To favor occupation of the maximum number of boxes by birds during the first season for the project, the contents of the houses were not closely examined during the nesting period. Hence no observations were made on parasites of nestling birds, such as species of *Protocalliphora*. Some of these may have been at work, for mummied young birds were found in four of the nests. In five nests occupied by house wrens, three by bluebirds, one by crested flycatchers, and in three compartments of a house occupied by purple martins were found puparia of Sarcophagids in such numbers as to make it improbable that they could have been produced wholly as scavengers. It may be that further investigation will prove that the usual scavenging habits of these flies are varied to include some degree of parasitism of nestling birds.

It will be of most interest as well as of most value in giving definiteness to the records to treat the bird house insects according to the kind of bird with which they were associated, a procedure followed in succeeding paragraphs.

Purple martin (*Progne subis*). Apparently the purple martin does not clean its quarters at all, so that the scanty layer of weed stalks, grass, and leaves it gathers as a nest is soon exceeded by a mass of remains of the insect food brought to the young. This makes splendid pasturage for scavengers. Among these the most numerous were Psocidae, which fairly swarmed in the nest debris. Next in abundance were various diptera represented chiefly by empty puparia, and thirdly beetles mostly Dermestidae of the genus *Attagenus*. A list of the scavengers grouped by orders follows:

Corrodentia.

Troctes divinatorius Müller, numerous adults.

Lepidoptera.

Tinea sp., 2 rubbed adults, several empty chrysalides, and much webbing.

Coleoptera.

Silvanus planatus Germar, 1 adult.

Attagenus sp., numerous larvae, and their cast skins.

Diptera.

Sciara sp., many empty puparia.

Scenopinidae, numerous larvae.

Fannia scalaris Fabricius, 1 adult.

Sarcophaga haemorrhoidalis Fallen, numerous puparia.

Sarcophagid puparia, many.

Neossos marylandica Malloch, puparia, many; see description later in this paper.

The parasitic forms in the martin house included parasites of the birds them-

selves, and of insects of the scavenging groups just listed. Fleas and feather mites (*Cheletoides*) swarmed in the nest debris; the chalcid named below, a parasite of the Sarcophagids, was numerous, while the other forms were rare. The parasites included:

Acarina.

Cheletoides sp., many adults and young.

Dermanyssus sp., a few adults.

Suctoria.

Ceratophyllus idius Jordan and Rothschild, many adults. This flea was originally described from the nest of a swallow from British Columbia.

Hymenoptera.

Apanteles carpatus Say, one adult.

Pachycrepoideus dubius Ashmead, numerous adults.

HOUSE WREN (*Troglodytes aedon*).

The scavengers listed by orders below were found in the nests and other debris from 8 bird houses occupied by house wrens.

Acarina.

Cheletoides sp., in 2 nests.

Corrodentia.

Troctes divinatorius Müller, in 3 nests.

Coleoptera.

Atheta sp., nine larvae in 1 nest, and one larva and 18 adults in another.

Attagenus sp., larvae in 5 nests.

Diptera.

Sciara sp., puparia, in 3 nests numerous in 1, one adult identified as *S. impatiens* Johannsen?

Sarcophagid puparia, in 4 nests.

Sarcophaga falculata Pandelle, 26 puparia in 1 nest from which four adults have emerged.

Neossos marylandica Malloch, puparia, in 3 nests, one yielding several.

Lepidoptera.

Tinera carnariella Clemens, in 1 nest.

BLUEBIRD (*Sialia sialis*).

Three houses occupied by bluebirds yielded the following:

Acarina.

Cheletoides sp., a few immature specimens in one nest.

Corrodentia.

Troctes divinatorius Müller, numerous in one nest.

Diptera.

Sciara sp., puparia in 1 nest.

Sarcophagid puparia, in 3 nests, two of them containing many specimens each.

Plectops pruinosus Malloch, new species described later in this paper. Three adults bred from 1 nest, one broken and therefore not used in the description.

Neossos marylandica Malloch, puparia, in one nest.

CRESTED FLYCATCHER (*Myiarchus crinitus*).

A single nest box was occupied by crested flycatchers up to the time their young were about one-third grown. The parents disappeared for unknown reasons and the nestlings perished in the nest. In the material removed from this bird house were found:

Corrodentia.

Troctes divinatorius Müller.

Coleoptera.

Atheta sp., larva.

Diptera.

Hydrotaea sp. (?), one puparium.

Fannia nidicola Malloch, new species described later in this paper, puparia from which 8 adults were bred.

Sarcophagid puparia.

Desmometopa latipes Meigen, one adult.

Neossos marylandica Malloch, puparia.

Lepidoptera.

Tinea sp., 2 chrysalides.

NEOSSOS MALLOCH, new genus.

This genus belongs to the group to which Hendel assigns the family name Trixoscelidae. I hardly care to admit the validity of family rank for this group, but defer a discussion of the matter until opportunity offers in another paper dealing more exclusively with broader phases of taxonomy. In several respects the new genus resembles *Trixosceles*, but it has no mesopleural bristle, the frons is furnished with numerous short setulae, the anterior pair of orbital bristles is more obviously curved outwardly, there is but one strong sternopleural bristle present, and there is a small downwardly directed stigmal bristle evident.

Genotype, the following species.

***Neossos marylandica* Malloch, new species.**

Male and female.—Head clay-yellow, frons reddish, upper occiput, frontal triangle, and orbits, grey dusted; arista fuscous. Thorax fuscous, dorsum densely gray dusted, not shining, pleura testaceous, darker above, less densely dusted than dorsum, and slightly shining. Abdomen fuscous, distinctly shining, slightly gray dusted above near base. Legs testaceous. Wings hyaline. Halteres yellow.

Frons about twice as long as its anterior width, the latter about one-third of head width, the width at vertex greater than that at anterior margin, surface hairs short, strong, and quite numerous, orbits reduced to a mere line in front of anterior pair of bristles, the latter outwardly and backwardly directed, as long as upper pair, and but little proximad of middle of frons; ocellar bristles long; postverticals short; third antennal segment not longer than wide; arista almost bare; cheek as high as width of third antennal segment; vibrissae of moderate length. Thoracic dorsocentrals 1+3, the posterior pair longest;

intradorsocentral hairs in 6-8 series, usually with one or more short but distinct bristles in the acrostichal series near suture, the prescutellar pair of acrostichals distinct; inner postalar bristle shorter than outer one; mesopleura bare; sternopleura with one long bristle and a number of hairs; basal pair of scutellar bristles shorter than apical pair. Fore femur with posteroventral bristles distinct only apically; mid femur with one or two short bristles near middle on anterior surface; preapical dorsal bristle present on all tibiae, longest on mid pair. Inner cross vein at a little over one-third from apex of discal cell; ultimate section of fourth vein not over three times as long as penultimate; costal setulae fine but distinct, the longest not much longer than diameter of costal vein.

Length 2 mm.

Type, male, reared from nest of *Progne subis*, collected September 23, 1926, emerged February, 1927; allotype and one female paratype, from debris in same nests (W. L. McAtee).

The puparium of this species is about 2.75 mm. in length, 1 mm. thick, of a glossy testaceous color, and is nearly cylindrical except at anterior extremity where it is rather abruptly flattened above. The surface is finely transversely wrinkled, and without protuberances. I can detect only three minute papillae on each anterior respiratory organ in the specimens before me. Posterior spiracles upon a pair of short stout processes which are not higher than wide, the processes situated upon two tumid areas between which there is a slight longitudinal impression, the distance between the spiracular processes about five times as great as width of one process. The three spiracular slits are small, straight, and radiate from a plainly indicated button.

Plectops pruinosa Malloch, new species.

Male and female.—Black, with dense grey dust obscuring ground color of frons, face, thorax, and most of abdomen, the tergites of latter with the shining black ground color showing through the dust apically, but nowhere entirely free from it. Antennae black, basal two segments brownish or reddish; palpi testaceous; interfrontalia brownish. Thorax not vittate. Abdomen with a faint dark dorsocentral vitta. Legs pitchy, femora paler below at apices, and tibiae usually reddish at bases. Wings hyaline. Calyptrae white. Halteres yellow.

Frons in male and female of equal width, at vertex fully one-third of the head width, at anterior margin almost half the head width, orbits differentiated when seen from behind, at middle the grey portion is about three times as wide as the rufous interfrontalia, each orbit with two forwardly directed and one backwardly directed outer bristle on upper half, the last nearest vertex, about five inwardly directed bristles near inner margin below middle, the lowest one nearly opposite apex of second antennal segment, and an isolated backwardly directed bristle a little in front of anterior ocellus, the surfaces with additional fine hairs extending a little below the lower bristle; ocellar bristles strong, porrectly divergent; parafacial narrowly visible from side, bare from opposite

apex of second antennal segment to lower extremity; face concave; a few setulae above vibrissae; antennae enlarged, third segment of male less sharply truncate and narrower at apex than in *setigera* Coquillett, its width a little less at apex than that of cheek and less than twice its basal width, in female this segment is narrower at apex than in male; length of second segment of arista about six times its diameter; palpi slender, of average length. Thorax with five presutural lateral bristles, the posthumeral a little mesad of the presutural and very weak; presutural acrostichals usually two pairs; anterior presutural dorso-central short; postsutural dorso-centrals three pairs; lower stigmatal bristle downwardly directed; posternum with about four bristles; hypopleura with a setula near its upper anterior angle. Third tergite with a pair of central apical bristles, fifth without discal bristles. Fore tarsi normal in both sexes.

Length 4 mm.

Type, male and allotype, bred from nest of Bluebird collected at Bell, Md., Sept. 23, 1926 (W. L. McAtee). Paratypes, female, Washington, D. C., Sept. 27, 1907 (W. L. McAtee); female, Washington, D. C., Sept. 4, on window (F. Knab); male, Glencarlyn, Va., June 2, 1925 (J. R. Malloch).

The species is readily distinguished from any other so far described in the genus by the entirely grey dusted dorsum of abdomen, all the others having no dust on apices of the tergites, which are conspicuously glossy.

***Fannia nidicola* Malloch, new species.**

Male.—Black, distinctly shining, very similar to *sevana* Fallen. Thorax not vittate, lateral and posterior margins of mesonotum whitish dusted. Abdomen white dusted on dorsum, the usual triangular black tergal marks not clearly outlined. Legs black. Calyptrae yellowish. Halteres yellow.

Frons at narrowest point not as wide as third antennal segment; arista subnude; palpi rather long, not dilated. Thorax with acrostichals in three or four irregular series; prealar duplicated. Hypopygium as in Figure 1. Legs as in *canicularis*, the mid tibia with very short even ventral pubescence; hind coxa with at least one fine setula at apex above base of femur. Lower calypter projecting well beyond upper. Characters of hypopygium and fifth sternite as shown in accompanying figure.

Female.—Very similar to *canicularis*, the thorax quite evidently trivittate, but the abdomen is never yellow at base.

Length 5–5.5 mm.

Type, male, allotype, one male and five female paratypes, bred from puparia from nest of *Myiarchus crinitus*, collected at Bell, Md., Sept. 23, 1926 (W. L. McAtee).

The puparium of this species has six series of long tapered processes, two on dorsum and two on each side, the posterior spiracles are upon two short stout stalks which are a little



Fig. 1.

longer than their basal diameter and separated by over four times the length of either, the inner spiracular papilla is directly obliquely inward and backward, the other two backward and outward, closely placed, and divergent from the inner one, the central papilla longest. Length, 6-7 mm.

The posterior spiracles in puparia of *manicata* Meigen are not on stalks, though those of some other species of the genus are.

A CALENDRID WEEVIL VISITOR FROM JAPAN.

BY R. T. COTTON, U. S. Bureau of Entomology.

It is of interest to note that during the year 1925 [*Calandra Myocalandra elongata* (Roelofs),¹ a little known calendrid weevil from Japan was intercepted at two different ports on the Pacific Coast. On February 19, 1925, a Canadian official collected four specimens at Vancouver in a shipment of bamboo from Japan. An additional specimen was intercepted on July 7, 1925, by an inspector of the Federal Horticultural Board at Seattle, Washington, in a shipment of Japanese lily bulbs from Yokohama, Japan.

The writer became interested in this species in 1920 when a specimen was received from Dr. F. H. Chittenden with the remark that it was collected in Japan in flour and might be subsequently introduced into this country through shipments from Japan.

Mr. Shonosuke Nakayama, in correspondence with the writer, states that the weevil is occasionally seen in dwelling houses in Yokohama. He has observed it living in small pieces of bamboo and also feeding slightly on macaroni. The species probably breeds in bamboo and is found in other commodities only through accident.

The weevil was described by Roelofs in 1875 from specimens collected in Japan. It closely resembles the rice weevil *Sitophilus oryza* Linn. in color, size, markings and general appearance (fig. 1) but may be readily distinguished by its

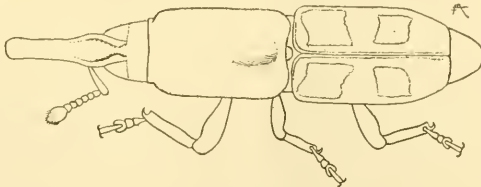


Fig. 1.

¹The writer is indebted to Dr. Guy A. K. Marshall for the identification of this species.

elongate, flattened form, nearly straight beak, and prothorax, which is twice as long as wide with sides almost straight and furnished with a distinct depression in the central portion posterior to the disk.

A more detailed description of the weevil is contained in the following rather free translation of the original description:

"Very variable in size, elongate, flat, dull black to reddish brown or testaceous along the edges of the abdominal segments, the base of the femur, tibia, tarsi, beak and antennae. Elytra with testaceous patches; provided with erect, pale yellow scales. Beak with the head scarcely as long as the prothorax, nearly straight, cylindrical, thickened and square at the base, rugosely punctate, carinate behind, gradually more finely punctured towards the tip. Head densely and grossly punctured, with a large and elongate impression; laterally bordered with scales between the eyes. Prothorax twice as long as wide, truncate at the ends, straight along the edges, feebly narrowed and broadly margined in front, covered with coarse punctures, close set and bearing erect scales, furnished with a depression in the central portion posterior to the disk. Scutellum scarcely visible. Elytra shorter than the prothorax and scarcely wider than at the base, subrectangular at base, sides parallel, rounded at end, with striae coarsely punctate, intervals alternately narrow and broad and elevated towards the base, the latter intervals carrying a row of yellowish hairs. The elytra are black, their sides, extremity and suture brown, they are adorned with four testaceous patches, the first two occupying the base and sometimes entirely covering it, the other two behind the middle and transverse, none attain the suture but otherwise vary considerably. Pygidium rugosely and deeply punctured, densely scaly, covered above with coarse punctures, close set and bearing scales. Femora rugose, tibiae punctate, striolate. The legs furnished with scales similar to those of the body. The distribution of colors varies, the beak is sometimes black and the testaceousness of the legs is more or less extended. Length 4 mm.-6 mm."

DESCRIPTION OF A NEW COTTON INFESTING SPECIES OF BUCCULATRIX (LEPIDOPTERA).

BY A. W. MORRILL.

The species here described was at first confused with *Bucculatrix thurberiella* Busck owing to the resemblance of the two species in coloration and to the coincidence of both being found on the same food plant and in the same locality. A subsequent opportunity for field observations lead to the discovery that striking differences exist between the two species in habits, in the form of the eggs, the coloration of the larvae and in the genitalia of the adults. Observations on the biology and eco-

nomics of the new species have been included in an illustrated paper to be published in the Journal of Economic Entomology.¹

ORDER LEPIDOPTERA.

Family LYONETIIDAE.

Bucculatrix gossypiella, n. sp.

Egg. (Fig. 1). The hatched egg appears light brown or bronzed in color, with glistening, somewhat iridescent reticulations and distinct longitudinal ridges. Egg shell clear and transparent. The unhatched egg is clear, glassy or greenish. Form flat, broadly elliptical or oval in outline with narrow flattened rim, otherwise rounded, resembling the form of a lecanium scale. Length approximately $\frac{1}{3}$ mm.; width approximately $\frac{1}{4}$ mm. Greatest height approximately $\frac{1}{10}$ the length. The longitudinal ridges are somewhat variable in

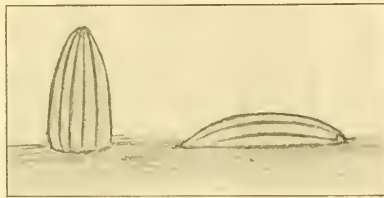


Fig. 1.

arrangement, usually consisting of a median ridge and two similar ridges on each side. Toward the micropilar end these ridges join what appears from above to be a short transverse ridge located within $\frac{1}{10}$ of the length of the egg from the anterior margin, in some cases much closer. Viewed from the front this cross ridge is seen to constitute a semicircle partially surrounding the micropile. In some specimens the ridges converge and join anteriorly where they meet the cross ridge. The longitudinal ridges diverge posteriorly, usually converging again very slightly toward the posterior margin of the egg, disappearing before reaching the extreme edge.²

Larva. Second stage. Length 2.6 mm.³ Head shield .3 mm. wide. Sparsely

¹The writer takes this opportunity to acknowledge the courtesies shown by Mr. August Busck in connection with the taxonomic work, including the preparation of the slides of the genitalia, selection of type material and the examination of adults.

²In one instance an additional short ridge was noted on one side next to the median ridge, not extending to the junction of the other ridges anteriorly but extending backward as far as any of the other five. Sometimes the longitudinal ridges diverge rather strongly, giving a fanlike appearance.

³The size attained by the larvae is dependent on the succulence of the portion of the plant serving as food. The smallest specimens of each stage can be found in woody stems.

clothed with short yellowish hairs. Head brownish. Pronotal shield greenish yellow with small median brownish black spot located near anterior margin and with a large irregular patch of brownish black extending transversely near the posterior margin. Anal plate with blackish markings. Body elsewhere dull green or yellowish green. In some specimens ellipsoid brownish genital organs are plainly visible in the fifth abdominal segment.¹

Larva. Third stage. Length 4.3–5.5 mm. Color of live specimens varies from clear straw yellow and pale greenish yellow to dull green with the sides of the body smoky green. Head, pale brown with dark brown clypeus and black eye spots. Pronotal shield distinctly spotted with black and dark brown with slight variations in different specimens. A small median black spot occurs near the anterior margin corresponding to that found in the second stage.² A comparatively large and conspicuous black spot occurs near the outer margin on each side in the posterior half of the pronotal shield and between this spot and the median line on each side is located a series of three comparatively small dark brown spots, the posterior one being the largest and elongated transversely. The spot near the anterior margin and the pair of large spots in the posterior half of the pronotal shield are invariably present in the type material,³ although variable in form and size. The anal plate is marked with a median dark brown area and with a black longitudinal line on each side. The basal segments of the legs are marked with black spots and the other segments have more or less blackish coloration on the outer sides. The body is sparsely clothed with fine, comparatively short pale yellowish hairs. Tubercles from which hairs arise occur on the thorax and abdomen. These are pale green or yellowish in color and very inconspicuous. Twelve such tubercles have been distinguished on the prothorax above the bases of the legs. The meso- and metathoracic segments have six tubercles extending from side to side, while the abdominal segments, except the last, have two transverse rows each, the anterior row consisting of six and the posterior row of four. (Fig.

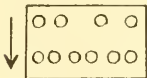


Fig. 2.

2.) Ellipsoidal genital organs in the fifth abdominal segment are conspicuous in some specimens. Their color in live specimens varies from grayish brown to brick red. Pinkish malpighian tubes are conspicuous in some specimens in the 4th, 5th, 6th and 7th segments.

Adults. Face tuft, head and thorax white. Fore wings white with black and light brown scale markings, cilia ochreous white. Hind wings and cilia ochreous white. Coloration closely similar to adults of *Bucculatrix thurberiella* Busck. Male genitalia of paratype figured. (Fig. 4, Plate 4.)

Alar expanse.—5 to 8 mm.

¹It is assumed that these organs are testes, but this has not been checked by breeding observations. At least one recent authority states that male and female reproductive organs are similar in appearance in lepidopterous larvae.

²In one specimen a much smaller black spot was observed located just posterior to the primary spot mentioned above.

³A small black spot is sometimes located just posterior to each of the large lateral spots. One or more of the inner series of three spots may be absent on each side.

Types.—Egg, second stage larva, third stage larva and adult. Catalogue No. 40380, United States National Museum.

Type locality.—Cajeme, Sonora, Mexico.

Food plants.—Cottons, including varieties of American Upland and Egyptian and several Mexican wild species, including *Gossypium davidsoni* Kellogg, *G. hypodenum* Cook and Hubbard, *G. patens* Cook and Hubbard, *G. eontextum* Cook and Hubbard, *G. morrilli* Cook and Hubbard, and *G. dicladum* Cook and Hubbard.

Described from type and paratypes of eggs, from type and paratypes of second stage larvae, from type and paratypes of third stage larvae and from adult male type and 2 paratypes of males and 3 paratypes of females. All type material from vicinity of Cajeme, Sonora, Mexico. The adults were bred from larvae which developed in burrows in woody cotton stem in one instance and which developed to full grown larvae in burrows in the carpels of cotton bolls in all other cases and in no instance fed exteriorly before pupating.

Fig. 1. Egg *B. gossypiella* n. sp. on cotton stalk $\times 50$.

Fig. 2. Diagram showing typical arrangement of spots on pronotal shield of larva of *B. gossypiella* n. sp.

Fig. 3. Female genitalia *B. gossypiella* n. sp. $\times 90$.

Fig. 4. Male genitalia *B. gossypiella* n. sp. $\times 90$.

Fig. 5. Male genitalia *B. thurberiella* Busck $\times 90$.

Fig. 6. Female genitalia *B. thurberiella* Busck $\times 90$.

NOTE.

In the Proceedings of the Entomological Society of Washington, March 19, 1927, there appeared two papers on the adult and larva respectively of *Nevermannia dorcatomoides*, new genus, and new species of Coleoptera collected from a termite nest in Costa Rica. The name of the termite with which this Anobiid beetle was found was not mentioned. The termite is *Nastutitermes* (*N.*) *ephratae* Holmg. which makes carton "niggerhead" nests on trees.

—Thomas E. Snyder.



1.



2.



3.



4.



5.



6.

A NEW SPECIES OF SYNTOMASPID.

By A. B. GAHAN, U. S. Department of Agriculture, Bureau of Entomology.

A large series of what appears to be a new species of *Syntomaspid* was recently sent to the writer by R. H. Beamer of the University of Kansas. Attention is called to the unusual habit of the species of feeding as a larva on the eggs of *Melampsalta calliope* (Walker).

Syntomaspid oviperditor, new species.

Similar in many respects to *S. tubicola* Osten Sacken, but differs by having a somewhat longer ovipositor, more strongly metallic tibiae, the mesoscutum and scutellum less strongly sculptured, the apical one-third of scutellum more weakly sculptured than basal two-thirds, the head less strongly transverse, and the hind coxae not quite so strongly punctate on its outer face.

Female.—Length 2.8 mm.; ovipositor 4 to 4.50 mm. Head as broad as thorax at tegulae, finely closely shagreened; lateral ocelli very slightly more than their own diameter from the eye margins; antennae with the first funicle joint slightly longer than the pedicel and about one-third longer than broad, last funicle joint subquadrate; club ovate a little thicker than last funicle joint and about equal in length to the two joints which precede it; prothorax and mesoscutum finely reticulate, the reticulations transversely elongated and giving an appearance of very fine, rather indefinite and irregular transverse lineolation or rugosity; axillae and basal two-thirds of scutellum sculptured like mesoscutum, the apical one-third of scutellum set off by a distinct cross furrow and much more weakly reticulated than the basal portion, often nearly smooth; propodeum shining, nearly polished, but with some very faint reticulations, without any indications of carinae or folds, the spiracles elliptical; mesepimera and metapleura polished, rest of pleura reticulated; stigmal vein sessile; postmarginal two or three times as long as stigmal; hind coxae outwardly rather strongly reticulated, without a distinct carinate line along the dorsal margin; hind tibial spurs unequal, the inner spur the longest and less than half the length of basitarsus, abdomen about as long as head and thorax, compressed from the sides, the first tergite smooth and comprising approximately one-third of the dorsal length of abdomen, segments beyond the first subequal in dorsal length and uniformly weakly reticulated; ovipositor one and two-thirds times the length of body. Head, thorax and abdomen bright green, more or less tinged with brassy, the scutellum strongly so; scape metallic with a yellowish spot at base; flagellum black; fore and middle coxae, femora and tibiae aeneous, their knees, apices of tibiae and tarsi pale yellowish; hind coxae and femora bluish, their tibiae blackish with an aeneous tinge, their knees very slightly, apices of tibiae very narrowly, and tarsi entirely pale yellowish; ovipositor sheaths black; wings hyaline, venation pale yellow.

Male.—Length 2.0 mm. Abdomen not more than two-thirds as long as the thorax, not strongly compressed; first tergite comprising a little more than one-third its dorsal length; scutellum not strongly tinged with brassy, and with

its apical one-third rather distinctly reticulated but still not as strongly so as the rest of scutellum. Otherwise agrees with the description of the female.

Both sexes show considerable variation in size. Females range from 2 mm. in length to slightly more than 3 mm. and the exerted portion of the ovipositor is correspondingly variable ranging from 3.3 mm. to 4.6 mm. Males vary from 1.6 mm. to 2.15 in length.

Type locality.—Douglas County, Kansas.

Type.—Cat. No. 40465, U. S. N. M.

Twenty-three females and twenty-six males reared by R. H. Beamer of the University of Kansas from egg clusters of *Tibicen aurifera* Say in May, 1924, and September, 1925; also five females and two males reared July 8, 1925, by the same collector from stems of sweet clover containing egg-clusters of *Melampusalta calliope* (Walker). Type, allotype and forty-four paratypes in the U. S. National Museum; ten paratypes in the collection of Kansas University.

The parasitism of this species upon the eggs of its host is an altogether anomalous habit for species of *Syntomaspis* and even for the family Callinomidae, so far as known to the writer. Mr. Beamer assures me, however, that he has observed the parasite larva feeding upon the eggs of the cicadas and has reared them through to maturity, so there can be no doubt of the correctness of the record.

Actual date of publication, May 18, 1927.

EDITORIAL.

Versatility is a common attribute of insects and we as entomologists never cease to marvel at such examples as the flies that live in crude petroleum or frolic in the caustic waters of the alkali lakes or the acrid billows of Great Salt Lake. Likewise the beetles and flies which gambol in the waters of hot springs, so torrid that they would parboil a human being, but do we ever pause to meditate on that group of remarkable insects which, like man, have learned to chew tobacco,—but swallow the juice?

Speaking of flies, since man flees fleas why don't he flee flies or else make the flies flee?

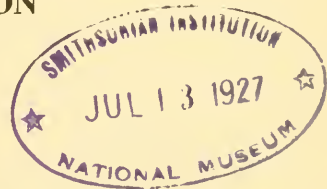
Where is this crime wave to halt? Heretofore the classic example of pusillanimous pilfering was held to be that enterprising yegg who filched the fractional currency from the ocular orifices of the deceased African, but now¹ comes the story of the sexton beetles caught in the act of robbing the grave of its worm!

—*W. R. Walton.*

¹Steele, B. F. Jour. N. Y. Ent. Soc., March, 1927, p. 77.

PROCEEDINGS
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PROCEEDINGS OF THE
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VOL. 29

MAY 1927

No. 5

NEW SPECIES OF HETEROCERA (LEPIDOPTERA) FROM
CENTRAL AND SOUTH AMERICA.

By W. SCHAUS, *Bureau of Entomology, U. S. Department of Agriculture.*

SATURNIIDAE.

Ormiscodes cutteri, new species.

Male.—Head and mesothorax flesh ocher; a dorsal black patch on collar and broad black streaks on shoulders; metathorax old rose; abdomen black with sublateral yellowish spots; anal hairs old rose; antennae pinkish cinnamon; palpi and legs fringed with old rose. Fore wing vinaceous fawn faintly suffused with Japan rose; an ochraceous buff streak on costa from beyond base and not reaching apex; veins finely black; a thick outbent antimony yellow mark at end of cell with projecting whitish tooth along vein 4 to beyond postmedial line which is rather broad, blackish, straight and inbent, cut by the discal tooth; cilia on termen and inner margin geranium pink. Hind wing and cilia geranium pink; veins black; a postmedial and broad subterminal blackish shade. Fore wing below suffused with buffy brown, the inner margin whitish; no discal mark; veins black; postmedial line macular, reddish. Hind wing below pale ochraceous buff; costa white; veins black; a postmedial reddish line; a broad subterminal drab shade.

Expanse 67 mm.

Habitat.—Azogues, Ecuador.

Type.—Cat. No. 33249, U. S. N. M.

Named in honor of Mr. V. M. Cutter, President of the United Fruit Company.

Hylesia petena, new species.

Male.—Palpi and frons ferruginous; vertex, collar, thorax, and dorsal tufts of abdomen at base black; the abdomen otherwise dorsally cinnamon brown; anal hairs vinaceous rufous. Fore wing livid brown, suffused with blackish towards apex; an oblique black fascia from base of cell to inner margin; faint traces of a double dark postmedial line. Hind wing livid brown, the inner margin broadly suffused with vinaceous brown; a fine pecan brown discocellular line; very faint traces of a darker postmedial line. Wings below deep livid brown, the postmedial line more distinct.

Female.—Head and thorax vinaceous brown mottled with yellowish hairs; abdomen above olive brown, also mottled with yellowish hairs; long lateral tufts of ochraceous buff hairs, with shorter similar hairs ventrally. Fore wing

livid brown; a broad vertical dark vinaceous brown bar on discocellular and a broad similar outer fascia from costa to inner margin. Hind wing paler; veins at cell russet vinaceous; a faint darker postmedial shade.

Expanse ♂ 47 mm.; ♀ 62 mm.

Habitat.—Peten, Guatemala.

Type.—Cat. No. 33250, U. S. N. M.

Nearest *H. hamata* Schs. Abdomen darker in both sexes. Wings more brilliantly colored. The outer fascia in female of even width, not diffuse on outer edge; the discal bar much broader.

A mass of cocoons in a web surrounding the branch of a tree received from Guatemala, the moths emerging over a period of two years.

***Hylesia olivenca*, new species.**

Male.—Body drab, the abdomen dorsally mottled with cinnamon hairs. Wings brownish drab. Fore wing: a broad, vertical, white antemedial line; a similar slightly inbent postmedial line more darkly edged basad, this shade suffusing with the blackish spot at end of cell; some irregular terminal whitish shading from vein 4 to tornus; a terminal white spot below apex. Hind wing: a darker postmedial shade including the dark discal spot followed by a faint whitish shade.

Expanse 45 mm.

Habitat.—Bogota, Colombia; São Paulo de Olivença, Amazonas.

Type.—Cat. No. 33251, U. S. N. M.

Closely allied to *H. novex* Dognin, which has the discal spots quite separate from the dark shading of postmedial line; it is also smaller in both sexes. Three males and two females in National Museum.

***Hylesia palcazua*, new species.**

Male.—Head and thorax deep brownish drab, the abdomen somewhat paler, mottled with buffish brown hairs. Wings light cinnamon drab. Fore wing: a small dark spot on discocellular; a deep brownish drab postmedial shade, outcurved on costa, inbent and broader from vein 6 to inner margin, joined at vein 6 by a fine dark line, also outcurved at costa; terminal space mostly pale drab gray; a fine dark subterminal line inbent to below vein 6, then sinuous and vertical to inner margin; a terminal dark shade below vein 8, narrowing to a point at vein 3. Hind wing: a dark discal point; traces of postmedial and subterminal dark lines.

Female with fore wing broad, more quadrate; the markings almost as in male; the discocellular mark on fore wing more linear; the pale markings of terminal area consisting of a broad shade on outer side of subterminal line from vein 6 to tornus.

Expanse ♂ 42 mm.; ♀ 53 mm.

Habitat.—Palcazu, East Peru.

Type.—Cat No. 33252, U. S. N. M.

One male and three females in National Museum.

***Hylesia biolleya*, new species.**

Male.—Head and thorax hair brown; abdomen hair brown at base, otherwise ochraceous orange. Fore wing hair brown; base suffused with drab gray limited by a faint whitish vertical shade before middle of wing; a darker patch over discocellular; postmedial line fine, darker, outangled below costa and slightly inbent to inner margin, outwardly edged by a narrow whitish shade, somewhat broader on costa; an irregular whitish subterminal shade from apex to vein 3, expanding to termen from vein 3 to tornus. Hind wing hair brown; a darker postmedial narrow shade.

Expanse 40 mm.

Habitat.—Costa Rica.

Type.—Cat. No. 33253, U. S. N. M.

Two males collected by P. Biolley.

***Citheronia guayaquila*, new species.**

Male.—Head and thorax cream white, with some grayish shading. Abdomen above flesh ocher with maize yellow segmental lines. Fore wing brownish drab, the pale markings yellowish white; a spot at base below cell and similar scaling at base of inner margin; a large spot at end of cell containing, and followed by, macular lines of ground color; a large spot on costa at apex, its lower edge inbent below apex and sinuous, and from vein 6 a broken series of small spots inbent to middle of inner margin, connected by a slightly darker shade than ground color, the largest spot below vein 4, a point below vein 3, and small spot on inner margin; a faint yellowish subterminal line, deeply lunular. Hind wing: costa broadly maize yellow; basal half of inner margin suffused with deep brownish vinaceous; postmedial and terminal space dark grayish brown; a subterminal pale orange yellow line, dentate to termen on veins 5 and 6, more lunular, wavy, from vein 4 to inner margin. Fore wing below with base broadly whitish yellow. Hind wing below yellowish white; a large ocher red discal spot; an outer incurved ocher red lunular line from termen at vein 7 to inner margin above anal angle, outwardly shaded with light drab; terminal light drab spots on interspaces.

Expanse 81 mm.

Habitat.—Guayaquil, Ecuador.

Type.—Cat. No. 33254, U. S. N. M.

Close to *C. claveryi* Bouvier, from which it differs in the subterminal markings of hind wing.

PERICOPIDAE.

***Pericopsis schadei*, new species.**

Female.—Head, collar, thorax, and fore wings fuscous black; a few white

hairs on vertex, back of eyes, and outwardly on collar; a small orange buff spot on shoulder and one on base of costa; a small cream color spot on base of median vein; a black fascia across end of cell and another before a broad postmedial white fascia from costa to termen above vein 3; traces of some whitish scaling incurved from inner edge of white fascia above vein 3 to submedian. Abdomen and hind wing blue black, the latter with a triangular white spot between veins 3 and 5, the apex close to termen above vein 3, the upper angle extending as a line to vein 6. Wings below bluish black; a scarlet spot at base of both wings; the white spot on hind wing reduced. Legs black with a few white scales. Abdomen below with some white scaling sublaterally on terminal segments; anus orange.

Expanse 60 mm.

Habitat.—Villa Rica, Paraguay.

Type.—Cat. No. 33255, U. S. N. M.

This species is different from any I know, but may be the female of some quite different known male.

MEGALOPYGIDAE.

Euglyphis primola, new species.

Male.—Palpi pale drab gray with a black streak behind. Head mottled drab gray and fuscous. Collar dark vinaceous brown mottled with white hairs. Thorax white faintly tinged with sulphur. Abdomen vinaceous fawn. Fore wing sorghum brown faintly tinged with purple; base to near middle white crossed by indistinct subbasal and antemedial wavy grayish lines, the costa irrorated with purplish; postmedial line white slightly outangled below costa then punctiform and nearly vertical to inner margin; an irregular subterminal white line; cilia with whitish spots at veins. Hind wing vinaceous fawn, the costa and apical area mottled white and vinaceous brown; a darker medial line; a wavy subterminal white line. Fore wing below brown; costa finely, a fine postmedial line, a wavy subterminal line, a line on base of cilia and spots on cilia white. Hind wing below as above, the costa broadly darker with white mottling, the subterminal line broader and more diffused.

Expanse 34 mm.

Habitat.—Tumatumari, Potaro River, British Guiana.

Type.—Cat. No. 26238, U. S. N. M.

Near *E. mediana* Schaus in wing pattern, but distinguished by the white thorax.

EUPTEROTIDAE.

Apatelodes paraguayana, new species.

Male.—Body and shaft of antenna pale drab gray, the pectinations drab; palpi ocher red tipped and fringed with pale drab gray; fore femora ocher red; abdomen ventrally whitish irrorated with ocher red. Fore wing pale drab gray; an oblique antemedial fuscous black fascia from below cell, inbent to inner margin; a fine medial drab line, outcurved, faintly angled on submedian fold; postmedial line outangled below costa, then slightly incurved, vertical, from

below vein 6 fuscous black preceded by a triangular drab shade, its apex touching the medial line; a fuscous black subterminal mark from costa to vein 6. Hind wing: basal half cinnamon drab shaded with white along inner margin, crossed by a fine curved dark medial line ending in a small fuscous black spot on inner margin, and limited by a broad whitish, evenly curved line; terminal space suffused with light cinnamon drab with a darker shade at anal angle. Fore wing below whitish; an outcurved lunular postmedial fine line, preceded by a vertical drab shade; termen at apex van dyke brown, preceded by a white line and dark costal spot. Hind wing below: base from costa to below cell cinnamon drab, the inner margin white; a broad medial verona brown line, outwardly edged with white; termen light drab.

Expanse 26 mm.

Habitat.—Paraguay.

Type.—Cat. No. 33256, U. S. N. M.

Nearest *A. quadrata* Jones, but smaller and differently marked.

***Apatelodes ibar*, new species.**

Female.—Body light drab, the head and thorax suffused with grayish olive, the abdomen with paler segmental lines. Fore wing light drab suffused with light grayish olive; antemedial line drab, double, faintly inbent from costa; postmedial line drab, double, defined by fine darker lines, the inner line slightly outcurved below costa, the outer line outangled at vein 5; subterminal line pale, straight from costa before apex to tornus, preceded by a triangular benzo brown spot on costa and followed above vein 5 by a black point; apex acute, slightly falcate; termen slightly crenulate. Hind wing light cinnamon drab; a medial band slightly darker defined by a dark medial line, and a pale postmedial line. Fore wing below paler without the antemedial line; hind wing below brighter, the medial band mikado brown, the postmedial line distinct white.

Expanse 29 mm.

Habitat.—Cordoba, Argentina.

Type.—Cat. No. 33257, U. S. N. M.

Quite unlike any described species.

***Thelosia jorgenseni*, new species.**

Male.—Body cinnamon buff, the head and thorax somewhat darker. Fore wing cinnamon buff, the base shaded with cinnamon; a small sepia spot on discocellular; a postmedial sayal brown line from subcostal, almost vertical to inner margin, followed by a very fine dark line somewhat wavy; a fine subterminal dark lunular line from vein 7 to vein 2. Hind wing clay color, the termen cinnamon buff; a faint discal point; a medial sayal brown line, angled beyond cell and inbent to middle of inner margin; traces of a fine postmedial line, the space between the lines suffused with sayal brown. Wings below warm buff. Fore wing with the two postmedial lines slightly wavy; discal point as above; the subterminal fine, forming two short inbent streaks above and below vein 6. Hind wing: the postmedial line fine, lunular, cinnamon,

vertical from costa and inbent beyond cell to middle of inner margin; the postmedial line very fine and indistinct, lunular.

Expanse 25 mm.

Habitat.—Villa Rica, Paraguay.

Type.—Cat No. 33258, U. S. N. M.

Allied to *T. truncata* Schaus and *T. rectilinea* Dogn., but darker, especially the hind wing. The underside of hind wing is more like *T. rectilinea* Dogn.

MEGALOPYGIDAE.

Megalopyge incachaca, new species.

Male.—Frons brownish olive. Vertex, collar, and thorax yellow ocher. Abdomen light ochraceous buff. Palpi and throat mummy brown. Body below light ochraceous buff. Legs clothed with long black hairs, and a few long white hairs; fore legs with an under layer of light ochraceous buff hairs. Fore wing: base below cell to inner margin walnut brown, outwardly shaded with fuscous, and then whitish obliquely from base of vein 2 to near tornus; cell with a fine whitish line at base, and one below cell, mostly walnut brown for two-thirds, the end white; discocellular and veins from it finely black for some distance; veins 2 and 3 white at base, fold and submedian finely black; outer space to termen Naples yellow faintly shaded with brownish towards cell; none of the black lines on veins reach termen; costa white at apex. Hind wing Naples yellow. Fore wing below: costa black not reaching apex; subcostal vein white. Hind wing below: costa walnut brown.

Female.—Base of fore wing and below cell to middle yellow ocher, otherwise as in male.

Expanse ♂ 35 mm.; ♀ 55 mm.

Habitat.—Incachaca, Bolivia.

Type.—Cat. No. 33259, U. S. N. M.

Of several species described belonging to this group it is the only one with veins streaked with black.

Megalopyge guaya, new species.

Female.—Head avellaneous. Body buffy brown, the abdomen with light drab segmental shading. Fore wing: more than basal half fuscous, below cell cinnamon drab, crossed by antemedial and medial double darker lines, the scaling very hairy and undulating, mottled with whitish hairs at base and along costa, this space vertical on outer edge; outer portion of wing drab, mottled next to dark area with wavy white hairs between veins, above vein 5 shaded with whitish to apex, with three short black streaks between veins 5 and 8. Hind wing drab, cilia paler. Wings below drab, the cilia whitish.

Expanse 30 mm.

Habitat.—Villa Rica, Paraguay.

Type.—Cat. No. 33260, U. S. N. M.

The antennae are shortly pectinated. In one specimen veins

3 and 4 are shortly stalked. This is the only described species with the dark basal area vertical on outer edge.

Megalopyge sevarina, new species.

Female.—Head and thorax snuff brown mottled with cinnamon buff hairs. Abdomen clay color with sayal brown segmental lines and mottled with cinnamon buff hairs; anal hairs cinnamon buff. Fore wing light drab crossed by numerous hair brown lines, hardly traceable in cell, the third line beyond cell from subcostal to vein 5, the fourth and fifth lines suffusing below vein 5; basal third below cell shaded with cinnamon and mottled with cinnamon buff hairs; all the scaling hairy and undulating. Hind wing thinly scaled, grayish drab; some cinnamon buff hairs at base of inner margin. Wings below drab.

Expanse 48 mm.

Habitat.—San Bernardino, Paraguay.

Type.—Cat. No. 33261, U. S. N. M.

Unlike any described species; the termen of fore wing oblique, the apex and tornus rounded.

Megalopyge victoriana, new species.

Male.—Body above tawny olive, underneath paler. Fore wing: basal area, its outer edge oblique from costa to inner margin near subterminal line dark olive buff suffused with avellaneous; postmedial area forming a triangular patch from within end of cell and vein 5 to subterminal line olive buff; an irregular pale spot at end of cell followed by an oblong dark patch between costa and vein 5, on which the veins are white; subterminal line broad, pale olive buff, parallel with termen, and outwardly shaded with deep olive buff extending on veins. Hind wing pale olive buff.

Expanse 28 mm.

Habitat.—Victoria, Espirito Santo, Brazil.

Type.—Cat. No. 33262, U. S. N. M.

Belongs to the group of *M. vulpina* Berg. and *M. lanceolata* Dogn.

GEOMETRIDAE.

Argyrotome prattaria, new species.

Male.—Body and wings pale drab gray, the abdomen above shaded on terminal half with drab. Fore wing with scattered silver scales; postmedial area irrorated with drab; an oval black spot on discocellular, its upper part almost entirely covered with raised silver scales, its lower part broadly edged with ochraceous buff and then with deep grayish olive covered with silver scales; subterminal line outbent from costa and sinuous, silver, preceded by cinnamon drab shading; some drab striae on termen, and a fine cinnamon drab terminal line. Hind wing thickly irrorated with drab gray and silver; a dense patch of silvery golden scales across end of cell, expanding outwardly from above vein 4 to near inner margin; a line of silvery striae from costa near apex to tornus; small marginal silver spots below vein 6 and above vein 4, larger

silver spots above and below vein 3, these latter with black points on either side. Wings below mostly light ochraceous buff.

Expanse 30 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 33263, U. S. N. M.

Nearest *A. metallicata* Warr.

Named in honor of Mr. Geo. D. Pratt of New York, a generous contributor to the fund for the purchase of the Dognin Collection.

***Argyrotome paraguayaria*, new species.**

Male.—Palpi and frons sayal brown. Vertex and thorax white. Abdomen white irrorated with olive gray, leaving white segmental lines. Wings white with scattered silver scales. Fore wing: costa finely light buff; a black discal spot almost entirely covered with raised silver scales, circled with pinkish buff, then narrowly with hair brown and basad with dense clusters of silver striae; a very faint postmedial tillule buff narrow shade, followed by a broader line of hair brown striae on a cream color shade; subterminal line outcurved cinnamon buff, edged inwardly with silver scales on interspaces. Hind wing: a faint light drab shade on discocellular; postmedial and subterminal drab striae with clusters of silver scales on interspaces between them; termen narrowly cinnamon buff, preceded by small black spots almost completely covered with raised silvery scales, the largest above and below vein 3, the smallest above and below vein 6.

Expanse 23 mm.

Habitat.—Paraguay.

Type.—Cat. No. 33264, U. S. N. M.

Intermediate between *A. alba* Druce and *A. melae* Druce, but quite distinct from either.

Described from a small series.

***Asestra psalmoidaria*, new species.**

Male.—Body and wings avellaneous, rather browner than Ridgway's color. Fore wing: an antemedial hair brown line, outcurved at costa and inbent to near base of inner margin; a postmedial tawny olive line slightly sinuous, vertical to submedian fold, then slightly inbent to inner margin; a fine dark subterminal line, outwardly pale edged, outbent on costa with minute black points on veins from costa to vein 5, the line inbent from vein 5, outbent at vein 2, angled on fold and inbent to inner margin; an irregular broad tawny olive shade on terminal area. Hind wing: an antemedial hair brown line; postmedial line fine outwardly edged with white points; a tawny olive shade on terminal area expanding at vein 2 to termen, above narrowing to anal angle. Wings below buffish suffused with light vinaceous brown, chiefly on fore wing; antemedial line very faint; black points on discocellulars; postmedial line more heavily pale edged on fore wing, faint on hind wing, which has a subterminal line of black points on veins.

Expanse 35 mm.

Habitat.—Volcan Sta Maria, Guatemala.

Type.—Cat. No. 33265, U. S. N. M.
 Allied to *A. cabiria* Druce; the lines quite different.

Hygrochroma lincanaria, new species.

Male.—Body and wings brownish drab suffused with neutral gray. Fore wing: antemedial line fine, olive brown, outcurved and lunular; the outangled shade before postmedial olive brown, with an oblong grayish shade above it on costa; postmedial line fuscous, oblique and excurved below costa, straight and inbent from vein 7, followed by an irregular olive brown shade. Hind wing similar in color, the olive brown shading before postmedial extending to base in and below cell; a broad subterminal olive brown shade, its outer edge dentate. Wings below paler. Fore wing: some fine striae from base to postmedial, not reaching inner margin; whitish scaling along outer edge of postmedial; a subterminal incurved white line from costa followed by olive brown to apex and vein 6, below 6 the line is faint, lunular, whitish; a narrow darker shade from costa across discocellular to vein 2. Hind wing: a faint medial shade; postmedial fine; subterminal short white streaks on veins.

Expanse ♂ 37 mm.; ♀ 44 mm.

Habitat.—Volcan Sta Maria, Guatemala.

Type.—Cat. No. 33266, U. S. N. M.

Very similar to *H. olivinaria* H. S. but easily distinguished by the subterminal markings on underside of hind wing. *Olivinaria* has a distinct subterminal dentate white line.

Selenia mariaria, new species.

Male.—Body wood brown. Fore wing: base and terminal area avellaneous suffused with vinaceous fawn; a fine fuscous antemedial line outangled in cell; medial space darker, almost benzo brown before postmedial line, the darker shading oblique from costa above discocellular to postmedial line; postmedial line fuscous, outbent to vein 7, lunular to vein 5 outwardly edged with white, then inbent to vein 3 at cell, slightly wavily outbent to near submedian and inbent to inner margin; a few black specks on terminal area. Hind wing wood brown; a faint dark medial line; postmedial and subterminal lines fine, faint, better defined on inner margin where they are outwardly edged with white. Wings below paler. Fore wing: a line on discocellular, the postmedial fine, inbent, and traces of an irregular subterminal line. Hind wing below with a black spot on discocellular; a fine postmedial line; subterminal line macular interrupted.

Expanse 37 mm.

Habitat.—Volcan Sta Maria, Guatemala.

Type.—Cat. No. 33267, U. S. N. M.

Nearest to *S. narcaea* Druce, but quite distinct.

Selenia blaziaria, new species.

Male.—Body light cinnamon drab. Wings light cinnamon drab with grayish

suffusions, finely striated with hair brown. Fore wing: base of costa with hair brown scaling; a subbasal small dark spot on submedian; antemedial line hair brown with small darker spots on costa, subcostal vein and above submedian; a faint dark medial shade, outangled below costa with some dark spots on costa, discocellular and at base of vein 3, and followed except on costa by a tawny shade to postmedial; postmedial line fine, black, slightly outangled below costa, then inbent, sinuous to inner margin, partly edged outwardly with whitish gray, sometimes followed by two small hair brown spots above and below vein 3; an excurved subapical white line from costa. Hind wing: costa whitish to postmedial line; a black point on discocellular; postmedial line fine, black partly edged outwardly with whitish, and followed by a tawny shade. Wings below cream buff striated with hair brown; postmedial line very fine, straighter; dark points on discocellulars; subapical line of fore wing reaching vein 5 followed by rood's brown to termen.

Expanse 40 mm.

Habitat.—Popocatepetl, Mexico, between 8,000 and 10,000 feet.

Type.—Cat. No. 33268, U. S. N. M.

Nearest *S. ricochetta* Dyar, larger, the markings less defined, the underside without the strong lines, or the terminal orange spot on fore wing.

***Selenia abramaria*, new species.**

Male.—Body drab gray. Wings drab gray. Fore wing with a few brownish striae; medial area suffused with light cinnamon drab; antemedial line hair brown almost vertical; a fine medial dark lunular line from subcostal to inner margin; postmedial line excurved on costa, angled below vein 7 inbent and sinuous, fuscous on costa and from vein 7 to vein 5, then very faint brownish followed by small faint spots above and below vein 3; a black line on discocellular; a subterminal curved white line from costa. Hind wing rather paler, the costa whitish; a black discal point; faint medial and postmedial lines. Wings below paler, duller, the markings faintly indicated; apex of fore wing light drab.

Expanse 30 mm.

Habitat.—Popocatepetl, Mexico, between 8,000 and 10,000 feet.

Type.—Cat. No. 33269, U. S. N. M.

Allied to *S. blaziararia* Schaus, but smaller, grayer with the markings less defined.

***Perigramma guatemalaria*, new species.**

Male.—Palpi and head olive brown, the fringe at base of palpi, vertex behind, neck, throat, shoulders, and fore femora buff yellow; legs white partly streaked with hair brown. Body white, anal hairs yellowish buff. Wings white. Fore wing: costa finely light brownish olive, slightly expanding on outer half; a narrow deep olive buff fascia outbent from middle of costa to inner margin

well before tornus. Hind wing: a fascia as on fore wing from middle of costa vertical to inner margin before anal angle. Wings below white.

Expanse ♂ 37 mm.; ♀ 40 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 33270, U. S. N. M.

Near *P. cesata* Druce which has no fascia on hind wing, and the fascia on fore wing ends close to tornus.

***Scordylia guatica*, new species.**

Male.—Body and wings mouse gray. Fore wing: an oblique white fascia from middle of costa where it is narrow, expanding and ending on vein 2 before termen; apical space somewhat darker. Fore wing below with costa, apex, and termen suffused with brick red irrorated with whitish scales. Hind wing below brick red irrorated with whitish scales.

Expanse 20 mm.

Habitat.—Volcan Sta Maria, Guatemala.

Type.—Cat. No. 33271, U. S. N. M.

Belongs to the group of *S. anicata* Feld, and *S. mortipax* Butl., still smaller than the latter species.

***Synneuria cannonaria*, new species.**

Male.—Body light drab, the abdomen with fine white segmental lines. Wings light orange yellow; cilia white with quadrate black spots, and suffused at base with buff pink. Fore wing: a postmedial cinnamon drab elongated spot on costa; apex broadly black narrowing to just below vein 3 at termen; sub-terminal buff pink points on veins 7 and 8. Hind wing: apex more narrowly black containing a triangular light orange yellow spot on costa. Fore wing below as above, the costa and apex argus brown; a vertical white postmedial line from costa to vein 6; an inbent white line before apex to below vein 7; a dentate white marginal line from above vein 5 to vein 3. Hind wing below argus brown, the markings white; base of costa down bent as a broad fascia through end of cell to termen between veins 4 and 5; a dark spot at upper angle of cell on fascia; an antemedial line from fascia to inner margin; a medial curved line above and below fascia; a white mark at apex and short line at anal angle.

Expanse 31 mm.

Habitat.—Volcan Sta Maria, Guatemala.

Type.—Cat. No. 33272, U. S. N. M.

Named in honor of Mr. H. W. Cannon, a subscriber to the Dognin Collection Fund.

THREE NEW PHLÆOTHRIPIDÆ (THYSANOPTERA) FROM THE DISTRICT OF COLUMBIA.

By J. DOUGLAS HOOD, *University of Rochester*.¹

One of the new species described below was collected nearly forty years ago by the late Theodore Pergande, of the Bureau

¹Contribution from the Entomological Laboratories of Cornell University.

of Entomolgy. The two remaining ones were taken by Mr. John E. Walter, of the Federal Horticultural Board. Paratypes of all have been deposited in the U. S. National Museum, while the holotypes, allotypes, and such of the paratypes as have not been returned to Mr. Walter, will remain in the collection of the author.

Haplothrips rectipennis, sp. nov.

(Pl. 5, figs. 1 and 2.)

Female (macropterous).—Length about 1.6 mm. Color brown, with bright red subhypodermal pigmentation; fore tarsi yellow, other tarsi and tips of fore tibiæ yellowish brown; segments 3-5 of antennæ bright yellow, 6 yellowish brown, 7 and 8 blackish brown; wings clear.

Head, Plate 5, fig. 1, about 1.2 times as long as wide, broadest behind eyes, sides slightly rounded, decidedly narrowed to base, which is 0.85 the greatest width of head; vertex slightly produced in front of eyes and overhanging insertion of antennæ, the anterior ocellus nearly attaining frontal costa and directed forward; dorsal and lateral surfaces almost perfectly smooth, without distinct anastomosing lines, the minute bristles barely distinguishable; postocular bristles pointed, one-third as long as head and dark in color. Eyes about 0.37 as long as head and 0.84 as wide as their interval. Ocelli anterior in position, the posterior pair decidedly in advance of middle of eyes. Antennæ fully 1.8 times as long as head; segments 3 and 4 subequal, slightly longer than 2 and 5, 3 symmetrical, swollen apically, only about 1.6 times as long as wide; 8 rather long and slender, not closely united to 7; sense-cone formula: 3, 1-2; 4, 2-2; 5, 1-1+1; 6, 1-1+1; 7 with the usual one on dorsum near apex. Mouth cone sub-acute, reaching two-thirds across prosternum.

Prothorax about 2.1 times as broad across coxæ as median length of pronotum, which is about 0.64 the length of head, surface perfectly smooth; anterior marginal bristles very minute, all others present, nearly or quite pointed, dark brown in color, the epimeral pair equal to postoculars, and the posterior marginals, midlaterals, and anterior angulars successively shorter, the last named hardly half the length of postoculars. Mesoscutum very delicately marked with transverse anastomosing lines; metascutum rather closely and deeply longitudinally striate in a narrow patch at each side of base. *Wings not at all narrowed at middle*; fore pair with 8 or 9 accessory hairs; third subbasal bristle slightly longer, slenderer, paler, and more pointed than the other two. Tarsal tooth very minute.

Abdomen only slightly wider than pterothorax, almost perfectly smooth. Tube about 0.7 as long as head, nearly 1.8 times as long as basal width, which is more than twice the apical, sides nearly straight. Bristles long and pointed, those at apex of segment 9 much longer than tube; terminal bristles about equal in length to tube.

Measurements (principally of holotype), ♀: Length 1.56 mm.; head, length 0.198 mm., greatest width 0.168 mm., width at base 0.144 mm.; eyes, length 0.074 mm., width 0.052 mm., interval 0.062 mm.; postocular bristles, length 0.068 mm.; prothorax, median length of pronotum 0.127 mm.; width across

coxæ 0.273 mm.; pterothorax, width 0.309 mm.; abdomen, width 0.345 mm.; tube, length 0.140 mm., width at base 0.079 mm., at apex 0.037 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	40	52	55	56	52	48	47	32
Width (μ)	34	32	34	34	31	25	24	12
Total length of antenna 0.38 mm.								

Male (macropterous).—Like female in all essential respects, but with head somewhat longer, abdomen slenderer, and fore legs (particularly the femora) enlarged as usual, the tarsus with a strong tooth.

Described from 19 females and 2 males taken by Mr. John E. Walter at Washington, D. C. (Rock Creek Park), July 26, 1924, on leaves of blueberry ("*Vaccinium*, probably *vacillans*") [Hood No. 549].

Paratype.—Catalogue No. 40283, U. S. Nat. Mus.

Notwithstanding the non-narrowed wings, I have placed this species in *Haplothrips* because it is otherwise thoroughly typical of that genus. The wing character just mentioned, taken together with the antennal coloration and the form of the third antennal segment, make it easily recognizable.

***Rhynchothrips usitatus*, sp. nov.**

(Pl. 5, figs. 5, 6, and 7.)

Female (macropterous).—Length about 1.7 mm. Color dark blackish brown (black to the naked eye); all femora brown, becoming rather abruptly pale lemon yellow in distal two-thirds or more of lower surface, the fore femora pale at apex also; fore and middle tibiæ dark blackish brown along upper surface (especially basally), remainder pale yellow; posterior tibiæ blackish brown, darkest at base, paler ventrally and distally; all tarsi brownish yellow; antennæ pale yellow in segments 1-4, segment 5 tinged with brown, 6 brown with yellow pedicel, 7 and 8 blackish brown, the former with paler pedicel; fore wings dark brown at base, shading to very pale brown at tip and along margins, the dark color predominating in basal half.

Head about 1.17 times as wide as long, broadest behind eyes; cheeks rounded, decidedly converging posteriorly, the head at base about 0.85 the greatest width; dorsal and lateral surfaces striate with rather widely spaced anastomosing lines which become stronger and more reticulate on vertex, and with the usual minute transparent bristles; vertex broadly rounded in front, overhanging insertion of antennæ, and bearing the anterior ocellus at its extremity; postocular bristles fully as long as eyes, almost pointed, nearly black. Eyes about 0.36 as long as head and about 0.86 as wide as their interval. Ocelli situated well forward. Antennæ about 2.67 times as long as head, rather more slender than usual in the genus; segment 3 about 2.25 times as long as wide; 4 a little less than twice as long as wide; 8 slender, elongate-conical, rather broadly united to 7; sense-cone formula: 3, 0-1; 4, 1-2; 5, 1-1+1; 6, 1-1+1; 7 with one on dorsum near apex. Mouth cone long and acute, reaching well onto mesosternum.

Prothorax about 2.77 times as wide across coxæ as median length of pronotum, with a short dark median line in anterior portion only, surface without sculpture; all bristles present, blunt but not knobbed, nearly black in color, outer pair at posterior angles decidedly longer and stronger than postoculars, inner pair about equal to postoculars and twice as long as the two pairs on anterior margin, midlaterals about 0.8 as long as postoculars. Pterothorax decidedly wider than prothorax, sides convex. Wings of fore pair rather broad, of equal width throughout, and with the three subbasal bristles about equal to midlaterals in color, size, and form; about 8 accessory hairs on posterior margin. Legs rather long and slender, fore tarsi unarmed.

Abdomen rather large and heavy, fully 1.4 times as wide as prothorax. Tube about 0.85 as long as head, 1.8 times as long as basal width, and 2.18 times as wide as at apex, sides slightly concave. Bristles dully pointed, dark brown; lateral bristles on segment 9 about 0.7 as long as tube, much shorter than terminal bristles.

Measurements of female.—Length 1.71 mm.; head, length 0.176 mm., greatest width 0.206 mm., width at base 0.176 mm.; eyes, length 0.064 mm., width 0.060 mm., interval 0.070 mm.; postocular bristles, length 0.068 mm.; prothorax, median length of pronotum 0.122 mm., width across coxæ 0.338 mm.; pterothorax, width 0.398 mm.; abdomen, width 0.480 mm.; tube, length 0.150 mm., width at base 0.083 mm., at apex 0.038 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	48	56	72	72	64	61	59	38
Width (μ)	36	33	32	37	33	31	27	15
Total length of antenna 0.47 mm.								

Male (macropterous).—Length about 1.2 mm. More slender than female and with slenderer antennæ. *Segment 3 of antenna about 2.3 times as long as wide; 4 slightly less than twice as long as wide.* Fore tarsi unarmed. Tube about 0.87 as long as head, hardly twice as long as basal width, which is nearly 2.1 times the apical.

Measurements of male.—Length 1.24 mm.; head, length 0.170 mm., width 0.185 mm., width at base 0.154 mm.; eyes, length 0.060 mm., width 0.054 mm., interval 0.069 mm.; postocular bristles, length 0.062 mm.; prothorax, median length of pronotum 0.106 mm., width across coxæ 0.297 mm.; pterothorax, width 0.353 mm.; abdomen, width 0.383 mm.; tube, length 0.148 mm., width at base 0.075 mm., at apex 0.036 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	42	49	69	66	65	60	52	34
Width (μ)	33	30	30	34	30	27	27	12
Total length of antenna 0.44 mm.								

Described from 6 females and 3 males collected by Mr. John E. Walter at Washington, D. C. (Rock Creek Park), July 26, 1924, on *Rhus copallina* [Hood No. 548].

Paratype.—Catalogue No. 40284, U. S. Nat. Mus.

This species is very closely related, indeed, to *Rh. debilis* Hood, described and still known from only one male taken in

New Jersey, but I can not reconcile it with that species because the three males before me differ constantly in the shorter, broader tube and the stouter antennae. The italicized characters in the above description of the male emphasize these differences.

Trichothrips pergandei, sp. nov.

(Pl. 5, figs. 3 and 4.)

Female (apterous).—Length about 1.5 mm. Color clear brownish yellow (golden yellow under microscope, in balsam mounts), with conspicuous subhypodermal pigmentation in head, thorax, and abdomen, this pigmentation orange-yellow by reflected light and (because of its opacity) black by transmitted light, densest in pterothorax and basal abdominal segments, almost wanting in head; tube and antennae not at all darkened nor shaded in any part.

Head very slightly longer than wide, narrowest at posterior margin of eyes, broadest midway between them and base, which is only slightly broader than width behind eyes; dorsal and lateral surfaces without sculpture, but with a few minute and almost invisible bristles; vertex flat, evenly declivous; *postocular bristles dilated at apex*, hardly one-third as long as head. Eyes greatly reduced, only three facets visible on lateral profile. Ocelli wanting. Antennae about twice as long as head, stout, segments 3-8 pedicellate; sense cones prominent because of their location on the exact profile of the segments; formula: 3, 1-1; 4, 1-1; 5, 1-1⁺; 6, 1-1⁺; 7 with one at apex, toward outer margin. Mouth cone broadly rounded, reaching about half way across prosternum; labrum blunt, hardly attaining tip of labium.

Prothorax rather large, lobed behind; pronotum along median line distinctly shorter than head; across coxae about 1.77 times as wide as length of head, anterior marginal bristles wanting, *all other bristles dilated at apex*, the two pairs at posterior angles, the midlateral, and the coxal about equal to postoculars, those at anterior angles shorter. Pterothorax only a little narrower than prothorax. Legs stout; fore tarsus armed with a strong, sharp, somewhat hooked tooth.

Abdomen about 1.2 times as wide as prothorax; bristles long, especially those of the lateral series on segments 4-7 and the three long pairs on segment 9, all of these pointed; all other bristles dilated at tip, except the pointed terminal bristles, which are shorter than tube; all bristles yellowish. Tube about 0.85 as long as head, fully twice as long as basal width, and nearly 2.4 times as wide at base as at apex, sides slightly concave.

Measurements of holotype (♀).—Length 1.49 mm.; head, length 0.211 mm., greatest width 0.204 mm., width behind eyes 0.177 mm., width at base 0.186 mm.; eyes, length 0.038 mm., width 0.030 mm., interval 0.120 mm.; postocular bristles, length 0.064 mm.; prothorax, length of pronotum 0.188 mm., width across coxae 0.374 mm.; prothorax, width 0.363 mm.; abdomen, width 0.450 mm.; tube, length 0.180 mm., width at base 0.086 mm., at apex 0.036 mm.

Antennal segments:	1	2	3	4	5	6	7	8
Length (μ)	54	62	64	54	52	50	48	57
Width (μ)	50	42	42	41	40	36	30	21

Total length of antenna 0.44 mm.

Male (apterous).—Smaller than female, but with the prothorax heavier and the abdomen more slender, otherwise nearly identical; tarsal tooth stout, nearly equilaterally triangular.

Described from one female and four males, as follows:

DISTRICT OF COLUMBIA: Washington, September 22, 1890, among rotting leaves, Theodore Pergande; 1 ♀ (*holotype*), 3 ♂ (*allotype* and *paratypes*).

MARYLAND: Plummer's Island, September 14, 1913, under dead leaves, J. D. Hood; 1 ♂ (*paratype*).

Paratypes.—Catalogue No. 40285, U. S. Nat. Mus.

This species is dedicated to the late Theodore Pergande, who collected it and who had assigned to it a manuscript name. It is one of our most distinct species. The uniform yellow color, capitate bristles, pedicellate terminal antennal segment, and the unusual sense-cone formula are very distinctive.

EXPLANATION OF PLATE 5.

(Inez D'Amada, Clara Husted, and J. D. H., del.)

- Fig. 1.—*Haplothrips rectipennis* Hood, ♀, paratype, head and prothorax; all bristles on appendages omitted.
 Fig. 2.—*Haplothrips rectipennis* Hood, ♀, holotype, right antenna.
 Fig. 3.—*Trichothrips pergandei* Hood, ♀, holotype, head and prothorax; all bristles on appendages omitted.
 Fig. 4.—*Trichothrips pergandei* Hood, ♂, allotype, right antenna.
 Fig. 5.—*Rhynchothrips usitatus* Hood, ♀, holotype, head and prothorax; all bristles on appendages omitted.
 Fig. 6.—*Rhynchothrips usitatus* Hood, ♀, holotype, left antenna; all sense cones and bristles omitted.
 Fig. 7.—*Rhynchothrips usitatus* Hood, ♀, holotype, left fore wing.

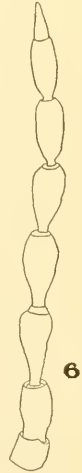
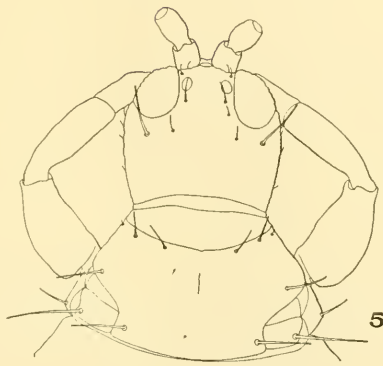
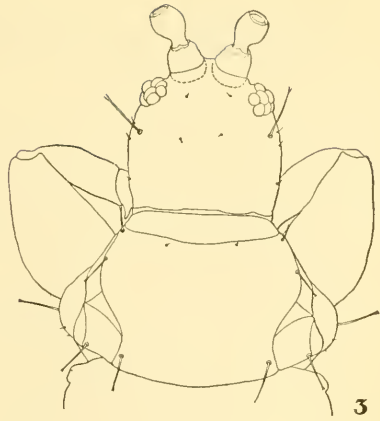
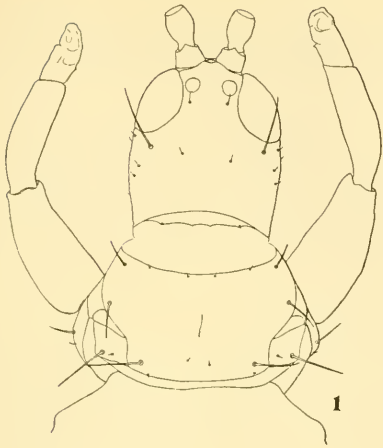
A CHANGE OF NAME IN ANOBIIDAE (COLEOPTERA).

By W. S. FISHER, *Bureau of Entomology.*

Dr. E. Martini has informed me that the name *Nevermannia*, which I used for a genus of Coleoptera from a termite nest in Costa Rica (Proc. Ent. Soc. Wash., vol. 29, 1927, p. 49), was previously used by Enderlein for a genus of fossil Simuliidae from East Prussia (Zoologischer Anzeiger, vol. 53, 1921, p. 75). This error was caused by the name not being included in the index to the new genera in the Zoological Record, so I am here-with proposing *Nevermannus* new name for *Nevermannia* Fisher (not Enderlein).

NOTE.

The address of the retiring president of this society, Dr. J. M. Aldrich, entitled "The Limitations of Taxonomy," was published in Science, April 22, 1927, Vol. LXV, pp. 381-385.—Ed.



DESCRIPTIONS OF THREE NEW SPECIES OF SUCKING LICE,
TOGETHER WITH A KEY TO SOME RELATED SPECIES
OF THE GENUS *POLYPLAX*.

By H. E. EWING, *U. S. Bureau of Entomology*.

In this paper three new species of sucking lice, or Anoplura, are described, and a key to four of the species of the *spinulosa* group of the genus *Polyplax* is given. One of the new species comes from an American mouse, one from an American deer and one from the gorilla.

HAEMATOPINIDAE.

Polyplax alaskensis, new species.

Male.—Head almost as broad as long and not produced into a median process posteriorly. First segment of antenna much broader than any of the others and as broad as long; second segment longer than broad and about half as broad as the first; third segment with anterior appendage well developed and bearing a very short, stout spine at tip; fourth segment broader than long; fifth segment slightly longer than broad and not so broad as fourth segment. At the angle of each temporal lobe is situated a very large seta and in front of it two smaller ones, the most anterior being the shortest.

Thorax as broad as long. Spiracles directly over the second coxae and in diameter equal to about one-fourth the width of the latter. Sternum about as broad as long, at its broadest place overlapping the second coxae, and with the posterior, median process extending to between the inner processes of the third coxae.

Abdomen rather slender. Setae on tergites and sternites not flattened, almost straight. First pleurite unchitinized in the middle, its ventral seta larger than its dorsal and almost as long as the pleurite itself; second pleurite chitinized at the middle, barely enclosing the spiracle at its ventral border, and bearing one discal and two marginal setae, the ventral marginal being the longest and stoutest and equaling the pleurite itself in length; third pleurite similar to the second except that the discal seta is the longest and the ventral marginal one the shortest, this latter seta being not over a third the length of the pleurite; fourth pleurite and its setae similar to the third; fifth similar to the fourth but the position of the discal seta is more ventral, and the ventral marginal seta is somewhat longer; sixth pleurite much more slender than the fifth, with the spiracle ventrally placed and the marginal setae subequal, very long and somewhat flagelliform, also the discal seta is situated more ventral than the ventral, posterior seta; seventh and last pleurite similar to but shorter than the sixth and without discal seta.

Genital armature of the *spinulosa* type; basal plate with incurved and thickened lateral margins which are continued backward into enlarged, truncate, articulating processes bearing the parameres; parameres much reduced, angulate laterally, articulating with processes of basal plate along a surface that is at an angle of about 45° to median plane, extending forward scarcely beyond the articulations with processes of basal plate; pseudopenis a very large, up-

turned hook with basal process, and about twice the length of parameres; no well-developed penis present.

Legs as in the *spinulosa* group of species.

Length, 1.02 mm.; width, 0.31 mm.

Type host and type locality.—*Microtus* sp., from Alaska.

Type.—Cat. No. 40159, U. S. N. M.

Described from a single male in excellent condition, taken from *Microtus* sp. in Alaska, May 17, 1924, by A. H. Twitchell. This species differs from *spinulosa* (Burmeister), *serrata* (Burmeister) and *reclinata* (Nitzsch) in the shape of the sixth pleural plates which are narrower and differently shaped from the typical ones and in having the unpaired discal seta on the typical pleural plates situated differently. *P. spinulosa* and *P. reclinata* have three setae on the typical pleural plates, but the unpaired seta is much smaller and usually situated at or on the posterior margin. The relationships of this new species to three of the species of the *spinulosa* group are further indicated in a key that follows.

Key to Four Related Species of the spinulosa Group of the genus Polyplax.

1. Setae on typical pleural plates longer than the plates themselves; spiracles large.....*P. reclinata* (Nitzsch).
 Setae on typical pleural plates much shorter than the plates themselves; spiracles smaller..... 2.
2. Parameres of male genital armature large, distinctly crescentic and longer than the pseudopenis.....*P. spinulosa* (Burmeister).
 Parameres of male genital armature much smaller, not crescentic and much shorter than the pseudopenis.....3.
3. Sternal plate as broad as long; articulating processes of basal plate (of male genital armature) enlarged and truncate distally; parameres angulate on outside margin. Larger, stouter species.....*P. alaskensis*, new species.
 Sternal plate longer than broad; articulating processes of basal plate attenuated distally; parameres not angulate on outside margin. Smaller and more slender species.....*P. serrata* (Burmeister).

***Linognathus panamensis*, new species.**

Female.—Head small. Forehead short, slightly swollen, dome- or crown-shaped; broader than long. Antennae long, equal to the head in length; first segment the broadest, as broad as long; second segment slightly longer than the first; third slightly shorter and slightly narrower than the second; fourth broader than the third and broader than long, its sense area covering about the distal third of posterior margin; fifth segment slightly shorter and narrower than the fourth, its sense area covering about the basal one-half of posterior margin.

Thorax broad, with sides diverging posteriorly. Thoracic spiracles large, the anterior margins of spiracular bulbs lying directly over the anterior margins of second coxae; openings of spiracles about one-half the diameter of bulbs. Inside and posterior to the spiracles is situated a pair of setae, each being about

as long as a third of the width of the thorax; between this pair and the spiracles is situated a minute pair of setae.

Abdomen large and long, the segments bearing typically above and below two very irregular, transverse rows of setae. Pleural setae as follows: A single, very long pair on segment II, a pair of minute setae on segment III and segment IV; a single pair of very long setae on segment V; two pairs of very long, flagelliform setae on segment VI and on segment VII. The last abdominal segment is deeply incised, the notch being squarish and leaving a pair of projecting lobes. Each of these lobes bears two terminal setae, the outer being the stoutest, and four large marginal setae, some of which are longer than the segment itself. Gonopods slender, convergent and each bearing at its tip three large subequal setae that extend beyond the free margin of the last segment.

Legs stout; the last pair very slightly larger than the middle pair. First tarsal claws very long, slender and curved; third tarsal claws slightly longer than second.

Length, 1.74 mm.; width, 0.71 mm.

Type host and type locality.—*Odocoileus chiriquensis*, from Panama.

Types.—Cat. No. 40160, U. S. N. M.

Described from a few females which are part of a lot of six specimens obtained from a deer, *Odocoileus chiriquensis* (U. S. N. M. No. 240843) originally obtained in Panama, but which died at the National Zoological Park, January 28, 1925. This species differs from *Linognathus crassicornis* Nitzsch, reported from *Odocoileus columbianus*, in a number of characters. Nitzsch's *crassicornis* has but a single transverse row of setae for each abdominal segment, and should be placed in Mjöberg's genus *Cervophthirus* if this genus is to be recognized, while *panamensis* has two transverse rows. Also each of the gonopods of *crassicornis* terminates in a stout spine, while in *panamensis* each terminates in three long setae.

PEDICULIDAE.

Phthirus gorillae, new species.

First nymph.—Head rather small; forehead broader than long. Antennae not equal to the head in length; first segment the shortest, broader than long; second segment longer than first but broader than long; third segment as broad as second and about twice as long.

Thorax much broader than long. Thoracic spiracles in usual place, but no larger than the abdominal spiracles; tracheal trunk from spiracles running backward.

Abdomen as broad as long and slightly two-lobed behind. Abdominal spiracles situated on tubercles; first pair greatly displaced medially, being situated about half way between the lateral margin of the abdominal segment and the median line; second spiracles displaced about one-half as much as the first and situated between the first and third spiracles; third, fourth, fifth and sixth spiracles lateral in position. Abdomen sparsely studded with medium setae, there being a short transverse row of three on each side, ventrally on

the last abdominal segment, in the position of the gonopods of the adult louse. The two outer of these are much longer than the inner one.

Legs stout. First pair as long as but much more slender than the others; its tarsal claw long, slender, sharp and much curved, equal in length to the tarsal segment that bears it; tibial thumb small but bearing a straight, sharp spine about one-half as long as the tarsal segment, and two longer setae. Second pair of legs enlarged, equal to the third; tibia broader than femur and with well-developed tibial thumb bearing at its tip a spine and a much longer seta; tarsus longer than tibia and bearing on its inner surface four tooth-like, gripping tubercles; tarsal claw flattened, more or less scoop-like and provided on its inner surface with two large and one small gripping tubercles. Third legs almost complete duplicates of the second, probably a little larger.

Length, 0.60 mm.; width, 0.33 mm.

Type host and type locality.—*Gorilla beringeri*, from eastern Belgian Congo.

Type.—Cat No. 40161, U. S. N. M.

This species differs in the first nymphal stage from *P. pubis*, the only other species in the genus *Phthirus*, in a number of characters. The third segment of the antenna is much stouter than in *pubis*; the legs are shorter; the tarsal claws of the second and third legs are much shorter than the tarsi, have three gripping tubercles and only slight indications of terminal swellings; while these claws in *pubis* are about equal to the tarsi in length, have five gripping tubercles, in addition to terminal enlargements. Only first nymphs and eggs obtained from two skins of *Gorilla beringeri* (U. S. N. M. 239883 and 239884) obtained by Benjamin Burbridge during his expedition for taking moving pictures of the gorilla in eastern Belgian Congo. I collected the material before the skins were tanned but was unable to obtain adult specimens although scores of nits were present on both skins. The nits were placed over many parts of the body, showing that this species is a true body louse and not restricted chiefly to the pubic region like *P. pubis*. The significance of this species taxonomically and from the standpoint of phylogeny of both the higher lice and their hosts will be left for consideration in another paper in which it is planned that photographs of the first nymphal instars of both *pubis* and *gorillae* will be given.

A BLIND BEETLE EXCAVATED FROM AN EGYPTIAN CITY'S RUINS DATING BETWEEN 117 AND 235 A. D.

BY FRANK E. BLAISDELL, SR., San Francisco, California.

Fragments of a curious, minute, blind and wingless beetle were referred to the writer from the National Museum in the belief that they might represent a highly specialized subterranean form of Tenebrionid, and the result of its examination

while not permitting positive assignment in either this family nor in the Colydiidae, permits me to record its observed structure only by proposing new generic and specific names.

Curious also is the way in which so small a species, whose structure and habits suggest that its entire existence may be passed below the surface of the ground, happened to attract the attention of an entomologist. Headed by Prof. A. E. R. Boak during the winter of 1924/25 the Egyptian Expedition of the University of Michigan made investigations at Kom Washim, Fayoum Province, and brought back the biological, zoological and botanical material found in their archaeological excavations. One of the samples submitted to Mr. H. S. Barber for identification consisted of some large, oval, woody, stem-galls measuring 35 x 28 x 24 mm., having a round exit hole about 7 mm. in diameter near one end of each. From these he believed adults of a large weevil (perhaps *Lixus* or *Cleonus*) had issued, and hoping to prove this guess he sectioned certain specimens and searched for remnants of the larval head-capsule of the gall-maker but found only fragments of a clothes moth larva and the beetle here discussed, which must have crawled into the cavity some time since the galls became buried. According to information from Prof. Boak, the Greco-Roman town of Karenis, the ruins of which were being investigated, was inhabited for about 700 years, having been abandoned early in the fifth century, but the galls were found in a private house in the intermediate layer of the city's ruins, which layer can be dated between the years 117 and 235 A. D. This shows that the galls have been buried for perhaps 1700 years, and as such chitinous fragments decompose with extreme slowness it is very likely that the beetle died there a very long time ago. The rarity and accidental nature of our glimpses of this blind, wingless, subsoil fauna beneath our feet makes the details of each such critically observed case worthy of record.

The specimens received, although very imperfect, comprise most of the exoskeleton of one individual but are in three parts as follows: Head and prothorax, with both anterior legs, greater part of the right antenna and only the first joint of the left; elytra, meso- and metathorax with only the right middle leg; the ventral abdominal segments. Extremely fine pellets of excrementitious matter of some other minute insect adhere to the fragments. On account of the very small size of the beetle and of its being a unique, no attempt could be made to put the appendages in position for study and cleaning was out of the question.

After searching the available literature without identifying or associating the species with any that are known, it has been assumed that it is new.

THAUMAPHRASTUS, new genus.

(θαύμα, (a wonderful thing) + αφραστος (unexpected).)

Head relatively small, somewhat deflexed, occipital condyle large, eyes absent. Antennae arising from the sides of the front; first two joints globular, the first larger than the second, each larger than any following joint; third and fourth smaller and subequal in size; the remaining three joints present small and equal in width. Antennae when at rest received in grooves bounded above by the side of the head, the marginal bead of which is continuous with the thickened and arcuate posterior border of the antennal fossa and, below by the rather prominent margin of the buccal fissure which is continuous with the side of the front and forming a rectangle therewith. Mentum apparently attaining the mandibles, hiding the ligula and labial palpi; maxillary palpi small, terminal joint pointed; basal joints filling the buccal fissure. Genae not in the least prominent and forming the floor of the antennal grooves.

Pronotum relatively large and inflated anteriorly to receive the occipital condyle; apex semicircularly arcuate and prominent anteriorly. Propleura with a shallow oval impression anteriorly.

Prosternum very short in front of the coxae, not entering between them except for a very short distance. Anterior coxae contiguous, small, slightly prominent, cavities open posteriorly.

Elytral suture connate, scutellum not entering between the elytra. Epipleura present, defined superiorly by a fine raised line extending from the humeri to the elytral apex; surface in apical two-thirds continuing the line of the discal curve; in basal third more abruptly deflexed with the surface plane beneath the humeri. Mesosternum slightly prominent along the median line, and slightly ogival when viewed transversely, surface slightly impressed and asperulate in front of the coxae; suture between the meso- and metasternal side pieces visible and slightly oblique, epimera not recognizable from the episternum; surface obliquely impressed in front of and parallel to the suture, the impression beginning just in front of the humeri. Metasternum broad, short, with lateral surface quite deeply impressed anteriorly at angle, behind and lateral to the middle coxae. Episternum oblong, quite equal in width throughout, metasternal suture distinct; epimera present, apparently triangular, apex at the hind coxa. Middle coxal cavities rounded and narrowly separated by a mesosternal process; coxae small and not prominent, trochantines apparently present. Posterior coxal cavities oval attaining the episternum laterally, distance from the elytral margin quite equal to the width of the coxa; coxae moderately widely separated by the obtuse process of the first abdominal segment.

Tibial spurs present and minute in size. Anterior and middle tarsi five-jointed. Abdominal segments five, first three apparently connate.

Thaumaphrastus karanisensis, new species.

Form oblong, color castaneous to castaneo-piceous.

Head obtusely angulate and prominent between the antennae, declivous anteriorly; broadly and arcuately impressed behind the eyes, less so on the vertex; surface finely and sparsely punctate. Epistomal area rather narrow, slightly impressed and piceous in color; apex broadly and moderately arcuately

emarginate, suture not distinct, surface finely punctate. Labrum short, feebly and arcuately emarginate at apex, angles apparently rounded. Mandibles in adduction, the left cleft at apex, cusps sharp and unequal. Mentum apparently oblong with lateral edges slightly prominent. Antennal fossa not beaded anteriorly, but rather coarsely margined posteriorly and continuously so with the sides of head. Antennal joints closely articulated.

Pronotum about a fourth wider than long; apex broadly, evenly and semi-circularly arcuate, continuously so with the sides, the latter broadly arcuate, becoming broadly and feebly sinuate, as well as moderately convergent in about basal third, margins briefly subparallel before the small, nearly rectangular basal angles, a marginal bead not discernable, the lateral edge apparently extremely finely, microscopically denticulate; base lobed, lobe broadly and strongly arcuate, feebly and broadly sinuate laterally within the angles; disk strongly convex and evidently inflated anteriorly, much less so posteriorly, more strongly declivous antero-laterally than posteriorly, finely and sparsely punctate, punctures not denser laterally, each with a very minute pale hair. Propleura microscopically sculptured.

Elytra conjointly, broadly, evenly and quite semi-circularly rounded at apex, continuously so with the feebly arcuate sides which are slightly convergent to the humeri; the latter rather narrowly rounded and not in the least prominent laterally; base broadly and arcuately emarginate, not margined, but very narrowly rounded and inflexed; disk rather depressed, estriate, feebly convex, arcuately declivous at the sides, more broadly and evenly so posteriorly, at the humeri the surface is more abruptly and rather sharply inflexed; surface quite smooth, sparsely, evenly punctate, punctures fine and slightly oval longitudinally, shallow and not impressed, slightly larger basally; floor of the punctures whitish giving the impression of the presence of a minute hair. Epipleura moderately wide, plane and nearly vertical in basal third, thence gradually taking the curve of the elytral disk, gradually narrowing to apex. Parapleura impunctate. Meta-sternum sparsely and relatively coarsely punctate.

Abdomen subglabrous, first ventral segment apparently as long or longer than the second, third and fourth taken together; the fifth broadly rounded at apex, evenly convex and about as long as the third and fourth taken together; intercoxal process of first segment obtusely pointed at apex, sides slightly arcuate, a little wider at base than long. First segment sparsely, finely and distinctly punctate; remaining segments very finely and sparsely punctate.

Legs.—Left middle and posterior two missing. Anterior legs stout, femur and tibia subequal in length, the former slightly swollen and sparsely punctate; tibia gradually widening from base to apex, apical margin fringed with exceedingly fine, short spinules, external edge not denticulate; spurs short and fine. Tarsi rather stout and compact; first joint short, rather wider than long; second third and fourth quite equal in length, fifth feebly elongate narrowing slightly apically; planta with fine hair-like setae along the margins. Ungues small, slightly arcuate and sharp. Right middle femur and tibia sparsely pubescent or extremely finely spinulose.

Measurements.—Length about 1.2 mm.; width .5 mm.

Named from a unique, No. 24-5024B. Collected by the Ann Arbor Expedition.

Thaumaphrastus can not positively be referred to the right one of the great Complexes on account of the absence of the posterior tarsi. The facies of the insect forbids its being placed in one of the heteromerous series unless it be the Tenebrionidae or Monommidae. It can not belong to the former on account of the open anterior coxal cavities, and besides, the antennae are evidently capitate as indicated by the presence of an oval depression on the anterior surface of the propleura in line with the antennal grooves.

In facies the species resembles *Aglenus* Gyll. of the Colydiidae and not at all in harmony with the Monommidae. It probably belongs to the Isomera, and here it is difficult to decide on the Series on account of the imperfect condition of the insect. It can with certainty be said not to belong to the Adephaga, Lamellicornia or Phytophaga. There remain then only the Clavicornia and Serricornia. The facies and structure affiliates the species with the Clavicornia, and yet it is in discord with all but possibly the Cryptophagidae and Colydiidae. It may belong to a different and closely related family or genus unknown to the North American fauna. The affinities will have to be determined by some student acquainted with the northern African or Mediterranean fauna. If the species should be already known, it is hoped that the present report will facilitate the recognition of this interesting blind beetle.

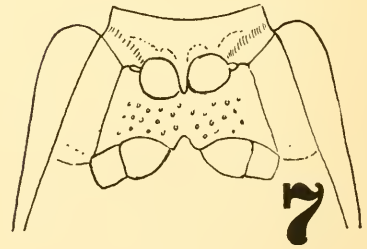
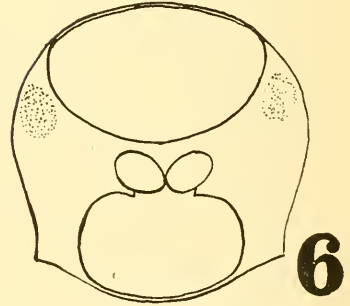
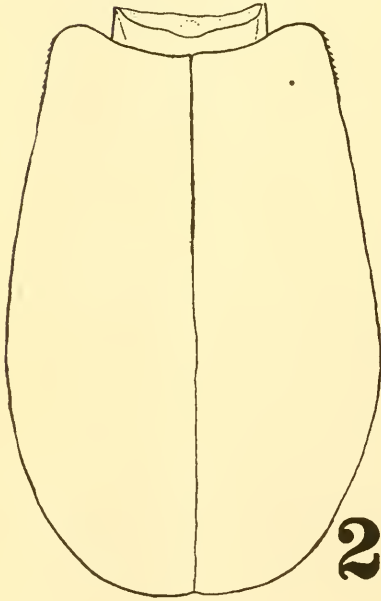
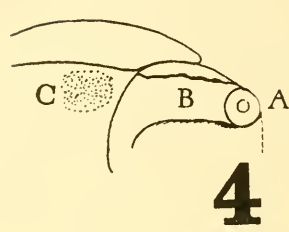
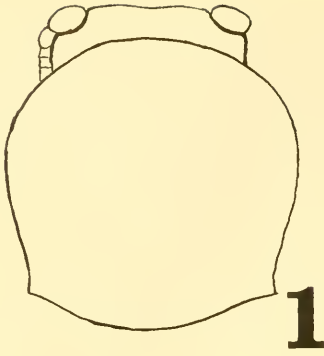
EXPLANATION OF THE FIGURES, PLATE 6.

1.—Dorsal view of pronotum and head; 2.—Dorsal view of the elytra; 3.—Anterior view of the head, showing the epistomal region and labrum; 4.—Diagrammatic side view of head and apical portion of the propleura, showing: (a) antennal fossa; (b) antennal groove and (c) position of the oval depression on propleura near apex; 5.—Anterior leg; 6.—Ventral view of the prothorax; 7.—Ventral view of the meso- and metathorax.

TWO NEW SPECIES OF HARMOLITA (HYMENOPTERA).

BY W. J. PHILLIPS, *Entomologist, Bureau of Entomology, U. S. Department of Agriculture.*

This paper adds two species to the list of our North American jointworms. The genus *Elymus* incidentally is found to be the host for one of these. This genus is already by far the most favored group of host plants among our wild and cultivated grasses. The list of *Harmolita* now inhabiting our various species of *Elymus* is as follows: *H. ovata*, *H. hesperus*, *H. rufipes*, *H. elymi*, *H. elymoxena*, *H. elymophila*, *H. elymophthora*, *H. elymivora*, *H. elymicola*, *H. elymophaga*.



Harmolita elymophaga, n. sp.

Female.—Length 3 mm. The individuals of this species are slender. Praescutum rugulose; pronotum reticulate, shining, often with irregular, broad, shallow impression. Head broader than pronotum. Scutellum feebly rugulose, rather strongly convex and sparsely hairy. Pronotal spots dull and medium sized, occupying fully half of anterior dorsal margin of prothorax.

Propodeum with a distinct, broad, shallow, median, immargined, longitudinal groove at least in the anterior half; occasionally the groove is continuous but more often it fades out posteriorly. Propodeum most often somewhat granulose within and laterad of the groove. The propodeum is not so strongly rugose as in many other species, for example *H. tritici*.

When the specimen is viewed in lateral profile the abdomen is distinctly longer than the head and thorax combined. The abdomen is narrowly lanceolate. First tergite beyond the petiole comprising about one-fifth of the entire length of the abdomen; second tergite shortest, fourth the longest and three, five and six about the same length.

The legs are much darker in some specimens, varying from testaceous to almost pitchy black. Basal half of upper surface of front femora and all of the middle and hind femora testaceous to fuscous; sometimes the middle and hind femora quite black. Front tibiae and knees testaceous; middle and hind tibiae varying from testaceous to fuscous.

Antennae (Pl. 7, c) 11-jointed; club 3-jointed, its joints slightly wider than the preceding joints; first funicle and ring joint together about same length as pedicel. Usually none of the segments appear quadrate but some specimens show the fifth funicle and first club joints quadrate.

Forewings reach about to the tip of the abdomen; marginal vein twice as long as stigmal; postmarginal and stigmal vein about the same length.

Species small to medium in size.

Male.—Length 2.3 mm. Punctuation of thorax as in female. Pronotal spots large, occupying about half of anterior dorsal margin of the prothorax; spots dull.

Propodeum with a complete, margined groove; somewhat granulose within and laterad of the groove.

Petiole granulose; nearly twice as long as broad and nearly as long as the hind coxae.

Legs colored as in female but darker.

Antennae (Pl. 7, f): flagellum plus pedicel longer than head and thorax combined; hairs on the first joint of flagellum not quite half as long as the last antennal segment; last segment bearing a small tubercle which is about twice as long as broad. Scape, as seen in lateral profile, with a distinct shoulder at distal extremity; scape broadest at distal extremity and broader than flagellar segments. The first articulation of the flagellar joints has no annulations; the second articulation has one, and there are three at each of the other articulations.

Type locality, Lind, Washington.

Type.—Cat. No. 40416, U. S. Nat. Mus.

Described from twenty-six females bearing labels, "reared

from *Elymus condensatus* Presl. by M. C. Lane from Lind, Washington" and two males and one female bearing labels, "reared from *Elymus triticoides*, Bird's Landing, Cal., by B. G. Thompson."

This species perhaps comes nearer *H. festucae* than to any of our other species, but may be separated from it on the following characters: thorax not so coarsely rugulose, the abdomen stouter, and the propodeal groove not so strongly developed.

Harmolita kingi, n. sp.

Female.—Length 3.07 mm. The individuals of this species are rather stout. Praescutum rugulose; pronotum somewhat rugulose but more shiny than praescutum; scutellum rugulose, convex and sparsely hairy; pronotal spots very large, occupying two-thirds of anterior dorsal margin of the prothorax. Head broader than pronotum.

Propodeum with a narrow, deep, immargined, median, longitudinal groove, which is broader anteriorly; usually granulose laterad of groove though it may be very rugose laterad of the groove.

When viewed in lateral profile the abdomen looks shorter than the head and thorax combined, but by actual measurement it equals the head and thorax in length. Abdomen ovate; first tergite beyond the petiole between a fifth and a fourth the length of the abdomen; second tergite shortest; third, fifth and sixth about equal in length; fourth tergite longest; sometimes the second almost as long as third; sometimes the fourth tergite but little longer than the third, fifth or sixth.

Legs varying in color from fuscous to testaceous; basal half of upper surface of front femora, basal two-thirds of middle and hind femora and middle and hind tibiae fuscous; knees and front tibiae testaceous.

Antennae (Pl. 7, d.) 11-jointed; club 3-jointed and but little if any broader than the preceding segments. The first funicle plus the ring joint about same length as pedicel; usually none of the funicle joints are quadrate although occasionally a specimen shows the fifth funicle almost quadrate.

Forewings reaching very distinctly beyond the tip of the abdomen. Marginal vein twice as long as stigmal; postmarginal vein very slightly longer than stigmal.

Species medium in size.

Male.—Length 2.3 mm. Punctuation of the thorax same as in the female. Pronotal spots small to medium; spots dull.

Propodeum with a complete, margined groove; most often granulose laterad of groove.

Petiole granulose; about two-thirds as long as hind coxae; not twice as long as broad.

Legs colored as in female but considerably darker.

Antennae (Pl. 7, e): flagellum plus pedicel equal in length to head and thorax combined. Hairs on first flagellar joint about half as long as last joint of flagellum. The last segment of the antenna has no distinct tubercle, though it is drawn out at the tip, giving it quite a pointed appearance. Scape, as seen in lateral profile, with a pronounced shoulder near the distal extremity; scape broadest near the distal extremity and broader than the flagellar joints. There

is not more than one distinct annulation at any of the articulations of the flagellar joints and these are not always clearly defined.

Type locality, Saskatoon, Saskatchewan, Canada.

Type.—Cat. No. 40417, U. S. Nat. Mus.

Described from 18 females and 12 males, reared, according to record on pins, from galls in the stems of *Hordeum jubatum* L. by Kenneth M. King, at Saskatoon, Saskatchewan, Canada.

This species perhaps comes nearer *H. ovata* than to any of our other species but may be separated from it on the following characters: legs darker; praescutum less coarsely sculptured; pronotal spots usually duller; propodeum more often granulose; flagellar joints not quadrate.

PLATE 7.

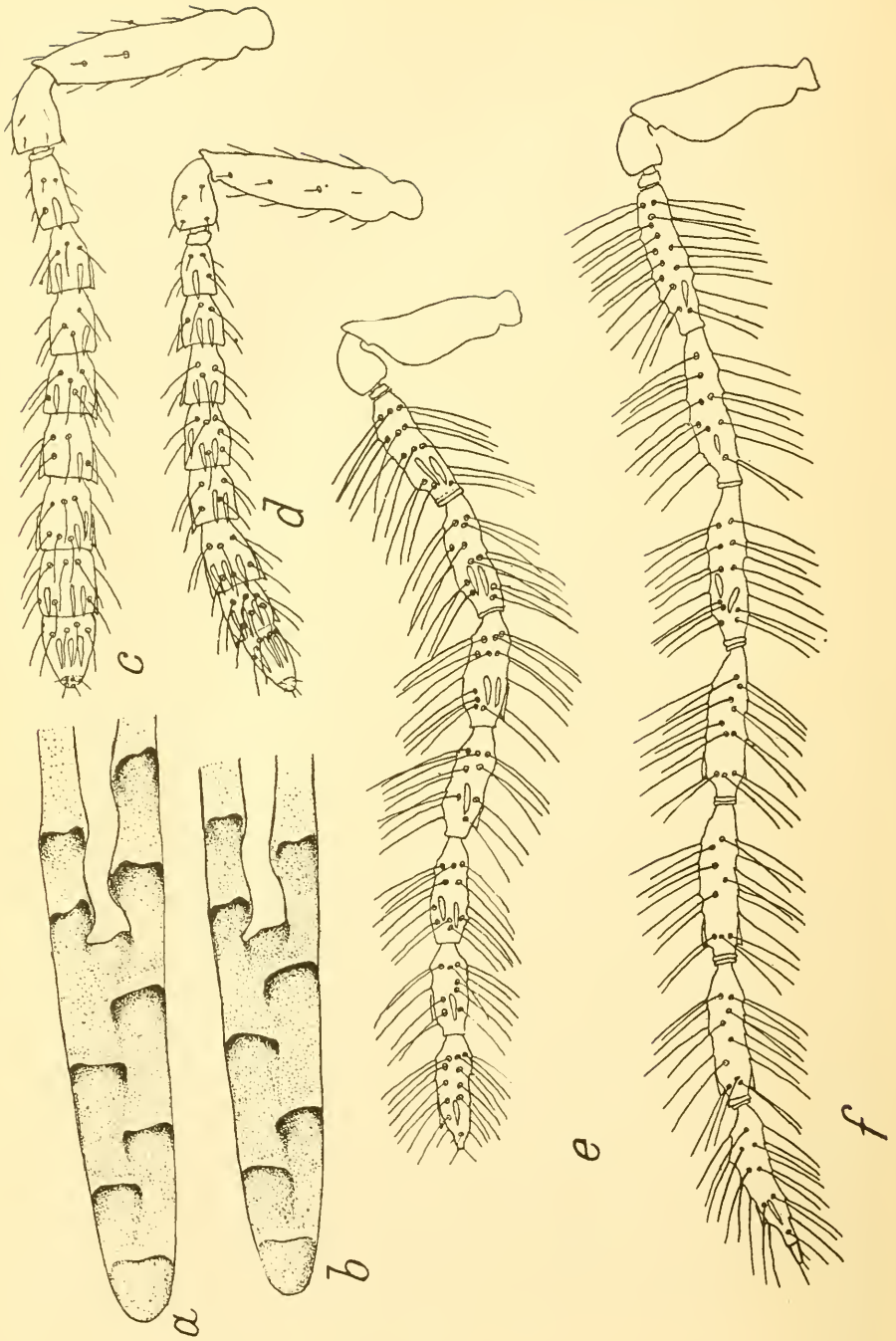
- a—Ovipositor of *Harmolita kingi*.
- b— “ “ *Harmolita elymophaga*.
- c—Antenna of female of *Harmolita elymophaga*.
- d— “ “ *Harmolita kingi*.
- e— “ “ male of *Harmolita kingi*.
- f— “ “ *Harmolita elymophaga*.

PROBLEMS IN TAXONOMY.

BY A. N. CAUDELL, *Bureau of Entomology, U. S. Department of Agriculture.*

Dr. B. Uvarov, now of the British Museum, has written rather laudably of Francis Walker's works on the Orthoptera and rather disparagingly of that of the late Mr. Kirby.¹ This praise of the work of Walker seems worthy of being called to the attention of readers, for it is rarely indeed that one takes up the cudgel in defense of that prolific describer of species. But whether this praise is justifiable is at least debatable. The fact that Walker often gives wing length when he really means wing expanse, that he describes a Tettigoniid nymph as a short-winged species without an indication of its obvious immaturity, and his generally unsatisfactory descriptions, make this tardy praise of his work rather noteworthy. In addition to this Dr. Uvarov's somewhat severe criticism of the work of his predecessor, Mr. Kirby, makes his contribution worthy of consideration. That Kirby was a better compiler than a systematist is probably indisputable but that his Synonymic Catalogue of Orthoptera, which appeared almost half a century after Walker's death, has served to make the recognition of Walker's species more difficult seems doubtful. It is to be deplored, it is true, that Kirby did not more accurately place Walker's species of which the types were available, but in spite of this fault one can but admit that this

¹ Trans. Ent. Soc. London, p. 265, 1925.



catalogue is one of the best comprehensive catalogues of the Orthoptera ever printed. When one considers the field included, it is remarkably complete, relatively few species being omitted.

Gross carelessness appears to have been chiefly responsible for the generally unsatisfactory character of Walker's work, but that cause does not apply in the case of some equally deplorable instances occurring here and there in the systematic field. Thus it was not carelessness that caused the late Dr. Hancock to leave the Tetriginæ in a condition that seems almost hopeless, in which state the group must remain until some comprehensive revisional work is done on it. Hancock's trouble seems to have been a remarkable inability to construct a practicable dichotomous key. Any one who has tried to use almost any one of his keys will realize how absolutely impossible it is to do this. Another fault with Dr. Hancock was that he, like many other workers in rather restricted groups, acquired such an intimate familiarity with his subjects that he could see, or thought he could, differences wholly imperceptible to the more general worker. This led him into describing as new certain species the types of which appear quite identical to less discerning students. That the making of determinations in the Tetriginæ is fraught with much difficulty is illustrated by the lists of determinations of Indian forms by Kirby, a general worker of experience, and the determinations of the same material by Hancock as set forth in contrast on page 132, *Recd. Ind. Mus.*, vol. xi, (1915). There is barely a point of agreement in these results.

The worrying over inadequate descriptions of a Walker and the struggling with the hopelessly arranged keys of a Hancock are but some of the woes of the general systematist. Other discouraging difficulties that confront him all too often are the constantly encountered contradictions in published keys and descriptions. Of the many examples of this which might be cited the following will serve to illustrate this matter: In a general key by Shelford, *Gen. Insectorum*, Fasc. 109, p. 2, the genus *Platyzozeria*, separates from certain allies on the character of ocelli being present in that genus. But turning to the description of *Platyzozeria* on page 5 we are confronted with the statement that the ocelli are absent.

Through inadvertence erroneous or misleading statements are sometimes made by our best and most careful workers. Thus Mr. Hebard described his dectician genus *Cyrtophyllicus* as with the posterior tibiae armed below with two apical spurs; he should have said there were two on each side, four in all.

Indefinite alternates as contained in keys, present another source of difficulty to be contended with. "Size larger with vertex relatively narrower" is the opposite of "Size smaller with vertex relatively broader," but these are poor alternates for

use in a key. The expressions "Antennae with from seventeen to twenty-two segments," and "Antennae with from twenty to thirty segments" are scarcely better.

At the present time it is practically impossible, in the writer's opinion, for any one, even the most gifted, to produce a wholly satisfactory revision or monograph of any comprehensive group, widely distributed. To do this would necessitate the possession by the monographer of either the type or a good description of every species concerned. In no comprehensive group of importance is this now possible. Of course it is theoretically true that a worker may travel the world over and see all extant types, but has this ever been done? Even if this were attempted it would surely result that in some and possibly many cases, the types would be lost or unavailable, and then the species would have to be entered from meager and often wholly inadequate descriptions.

The publication in obscure places of matter of systematic importance, too brief, carelessly made, or otherwise inadequate descriptions of species, nonfunctional keys, careless and misleading statements of writers, inaccessibility of types through universal distribution of such material, lack of proper coordination of taxonomic work and conflicting rules, opinions and decisions of current codes of nomenclature are factors fast leading to systematic chaos in entomology. Synonymy is multiplying at an alarming rate and it seems inevitable that some radical changes must soon be made. Such changes eventually will very surely be brought about, and the first step very likely will be the selection of a new taxonomic genesis, a date to replace 1758. This date probably will be that of some general and comprehensive work by divers authors, comparable to Wytman's *Genera Insectorum*, in which there will be no synonymy and perhaps no citation of previous literature. After this change is made matters will continue very much as they are now, and have been since the time of Linnaeus; synonymy will at once commence to multiply and confusion will soon again reign, and within a century or so conditions will become as bad as or worse than they are now. It is here predicated that this will finally lead to a change that will promise lasting and satisfactory results; viz: the selection of still another commencing date correlating with an international exchange of type material, thus assembling all types of given groups in one of several selected collections, and the compulsory description of new entities in certain authorized places of publication after submitting types to designated depositories for comparison and permanent preservation. It is to be regretted that the present age is one which probably would not allow even the serious proposal of such a desirable, though radical, revolution.

Actual date of publication, July 11, 1927.

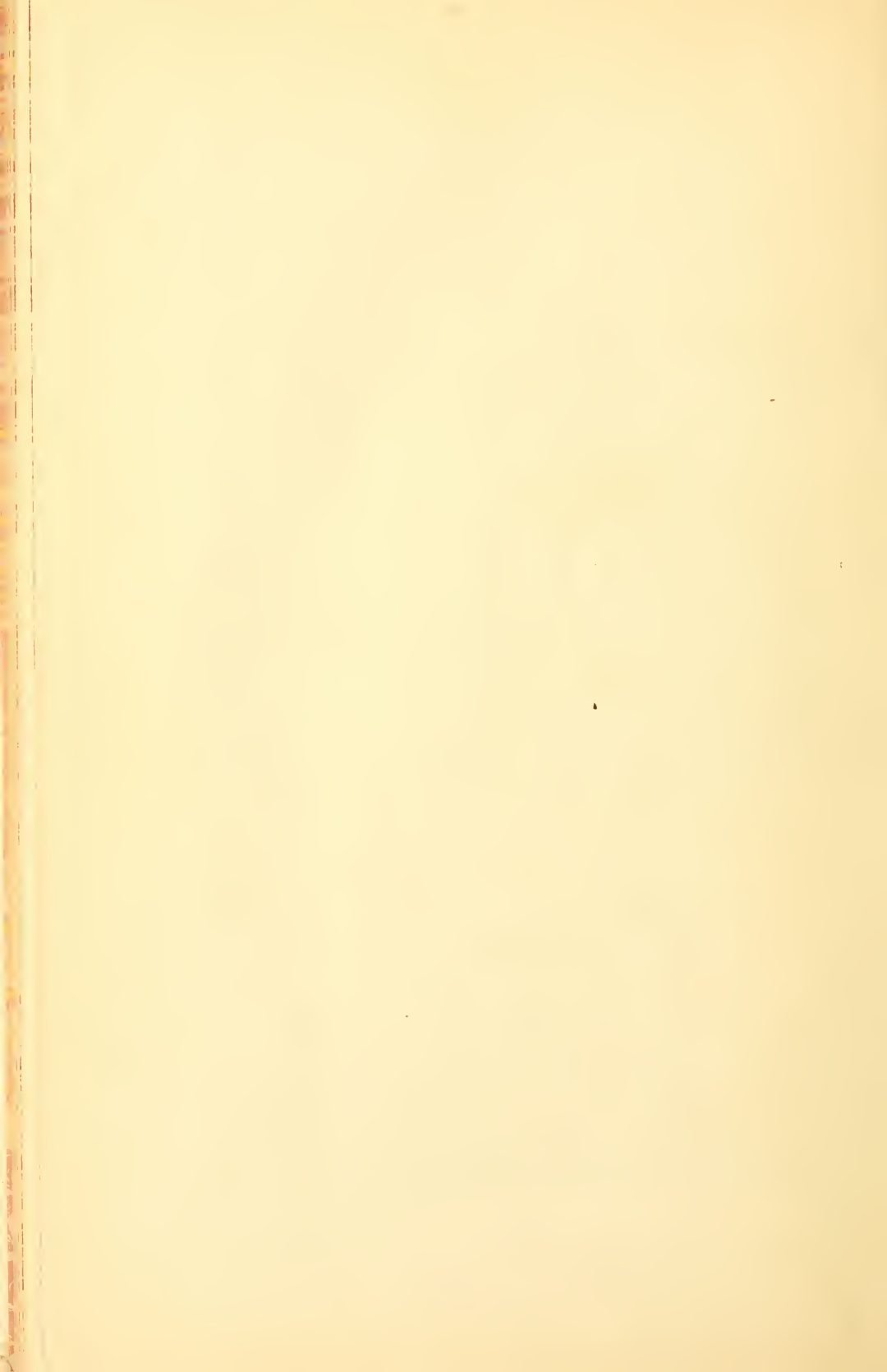
EDITORIAL.

It is sad to contemplate the fact that the almost venerable but utterly irrepressible C. H. Tyler Townsend has brought forth still another taxonomic monstrosity in the form of descriptions of the Muscoidean flies in a code which would do credit to Edgar Allen Poe's cryptogram in its abstruse complexities.¹

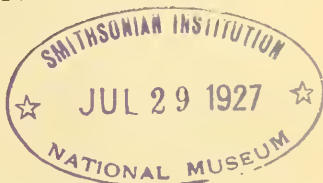
For many years Dr. Townsend has been engaged in "piling Pelion on Ossa" for posterity to wrestle with, but nothing he has hitherto perpetrated on a long suffering scientific fraternity begins to approach in absurdity his most recent lapsus calami. The code which he now proposes to inflict on systematists contains more than one hundred symbols, most of which are new to his readers. It amounts practically to a new, synthetic, language which his prospective readers will be compelled to learn before they may be able to translate his recent paroxysms of taxonomy into the "king's English." Here is a sample from the middle of a description: "the lower part $\frac{1}{2}$ cw; ch $\frac{1}{3}$ el; 2 st, 3 pi and ps, 2 pra, 3 poa a and is; no aps"; it is perhaps needless to say that in addition to the many objections to such a scheme, its potentialities for typographic error are limitless. Dr. Townsend could not have adopted better means to limit his reading public had he written in the Eskimo language.

—*W. R. Walton.*

¹ *Ins. Inscitae*, Mens. Jan. March, 1926, pp. 24-41.



PROCEEDINGS
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No. 6

ON THE CLASSIFICATION OF THE MYLABRIDAE-LARVAE
(COLEOPTERA: MYLABRIDAE).

BY ADAM G. BÖVING, *U. S. Bureau of Entomology.*

The larvae of the small family Mylabridae (or Bruchidae) are whitish, fleshy, thick, curved, and often with thorax somewhat larger than the rest of the body. The head is elongate-oval, posteriorly often attenuate, pointed and provided with a small, flat and horizontal blade for the attachment of promotor and retractor muscles; mostly it is deeply retracted into thorax and then appears to the naked eye as a circular, dark disk in the middle of the front end of the body. Prothorax is very characteristic in shape, size and position, slightly convex, button-like, with or without a pair of thinly chitinated tergal plates; in diameter it is smaller than the two other thoracic segments and is mainly facing forward. The terga of mesothorax, metathorax and all the typical abdominal segments are transversely divided, usually with two equal, pubescent or naked bulges and only rarely a small third bulge, a separate prescutum, can be found. The epipleura (e) are distinct and

swollen, in the thoracic segments divided into a triangular pre-epipleurum (E) and similar post-epipleurum (E¹) which are separated from each other by a prolongation of the alar area (a) that almost or entirely extends to the ventro-lateral suture. The ninth abdominal segment is rather short, and the tenth is small, nipple-shaped and divided into two or three equal lobes by a single transverse sulcus or three sulci radiating from anus. Legs (figs. 20, 21, 22) are present, but either small, as in *Pachymerus gonagra*, or minute, as in other species of *Pachymerus* and in the genera *Spermophagus* and *Mylabris*. The anterior pair is inserted closely together, the second pair in greater distance from each other and the third pair widely apart. The single leg is two- to four-jointed. In *Pachymerus gonagra* and



Fig. 1.
Mylabris obtectus Say.

Pachymerus languidus (fig. 20) the penultimate joint is as long as the proximal joints taken together, rather slender, somewhat curved and strengthened on the front side by a chitinous greave-shaped plate; the terminal joint is minute, obtuse and soft. No similar development of the penultimate joint is found in any of the other Mylabridae larvae. In these it is short, conical, soft, and the terminal joint is papilliform or peg-shaped. The spiracles (figs. 5 and 7) are well developed, varying slightly in size, all present and lateral; they are ring-shaped, circular or oval, and often without a distinct peritrema; the atrium is subglobular, densely beset with stiff hairs, which do not reach to the middle of the structure; the closing apparatus follows closely after the atrium and it is of the one-armed type.

In a general way the larvae remind one in habitus of the ptinoid larvae, particularly the typical Bostrichidae larvae, but are immediately recognized by the shape and size of the prothorax and the small, nipple-shaped and sucking tenth abdominal segment.

From the study of the anatomical details of the head and the mouthparts certain interesting features arise for consideration.

The labrum and clypeus are both well developed and distinct. Labrum (fig. 1) is usually transversely oval, three to four times broader than long, more rarely obtusely and broadly subtriangular; posteriorly a transverse, rather thinly chitinized plate is found in all known species, carrying at each end a well developed seta and somewhat nearer the middle line a single sensory pore; the anterior half of labrum is densely beset with fine, pointed hairs, sometimes having the character of a thick fur, exceptionally only half a score of strong setae are present or a number of long setae are interspersed among the much shorter hairs.

Clypeus (figs. 3, 9, 11) is somewhat broader than labrum and either completely soft and white, or provided with a weak chitinization laterally, or covered by a single, transverse median plate; at each end clypeus is armed with one or two well developed setae.

The number of ocelli is small: usually one ocellus is found on each side, but in the genus *Pachymerus* (fig. 12) three occur.

The antenna (fig. 12) has two fairly well developed joints of same size, each about as long or two to three times as long as wide; terminally a minute conical structure may represent either a vestigial distal joint or simply a tactile papilla; several smaller unquestionably tactile papillae and a few setae are present in the membrane on top of the last of the two well developed joints.

The mandible (fig. 19) is strong and rather short; the inner surface is large and its anterior part gouge-shaped with a

transverse, slightly curved, sharp and light colored front-edge which meets and fits against the front-edge of the other mandible in the sagittal middle line of the head; the posterior part of the inner surface is enforced by a round, dark and globular thickening on the interior side of the wall. There is no molar structure, no pseudo-molar structure as in *Polycaon* and *Dinoderus* and no prosthema; altogether the mandibles resemble greatly the simple mandibles of typical Bostrichidae larvae like *Scobicia* or *Bostrichus* and are absolutely different from the palmate, distally multidentate mandibles which are so characteristic of the plurality of Chrysomeloidea larvae.

The maxilla (figs. 13, 14, 15) has a rather small cardo, a well developed stipes and a large, joint-like well chitinized palpiger which carries a single mala and a short palpus. Mala is projecting, digitiform and distally armed with a remarkable comb-like structure of about five slightly curved, flat spines of equal length; several moderately long setae of normal form may also be present. The maxillary palpus is short, either distinctly two-jointed, as in *Pachymerus* and *Spermophagus* (figs. 13, 14), or indistinctly two-jointed with rudimentary basal joint, as in *Mylabris julianus* (fig. 15), or one-jointed, as in most of the species of *Mylabris*. A freely projecting maxillary stylus or a maxillary inner lobula extending forward from the inner edge of stipes is never present, and the Mylabridae larvae differ in that respect both from many Chrysomeloidea larvae and from most of the Ptinoidea larvae, in which such structures are present.

The most characteristic formation of the Mylabridae is the whole subfacial region. Its posterior part is rather large, fleshy and formed by a fusion of submentum and the articulating maxillary area, it is contiguous with the sternal region of prothorax, no gula being present, and anteriorly it is usually marked by a single, transverse, more or less crescentic sclerite (sms fig. 17). This sclerite is large and strong in several forms, as in the known species of the genera *Pachymerus* and *Spermophagus* (figs. 26, 27) and in some of the species of *Mylabris*, for instance *Mylabris uniformis* LeConte (fig. 28), it is weaker in species like *Mylabris obtectus* Say and *Mylabris quadrimaculatus* Fabricius (figs. 23, 25), and vestigial or entirely lacking in a few species as *Mylabris floridae* Horn (fig. 29) and *Mylabris chinensis* Linnaeus (fig. 24). The anterior part of the subfacial region is comparatively large and composed of mentum, eulabium and structures pertaining to the floor of the buccal cavity, all aggregated into a whole whose single elements can not be distinctly defined. This region bears a yellow or brown chitinization (ls fig. 17) suggesting the crest or shield of a scutcheon; it varies in outline according to the different species and thus

offers specific characters of great value. In the middle line it is somewhat gouged and in front bifid or trifid; a more or less distinct whitish spot is located either at the basis of each prong, when only two prongs are developed (fig. 23), or between the middle prong and the lateral prongs, when three are present (fig. 30). In each of these spots a one-jointed rudimentary labial palpus can be traced in species of the genus *Pachymerus* (fig. 27) and occasionally it has also been found in a freak specimen of *Mylabris pisorum* (fig. 17), but normally there is not the least vestige of a labial palpus in any of the species of the genera *Mylabris* and *Spermophagus*. The entire sclerite, which in the following will be mentioned briefly as "the labial plate," consists of chitinous elements pertaining both to the labial palpi, and in many or most species probably also to that median part of mentum which in other coleopterous larvae, for instance of the Curculionidae, often is covered with a spear-shaped or broader chitinous piece. Immediately behind each of the white spots is a well developed seta. In *Pachymerus* (fig. 27), which represents the least modified larval form of the family, the hind margin of the labial plate is broadly emarginate, the entire plate transverse, two to four times wider than long, and the mental region is provided with a separate, thin, indistinct and median chitinization. In the other Mylabridae larvae the hind margin of the labial plate varies considerably according to species, from concave or circularly incised to distinctly convex without any incision, and regarding the proportions of the plate, it is at least as long as wide, but usually longer.

Ligula (figs. 18, 27), armed with one or two pairs of setae, is wedged in between the laterally and apically expanded and projecting paraglossae (pg fig. 27) and is not very distinct.

Toward the buccal cavity and above ligula the median prehypopharyngeal feature or "glossa" (g fig. 27) is less developed than the setose paraglossae (pg fig. 27), and is not sharply defined from the conspicuous, compressed and hump-like hypopharyngeal region behind it. A lateral hypopharyngeal rod is located on each side at the basis of the hump, but no transverse median hypopharyngeal chitinization is present and hypopharyngeal bracons are also lacking.

Above hypopharynx is a well developed soft-skinned epipharynx that paramedianly carries two pairs of small setae and on each side is raised as a soft lobe with finely setose free margin; posteriorly a pair of rather large, round but feebly chitinized plates may be seen in some of the species.

Remarkable as is the whole complex of ventral and buccal organs, it is not entirely unique in beetle larvae, being almost duplicated in the Buprestidae and very similarly built but not so reduced in the Hispidae.

As far as the Buprestidae are concerned, this resemblance can

hardly be interpreted otherwise than as a striking parallel development of homologous structures in a family which belongs to a different series of beetles but lives in similar surroundings. The same parallelism is repeated in the shape of the antennae, labrum, clypeus and the mandibles of the two families, but the arrangement of the mouthparts in continuation of the long axis of the body, and not vertical as in the Mylabridae, and the presence of a distinct gular plate and cribriform spiracles in the Buprestidae, but not in the Mylabridae, solely indicates the fundamental heterogeneousness of the two families.

On the other hand, the conformity of the ventral mouthparts in the Hispidae and the Mylabridae is unquestionably due to actual relationship. It is true, as pointed out above, that in the shape of the mandibles, the form and deep invagination of the head and the general form of the body the Mylabridae are more in keeping with the Bostrichidae of the series Ptinoidea than with any of the typical Chrysomeloidea, the Hispidae included. However, in both of the two series several of the composing families and subfamilies greatly deviate from the rest, and stand out as very distinct family types, and at the same time it does not seem possible to find a combination of characters or a single fundamental character, with the possible exception of one, by which the larvae in question can be separated into two series which embrace exactly the same families as do the series Ptinoidea and Chrysomeloidea according to the imagines.

The single separating character alluded to is found in a different development of the tenth abdominal segment. In the larvae of the Ptinoidea, comprising the Ptinidae, Anobiidae, Bostrichidae, Psoidae and Lyctidae, it is flatly convex with a pair of large, more or less distinct, oval cushions separated by a long sulcus in front of anus, and never has the form and function of a pygopod (= "ventouse anal" Lesne) but in the Chrysomeloidea (=the Chrysomelidae, sensu auctorum) and the Mylabridae it is a pygopod in form and function, either of the nipple-shaped type as in the Mylabridae, Sagridae and Hispidae, or long and cylindrical, usually with anus in the middle of the sucking surface. However, in the larvae of a few genera, particularly *Chrysochus*, belonging to the Eumolpidae (=Eumolpinae, sensu auctorum) the tenth abdominal segment is developed in a special way, and more as in the Ptinoidea than in the Chrysomeloidea.

Serious consideration as a hypothetical serial character should also be given to the development of mentum and stipes maxillae, as in all the Ptinoidea larvae the mentum is laterally free and not fused with stipes, but in most of the Chrysomeloidea attached in its entire length to stipes. However, in the Sagridae and Donaciidae, the mentum is completely or partially free

and thus these families would go to the Ptinoidea if this character is chosen to maintain a separation into two series.

In the Mylabridae it is rather doubtful whether or not the mentum shall be considered free, as it is not feasible to determine which elements in the fused labio-mental region are of unmistakable labial origin and which are conclusively mental, and, therefore, a decision can hardly be based on this character as to which of the two series in question the Mylabridae should be placed in.

A closer affinity of the Mylabridae to the Ptinoidea may finally be intimated on account of their deviating ontogenetic development, the first instar of the Mylabridae being remarkably different from the other instars, just as in the case of the Bostrichidae, Psoidae and Lyctidae, but not in the Chrysomelidae. This difference between the instars of the Mylabridae is not expressed in the general shape of the body, the anatomical details of the head and the pygopodial form of the last abdominal segment which are identical in all stages, but it is only in the first instar that an H- or X-shaped plate is present, situated far forward dorsally on the prothoracic segment. It is usually backward bent over the surface of the segment but is movable and can be raised; the free upper edge of each limb of the H is armed with a row of obtuse or sharp teeth and a few teeth are found on the cross-piece of the H or in the corresponding place when the plate is X-shaped.

The features and functions of the plate have lately been described and critically interpreted by K. Kunhi Kannan in a thorough and inspiring contribution concerning the adaptation of the first instars of the Mylabridae to enter the seeds of leguminous plants¹, and in this paper it is also shown that not only do the structural details of the plate vary according to species, but concomitantly several other features, particularly the legs and the number and location of the setae. Thus in *Mylabris obtectus* Say the prothoracic plate is narrow with about four blunt teeth on top of each limb of the H and one tooth on each side of the cross-piece; three pairs of legs are present, each pair longer than the foregoing, all with two long

¹K. Kunhi Kannan: "The function of the prothoracic plate in Mylabrid-larvae."—Bull. No. 7, Entomological Series, Dept. of Agriculture, Mysore State, India. Government press, 1923; pp. 1-47, 3 plates. (Contains many references to previous papers, for instance, by C. V. Riley, L. O. Howard and F. H. Chittenden.—Original descriptions are given of the first instars of the following species: *Mylabris obtectus* Say, *M. chinensis* Linnaeus, *M. horni* Pic, *M. uniformis* LeConte, *M. nigrinus* Horn, *M. Ulkei* Horn, *M. amicus* Horn, *M. arizonensis* Schäffer, *M. sallei* Sharp, *M. quadrimaculatus* Fabricius, *M. pauperculus* LeConte, *M. pruininus* Horn, *M. limbatus* Horn, *Zabrotes pectoralis* Sharp.—Eggs of many species are described.)

R. A. Cushman: "Notes on the host plants and parasites of North American Bruchidae," Jour. Econ. Ent., Vol. 4, 1911, pp. 489-510.

and slender joints, the proximal joint carrying two terminal spines and the distal joint being paddle-shaped at the end; the ninth abdominal segment carries a thick chitinous tergal shield with a few long setae; several setae are present all over the body; on the dorsal side one long seta is located on each side of the metathorax and the first to eighth abdominal segments, and at the root of each of these long setae is a short and weak seta; laterally below each abdominal spiracle and correspondingly placed on metathorax are two short and weak setae, and above the spiracle of the first abdominal segment is a short, strong, spine-like seta; ventrally near the inward basis of each leg is a long bristle, curved at the top and slightly shorter than the leg. In *Mylabris quadrimaculatus* Fabricius the dorsal plate is fairly broad with about five obtuse teeth on each limb and two on each side of the cross-piece; the legs are short and stout with two subequal joints, the distal joint subcylindrical; no shield on ninth abdominal segment; a dorsal series of long setae is present on each side of the body but no short setae occur at the root of them and laterally no short setae are found below the spiracles, only the spine-like seta above the first abdominal spiracle is still preserved; a long and curved bristle is also found inwardly near the basis of each leg, but in this species it is much longer than the leg. Still more reduced is the first instar of *Mylabris pruininus* Horn. In this species the plate is slender and the upper limbs have only two or three teeth, the cross-piece two minute teeth on each side; no shield on ninth segment; no setae at all, except the spine-like seta above first abdominal spiracle; no distinct legs.

To this record of a gradual reduction of the body in the first instars of the different species of the same genus *Mylabris*, it may be added that the first instar of *Spermophagus hoffmannseggii* Gyllenhal, of which specimens are in the National Museum, represents a type less adapted and transformed than the first instar of *Mylabris obtectus*, and that the first instar of *Zabrotes pectoralis* Sharp, according to Kunhi Kannan's description, is still more reduced than *Mylabris pruininus*, thus making the developmental series more complete.—In the first instar of *Spermophagus hoffmannseggii* the prothoracic plate is well developed and belongs to the X-shaped type with about eight obtuse teeth on each limb and one pair of curved claw-shaped hooks in the middle of the plate; the setae of the body are located and developed as in *Mylabris obtectus*, but no special plate is found dorsally on the ninth abdominal segment, and each of the three pairs of rather long legs consists of a coxa, a long and slender femur, a long and slender tibia and a strong, well chitinized, pointed and sickle-shaped claw. In *Zabrotes pectoralis*, on the other hand, hardly any armature is developed, the prothoracic plate being practically absent, except for two

isolated teeth on either side of the body which represent the last trace of the organ; the legs are all completely lacking, ninth abdominal segment is very small and without shield and no setae are present except the single spine-like one above the first abdominal spiracle.

The function of the structures and the purpose of these different adaptations have been fully explained by Kunhi Kannan and are, briefly, summarized as follows: The prothoracic plate procures purchase either against the inside of the egg-shell, in such species as *obtectus*, which cement the egg to the seed and whose newly hatched larvae penetrate into the seed from below the egg-shell, or against other objects, in those species as *quadrifasciatus* which attach the eggs to a pod, crevices in the pod or lay them loose among the seeds in storage and whose larvae wander about to find a favorable point of entrance. When thorax is fixed by help of the plate, the blood is forced forward and causes the head to incline as required for the proper action of the mandibles in excavating a hole. The legs, when present, are principally used as levers and the anal segment is the chief moving organ.

The North American Mylabridae are divided into four genera: *Pachymerus* Thunberg (= *Caryoborus* Schönherr), *Spermophagus* Schönherr, *Mylabris* Müller (= *Bruchus* Linnaeus; with several subgenera) and *Zabrotes* Horn. Of these the first three genera are represented in the National Museum by mature larvae of one or several species.

Key to Genera of Mylabridae.

1. Three ocelli (fig. 12). Maxillary palpus (fig. 13) two-jointed. Usually with vestigial one-jointed labial palpus (fig. 27).....2.
 One ocellus. Labial palpus completely lacking. (Legs small with penultimate joint short and conical) (figs. 21 and 22).....3.
2. Legs rather long (fig. 20) with penultimate joint slender, curved and provided with an elongate chitination on the outside, terminal joint indistinct, small, soft and pad-like.....*Pachymerus*, part 1.
 (Represented by *P. gonagra* Fabricius and *P. languidus* Gyllenhal.)
 Legs short with penultimate joint short and conical; terminal joint small and peg-like.....*Pachymerus*, part 2.
 (Represented by *P. gleditsiae* (Linnaeus), *P. nucleorum* Fabricius and *P. brasiliensis* Thunberg.)
3. Maxillary palpus (fig. 13) two-jointed with distinct terminal and basal joints; comb-like structure of mala with very long teeth. Labial plate (fig. 26) elongate with posterior margin entire; anteriorly with a single median projection.....*Spermophagus*.
 (Represented by *S. hoffmannseggi* Gyllenhal.)
 Maxillary palpus (fig. 15) with distinct terminal joint and vestigial or no basal joint; comb of mala with moderately long teeth. Labial plate of various form.....*Mylabris*.
 (Represented by the species given below.)

As a preliminary attempt to separate the few species of *Mylabris* preserved in the National Museum, the following key has been prepared:

Key to Species of Mylabris.

1. Labrum (fig. 10) comparatively small, anteriorly with about half a score of moderately long, stiff setae. Submental sclerite (fig. 28) large and closely surrounding the posterior half of a small labial plate with a single median posterior excision. Length of mature larva 4 mm.....
uniformis LeConte.
Labrum anteriorly densely beset with setae. Submental sclerite, when present, not closely surrounding the labial plate.....2.
2. Labial plate elongate with posterior margin entire and distinct; anteriorly with a single median subtriangular projection (fig. 30). Length of mature larva 7-8 mm.....*julianus* Horn.
Labial plate anteriorly with a deep, rounded or angulate cut.....3.
3. Labial plate (fig. 24) subquadrangular, about as long as wide; the anterior, lateral and posterior margins all flatly concave. (Clypeus (figs. 4 and 8) with a pair of lateral chitinizations. Front behind epistoma usually dark with a pair of large whitish spots.) Length of mature larva 3-4 mm.....*chinensis* (Linnaeus).
Labial plate longer than wide.....4.
4. Labial plate (fig. 29) slightly chitinized and posteriorly vanishing completely. (Submental sclerite indistinct. Clypeus without chitinization.) Length of mature larva 3 mm.....*floridae* Horn.
Labial plate distinct.....5.
5. Clypeus almost covered with a chitinous plate (figs. 3 and 6). (Labial plate laterally convex (fig. 23).) Length of mature larva 4 mm.....
quadrifasciatus Fabricius.
Clypeus with slight or no chitinization (figs. 1, 2 and 9).....6.
6. Legs comparatively well developed. Labrum with several long setae placed among numerous short ones (fig. 1a). (Labial plate with lateral margins converging posteriorly (fig. 17).) Length of mature larva 5 mm.....*pisorum* Linnaeus.
Legs poorly developed (text fig. 1). Labrum with more uniformly developed setae.....7.
7. Setae of labrum moderately long (fig. 2a). Length of mature larva 5 mm.....*rufimanus* Boheman.
Setae of labrum short and very dense (fig. 9). (Labial plate laterally concave.) Length of mature larva 4 mm.....*obtectus* Say (= *fabae* Riley).

LITERATURE.

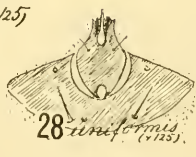
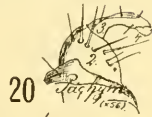
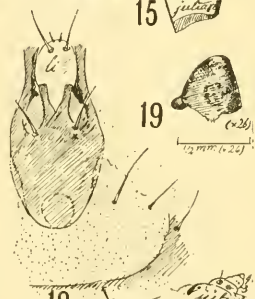
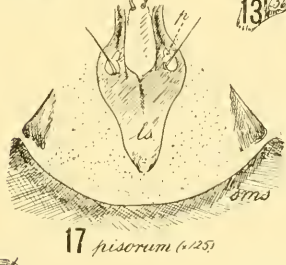
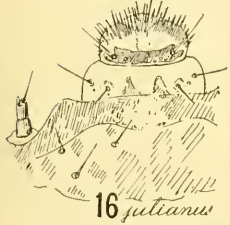
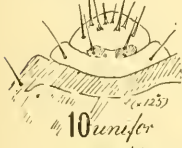
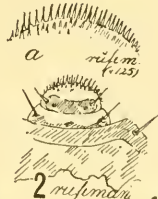
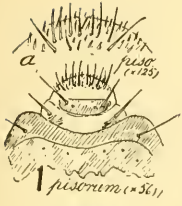
PADDOCK, F. B. and REINHARD, H. J.—“The Cowpea Weevil.” Texas Agricultural Experiment Station. Bull. No. 256; 1919. (On pp. 90 and 91 a useful bibliography on the Mylabridae.)
BACK, E. A.—“Weevils in Beans and Peas.” U. S. Dept. of Agric. Farmers’ Bulletin No. 1275, 1922 (with habitus-figures of the larvae of *Mylabris pisorum* (p. 12), *Mylabris obtectus* (p. 14), *Mylabris chinensis* (p. 15), *Mylabris quadrifasciatus* (p. 17)).

EXPLANATION OF PLATE 8.

(Drawings by the author.)

1. *Mylabris pisorum* (x 56).¹ Clypeus and labrum.
- 1a. *Mylabris pisorum* (x 125). Anterior part of labrum.
2. *Mylabris rufimanus* (x 56). Clypeus and labrum.
- 2a. *Mylabris rufimanus* (x 125). Anterior part of labrum.
3. *Mylabris quadrimaculatus* (x 125). Clypeus (c) and labrum; epi-epistoma.
4. *Mylabris chinensis* (x 125). Clypeus and labrum.
5. *Mylabris julianus* (x 56). Mesothoracic spiracle seen from the outside in face view.
6. *Mylabris quadrimaculatus* (x 56). Clypeus and labrum.
7. *Mylabris julianus* (x 56). Mesothoracic spiracle in lateral view. Note the atrium (a) and the closing apparatus (c).
8. *Mylabris chinensis* (x 56). Anterior part of frons, clypeus and labrum.
9. *Mylabris obtectus* (x 125). Clypeus and labrum.
10. *Mylabris uniformis* (x 125). Clypeus and labrum.
11. *Mylabris floridæ* (x 125). Clypeus and labrum.
12. *Pachymerus gonagra* (x 56). Three ocelli and an antenna.
13. *Spermophagus hoffmannseggii* (x 56). Dorsal part of maxilla.
14. *Pachymerus gonagra* (x 56). Distal part of maxilla.
15. *Mylabris julianus* (x 56). Dorsal part of maxilla.
16. *Mylabris julianus* (x 56). Anterior part of frons, left antenna, clypeus and labrum.
17. *Mylabris pisorum* (x 125). Labial plate (ls), ligula and submental sclerite (sms).—Drawn from a freak specimen with vestigial palpi (p).
18. *Mylabris rufimanus* (x 125). Labial plate, ligula (li) and submental sclerite.
19. *Mylabris julianus* (x 26). Right mandible, exterior face.
20. *Pachymerus gonagra* (x 56). Left prothoracic leg.
21. *Spermophagus hoffmannseggii* (x 56). Prothoracic leg.
22. *Mylabris julianus* (x 56). Prothoracic leg.
23. *Mylabris quadrimaculatus* (x 125). Labial plate, ligula, submental sclerite.
24. *Mylabris chinensis* (x 125). Labial plate and ligula.
25. *Mylabris obtectus* (x 125). Labial plate, ligula and submental sclerite.
26. *Spermophagus hoffmannseggii* (x 56). Labial plate and submental plate; ligula not figured.
27. *Pachymerus gonagra* (x 56). Labial plate, labial palpi, ligula (li), paraglossæ (pg), glossa (g), submental sclerite, left maxilla attached.
28. *Mylabris uniformis* (x 126). Labial plate and submental sclerite.
29. *Mylabris floridæ* (x 125). Labial plate, ligula and submental plate.
30. *Mylabris julianus* (x 56). Labial plate, ligula and submental plate.

¹For the sake of quick estimation of the natural size of the parts figured, a line showing the length of $\frac{1}{2}$ mm. magnified 26 times is drawn near figure 19, which itself is drawn with 26 times magnification, and to the left on the foot of the plate is shown a line $\frac{1}{2}$ mm. long, magnified 56 times, and another line $\frac{1}{4}$ mm. long, magnified 125 times, corresponding to the other two magnifications applied for the figures on the plate.



1/2 mm (1856)
1/4 mm (1825)

Mylabridae

Adams & Böving del

**ZOROTYPUS LONGICERCATUS, A NEW SPECIES OF ZORAPTERA
FROM JAMAICA.¹**

By A. N. CAUDELL.

Among miscellaneous material recently submitted by the Federal Horticultural Board for determination were two small whitish termite-like creatures which proved to represent a very distinct species of *Zorotypus*. It is such finds as these which now and then reward the specialist for hours devoted to naming material taken at quarantine. These specimens were intercepted at Philadelphia from Jamaica, the label accompanying them reading as follows:

“In soil about palm plants (taken from officer) from Jamaica. Intercepted at Philadelphia, Pa., April 27, 1927, by A. G. Barley. Philad. No. 5565.”

It is unfortunate that both specimens are immature, being larvae with eight segmented antennae. But the characters are so strikingly different from any described form that there is no hesitation in describing them as a new species. The specific name chosen has reference to the conspicuously elongated cerci, a character which at a glance differentiates them from all other described species of these little known insects.

***Zorotypus longicercatus*, new species.**

Description.—Larva. General color, dull translucent whitish, the alimentary canal shadowily visible through the body walls; head with a narrow lighter colored line extending from one minute black eye to the other and bowing semicircularly towards the base of the occiput. Body and limbs with a few short, fine, brownish hairs, those of the cerci similar to those on the body, but somewhat longer.

Head very much broader than the pronotum. Eyes represented by a very minute black dot on each side of the head; ocelli none. Apical segment of palpus about twice as long as broad, slightly longer than the preceding segment and much thicker, apically narrowing to a point. Antennae thick and heavy, as is characteristic for the genus, and consisting of eight segments, the number indicative of the larval condition; the basal segment decidedly longer than broad, gradually thickening apically; second segment subequal in diameter with the adjacent portions of the preceding and succeeding segments and scarcely longer than wide and about one-half as long as the basal segment; third segment approximately three times as long as broad, subequal in length to the basal and second segments together and about three times as long as the second alone; basally the third segment is broadly attached to the second segment, but the juncture between its apex and the fourth segment, as are the points of attachment of all succeeding segments, is very narrow; fourth segment

¹Since the above manuscript was written there has been received a single anterior wing of a species of *Zorotypus* from Cuba, found in a vial with an earwig submitted for determination. This is the first record of this Order from Cuba and except for the new species here described, the first from the West Indies.

somewhat longer than thick, mesally as thick as the thickest portion of the third segment and tapering to a point at each end; fifth, sixth and seventh segments very like the fourth; eighth, and last, segment similar to the preceding except somewhat more elongate. Figure 1 shows one of the antennae greatly enlarged.

Pronotum as broad as long, about two-thirds as broad as the head, posteriorly noticeably narrowing, the anterior margin broadly convex, the posterior margin almost straight and the lateral margins very gently convex, the angles rounded; mesonotum slightly transverse, a little shorter than the pronotum and about as broad as the anterior width of that segment, the anterior margin concealed beneath the pronotum, the hind margin very gently concave and the lateral margins parallel but decidedly convex; metanotum decidedly transverse, about as long as the mesonotum and anteriorly subequal to it in width but posteriorly very decidedly broader, the lateral margins convex and the posterior margin broadly and shallowly concave.

Legs short and stout, all the femora very noticeably swollen and about equally so; the posterior femora are without heavy chitinous ventral spines, such spines as are present being brownish colored and so minute as to be scarcely discernible under moderately high magnification.

Abdomen anteriorly somewhat narrower than the metanotum but becoming broader posteriorly. Cerci strikingly different from those of any other known form in being about five times as long as their greatest width, gradually tapering to a point and each bearing several fine, pale colored hairs much less than one-half the length of the cercus and without a principal apical seta as present in most described forms. Figure 2 shows the cerci much enlarged.

Measurements.—Length, antenna, 1.1 mm.; posterior femora, .4 mm.; cercus, .4 mm.

Holotype, larva, Jamaica, 1927, in soil about palm plants, preserved in spirits; paratype, same data, mounted on a slide.

Type material in collection of U. S. National Museum.

Catalogue No. 40496, U. S. N. M.

This species runs out in the published key¹ to *snyderi* but the long cerci will at once differentiate it from that species as well as from all other described forms. The cerci of *Zorotypus guineensis* Silv. is about twice as long as basally broad but in all other previously described species it is scarcely longer than broad; thus the cerci of the species here

erected, being as long as the posterior femora, or several times as long as the basal thickness, will separate this form at a glance from all other described species.

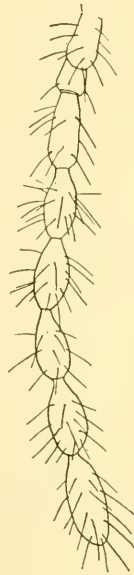


Fig. 1.

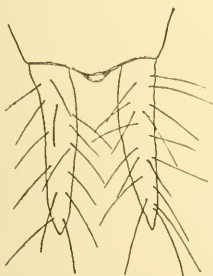


Fig. 2.

¹Trans. Amer. Ent. Soc., vol. xlvii, p. 135 (1922).

THE OCCURRENCE OF PROTURANS IN WESTERN NORTH AMERICA.

By H. E. EWING, *Bureau of Entomology, U. S. Department of Agriculture.*

While on a recent visit to the Yosemite Valley, California, in company with my brother, Dr. Fred Ewing, a small amount of decaying leaves and twigs, heavily infested with minute insects, was obtained. The leaves and twigs were picked up from the north side of the floor of the valley, a short distance east of the Yosemite Falls. They were sent by post to Mr. H. S. Barber at Washington, D. C., who placed the material in a "Berlese trap" and obtained thereby a large number of minute insects and other arthropods. Among these were two species of Protura.

The distribution of the Nearctic Proturans has been previously discussed by the writer.¹ It is sufficient here to state that up to the present no record of them occurring west of the Rocky Mountains has been obtained. Of these two species from the Yosemite one is new, and the other has not been previously reported from America.

Eosentomon yosemitensis, new species.

Head decidedly rounded laterally, about one and a half times as broad as long. Pseudoculi not conspicuous. Rostrum short. Mandibles extending to about the tip of rostrum.

Thorax very poorly chitinized, whitish; apodemes very little developed. Prothorax much reduced, with four dorsal setae arranged in a transverse row. Each of the thoracic spiracles with an anterior and a posterior seta situated at the outer border of the chitinous rim.

Abdomen slightly yellowish. Appendages on the ventral sides of the first three segments large and subequal. Eighth abdominal segment fully twice as broad as long, with about a dozen dorsal setae arranged in two irregular rows. Segments IX-XI together about as long as VIII. Telson with angulate posterior margin.

Legs rather weak and slender, in keeping with the slender body. Claw of first leg but little flattened and very pointed. Tarsus I a third longer than tibia I, without dorsal sense seta and with no terminal seta approximating the claw in thickness. Legs II and III subequal, with similar, sharp claws, each of which bears a seta-like tooth at the base.

Length when extended nearly to maximum, 0.96 mm.; width at metathorax, 0.06 mm.

Type locality.—Yosemite Valley, California.

Type.—Cat. No. 40485, U. S. N. M.

Described from a single female specimen taken by means of

¹Ewing, H. E. Nearctic Proturans. *Science*, Vol. LV, No. 1435, June 30, 1922.

a "Berlese trap" from decaying leaves and twigs collected from the floor of Yosemite Valley, California, April 15, 1927, by the writer. The species is most nearly related to *E. transitorium* Berlese, but differs from Berlese's species in size and in the absence of the sensory seta on the first tarsus and in some other particulars.

***Acerentomon microrhinus* Berlese.**

Three adult females were obtained from the same situation as the single specimen of *Eosentomon yosemitensis*. These specimens appear to agree in every detail with the excellent description and figures of *Acerentomon microrhinus* given by Berlese.

REMARKS ON THE DISTRIBUTION OF THE PROTURA.

Since the publication of the paper on Nearctic Proturans (1922) several new records have been obtained for the United States, including some from Florida. The Florida records were all from Orlando, far to the north of the Tropical Life Zone. The writer has searched in vain for Proturans in tropical Florida and in the Sonoran Region of Arizona. If they occur in these areas they must be exceedingly rare. Our North American Proturans are associated almost entirely with moist deciduous forests where they occur under favorable situations in the slowly decaying litter of twigs and leaves lying on the ground.

**A PROTOZOAN AND A BACTERIAL DISEASE OF EPHESTIA
KUEHNIELLA ZELL.**

By G. F. WHITE, *Bureau of Entomology.*

A reference to the Mediterranean flour moth, *Ephestia kuehniella*, at once recalls heavy financial losses, especially marked in flour mills. Although primarily a pest, this species is serving various students of biology a useful purpose. Richardson while making physiologic and Whiting genetic studies, using this insect, have encountered a protozoan disease of it which has proved to be particularly troublesome to them.

The sporozoan causing the disease gains entrance to the larva with the food. The young parasites find their way through the gut wall and enter fat cells. Here they grow and multiply to an enormous extent, causing their host to sicken and usually to die. Death may take place during the larval, pupal, or adult stage.

The disease is very infectious and causes a heavy mortality in insect cultures. When working on problems employing this insect one is compelled to use extreme care to prevent the spread

of the disease to healthy stock. Infection with this protozoan is not confined to *Ephestia* alone.

Berliner observed a bacterial disease of the Mediterranean flour moth in Germany, in 1911, which he referred to as "Schlaffsucht" (wilt). He described a bacterium as the cause, to which he gave the name *Bacillus thuringiensis*. The bacillus is a spore-bearing species and is readily cultivated on the media commonly used in bacteriological work.

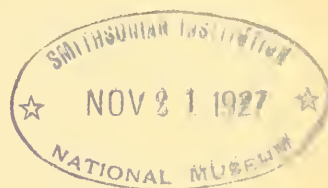
This disease has been encountered in this insect in the laboratory in Washington. Death from it usually takes place during the larval stage, the remains turning black and on drying becoming brittle. So far the mortality in the insect cultures has been heaviest during the hotter periods of the summer, at which time it has reached 100 per cent. These notes will be followed by a fuller report.

NOTE.

Owing to the writer's absence in Mexico and consequent failure to read the proof of the article on pages 95 to 97 of the April number of the Proceedings, certain omissions and corrections are noted. Text figure 1 should be explained as follows: Right, egg of *B. gossypiella*; left, egg of *B. thurberiella*, lateral view. Text figure 2 was intended for insertion with arrow, which points anteriorly, at top. On page 97, seventh line, for "contextum" read contextum. Figure 6 on the plate 4 should have been shown with end of abdomen upward to correspond with figure 3.—A. W. MORRILL.

Actual date of publication, July 26, 1927.

PROCEEDINGS
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A SUPPOSEDLY NEW BARIDIID WEEVIL FROM PERUVIAN
SUGARCANE.

BY H. S. BARBER.

A name for a small weevil said to be injurious to sugarcane in Peru being required and all attempts to identify it from available literature having failed, it appears necessary to consider it as new. It may easily have been introduced into Peru from the Orient but records of a similar sugarcane weevil are not before me. From the characters recorded for *Baris saccharivora* Matsamura 1911 this Formosan sugarcane weevil must be a very different form and the Chilean *Baridius tenuis* Blanchard 1854 can not be the species here described. Attempts to include it among the Madopterini as treated by Casey 1922 appeared satisfactory at first but were rejected when specimens of *Eumycterus albosignatus* (= *Baridius tenuirostris* Brisout 1870) of the eastern Mediterranean countries were compared. This latter species was described as a Cossonid by Schoenherr 1837 and was placed by Lacordaire 1866 as one of the five genera comprising his group Lyteriides of which the other four genera are unknown to me. From *E. albosignatus* the Peruvian species differs very greatly in the reduced and almost concealed pygidium, in the deeper sculpture and short setiform nature of the vestiture, and in the more feebly convex dorsum, flat sternal region and flatter pleural areas, as well as in the straight median part of the 2d, 3d and 4th abdominal sutures.

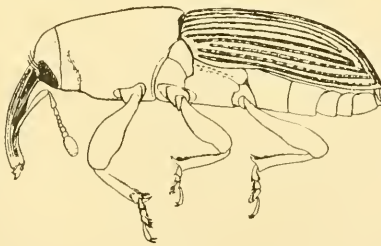


Fig. 1

Eumycterus? *saccharidis*, n. sp.

Elongate, subparallel, feebly depressed, shining, piceus black, rather strongly sculptured and sparsely clothed with short curved setiform scales except on

median three-fifth of the pronotum; sexes very similar, the ♀ rostrum slightly more elongate before scrobes.

Length, excl. rostr., 3.7–4.0 mm.; width, 1.4–1.5 mm.; rostrum, length, 1.25 mm.

Habitat.—Peru.

Head alutaceous, feebly shining, minutely and very remotely punctulate; eyes small, vertically elongate-oval, separated above and below by the width of the rostrum; rostrum moderately curved and slender (Fig. 1), nearly as long as the pronotum, nearly cylindrical, the base and apex slightly widened; surface confusedly punctulate apically, becoming dorsally quadriseriately punctulate behind antennal sockets, and laterally confluent punctate between the feeble dorso-lateral carina and the margin of the scrobe, these lateral punctures bearing vertically directed curved scale-like hairs which culminate in a conspicuous tuft of 3 or 4 hairs at upper front margin of eye; scrobes becoming ventrally confluent at basal fourth. Antennae as in *albosignatus* but with ochreous hairs instead of white scales on funiculus and on upper side of scape.

Pronotum one-tenth longer than wide, widest before middle, base feebly lobed, apex very feebly emarginate, sides very feebly arcuate and almost parallel in basal three-fifths, thence strongly, arcuately convergent to the impressed ends of the trans-ventral constriction; surface depressed, feebly convex, shining, with narrow, median, impunctate line, strong regular punctures with wide, flat, shining intervals on disc, the lateral areas more coarsely, confluent punctate with suberect curved scale-like hairs. Scutellum small, subquadrate, flat. Elytra slightly wider than pronotum and four-fifths longer, five-eighths as wide as long; widest behind humeri, sides straight and nearly parallel from humeral gibbosity to near middle, thence gradually arcuate to apices; surface shining, deeply, regularly striate, the stria obsoletely punctate and about half as wide as the intervals, the latter each with a row of setiferous punctures, setae curved decumbent and regular in spacing and direction, those of the 2d intervals pointed about 30 degrees outward from the suture, those on 4th interval parallel to suture and those on 7th interval inwardly directed at angle of about 20 degrees. Pygidium of ♂ short, transverse, almost flat, only the apical fourth exposed; of ♀ long but appearance of normally exposed part similar to ♂. Under surface shining, more strongly punctate than pronotal disc with decumbent, hair-like scales. Prosternum transversely tumid before coxae, which are separated by nearly their own width; postcoxal area feebly lobed and more strongly pubescent. Mesosternum transverse, the intercoxal suture evanescent but straight when visible. First abdominal suture broadly obliterated at middle but straight to side margins, the other three very strongly bent posteriorly at sides in lateral fourths but straight at middle; femora stout, unarmed, tarsi only moderately broad, claws free. Aedeagus very broadly oval, flattened, twice as long as wide, not much bent downwards apically, apex vaguely truncate, elliptic, orifice transverse.

Type, allotype and 3 paratypes.—Cat. No. 40302, U. S. N. M.

The five adults were submitted in alcohol with larvae and pupae by C. H. T. Townsend as having been found in sugarcane at Pomalca, near Chiclayo, Peru, June 12, 1926.

IMMATURE STAGES OF *EUMYCTERUS* (?) *SACCHARIDIS* BARBER,
WITH COMMENTS ON THE CLASSIFICATION OF THE
TRIBE BARINI (COLEOPTERA: CURCULIONIDAE).

By ADAM G. BÖVING, U. S. Bureau of Entomology.

The material from which the following descriptions of the mature larva and the pupa of *Eumycterus* (?) *saccharidis* Barber are made, was collected by Dr. C. H. T. Townsend in Pomalca, near Chiclayo, Peru, June 12, 1926. It consists of three specimens of the larva and one of the pupa, was preserved in alcohol, and sent by Dr. Townsend to the U. S. Bureau of Entomology, together with five imagines for determination and figuring. Mr. H. S. Barber, U. S. Bureau of Entomology, examined the adults, found that they probably represented a new species and has described and named this species in the article immediately preceding (p. 149). Dr. Townsend records that the insect is associated with sugar-cane, the larva attacking the heart of the terminal shoot.

Of the three specimens of the larva one is kept in alcohol in the collection of coleopterous larvae in the U. S. National Museum, and the two others are dissected, mounted on slides and placed in the slides collection of the Museum.

DESCRIPTION OF THE MATURE LARVA.

(U. S. Nat. Mus., one specimen in a vial marked: Pomalca, near Chiclayo, Peru, C. H. T. Townsend, June 12, 1926.)

General aspect—(Plate 9, Fig. 1).

The larva is about 5 mm. long, cylindrical and slightly curved. The head is sub-globular, retractible into prothorax. The prothorax is hardly so wide as the mesothorax and metathorax which are of about the same size as the first five abdominal segments. The pedal lobes are distinct but not protuberant, each carrying four small setae. The areas of the body are arranged as usual in weevil larvae. The tergum of the prothorax is entire; the mesothorax and metathorax have two transverse tergal bulges representing the prescutum and the fused scutal and scutellar areas; each of the first seven abdominal segments has three distinct transverse tergal bulges, the middle one, scutum, being considerably smaller than the prescutum and scutellum which are of about equal size. The eighth abdominal segment has two tergal bulges, the scutum being eliminated, probably incorporated in the scutellum. The ninth abdominal segment has a simple entire tergum and the tenth abdominal segment is short and wart-shaped, on each side with two short sulci radiating obliquely up and down from the anus. The hypopleural lobes are simple in all the abdominal segments. An indication of a short and narrow postscutellum is found in the lower part of the tergal areas of most abdominal segments, but there are no ring-shaped intersegmental connecting membranes.

The body is mainly whitish but with a yellowish-brownish head with dark margins and on the dorsal surface with a system of whitish bands which form a large figure somewhat like a reversed letter A (Plate 9, Fig. 2). Very charac-

teristic is also a dark, semicircular line posteriorly on the dorsal side of the epicranium almost parallel with the outline of the head capsule seen from above. The pedal lobes are slightly callous and yellowish; a thinly chitinized, yellowish prothoracic shield covers most of the tergal areas of this segment, and the mouthparts and spiracles are completely or partially chitinized.

The setae are moderately long on the head capsule and the mouthparts, often smaller but distinct on the rest of the body.

The spiracles (Plate 9, Fig. 6) are bifore, small, all of equal size, present on the mesothorax and the first eight abdominal segments and all lateral. The area in which the mesothoracic spiracle is seated is pushed into the posterior part of the prothorax but separated from the anterior margin of the prothorax by a considerable distance. The two air tubes are rather short, each with about five incomplete annuli. Spiracular opening (*o*) circular, atrium (*a*) large and beset with short hairs. The closing apparatus (Fig. 8) near the spiracle proper has one long arm.

Anatomical details.—(Plate 9).

Head capsule (Figs. 1 and 2) connected with the rest of the body by a large cervical collar, permitting considerable motion forwards from and backwards into the prothorax.

Epicranial median suture (Fig. 2) somewhat longer than half of the cranium; each of the epicranial ridges parallel with the outline of the head, somewhat more than half as long as the epicranial suture, posteriorly in the middle line extending from a well chitinized, inverted V-shaped thickening of the margin of occiput.

Ocelli (Fig. 5) indistinct, judging from the preserved specimens investigated; only one ocellus present on each side and that reduced to a pigmented spot.

Antenna (Fig. 5) small, two-jointed. Basal joint wide, flat, membranous, dome-shaped and carrying tactile hairs. Apical joint mamillate, somewhat pointed and proximally with a ring-shaped chitinization.

Clypeus about twice as wide as long; without setae.

Labrum (Fig. 2) transverse, anterior margin slightly concave, posterior margin prolonged into a triangular projection and covered by the clypeus; laterally with one well developed seta.

Epipharynx (Fig. 7) on each side with (1) a lateral group of three stout, elongate-ovate, somewhat curved, basically suddenly constricted setae, arranged in a slightly oblique, inwardly and anteriorly directed series; (2) near anterior margin a median, triangularly arranged group of three much smaller, pointed, thick and claw-shaped setae; and (3) immediately behind the lateral group and inside of the anterior end of the epipharyngeal rod two setae, one in front of the other, the anterior broadly ovate, the posterior more elongate, pointed and shaped as ordinary setae.

Mandible (Figs. 3 and 4) strong, subtriangular, with broad basis and heavy condyle; apex simple; facing the buccal cavity with a hollow, gouge-shaped side; dorsal and ventral inner margins thick without teeth or sharp longitudinal crest; on the back with a single small seta.

Maxilla (Fig. 9) having a cardo and a stipes of the shape, proportional size and with the setal armature typical of curculionid larvae. Maxillary lobe or

"mala" large, simple, reaching beyond the end of the maxillary palpus and apically soft skinned, basically slightly chitinized; distally in the soft-skinned part armed with seven setae, of which the three anterior are of the same shape and size as the large lateral epipharyngeal setae, the rest slender and of ordinary type. Maxillary palpus short, two-jointed, with the distal joint of about the same length as the proximal joint but only half as wide; distal joint with one seta, proximal joint without setae but with a few sensory punctures.

Subfacial area (*sf*, Fig. 9) entire; a subdivision into a mental, submental and maxillary articulating area not marked. On each side three well developed setae.

Labium (*l*, Fig. 9) posteriorly limited by an unimpaired, arcuate, anteriorly concave, in the middle spear-like postlabial chitinization (*pl*); one long seta on each side. Ligula thick, broad and short; ventral surface with one small seta and a sensory puncture.

COMMENTS ON THE TAXONOMIC POSITION OF THE GENUS *EUMYCTERUS* ACCORDING TO THE LARVA.

According to the characters found in the imago, the genus *Eumycterus* is placed in the tribe Barini and the soundness of this systematic arrangement is substantiated by the results from the examination of the larva. In this all the characters are found by which the larvae of Barini are defined, namely:

(1) Short, bifore spiracles with from four to six incomplete annuli on each air tube.

(2) A dorsal internal epicranial ridge, posteriorly placed, parallel with the outline of the head capsule and usually visible on the outside.

(3) Body sparsely beset with short, fine setae; on each typical abdominal prescutum present in the number of one on each side, or absent, and on scutellum in a transverse single series of two to four.

(4) Anal segment wart-shaped, with centrally placed anus from which four sulci of equal length radiate in an oblique direction, one upward and one downward on each side, limiting one dorsal, one ventral and two lateral anal lobes, all lobes of the same size.

(5) Dorsal side of the cranium with a system of broad whitish bands forming a figure like an inverted letter A (absent in a few genera).

The tribe Barini is listed in Leng's Catalogue of the North American Coleoptera, 1920, between the tribes Laemosaccini and Zytopsini, but the larval type of the tribe Laemosaccini, represented in the U. S. National Museum by many reared larvae of *Laemosaccus* sp., has a general habitus very aberrant from the larvae of Barini, having a large subglobular thorax with swollen pedal lobes and oval ring-shaped spiracles, and therefore can not be considered a close relative of the Barini. On the other hand, the larvae of the genera *Cleonus* and *Lixus* repre-

senting the tribe Cleonini, which is placed in the catalogue right before the Laemosaccini, are so closely related to the Barini that the two tribes can be separated only by minor differences in the setal arrangement on the abdominal scutellum, the maxillary mala and the epipharynx and by the absence in the Cleonini of the posterior epicranial ridge, which is present in the Barini, and all these characters may possibly even prove to be of no tribal value when the larvae of more of the species of both tribes become known.

The lack of generic homogeny in the tribe Zygopsini has been discussed by the author in an earlier paper¹ in which a fundamental difference was pointed out between the larva of *Zygops* and the genera *Cylindrocopturus* and *Eulechriops*, the larva of *Zygops* having oval, ring-shaped spiracles and a tenth abdominal segment with a large, soft, pad-like ventral anal lobe and the larvae of the two other genera having short, bifore spiracles and a tenth abdominal segment with normally developed ventral anal lobe. Therefore it was also suggested that the tribe Zygopsini be reconstructed by removing the genera *Cylindrocopturus* and *Eulechriops* from it and a new tribe created for them, but a name was not given to this new tribe at the same time; for practical purposes it is now proposed to name it here, and I suggest that it be called Cylindrocopturini.

Whereas the larvae of the Barini show little relationship to the larva of *Zygops*, representing the tribe Zygopsini (sensu restricto), they approach rather closely the larvae of the tribe Cylindrocopturini and are separated from them only by minor differences.

Regarding the genera *Laemosaccus* and *Zygops* as misplaced, and therefore to be eliminated from further consideration at present, the rest of the long series of genera which constitute the tribes Cleonini, Barini and Cylindrocopturini seem to be correctly placed in these tribes and the tribes themselves to be properly limited and well defined, except the tribe Barini, which should be divided into two groups of genera, and each group given tribal rank. Following the systematic arrangement in Leng's Catalogue the tribe Barini is composed of two subtribes, namely, the Barides and the Centrinides. In the U. S. National Museum are present the larvae of the following genera of Barides: *Baris*, *Pycnobaris*, *Madarellus*, *Ampelogypter*, *Trichobaris* and *Orthoris*. These larvae are closely related and recognized (1) by having mandibles with one apical tooth and usually two, rarely one or three lateral teeth on the dorsal inner edge, but never more than four teeth altogether, and (2) by lacking a complete, ring-shaped intersegmental region, the postscutellum being short and dorsally vanishing

¹Böving, A. G.: Immature stages of *Eulechriops gossypii* Barber with comments on the classification of the tribe Zygopsini (Proc. Ent. Soc. Washington, Vol. 28, 1926, p. 54-62).

or entirely absent, and the poststernellum not developed. The subtribe *Centrides* is represented in the National Museum by the following genera: *Geraeus*, *Limnobaris*, *Eisonyx*, *Zygo-baris* and *Barinus*. Of these larvae the three last are very closely related to the larvae of the Barides and possess the same type of mandibles and show the same absence of a distinct inter-segmental ring as the larvae of Barides, but the larvae of *Geraeus* (= *Centrinus*) and *Limnobaris*¹ have (1) palmate mandibles with five almost equal teeth and (2) the postscutellum and poststernellum of the abdominal segments forming a broad or very broad ring-shaped intersegmental region. These structures are so strikingly different from the corresponding ones by which all the other larvae of Barini are characterized that it is deemed necessary not only to separate the genera *Geraeus* and *Limnobaris* from the rest of the Barini as a subtribe, but to create a special new tribe for them, and this tribe is here named *Centrini*. On the other hand, the larvae of *Eisonyx*, *Zygo-baris* and *Barinus* are not essentially different from the larvae of the genera included in the subtribe Barides and can not be held together as a separate subtribe, but should be united with the rest of the genera, constituting together with these a simple, not subdivided tribe, the Barini (*sensu restricto*).

In connection with the above-given taxonomic comments the following two keys have been prepared, one for the separation and characterization of the larvae of the six discussed tribes of Curculioninae and the other for the determination of the larvae of the genera of Barini in the National Museum.

Key to Tribes.

- 1. Spiracles annular, oval. (Mandibles subtriangular, apically simple and wedge-shaped, without marginal teeth, gouge-shaped inner face. Anus transverse, surrounded by four lobes of different sizes).....2
- Spiracles bifore; air tubes short with four to six annuli.....3
- 2. Anal segment with the dorsal and ventral anal lobes thick and lip-shaped the lateral lobes triangular and small. Epipharyngeal rods parallel.....
 - Laemosaccini
 (*Laemossaccus*)²
 - Anal segment with a large, soft, pad-like ventral lobe, the upper lobe and the lateral lobes narrow and sausage-shaped. Epipharyngeal rods converging posteriorly and fused near pharynx.....*Zygopsini*
 (*Zygops*)

¹Böving, A. G.: Description and figures in "Ainslie, G. G. The Cornpit weevil, *Centrinus penicellus* Herbst." (Journal of Economic Entomology, Vol. 13, 1920, pp. 277-280—one plate.)

Böving, A. G.: The larva of *Limnobaris reticornis* LeConte. (Journal New York Entomological Society, Vol. 32, 1924, pp. 197-204—one plate.)

²In parenthesis are given the names of the genus or genera whose larvae are kept in the National Museum and in the present investigation have been considered as representing the tribe.

3. Either with a low, conical projection of the posterior end of 9th abd. tergum¹
or with a large, eye-like, dark colored mark on each side of the head.....
Cylindrocopturini
(*Cylindrocopturus* and
Eulechriops)
- Without such characters.....4
4. Mandible palmate with five digitate teeth. Intersegmental region ring-
shaped, broad and complete between the abdominal segments.....Centrini
(*Geraeus* and
Linnobaris)
- Mandible not palmate, with one apical and usually two lateral teeth,
never more than four teeth in all. Intersegmental region absent or not
developed as a complete ring.....5
5. Abdominal scutellum on each side with a longitudinal single series of five
or less setae. Epicranial curved inner ridges usually visible on the out-
side.....*Barini*
(*Baris*, *Pycnobaris*,
Madarellus, *Ampelogypter*,
Trichobaris, *Orthoris*,
Eisonyx, *Zygoberis*,
Barinus, *Eumycterus*)
- Abdominal scutellum on each side usually with a longitudinal series of
about eight setae, the uppermost arranged in pairs; all carried by small
round plates, one or two setae on each, or set on top of minute, dome-
shaped, soft projections. Epicranial curved inner ridge not visible on
the outside.....Cleonini
(*Cleonus*, *Lixus*)

*Key to Genera of Barini.*²

1. Mandible triangular; inner face broad and excavated; apex simple, dorso-
lateral margin thick and entire.....*Eumycterus* (?)
(*saccharidis* Barber)³
- Mandible different; apically with a single strong tooth, dorso-lateral mar-
gin dentate or otherwise produced.....2
2. Dorso-lateral margin of mandible raised into a low sharp crest with anterior
and posterior ends projecting into small tooth-like processes.....3
- Dorso-lateral margin of mandible with at least one distinct tooth and no
well defined crest.....4
3. Epipharyngeal setae long and pointed along the Epipharyngeal free lateral
margins, but small, thick and ovate between the epipharyngeal rods.....
Baris
(*monardae* Pierce, *callida*
Casey) and
Pycnobaris
(*pruinosa* LeConte)

¹As in the very similar larva of *Anthonomus eugenii* Cano (the pepper weevil).

²The nomenclature applied by Leng in his Catalogue of North American Coleoptera, 1920, is followed in this generic key to the larvae of the tribe Barini.

³In parenthesis are given the names of the species whose larvae are kept in the National Museum and in the present investigation have been considered as representing the genus.

- Epipharyngeal setae all of about the same size and rather short, slender and pointed.....*Trichobaris*
 (*trinotata* Say, *micorea* Leconte, *compacta* Casey, *texana* Leconte)
4. Lateral marginal setae of epipharynx strong and considerably longer than the other epipharyngeal setae.....5
 Lateral marginal setae of epipharynx not particularly longer and stronger than the rest.....6
5. Anterior pair of setae between the epipharyngeal rods elongate-ovate.....
Ampeloglypter
 (*ater* Leconte)
- Anterior pair of setae between the epipharyngeal rods strong and hook-shaped.....*Madarellus*
 (*undulatus* Say)
6. Body with minute setae. (Mandible with one well developed lateral tooth and a second much smaller).....*Orthoris*
 (*crotchi* Leconte, *cylindrifera* Casey)
- Body with well developed setae.....7
7. Mandible with two distinct lateral teeth and a third very small.....*Zygo-baris*
 (*xanthoxyli* Pierce)
- Mandible with one distinct lateral tooth and with or without a minute second one.....8
8. Mandible with regularly curved back; dorso-lateral tooth shorter than the apical tooth.....*Eisonyx*
 (*picipes* Pierce)
- Mandible with a somewhat hump-shaped back; dorso-lateral tooth larger and longer than the apical tooth.....*Barinus*
 (*albescens* Leconte)

DESCRIPTION OF PUPA.

(U. S. Nat. Mus., one pupa in vial, together with one mature larva, marked as given above for the larva.)

The pupa (Fig. 2) is about 4 mm. long. The head, the beak not taken into consideration, is comparatively small, round and bent completely below the prothoracic shield whose anterior free margin is seen in whole in the ventral view of the pupa. The eye-cases are of moderate size, transverse and as widely separated as the width of the beak. The beak is long, cylindrical and extends to the posterior third of the mesothoracic sternum. The antennae are geniculate and the tip of each reaches to the middle of the mesothoracic sternum at the level with the insertion of the second pair of legs. The prothoracic shield ("pronotum") is large and in dorsal view dome-shaped in outline. Both the elytra and the hind wings go as far back as the fifth abdominal sternite. The prothoracic legs are inserted well apart and close to the posterior margin of the segment. The coxae of all three pairs of legs are of moderate size, subcylindrical and differ little in length and width from each other. The tarsal tip of each prothoracic leg extends to near the posterior



Fig. 2

margin of the mesosternum; the tarsal tip of the mesothoracic leg extends to the middle of the metathorax and each metathoracic leg to the middle of the fifth abdominal segment. The abdomen is not fully as long as the anterior remainder of the body and rather broadly oval; the sternites of the third to seventh abdominal segments are about of equal length. The ninth abdominal segment is armed on each side with a somewhat S-shaped, slender and pointed pleural process, about as long as half of the width of the ninth abdominal segment.

The setae are all of moderate length and yellowish brown. They are distributed as follows:

On each side of the head (1) one on vertex near the longitudinal middle line, (2) one laterally above the eye-case, (3) one near the inner margin of the eye-case, (4) one at basis of the beak, (5) one immediately behind, and (6) one immediately in front of the insertion of the antenna.

On each side of the prothoracic tergum are inserted (1) five marginal setae, two of which are more anterior in position, the other three more posterior; (2) one seta in the hind corner; (3) one anterior discal seta near the longitudinal middle line, and (4) one posterior discal seta twice as far to the side from the longitudinal middle line as the anterior discal seta and rather close to the seta in the hind corner.

On each side of the mesothoracic tergum are two setae, the one a little more anterior and somewhat nearer the middle line than the other.

On each side of the metathoracic tergum are two setae, placed farther from the longitudinal middle line than the mesothoracic setae but otherwise in a similar way.

On the abdominal segments are on each side (1) three dorsal setae in a transverse line on each of the first to the eighth abdominal segments and (2) one lateral seta on each pleurum of the first to eighth abdominal segments.

There are no setae on any abdominal sternum.

The femur of each leg has two setae near the distal end.

The spiracles, nine in number, are rather small, circular and latero-dorsally placed on each side of the body.

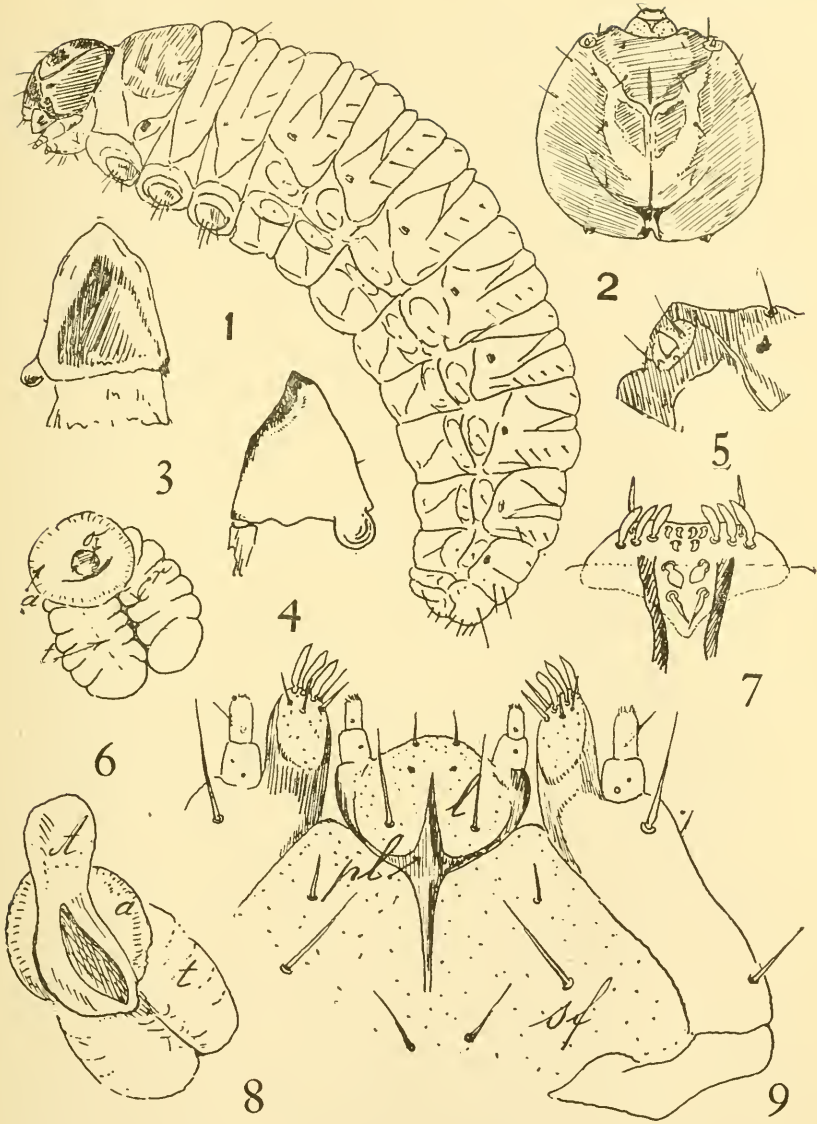
EXPLANATION OF PLATE.

(Drawings by the author.)

- | | | | |
|----|--|---------------|--|
| 1. | <i>Eumycterus</i> (?) <i>saccharidis</i> Barber. | Mature larva. | Lateral view of the larva. |
| 2. | " | " | Head, dorsal view. |
| 3. | " | " | Mandible, buccal view. |
| 4. | " | " | Mandible, ventral view. |
| 5. | " | " | Antenna and eye-spot. |
| 6. | " | " | Spiracle; a, atrium; o, spiracular opening; t, spiracular air tube; r, annulus. |
| 7. | " | " | Epipharynx. |
| 8. | " | " | Closing apparatus. Atrium and air tubes in the background: A, arm; a, atrium; t, air tube. |
| 9. | " | " | Ventral mouthparts: l, labium; pl, postlabial chitinization; sf, subfacial region. |

Text figure.

Eumycterus (?) *saccharidis* Barber. Pupa; ventral view. (Drawing by the author.)



Eumycteris saccharidis Barber.

BEES COLLECTED BY DR. H. M. SMITH ON TURTLE ISLAND
(KOH TAO), GULF OF SIAM.¹

By T. D. A. COCKERELL, *University of Colorado, Boulder, Colorado.*

Megachile penangensis, Cockerell.

Three females and one male. Previously known from a female collected on the Island of Penang, described in 1918. It is very like *M. umbripennis* Smith (*schauinslandi* Alfken), but the female is readily known by the very finely punctured abdomen, without the lateral white hair bands on apical half, and the upper part of clypeus and lower edge of supraclypeal area shining. The male is still more easily separated, by the pale fulvous hair covering the whole of the face, hiding the surface of the clypeus. The fifth segment of the abdomen is strongly rugose apically, and the sixth is obtusely bilobed. Anterior and middle tarsi thick, fringed with long pale hair behind; anterior coxae without spines. The hind tarsi have long pale hair in front.

The characters of the male clearly indicate affinity with the Philippine *M. laticeps* Smith and *M. mcgregori* Cockerell, the three species being separable thus:

Apical half of abdomen with more or less entire pale fulvous hair-bands.....	<i>laticeps</i> Smith
Apical half of abdomen with hair bands or lateral rudiments of them pure white.....	1
1. Thorax above thinly covered with fulvous hair; apical lobes of abdomen longer.....	<i>mcgregori</i> Cockerell
Thorax above thickly covered with bright ferruginous hair.....	<i>penangensis</i> Cockerell

The male *M. penangensis* has white hair bands at sides only of third segment, and right across, but very thinly, on fourth.

Megachile atratiformis sininsulæ, n. subsp.

Female.—Smaller, length about 16 mm. (instead of 20); clypeus densely rugoso-punctate all over, with a faint median keel, lower margin shining, slightly depressed in middle; scutellum densely and coarsely rugoso-punctate, hardly shining; labrum broadly rounded at end, but neither aureo-sericeous nor keeled. Perhaps a distinct species; although I have seen *M. atratiformis* Meade-Waldo in the British Museum, I have none to compare. From *M. atrata fulvipennis* Smith, which it closely resembles, it is easily known by the mandibles, the total absence of a beard of black hair on end of clypeus, the lack of the abundant erect black hair on last abdominal tergite, the conspicuously punctured upper

¹Koh Tao (=Turtle Island) lies off the east coast of peninsular Siam in latitude 10° N. and is the most remote island in the Gulf of Siam. It is about four and one-half miles long and two miles wide, covered with evergreen jungle, and uninhabited. It was visited December, 1926–January, 1927, and the bees herein listed were collected at that time.—H. M. Smith.

part of cheeks, and other characters. Two specimens were obtained. Meade-Waldo, in the British Museum, placed *M. shelfordi* Cameron, from Borneo, as a synonym of *M. atrata* Smith. This is not correct, as I have examined the type at Cambridge University, and find it to be a species very closely allied to *M. atratiformis*. From *M. a. sininsulae* it is known most easily by the rufous hair on under side of middle tarsi, this hair being black with a faint rusty tint in *sininsulae*. Cameron says of *M. shelfordi*, "clypeus smooth and shining above middle;" I found it very rugose, with a faint keel at upper end.

Type.—Cat. No. 40455 U. S. N. M.

M. sarawakensis Cameron, also from Borneo, I saw in the British Museum. It looks like a small edition of *M. atrata*.

Megachile kohtaoensis, n. sp.

Male.—Length, about 10 mm.; robust, black, with dark reddish tegulae; eyes black; head broad; face and front with long reddish-ochreous hair, but upper part of clypeus exposed, with strong irregularly placed punctures, the middle near the upper margin with a round polished impunctate area; vertex well punctured but moderately shining, with thin erect red hair, at sides posteriorly with some black; cheeks with long creamy-white hair; mesothorax and scutellum dullish, closely but shallowly punctured; scutellum and (more thinly) middle of mesothorax with black hair, anteriorly and at sides the mesothorax has thin red hair; hair about tubercles dense and reddish fulvous, on mesopleura black, giving way to white below; sides of metathorax with dull white hair; wings with apical half dilute fuliginous, violaceous, base paler; anterior coxae with short spines; anterior tarsi rather stout but simple; hair of legs pale, very scanty, ferruginous on inner side of tarsi; spurs ferruginous; abdomen somewhat shining, shallowly punctured, white hair-bands represented by rudiments at sides of first four segments, not conspicuous; basal segment short, abruptly truncate basally, with very thin white hair; keel of sixth segment rounded, shallowly emarginate, with a depression above the middle, second and third ventral segments with conspicuous white hair-bands, first with white pubescence on apical part.

Type.—Cat. No. 40456 U. S. N. M.

Close to the Philippine Island *M. morrilli* Cockerell, which however differs by being much less robust, with paler wings, light hair on pleura, etc.

Anthophora korotonensis, Cockerell.

One female. It is desirable to have the male for identification in this group, but on comparison with *A. zonata* (L.) from India and *A. korotonensis* from the Philippines, the Koh Tao female agrees with the latter in the narrower emerald green abdominal bands, and the large well punctured black areas on clypeus. *A. korotonensis* also occurs in Formosa.

Trigona testaceitarsis, Cameron.

Two workers. Described from Patani, Malay Peninsula. Allied to *T. laeviceps* Smith from Aru Island.

***Crocisa insulicola*, n. sp.**

Male.—Related to *C. surda* Cockerell, from China, but dark band on disc of first abdominal segment short, not nearly reaching sides; blue at sides much wider than the apical band; hair of thorax shaggy, discal spots on mesothorax rather small; eyes brownish; hind femora shining, not toothed beneath; hind tibiae conical in outline, extremely broad at apex; basitarsi light-haired on outer side; apical band on first abdominal segment slightly constricted in middle; apical plate of abdomen with a straight edge, and no median tooth. Length of anterior wing, 9.5 mm. The blue markings are dull pale blue, the light hair on face and thorax is white with only a faint blue tinge; on outer side of middle tibiae the dense hair is white, suffused with blue basally; the light hair on hind tibiae is distinctly bluish, but hardly extends beyond the middle. The band on second abdominal segment is very deeply constricted in middle, those on segments three to five are widely interrupted. The scutellum is without spots, and the hind edge is W-like.

Type.—Cat. No. 40454 U. S. N. M.

***Crocisa pernitada basifracta*, n. subsp.**

Female.—All the light markings beautiful light turquoise blue, not shining. The dark area on first abdominal segment is straight right across basally, the basal blue with a narrow band-like median interruption (no interruption in typical *C. pernitada*); anterior margin of pleura black in middle; sides of black on first abdominal segment pointed instead of rounded; axillae blue-spotted; compared with *C. angulifera* Cockerell the blue marks on mesothorax posteriorly are much larger, connected with band over tegulae, and blue spots on disc of mesothorax much larger. Basitarsi blue-haired on outer side. Eyes deep reddish-brown. Scutellum W-like, without spots. No entire bands on abdomen.

Type.—Cat. No. 40453 U. S. N. M.

C. pernitada Cockerell is recorded from India and Burma. *C. tarsalis* (*C. nitidula* var. *tarsalis* Friese) is probably a different species, but I have no material.

AMERICAN PSYCHODIDAE—I (DIPTERA).

BY HARRISON G. DYAR.

Under this heading it is proposed from time to time as material may warrant to present structural details of various species of American Psychodidae. Following Tonnoir (Ann. Soc. Ent. Belg., lxii, 50, 1922), I place in *Psychoda* those species in which the antennal joints are bulbous at their bases, and in *Pericoma* those without this structure. The only other American genus is *Trichomyia* Curtis (= *Maruina* Müller), distinguished by lack of one of the long central veins.

***Pericoma albitarsis* (Banks).**

Psychoda albitarsis Banks, Can. Ent., xxvii, 324, 1895.

Psychoda albitarsis (Banks) Aldrich, Cat. N. Am. Dipt., 106, 1905.

Psychoda albitarsis (Banks) Haseman, Trans. Am. Ent. Soc., xxxiii, 313, 1907.

Described from Ithaca, New York, whence I have examined a long series by the kindness of Prof. O. A. Johannsen. Specimens are before me also from Glencarlyn, Virginia, May, 1909, and 1910 (F. Knab); Black Mountain, North Carolina, N. Fork Swannanoa, May (N. Banks); Cabin John, Maryland, July 17, 1927 (H. G. Dyar). The species is recognizable by the nearly white contrasting tarsi, dark wings, with two darker tufts at the bases of the forked veins, and apical white fringe. It is very distinct from any other *Pericoma* known to me.

Female antennae 16-jointed; basal joint large, elongate, second joint spherical, third elongate ovate, the rest subspherical, slightly elongate, the last joint smaller, but similar to the others. Male antennae (Fig. 1) 15-jointed; basal joint large, elongate, second joint subspherical, third elongate, with five long spikes, the two apical ones generally side by side; joints of the flagellum subspherical, diminishing in size outwardly, the terminal joint conical. Male hypopygium (Fig. 2) with the basal plate short, with two lacunae, lower appendages single-jointed, conically tapered, with reversed long rod-like setae from tip to middle. Upper appendages two-jointed, basal joint stout, conical, terminal joint slender with slightly enlarged base. Aedeagus long, broadly blade-shaped.

Adults are found along the margins of small shaded runs on mossy rocks or overhanging roots.

***Pericoma satellitia*, new species.**

Body black, the hairs of thorax and dorsum of abdomen mostly white. Wings with black hairs, the fringe white apically from end of third to end of seventh veins, and a distinct tuft of white at end of the ninth; basal and medial areas crossed by broad faint whitish bands, and on the outer margin small white specks between the ends of the veins. Feet black; tips of tibiae and of first tarsal joints white, and in addition the second and third tarsal joints are white.

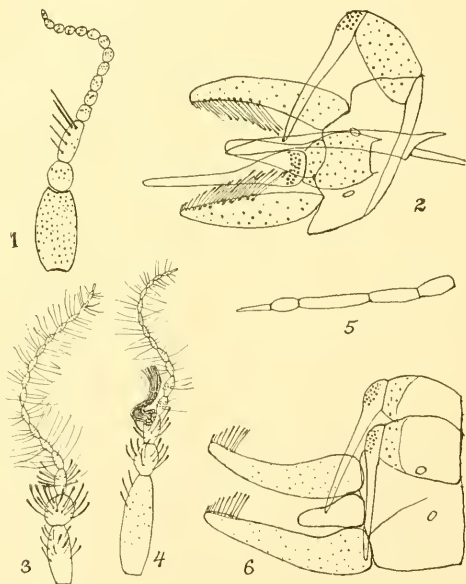
Female antennae 17-jointed (Fig. 3); basal joint large, second spherical, third fusiform, these bearing spatulate hairs; joints of flagellum fusiform, the last joint linear. Female palpi 5-jointed (Fig. 5). Male antennae (Fig. 4) 16-jointed; basal joint very large, second subspherical, third large, fusiform, giving rise on one side of apex to a tuft of long curved hairs; flagellar joints fusiform, diminishing, the last joint linear. Male hypopygium (Fig. 6) with the setiform spines of the lower appendages short and confined to the apical portion.

Six specimens, Cabin John Bridge, Maryland, July 2 and 4, 1927 (H. G. Dyar). Type No. 40,500, U. S. Nat. Mus. The specimens were found flying on foliage near some rocks (then dry) above the bed of Cabin John Creek near the bridge.

Kincaid describes under his *Pericoma americana* (Ent. News,

xii, 194, 1901) male antennae of this form. "*Psychoda*" *interrupta* Banks (Proc. Ent. Soc. Wash., viii, 150, 1906) has also the same antennal structure as I note by specimens before me. The coloration of these is described as gray with much white, not black with reduced white as in the present form. Nevertheless I shall not be greatly surprised if *americana*, *interrupta* and *satellitica* prove to be different names for the same species. The first two names at least I think undoubtedly synonymous.

The present form differs from *Pericoma megantica* Curran (Can. Ent., lvi, 217, 1924) in having much less of white on body and wings, no black tufts at bases of the forked cells, and in having white on second and third tarsals.



EXPLANATION OF FIGURE.

1. *Pericoma albitarsis* Banks, male antenna.
2. *Pericoma albitarsis* Banks, male hypopygium.
3. *Pericoma satellitia* Dyar, female antenna.
4. *Pericoma satellitia* Dyar, male antenna.
5. *Pericoma satellitia* Dyar, femae palpus.
6. *Pericoma satellitia* Dyar, male hypopygium.

Actual date of publication, November 16, 1927.

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DESCRIPTIONS OF NEW NEARCTIC SERPHOIDEA
(HYMENOPTERA).

BY ROBERT M. FOUTS.

Two new genera and fourteen new species of Serphoidea are described in this paper. Two of these new species belong to the family Bethylidae, six to the Diapriidae, one to the Calliceratidae, two to the Platygasteridae and three to the Scelionidae. The two new genera belong to the subfamily Scelioninae. They are most interesting and unusual and could not be confounded with any known genera.

I am indebted to Mr. Oscar Whittaker of Chilliwak, British Columbia, for the opportunity of examining the fine series of *Trichopria abdominalis* and *Diapria conica*. He has the honor of having been the first to discover the male of *Trichopria abdominalis* and my description of that sex is based on the material received from him.

The drawing of *Loxotropa nigrescens* was made by Mr. Whittaker from a paratype that has been returned to him.

BETHYLIDAE.

RHABDEPYRIS KIEFFER.

Rhabdepyris amabilis, new species.

Female.—Length, 3.50 mm. Runs to *dimorphus* Kieffer in Das Tier., Lief. 41, 1916, p. 347. It differs in having the head much wider than the thorax. Head, pronotum, and scutellum finely reticulate; mesonotum more strongly reticulate, with the notauli distinct, diverging anteriorly; frons sparsely covered with fairly large punctures; vertex, cheeks, pronotum and mesonotum likewise with punctures, but these are more scattered and less regularly arranged than they are on the frons; scutellum with two punctures; head (viewed from in front) nearly circular, a little longer than wide, one and one-fourth times as wide as the thorax; longitudinal groove at the base of the antennae very short and shallow; scape thick, a little longer than the following three antennal joints together; second joint a little longer than the third, as long as the fourth, slightly longer than wide; third joint as wide as long, thicker than the second, as thick as the fourth; following joints subequal, about as wide as long; last joint conical, a little longer than the penultimate; thorax twice as long as wide, widest just behind the middle; pronotum strongly convex; mesonotum flattened; scutellum and propodeum subconvex; metanotum not visible medially, the scutellum touching the propodeum; scutellum with an arcuate furrow

across its base; propodeum margined laterally and posteriorly, with five longitudinal ridges which converge from the middle and unite just before the margin; superior face of the propodeum diagonally aciculate; inferior face transversely striate, narrowly reticulate above, with a fine median longitudinal carina; wings short, narrow, reaching a little past the middle of the propodeum; black; frons, vertex, and dorsum of thorax (except the propodeum) cupreous; proximal three antennal joints rufous, other joints dark brown; mandibles reddish-brown; legs reddish-brown, the femora darker outwardly; anterior coxae black in front; collar (pronotum in front of transverse constriction) rufous; tegulae and wing veins light brown.

Type locality.—Glen Echo, Maryland.

One female collected by the author in July, 1925.

HOLEPYRIS KIEFFER.

Holepyris punctifrons, new species.

Female.—Length, 3.40 mm. Head, pronotum and mesonotum finely reticulate, rather closely covered with small punctures; the scutellum is also finely reticulate but the punctures are not so numerous; head one and one-eighth times as long (front view) as wide, a little wider than the thorax; head behind the eyes a little shorter than the eyes are long; longitudinal impressed line on the frons shorter than the clypeus; pronotum twice as long as the mesonotum, traversed by an impressed line extending across it near its posterior margin; notauli absent; lateral grooves on the mesonotum distinct; propodeum margined laterally and posteriorly, transversely striate, traversed by five longitudinal ridges; thorax nearly twice as long as the head, a little over twice as long as wide; wings normally developed, tinged with brown; discoideus, brachius, and all veins distad of the stigma (except the radius) wanting; radius long, slightly curved, extending three-fifths of the distance from the apex of the stigma to the apex of the wing; nervulus without a projecting vein; black; antennae and legs reddish-brown; anterior femora near apices, anterior tibiae, middle coxae, and all tarsi lighter, tinged with yellow; palpi yellow.

Type locality.—Hawthorne, Florida (March, 1925).

One female collected by Mr. M. D. Leonard.

DIAPRIIDAE.

DIAPRIA LATREILLE.

Diapria conica Fab.

Mr. Oscar Whittaker sent me some time ago seven females and seven males belonging to this species. He collected them at Chilliwak, British Columbia, in August, September, and October, 1926. One female was collected on May 24, 1926.

These specimens have been carefully compared with European specimens of *conica* recently received from and determined by Dr. Alexander Ogloblin. They seem to agree with them in every particular.

This is the first record of the species west of Marquette, Michigan. It seems to be fairly common in the Eastern States.

ACIDOPRIA KIEFFER.

***Acidopria columbiana* Ashmead.**

Loxotropa columbiana Ashmead, Bull. 45, U. S. Nat. Mus., 1893, p. 413; Kieffer, Das Tier., Lief. 44, 1916, p. 190.

Loxotropa ruficornis Ashmead, *ibid.*, p. 414.

Loxotropa ashmeadi Kieffer, Andre, Spec. Hym. Eur., Vol. 10, 1911, p. 923; Kieffer, Das Tier., Lief. 44, 1916, p. 188.

The types of *columbiana* and *ruficornis* have been compared and appear to be identical. The frons is armed with two short acute thorns just below the anterior ocellus. The male type of *ruficornis* has no thorns on the frons.

Distribution.—District of Columbia, Arlington, Virginia, and Glen Echo, Maryland.

One female collected by the author on September 24, 1923, at Washington, D. C., and another at Glen Echo in the summer of 1923.

TRICHOPRIA ASHMEAD.

***Trichopria abdominalis* Fouts.**

I have recently received from Mr. Oscar Whittaker a large series of specimens belonging to this species. The series was collected by Mr. Whittaker in Chilliwak, British Columbia, and consists of thirty-one females and nineteen males. The females were collected between April 7, 1926, and September 8, 1926; the males between June 6, 1926, and September 11, 1926.

The male, which has not hitherto been recognized, is described below.

Male.—Length, 1.57 mm. Head as long as wide, as wide as the abdomen; antenna two and one-fourth times as long as the abdomen, rather stout; scape as long as the third and fourth joints united, thickened distally; pedicel globular, half as long as the third joint, the latter as long as, but slightly narrower than, the fourth, twice as long as wide; fourth joint widened on distal half, distinctly wider than any of the following joints; joints five to fourteen a little longer than wide, wider at apex; last joint about two and one-third times as long as wide, subacute at apex; flagellar joints sparsely covered with short white hairs; thorax about one and three-fifths times as long as wide, about one and one-fifth times as wide as the abdomen, subconvex dorsally; scutellum with one large circular fovea at its base, without a trace of a longitudinal ridge; propodeum as in the female; abdomen twice as long as wide, one and one-tenth times as long as the thorax, convex above; second tergite one and two-fifths times as long as wide, scarcely narrowed anteriorly; legs stout, the femora

and tibiae strongly swollen; middle tibia a little longer than the tarsus; black; tibiae rufous proximad; tarsi brown; wings brownish.

In some specimens there is a small depression on either side lying within the scutellar fovea. There is no variation to speak of except in size. While the majority of specimens attain or very nearly attain the length of the one just described several are only 1.26 mm. in length.

PHAENOPRIA ASHMEAD.

Phaenopria occidentalis, new species.

Female.—Length, 1.89 mm. Head viewed from above about as wide as long, as wide as the thorax; lengths of the antennal joints: 155 (.302 mm.), 40, 35, 20, 20, 20, 20, 20, 20, 35, 35, 69; widths of the same joints: 27, 21, 16, 16, 17, 17, 17, 18, 21, 32, 35, 38; scape thinner on basal half; last joint ovate, rounded at apex; pubescence on all joints sparse, shorter than the joints are wide; thorax a little over one and one-half times as long as wide, without any trace of notauli; mesonotum convex, separated from the scutellum by a fine suture; scutellum without a fovea at base but with a scarcely perceptible, extremely shallow, transverse, immargined depression across its base just behind the suture; scutellum compressed into a short ridge posteriorly; propodeum traversed longitudinally by a high ridge; this ridge sharply angulate in front of the middle, the point thus produced slightly lower than the surface of the scutellum; that part of the ridge anterior to the angulation broader than the part behind it, its summit traversed by a groove; pronotum anteriorly and petiole densely covered with long sericeous pubescence; hairs on propodeum similar but sparser and shorter; dorsum of propodeum inside the lateral ridges bare, devoid of pubescence; wings extending a little more than one-fifth the length of the abdomen past the latter's apex, pubescent, with long marginal cilia; abdomen one and three-fifths times as long as the thorax, about one and one-sixth times as wide as the thorax, two and three-fifths times as long as wide, widest in the middle, pointed at the apex; petiole about as long as wide; second tergite about one and three-fifths times as long as wide, a little over twice as long as the following four segments together; second tergite as wide at the base as the propodeum, with the sides gently curved, widest just behind the middle; black, scape at extreme base, femora and tibiae (except the swollen parts of each), apices of anterior and middle tibiae, and all tarsi (except the last joint of each), rufous; other parts of antennae and legs very dark brown to blackish; wings light brownish beyond the marginal vein.

Variations.—One paratype is only 1.48 mm. in length. It is, except in size, just like the type. The other paratype does not differ in any way from the type.

Type locality.—Chilliwak, British Columbia.

Three females collected by Oscar Whittaker on the following dates: April 24, 1926, May 1, 1926 (type), and October 4, 1926.

One paratype returned to Whittaker. Other paratype in U. S. National Museum, Cat. No. 40,506.

This species represents the typical form of *Phaenopria*.

The depression at the base of the scutellum is not truly a fovea since it is immargined and extends all across the sclerite. One can not decide just where it begins or ends. It is perhaps not correct to say that the fovea is margined in typical species of *Trichopria*, *Loxotropa*, etc., but at any rate it is more or less clearly defined on all sides.

LOXOTROPA FOERSTER.

Loxotropa nigrescens, new species.

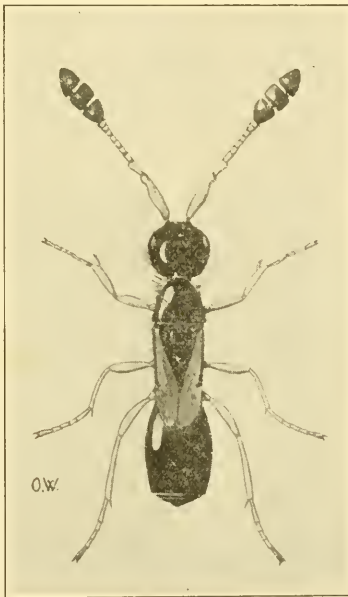


Fig. 1. *Loxotropa nigrescens* Fouts. Female.

Female.—Length, 1.38 mm. Differs from *nana* Ashmead only in having the body entirely black. The proportions of the various parts of the body are as in *nana*. Head slightly longer than wide, a little wider than high, about one and three-tenths times as wide as the thorax, as long as the abdomen is wide; antenna about one and four-fifths times as long as the thorax; scape three times as long as the pedicel, as long as the following six joints together, a little shorter than the club; pedicel twice as long as wide, as long as the two following joints together; third joint longer than the fourth but shorter than the fourth and fifth together; fourth joint a little longer than the fifth; fifth and sixth equal, about as wide as long; joints seven, eight, and nine transverse, becoming wider in the order named; club joints about twice as wide as the pedicel; first two club joints transverse; last joint as long as wide, subacute

at apex; thorax one and two-fifths times as long as the head, about twice as long as wide, subconvex dorsally; notauli indicated as shallow furrows anteriorly; scutellum subconvex, with one fovea at base; wings abbreviated, narrowed, extending one-seventh the length of the abdomen past the apex of the propodeum; marginal vein thick, cuniform; abdomen one and four-fifths times as long as wide, one and one-third times as wide as the thorax; second tergite not quite one and one-half times as long as wide; black; scape and pedicel reddish-brown; antennal joints three to ten the same color but lighter in hue; legs brownish-yellow, the femora slightly darker; last joint of each tarsus fuscous.

Type locality.—Chilliwak, British Columbia.

Description based on four specimens collected by Oscar Whittaker on the following dates: June 20, August 22, and August 27, 1926.

Paratypes in Coll. Whittaker and U. S. National Museum, Cat. No. 40,507.

PARAMESIUS WESTWOOD.

Paramesius laetus, new species.

Female.—Length, 2.32 mm. Head about as wide as long, a little narrower than the thorax; antennae slightly over one and one-half times as long as the thorax; scape nearly as long as the four following antennal joints united, three and two-thirds times as long as the pedicel, five and one-half times as long as the fourth joint; pedicel and third joint equally long, the pedicel a little the wider, as wide as joint seven; joints four to thirteen subequal in length; joints four to eight becoming gradually thicker, the following joints equal in width; joints nine to twelve about as long as thick; last joint conical, twice as long as the twelfth; thorax one and five-ninths times as long as wide; notauli delicately indicated on posterior half of the mesonotum; scutellum with a large fovea at its base; this fovea traversed longitudinally by carinae; scutellum nearly flat, without sculpture; propodeum short, with a tooth-like median keel; petiole one and one-third times as long as wide, with four strong longitudinal ridges above; the two interior ridges diverge posteriorly meeting the others near the apex of the segment; the area thus enclosed is smooth and flat; second tergite three and three-fourths times as long as the first, with a minute circular incision medially at base; ovipositor protruded to about the length of the second tergite; legs rather stout, the femora and tibiae strongly clavate; wings broad, about two and two-thirds times as long as the thorax; shining black; swollen part of each femur black; rest of legs brown, the swollen part of the middle and hind tibiae somewhat darker; wings brownish; scape piceous, reddish proximad; pedicel piceous; following five joints dark reddish-brown; last six joints black.

Variations.—The appendages may be lighter colored generally, with the proximal seven joints of the antennae reddish-brown, the swollen parts of the femora dark brown, and the tibiae and tarsi yellowish-brown. The last six antennal joints are black in all three specimens. The notauli are, in one paratype, very short, not longer than the scutellar fovea. The ovipositor is very

short in one paratype and is not protruded at all in the other. Both paratypes are about 2.06 mm. in length.

Type locality.—Chilliwak, British Columbia (VI-27-1926).

Paratypes in Coll. Whittaker and U. S. National Museum, Cat. No. 40508.

Three specimens collected by Oscar Whittaker. The paratypes were collected on July 25 and August 1, 1926.

PROSYNACRA KIEFFER.

Prosynacra gracilis, new species.

Female.—Length, 2.34 mm. Agrees with Kieffer's generic description in Das Tierreich, Lief. 44, 1916, p. 343, except in a slight difference in the shape of the head and in the venation. These differences are so small that they can not be considered as being of more than specific value.

Head seen from above about as wide as long, a little wider than the thorax, seen from the side about one and one-fifth times as long as high; a right angle is formed at the ocelli by the junction of the frons and the vertex; projection covering bases of antennae very short; inferior surface of head parallel with the superior one, the head seen from the side therefore oblong although the posterior margin is slightly oblique, not parallel with the anterior margin or frons; eyes nearly circular, separated by more than their width from the occipital carina; ocelli nearer to the antennae than to the occipital carina, the frons being decidedly shorter than the vertex; occipital carina sharp, extending on the cheeks to the bases of the mandibles; scape cylindrical, a little longer than the following two joints united, with two small tooth-like projections at the apex; antennae 12-jointed, filiform, the flagellar joints gradually thickening to the eighth, this joint and those following it subequal in width; pedicel twice as long as wide, indistinctly longer than the fourth joint; third joint one and one-half times as long as the pedicel, narrower than the pedicel, thin basally but widening toward the apex, as wide at the apex as the fourth joint; joints four to twelve subequal in length; fourth joint about twice as long as wide; eleventh joint about one and one-third times as long as wide; last joint as long as the third, about two and three-fifths times as long as wide, acute at apex; antennae nearly as long as the abdomen, all the joints with short white hairs, those on the first four joints less numerous than they are on the others; thorax nearly twice as long as the head, a little more than twice as long as wide, nearly one and one-third times as high as wide; mesonotum convex, polished, with several white hairs on its surface; notauli briefly indicated anteriorly; scutellum circular, flattened; fovea very deep, circular, just about as large as the scutellum; propodeum with an undivided longitudinal carina; petiole about one and one-third times as long as wide, cylindrical, strongly convex dorsally, irregularly striate, and with a small median longitudinal groove above; abdomen cylindrical, not quite one and one-fourth times as long as the head and thorax united, as wide as the head, elliptical seen from above, widest just behind the middle (at the apex of the second segment), strongly convex above and below, a little higher than wide; second tergite three and one-fourth times as long as the petiole, a little more than one and one-half

times as long as wide, without a depression basally but with a few short striae laterally at base; tergites three to seven subequal in length, a little less than half as long as the petiole; last tergite as long as three preceding ones united, hump-like and with a few hairs medially; behind this hump the segment is awl-like, without pubescence; wings large, broad, extending slightly past the apex of the abdomen; cilia rather short; venation as in *giraudi* Kieffer (see figure in Das Tier., 44, 1916, 344) except that the subcosta runs parallel with the costa; the costal cell is therefore of approximately equal width throughout; black; antennae brown, the proximal three joints yellowish-brown; legs straw colored.

Type locality.—Petersham, Massachusetts.

Type.—Cat. No. 40,509, U. S. National Museum.

One specimen, reared by Mr. H. J. MacAloney, June 10, 1926, from pine tips and recorded in the Bureau of Entomology under Hopkins U. S. No. 17605m. Specimens of *Pissodes strobi* Peck. were reared from the same material and it seems probable, in view of the habits of *Prosynacra giraudi* Kieffer that *gracilis* parasitizes this species.

This is the first species of the genus recorded outside of Europe. Kieffer's two species are from France and Italy. *Prosynacra giraudi* Kieffer parasitizes the larvae of *Hylurgus piniperda* and *Bostrichus laricis*.

XENOTOMA FOERSTER.

Xenotoma bradleyi, new species.

Female.—Length, 2.72 mm. Scape as long as the three following antennal joints united; third joint one and one-half times as long as the second, about three times as long as thick; all flagellar joints longer than thick; last joint as long as the third, pointed at apex; thorax as high as wide, a little wider than the head, one and one-third times as wide as the abdomen; cubitus curved from the base, parallel with the basal vein; marginal vein as long as the radial cell; first abscissa of the radius nearly perpendicular; abdomen one and one-half times as long as the thorax; petiole two and one-half times as long as wide, with a median carina; second tergite two and one-half times as long as the first, one and two-thirds times as long as wide, two and seven-ninths times as long as the following segments united; abdomen straight, not turned up at apex; black; scape and pedicel yellowish-brown; flagellum fuscous; legs reddish-brown, the posterior tibiae and tarsi darker.

Type locality.—Cuyamaca Mts., San Diego Co., California (Aug. 16, 1914).

Two specimens collected by Dr. J. C. Bradley.

Type in Cornell University. Paratype in Coll. Fouts.

This species is most closely related to *parvicellula* Kieffer. In *parvicellula* the scape is as long as the four following antennal joints together.

SCORPIOTELEIA ASHMEAD.

Scorpioteleia vera, new species.

Female.—Length, 5.36 mm. Runs to *gracilicornis* Kieff. in Kieffer's key (Das Tier., Lief. 44, 1916, p. 591). Has among other differences the scape as long as the third antennal joint and the first tergite a little more than four and one-half times as long as wide. Head one and two-fifths times as wide as long; the antennae if extended straight back would reach to the apical fifth of the second tergite; scape about five times as long as its greatest width; second joint a little longer than wide, considerably wider than the third; third joint seven times as long as wide, one and three-fourths times as long as the fourth, the latter and all following joints as wide as the third, becoming gradually shorter to the fifteenth; fourteenth about twice as long as wide; last joint as long as the fifth, about three times as long as wide, acute at apex; thorax one and one-half times as long as wide, a little wider than the head; wings hyaline, nearly attaining the apex of the second tergite; marginal vein about one and one-half times as long as the radial cell, as long as the slightly curved cubitus; metacarpa less than one-half the length of the marginal vein; first abscissa of the radius about half as long as the second; abdomen three and three-tenths times as long as the thorax, nine and three-tenths times as long as wide (at second tergite); petiole with two carinae laterally, smooth, without distinct or complete carinae dorsally; petiole viewed laterally slightly curved upwardly, somewhat thinner on distal one-fourth; second tergite two and one-fifth times as long as the petiole, one and three-fifths times as long as the five following segments united; fourth segment a little longer than the third, one and one-third times as long as the fifth, the latter slightly curved upward and acute at the apex; antennae stramineous, darker on the last seven or eight joints; thorax and petiole uniformly bright reddish; second tergite brown, becoming lighter near the apex; following segments and legs stramineous.

Variations.—Last ten antennal joints darker; head, except in front, black; propodeum and thorax ventrally and laterally, except the upper margin of the pronotum, black; petiole black; length, 4.59 mm. The other paratype has the same parts (except the antennae) darker than in the type but not so dark as in the paratype just mentioned. It is 4.81 mm. in length.

Type locality.—Gainsville, Florida (March 4 and 12, 1925, T. H. Hubbel, collector).

Three females received from Prof. C. R. Crosby.

Paratypes in National Museum, Cat. No. 40510, and in Cornell University.

CALLICERATIDAE.

CALLICERAS NEES.

Calliceras whittakeri, new species.

Female.—Length, 1.76 mm. Runs to *unicolor* in Kieffer's key (Das Tier., Lief. 42, 1914, p. 78). Differs in having the scape less than half as long as the flagellum and in having the third antennal joint slightly shorter than the

second, about three times as long as wide. Head, thorax, and abdomen of equal width; head strongly shagreened; frontal impression deep; a groove extends from the posterior margin of the impression to the anterior ocellus; head (including eyes) and thorax rather closely covered with short white hairs; antennae filiform, 1.14 times as long as the abdomen, the terminal joints about as wide as the scape, twice as wide as the third; lengths of antennal joints as follows: 30 (.324 mm.), 9, 8, 6, 6, 5, 6, 7, 7, 12; all the flagellar joints are slightly longer than wide; the last one is nearly three times as long as wide, acute at apex; thorax one and one-third times as long as wide, the posterior angles short, acute; dorsal surface of thorax shagreened, the posterior one-third of the scutellum shining, without sculpture; lines of frenum straight, coalescing before the suture; abdomen a little more than one and one-fourth times as long as wide, one and three-fourths times as long as the thorax, the apical segments strongly compressed; second tergite as long as the thorax, about one and two-fifths times as long as wide, with strong carinae on basal one-fourth; body, antennae, and legs black except at the joints and the tarsi, these parts reddish-brown.

Variations.—The body may not exceed 1.51 mm. in length and the abdomen may be but very shortly compressed at apex.

Male.—Length, 1.13 mm. Sculpture as in the female; head as wide as the thorax, slightly wider than the abdomen; antennae slender, two and one-half times as long as the thorax, all the joints subequal in width, the scape slightly swollen on basal half; scape as long as joints three and four united, about five times as long as the pedicel; third joint about one and one-half times as long as the fourth, three times as long as wide; joints three to ten subequal, about twice as long as wide; last joint conical, two and one-half times as long as wide; thorax one and one-third times as long as wide; abdomen as long as the thorax (the terminal segments are retracted leaving only the seventh visible); second tergite 1.18 times as long as wide, sculptured as in the female; color as in the female.

Variations.—Total length, 1.21 mm. (All the segments of the abdomen are visible.) Thorax 1.29 times as long as wide. Second segment of the abdomen one and one-third times as long as wide.

Type locality.—Chilliwak, British Columbia (March 13 to May 14, 1926).

Five females and two males collected by Mr. Oscar Whittaker.

Type, allotype and one paratype in Coll. Fouts. Two paratypes returned to Whittaker. Two paratypes in National Museum, Cat. No. 40,511.

I take great pleasure in naming this interesting species after its discoverer.

PLATYGASTERIDÆ.

LEPTACIS FOERSTER.

Leptacis longispina, new species.

Female.—Length, 1.17 mm. Runs to *gahani* Fouts in the author's key (Proc. U. S. Nat. Mus., Vol. 63, 1924, p. 117). The spine of the scutellum in the present species is threadlike, of equal width throughout. In *gahani* it becomes broader anteriorly. The antennal structure is quite different as is indicated in the following description.

Head a little wider than the thorax, one and two-thirds times as wide as long, full behind the eyes; frons shining, very delicately shagreened; lengths of antennal joints: 117 (.228 mm.), 42, 19, 22, 20, 17, 27, 22, 20, 33; widths of the same joints: 19, 15, 9, 9, 11, 11, 22, 28, 30, 28; seventh joint wedge shaped, strongly narrowed toward the base; last joint broadly rounded at the apex, with a thick colorless spine medially on the outer edge, this spine about one-fifth as long as the joint is wide; eighth and ninth joints each with a similar spine but it is situated near the apices of the joints, not in the middle; the spines on these joints are about one-fourth as long as the joints are wide; club joints very close together, the connections extremely short; thorax one and three-fourths times as long as wide, distinctly higher than wide; scutellum typical of the genus (see Kieffer in *Das Tier.*, Lief. 48, 1926, pp. 562 and 635); posterior face of the scutellum perpendicular; spine extending nearly to the base of the second tergite; wings hyaline, with long fringes; abdomen one and three-tenths times as long as the thorax, about one and one-third times as long as wide; second tergite one and two-fifths times as long as wide; following three tergites subequal, short; last tergite about as long as the three preceding ones, acute at tip; all tergites without sculpture; wings extending half the length of the abdomen past the latter's apex; spine of scutellum reddish-brown; the swollen parts of hind femora and the tarsi darker; flagellum brown; petiole reddish-brown.

Male.—Length, 1.05 mm. Essentially like the female; maxillary palpus one-jointed, the joint nearly four times as long as wide, with two strong bristles at apex; labial palpus one-jointed, short, wart-like, with one long bristle at its apex; lengths of the antennal joints: 105 (.205 mm.), 41, 17, 25, 21, 22, 28, 25, 26, 36; widths of the same joints: 18, 16, 8, 14, 12, 11, 16, 16, 16, 15; fourth joint not angulate, more or less regularly enlarged toward the apex, widest at its apical one-third, with its outer side straight; between the joints seven and eight, eight and nine, nine and ten is a short transverse ring-joint; these ring joints have not been included in the measurements given above; last joint subacute at apex, slightly curved on both sides; pubescence on flagellar joints sparse and fine, a little shorter than the joints are wide; second tergite about one and one-fourth times as long as wide, shagreened in a very narrow band near the apex; following tergites without distinct sculpture; abdomen a little longer than the thorax, twice as long as wide; wings extending nearly the length of the abdomen past the latter's apex; color as in the female.

Type locality.—Glen Echo, Maryland.

One female and three males collected by the author (Aug. 1, 1926).

Paratype in U. S. National Museum, Cat. No. 40512.

Leptacis aliena, new species.

Female.—Length, 1.52 mm. Differs from *americana* Ashm. in having the fourth antennal joint shorter than the fifth and sixth together. Head as wide as the thorax, about one and three-fifths times as wide as long, without distinct pubescence; frons, vertex, and occiput delicately reticulate; occiput convex, without a ridge separating it from the vertex; lengths of the antennal joints: 175 (.341 mm.), 48, 36, 38, 28, 18, 39, 35, 35, 51; widths of the same joints: 23, 15, 10, 10, 11, 11, 17, 22, 22, 20; scape thickened medially; pedicel and seventh joint narrowed basally; last joint narrowed from the base, acute at apex; third and fourth joints cylindrical, the sides parallel; fifth joint slightly widened on the outside just before the apex; sixth joint curved on the inside, narrowed toward the base; club joints without white spines as in *longispina* Fouts; thorax about one and four-fifths times as long as wide, one and three-tenths times as high as wide; spine of scutellum extending as far backward as the apex of the propodeum, a little longer than the rest of the scutellum, becoming thinner distally; scutellum rather thickly covered with short white hairs; abdomen about one and one-fifth times as long as the thorax, one and seven-tenths times as long as wide, rounded behind, the extreme apex of each tergite with a delicate line of sculpture; second tergite as wide as long; wings fuscous, pale on basal one-fourth, extending about three-fourths the length of the abdomen past the latter's apex; cilia on wings rather long; black; basal two-thirds of scape, spine of scutellum, and legs rufous; rest of antenna dark brown; abdomen along the reflexed margin and on the venter near apex reddish.

Male.—Length, 1.08 mm. Similar to the female; lengths of the antennal joints: 125 (.244 mm.), 30, 22, 26, 26, 32, 37, 37, 37, 56; widths of the same joints: 20, 14, 11, 17, 13, 14, 17, 18, 17, 14; fourth joint angulate on its inner side, widest just beyond the middle; each of the joints seven, eight, and nine followed by a small transverse ring joint as in *longispina*; last joint subacute at apex, with the sides nearly straight, parallel from the base to beyond the middle; pubescence on flagellar joints sparse and fine, about as long as the joints are wide; thorax as long as the abdomen; abdomen one and two-thirds times as long as wide, about as wide as the thorax, sculptured as in the female; second tergite about one and one fifth times as long as wide; wings colored as in the female, extending the length of the abdomen past the latter's apex; black; scape, pedicel, and legs bright yellow; propodeum, petiole, spine of scutellum, and abdomen along sides and on venter near apex, reddish; flagellum dark brown.

Type locality.—Glen Echo, Maryland (Aug. 8, 1926).

Two females and seventeen males collected by the author on the leaves of a beech tree.

Two paratypes in U. S. National Museum, Cat. No. 40513.

SCELIONIDÆ.

PSEUDANTERIS, NEW GENUS.

Runs to *Plesiobaenus* Kieffer in Kieffer's key (Das Tierreich, Lief. 48, 1926, p. 271). It differs from *Plesiobaenus* as follows: head about as wide as the thorax, a little less than twice as wide as long; lateral ocelli their diameter distant from the margin of the eye; frons without a groove or carina; antennae 12-jointed, with a four-jointed, closely articulated club; thorax somewhat less than one and one-half times as long as wide; propodeum with two carinae as in *Platygaster*; wings densely pubescent, with long cilia; marginal vein punctiform, shorter than the radius which is very short; radius not enlarged apically; metacarpa not present; legs slender; spine on anterior tibia bifid; abdomen a little longer than the head and thorax united, as wide as the head; first tergite about twice as wide as long, half as long as the second, which is a little shorter than the third; seventh segment as long as the sixth, triangular, narrowly rounded at apex.

This genus is remarkably similar, superficially, to some genera in the *Platygasterinae*, *Euxestonotus* Fouts for instance. The general shape of the body is practically the same and the mesonotal structure with the narrow suture in front of the scutellum is very similar.

The maxillary palpi are two-jointed and the labial palpi are one-jointed.

Type.—*P. insignis* Fouts.

***Pseudanteris insignis*, new species.**

Female.—Length, 1.02 mm. Length of head, 15 (.162 mm.), width, 24; head without sculpture except a few small punctures on the cheeks; lengths of antennal joints: 65 (.127 mm.), 26, 20, 11, 12, 12, 13, 11, 60 (four-jointed, closely articulated club); widths of the same joints: 16, 14, 9, 9, 9, 9, 10, 12, 21; at the apices of each of the proximal three club joints and in the middle of the last joint there is a ring of thick transparent spines or bristles; these spines are curved basally and are directed toward the apex of the antenna; they are not narrowed distally until the extreme apex is reached; just behind the tip of the last joint is a short, thick, blunt spine; this spine is, unlike the others, directed at right angles to the surface of the joint; it is about half as long as the other spines just referred to; the hairs on the funicular joints are about as long as the joints are wide; length of thorax, 33 (.356 mm.), width, 24; thorax convex dorsally, shining; mesonotum with two transverse rows of rather large punctures; anterior to the front row are a few smaller punctures irregularly arranged; scutellum separated from the mesonotum by a delicate suture, with four fairly large punctures close to its anterior margin, with a narrow margin laterally and posteriorly; length of anterior wing 80 (.864 mm.), width, 20; length of posterior wing, 72 (.778 mm.), width, 6; cilia on the anterior wings half as long as the wings are wide, as long on the whole costal margin as on the distal margin; cilia on the hind wings short on the costal margin, on the distal margin twice as long as the entire width of the wing; length of the abdo-

men, 46 (.497), width, 24; lengths of the first three tergites: 7 (.065 mm.), 10, 15; widths of the same tergites (across the middle): 12 (.130 mm.), 17, 27; following tergites united one and one-fifth times as long as the third; abdomen elliptical seen from above, sharply pointed apically, widest in the middle; first tergite, and second on basal half, striate; black; legs and antenna piceous; wings dark brownish, the anterior pair paler proximad of a dark transverse band at the radius.

Type locality.—Glen Echo, Maryland.

Five female specimens collected by the author, July 18, 1926, on leaves of ragweed near the Potomac River.

Paratype in Coll. U. S. National Museum, Cat. No. 40514. Also a paratype in Coll. Oscar Whittaker of Chilliwak, British Columbia.

SYNTELEIA, NEW GENUS.

Runs to *Lamproteleia* in Kieffer's key (Das Tier., Lief. 48, 1926, p. 271). It differs from *Lamproteleia* as follows: wings hyaline, not fasciate; radius rather long, much longer than the punctiform marginal vein; abdomen ovate, wide anteriorly, the first tergite as wide at the apex as the thorax; last tergite not style-like.

Type.—The following species.

Syntelesia coracina, new species.

Female.—Length, 1.51 mm. Head a little wider than the thorax, not quite twice as wide as long, as high as wide; vertex, mesonotum, and scutellum coreaceous, the latter sclerite more coarsely sculptured; frons shallowly excavated, the depression immargined, reticulate, with a median carina; antennae 12-jointed, rather slender, with short pubescence; lengths of joints: 133 (.259 mm.), 36, 33, 20, 16, 15, 14, 16, 22, 18, 18, 36; widths of the same joints: 21, 17, 15, 17, 18, 18, 22, 25, 27, 27, 26, 22; last joint cone-shaped, subacute at apex, narrowing regularly from the base; last six joints forming a club; thorax about as wide as long, convex dorsally; pubescence on thorax more dense than on the head, all of it very short and fine; seen from above the pronotum is visible only on the sides, and narrowly at that; mesonotum transverse, one and two-thirds times as long as the scutellum, the latter likewise transverse, broadly rounded posteriorly; seen from above the scutellum projects over the perpendicular propodeum as far as the base of the first tergite; in such a view, therefore, only the lateral angles of the propodeum are visible; these are, though short, very acute; wings hyaline, not quite attaining the apex of the abdomen; abdomen a little longer than the head and thorax united, slightly wider than the thorax, about one and three-fifths times as long as wide, pointed apically; first tergite broadly transverse, longitudinally striate, half as long as the second; second tergite a little less than twice as wide as long, as long as the four following segments united, coarsely scaly reticulate, briefly striate anteriorly; tergites following the second rather short, finely reticulate, broadly transverse, with the exception of the seventh which is as long as wide, polished; black;

scape reddish-brown on basal half, becoming darker distally; legs rufous, the coxae black.

Type locality.—Brownwood, Texas.

Described from one specimen collected by the author, June 15, 1924, in Pecan Bayou.

ACOLOIDES HOWARD.

Acoloides floridensis, new species.

Female.—Length, 1.40 mm. Head as wide as the thorax, slightly narrower than the abdomen, twice as wide as long; frons below polished, with a short median carina, without an impression, above it is more or less roughened, rather granular in appearance; vertex, mesonotum, and scutellum subopaque, with a sort of coreaceous sculpture; vertex bounded posteriorly by a sharp ridge; scape one and one-fourth times as long as the club, as long as the five following joints united; pedicel as long as the two following joints united, twice as long as wide, wider than any of the four following joints; third joint a little less than twice as long as wide, about twice as long as the fourth or fifth which are subequal, as wide as long; sixth joint wider than the fifth, transverse; club a little less than two and one-third times as long as wide, apparently five-jointed but the sutures are so fine as to be obscure; thorax as wide as long, subconvex above, not so decidedly flattened as in *saitidis* Howard; scutellum transverse, convex; first tergite more than twice as wide as long, fluted longitudinally; second tergite one and one-half times as long as the first, a little over twice as wide as long, half as long as the third tergite, more than one and one-half times as wide as long; following three tergites short, without sculpture, united about as long as the second; second tergite alutaceous, finely striate medially; third tergite granular like the frons; wings hyaline, the venation as in *saitidis* Howard; upper part of head and thorax deep reddish-brown; rest of body yellowish-red; antennae and legs stramineous.

Type locality.—Orlando, Florida.

Described from eight female specimens received from Prof. C. R. Crosby of Cornell University. They were reared by Mr. O. C. McBride December 17, 1926, from spider eggs.

Two paratypes in Cornell University and two in the U. S. National Museum, Cat. No. 40,515.

This species is typical of the genus being very closely related to the genotype *Acoloides saitidis*. It differs principally in being lighter in color and in having the sculpture everywhere more delicate.

One paratype is mounted in balsam on a slide. The antennal clubs in this specimen appear to be unsegmented. This is probably due to the fact that the chitin and the balsam are so nearly of the same color and have so nearly the same degree of transparency.

BIRD NESTS AS INSECT AND ARACHNID HIBERNACULA,

BY W. L. McATEE

and

DESCRIPTIONS AND FIGURES OF THE PUPARIA OF MINETTIA
ORDINARIA AND CALIOPE FLAVICEPS (DIPTERA).

BY J. R. MALLOCH.

In the experimental chestnut orchard at Bell, Maryland, the writer, assisted by Mr. E. A. Preble, collected on November 18, 1926, 20 bird nests. These included as certainly identified 12 of catbirds, and 3 of robins, and as questionably identified, 2 of mocking birds, 2 of cardinals, and 1 of a goldfinch. These were individually bagged, thoroughly analyzed later in the laboratory, and the organisms disclosed (sometimes after some delay to permit breeding of adults), distributed to specialists for examination. For assistance in this respect the writer is indebted to Messrs. L. L. Buchanan, C. R. Crosby, H. E. Ewing, J. W. Folsom, A. B. Gahan, C. F. Heinrich, J. R. Malloch, and S. A. Rohwer. The insect and arachnid inhabitants of the nests are listed at the end of this paper according to the nests from which they were obtained, and intervening remarks are made on points of interest in the results.

It is evident from the variety of certain of the insects, for example the beetles, together with the small total number, that birds' nests are for most of them merely a casual winter retreat. The same is true also no doubt of the Lepidoptera (except Tineidae), of the thrips, springtails, the single sawfly, the single ant, and of the mites recorded. The spiders are not so casual, however, and although we can not expect any restricted relationship between certain spiders and certain nests, yet from the numbers found (from 9 to 16 in each of several nests), and the regularity of occurrence of spiders in the nests, it is apparent that birds' nests are favored hibernacula for at least the spiders of the immediate environment.

Contrasting with the groups just mentioned, most of the Diptera found have some definite relation with the nests. The larvae and pupae of *Caliope flaviceps* were numerous in most of the nests, their cells being constructed of dirt and fine vegetable debris, making felt-like masses in the more thickly compacted portions of the nests. They were not attracted by the mud in the robin nests, however, but were most abundant in nests of catbirds from one of which 27 (and this is not the maximum possible) were bred. There was only one previous record of *Caliope flaviceps* from the District of Columbia region,¹ hence it is to be inferred that this is a veritable birds' nest species and keeping to the vicinity, or a stratum, of birds'

¹Proc. U. S. Nat. Mus., 65, Art. 12, 1924, p. 14.

nests evades ordinary collecting methods. There was no previous record for another sapromyzid *Minettia ordinaria* of which 10 adults were found in one nest and 20 puparia in another. Most of the puparia of this species were empty and it would seem that normally this fly is a late fall breeder in, rather than a hibernating inhabitant of, birds' nests. *Neossos marylandica*, of which a few empty puparia were found, so far as known, is a bird nest fly.¹ The genus *Louchaea* has numerous species undoubtedly of peculiar habits as their immature stages are almost unknown; those found in this investigation probably were predacious on the larvae and puparia of the *Caliope* and *Minettia*.

The empty Calliphorid puparia found, no doubt are relics from the time the nests actually held young birds when there was more pabulum for these scavengers. The tineid larvae also are scavengers in the nests, but whether specifically so, is doubtful. The staphylinid larvae found in one nest must have been scavengers also; they died without reaching maturity, so were not identified; it may be remarked, however, that a European staphylinid (*Microglossa*) is a regular inhabitant of birds' nests.

The Hymenoptera most frequently yielded by the nests are small parasitic forms, but being parasites of rare and little known flies, are themselves of slightly or not at all known species. The present study as well as that previously reported upon (Proc. Ent. Soc. Wash., l. c.) show that birds' nests are a source of interesting and unusual insects and even of undescribed species.

SCHEDULE OF INSECTS AND ARACHNIDS FOUND IN THE VARIOUS NESTS.

Catbird (Dumetella carolinensis).

Thysanura.

- Unidentified, several.
- Entomobrya assuta Folsom, scores.

Thysanoptera.

- Unidentified, 1.

Lepidoptera.

- Tinea sp., larva, 1, several.
- Tinea, sp., chrysalides, 2, 1.
- Gaberasa ambigualis Walker, 1 chrysalis.
- Hypsoropha hormos Hübner, cocoon, from which imago was reared.

Coleoptera.

- Staphylinidae, larvae, several.
- Melanophthalma distinguenda Comolli, 2.
- Phalacrus sp., 1.
- Geotrupes egeriei Germar, 1 dead.
- Mantura floridana Crotch, 1, 3.

¹See Proc. Ent. Soc. Wash., 29, No. 4, April, 1927, pp. 87-93.

Rhynchites aeratus Say, 1.
 Anthonomus nigrinus Boheman, 1.
 Anthonomus sp., 1.

Diptera.

Crassiseta costata Loew, 1.
 Lonchaea sp., larvae, 1, many.
 Caliope flaviceps Loew, puparia, 3, 8 and 1 larva, many, many (6 adults reared), many (27 adults reared), many, several, several also larvae, 2, many (22 adults reared).
 Minettia ordinaria Melander, puparia, 1, 8, few, 15, several, several, several, few, 4 and 10 adults, 1.
 Neossos marylandica Malloch, puparium, 1.
 Calliphoridae, puparia, 3.

Hymenoptera.

Coelopristhis suborbicularis Provancher, 1.
 Galesus sp., 1, 1, 3 from puparia of *Minettia ordinaria*.

Araneida.

Zelotes sp., young, 2.
 Clubionidae, 2, 1, 1.
 Clubiona abboti Koch, 1.
 Philodromus sp., young, 2, 1, 3, 2, 1, 1, 1.
 Steatoda borealis Hentz, 3.
 Coriarachne versicolor Keyserling, 1.
 Theridium murarium Emerton, 3, 1, 2, 1, 3, 4, 4, 2.
 Misumena sp., young, 1.
 Erigoneae, young, 1.
 Bathyphantes formica Emerton (?), young, 1.
 Salticidae, young, 2, 1, 1, 2, 6, 6, 2, 1, 3.
 Dendryphantes militaris Hentz, 2.
 Phidippus sp., young, 2.
 Phidippus audax Hentz, 1, 2.
 Peckhamia picata Hentz, 1, 2, 1.

Acarida.

Erythraeidae, 1.
 Unidentified, 1, several, several.

Robin (*Planesticus migratorius*).

Lepidoptera.

Tineid cocoon, 1.

Coleoptera.

Melanophthalma distinguenda Comolli, 1.
 Phalacrus sp., 1.
 Mantura floridana Crotch, 1.

Diptera.

Crassiseta costata Loew, 1.
 Caliope flaviceps Loew, puparia, 6, 3, 5.
 Minettia ordinaria Melander, puparia, 4, 3, 5.
 Calliphoridae, puparia, 3, 12.

Tachinidae, puparia, 2.
 Neossos marylandica Malloch, puparium, 1.

Hymenoptera.

Pteromalid, 1, bred from puparium of *Caliope flaviceps*.
 Galesus sp., 1, bred from puparium of *Caliope flaviceps*.
 Emphytina tener Fallen, 1 larva from which an adult was reared.

Araneida.

Clubiona sp., young, 1, 1.
 Theridium murarium Emerton, 1, 1.
 Philodromus sp., young, 1, 1.
 Salticidae, young, 3, 3, 6.
 Dendryphantes militaris Hentz, 1.
 Phidippus sp., young, 1.

Acarida.

Amystis agilis Banks, 1.
 Unidentified, 1.

Goldfinch (*Astragalinus tristis*)?

Diptera.

Caliope flaviceps Loew, numerous larvae.

Araneida.

Dendryphantes capitatus Hentz, 1.

Cardinali (*Richmondena cardinalis*)?

Lepidoptera.

Gaberasa ambigualis Walker, 2 chrysalides from which imagines emerged.

Coleoptera.

Anomala undulata Melsheimer, 1 (dead).
Mantura floridana Crotch, 1.
Anthonomus virgo Dietz, 1.

Diptera.

Lonchaea sp., larva, 1.
Caliope flaviceps Loew, many larvae and puparia (5 adults bred), many larvae and puparia (14 adults bred).
Minettia ordinaria Melander, puparia 20, several.

Hymenoptera.

Spalangia n. sp. (very near *S. haematobiae* Ashmead), 2, reared from puparia of *Caliope flaviceps*.
Cremastogaster lineolatus Say, 1.

Araneida.

Clubiona sp., young, 1.
Philodromus sp., young, 2.
Theridium murarium Emerton, 4, 1.
Bathyphantes formica Emerton, 1.
 Salticidae, young, 9, 5.
Dendryphantes militaris Hentz, 2.
Peckhamia picata Hentz, 1.

Acarida.

Unidentified, 1.

Mocking bird (*Mimus polyglottos*)?

Diptera.

Caliope flaviceps Loew, puparia, several from which 3 adults were bred.

Minettia ordinaria Melander, puparia, 14, 3 and 1 adult.

Hymenoptera.

Galesus sp., 2 bred from puparia of *Minettia ordinaria*.

Arancida.

Drassidae, young, 1.

Philodromus sp., young, 1.

Theridium murarium Emerton, 5, 2.

Dipoena nigra Emerton, 1.

Salticidae, young, 4, 1.

DESCRIPTIONS AND FIGURES OF THE PUPARIA OF MINETTIA ORDINARIA AND CALIOPE FLAVICEPS.

By J. R. MALLOCH.

Minettia ordinaria Melander.

Puparium.—Clay colored, covered with a coating of calcareous substance that dissolves immediately upon immersion in hydrochloric acid as is the case with certain larvae of Stratiomyiidae. The length averages about 3.5 mm. and width 1.5 to 2 mm., the general shape is cylindrical, slightly compressed dorsoventrally and both extremities are bluntly rounded. The surface has a great number of microscopic spinules in a band on each segment, the anterior respiratory organs are not stalked and each has 8 minute papillae (Fig. 1a); and extremity with 6 small protuberances visible from above (Fig. 1b); only 4 visible from below (Fig. 1d), the spiracles situated upon two black discs, the whole upon an almost circular area (Fig. 1c).

Caliope flaviceps Loew.

Puparium.—Similar to that of *Minettia ordinaria*, although somewhat larger, but without any trace of calcareous investiture. General shape and armature the same, but the anterior respiratory organs are stalked and have 6 apical papillae (Fig. 2a), the anal processes are the same in number but the apex of abdomen is less produced (Figs. 2b, d) and the spiracular area is decidedly more transverse (Fig. 2c).

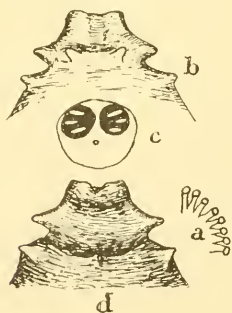


Fig. 1.

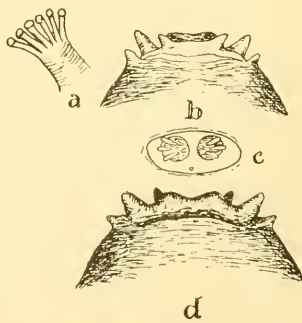


Fig. 2.

NEW SPECIES OF HETEROCERA (LEPIDOPTERA) FROM CENTRAL AND SOUTH AMERICA.

By W. SCHAUS, *Bureau of Entomology, U. S. Department of Agriculture.*

PSYCHIDAE.

Chalia pizote, new species.

Male.—Antennae with long coarse pectinations, blunt at tips. Body and wings entirely fuscous brown. Fore wing: veins 2, 3, 4 well apart; 5 shortly stalked with 4; 6 from middle of cell; 8, 9, 10 stalked; 11 absent. Hind wing: veins 2, 3, 4 equally apart; vein 5 shortly stalked with 4; 6 from upper angle. Expanse 15 mm.

Habitat.—Cavuga, Guatemala.

Type.—Cat. No. 33288 U. S. N. M.

PYRALIDAE.

PYRAUSTINAE.

Neurophyseta ursmaralis, new species.

Female.—Body and wings white, the lines fine, maize yellow. Fore wing: a subbasal fine mark on costa followed by an antemedial maize yellow spot; a slightly inbent medial line; postmedial faintly tinged with brown, vertical to vein 4, curved and retracted to upper angle of cell and downbent to inner margin; a broad subterminal line; termen faintly maize yellow inwardly edged by a punctiform black line; cilia white. Hind wing: an antemedial and a medial line, the latter faintly tinged with brown; subterminal line and termen as on forewing.

Expanse 10 mm.

Habitat.—Alta Parana River, between Argentina and Paraguay.

Co-type.—Cat. No. 27003 U. S. N. M.

Collected by the Cornell University Expedition.

Lamprosema caradocalis, new species.

Male.—Palpi fuscous black above, white below. Body white; abdomen with faint ochraceous bands, subdorsal points on third segment, and light cinnamon drab hairs on anal segment. Wings white, the markings fine, buffy brown. Fore wing: costa suffused with buffy brown; a fine almost vertical antemedial line followed by a small spot in cell; a larger spot on discocellular; postmedial fine, slightly oblique to vein 5, outcurved to below vein 3, inbent and vertical below vein 2 to inner margin; termen narrowly and faintly suffused with buffy brown. Hind wing white; a dark streak on discocellular; postmedial line almost straight from costa to vein 2, inset and down-curved to inner margin above tornus; termen narrowly buffy brown.

Expanse 20 mm.

Habitat.—La Merced, Peru.

Co-type.—Cat. No. 33287 U. S. N. M.

Collected by the Cornell University Expedition.

PHYCITINAE.

Mescinia peruella, new species.

Male.—Head and thorax hair brown, abdomen silvery gray with faint dark segmental lines. Forewing drab, irrorated with silvery white scales just below cell and on terminal area; costal margin broadly white, not reaching apex, with some drab scales on costal edge; some black scales on median vein; faint traces of a dark antemedial line; a double subterminal dark line parallel with termen indicated by absence of white irrorations; cilia silvery white spotted with drab at base. Hind wing silvery white; the termen narrowly drab; cilia silvery white.

Expanse 14 mm.

Habitat.—Canete Valley, Peru.

Type.—Cat. No. 33286 U. S. N. M.

Collected by C. H. T. Townsend on cotton bolls.

The species is larger than *M. parvula* Zeller, and the genitalia different, according to slides made by Mr. C. Heinrich.

Ten specimens.

PIERIDAE.

Dismorphia broomeae robinsoni, new form.

Male.—Similar to *D. broomeae* Butler, differing in the following respects: The oblique medial fascia broader, thus reducing the space before the subapical spots, which are larger, the one above vein 6 being produced basad to the upper angle of cell; there is also another small marginal spot between veins 5 and 4.

Expanse 63 mm.

Habitat.—Island of Margarita, off the Venezuela coast.

Type.—Cat. No. 33284, U. S. N. M.

SPHINGIDAE.

Protoparce quinquemaculata wirti, new aberration.

Female.—Body and wings much darker than in the typical form, *P. quinquemaculata* Haw. Forewing dull buffy brown devoid of all white scaling except on outer edge of the black subterminal line, and the white marginal line; the postmedial fascia more heavily suffused with black. Hindwing with termen chestnut brown without any white irrorations. Abdomen below chestnut brown with white segmental lines.

Type.—Cat. No. 33285, U. S. N. M.

Described from a specimen bred at Wingina, Va.

Named in honor of Colonel Wirt Robinson.

A REPORT UPON THE AQUATIC AND SEMI-AQUATIC HEMIPTERA OF THE MULFORD BIOLOGICAL EXPEDITION TO BOLIVIA, SOUTH-AMERICA, 1921-22.

By H. B. HUNGERFORD, *Department of Entomology, University of Kansas, Lawrence.*

The water bugs taken by William M. Mann on the above expedition comprise perhaps forty or fifty specimens representing ten species, some of which are undescribed.

HYDROMETRIDAE.

This family is represented by one species and this one is strikingly distinct both as to general color pattern and structure from any other *Hydrometra* known to me.

Hydrometra mulfordi, sp. new.

Size.—Length, 12.5 mm. Width across the eyes, 0.7 mm. Width across the abdomen, 1.1 mm.

Color.—Yellowish-brown. The mottled effect on the abdomen due to longitudinal, lateral streaks of dark brown which are narrower on the caudal margin of each segment and to the fact that the caudal half of each segment of the connexivum is smoky. This mottling is plainly visible to the unaided eye and sets this species apart from all others known. A lateral, dark brown stripe extends from the base of the antenna to the spine at the distal margin of the sixth abdominal segment. This stripe on the sides of the abdomen below the connexivum appears to arise behind the metacoxae due to the obscurity of the lateral band on the thorax.

Structural characteristics.—The head is provided with a well marked, median ventral groove beginning at the front margin of the eyes and extending nearly to the rear margin of the head. The antecular portion is to the postocular portion as twenty-nine is to thirteen. The formula would be AO:PO::29:13. The rostrum surpasses the eyes by eight-thirteenths of the postocular length. The antennal segments have the following relation beginning with the basal one: 7:18:60:18. The length of the pronotum is to that of the metanotum as four is to seven. The distance between the first and second coxae is to that between the second and third coxae as three is to seven. The anterior femora surpass the head by about one-fifth their own length while the hind femora surpass the tip of the abdomen by about one-sixth their length. The body is clothed with a silvery pubescence which is longer on the thorax than elsewhere and somewhat obscures the thoracic pitting. There are no pits on the acetabula. Two distinct spines on the caudal margin of the sixth abdominal segment in these females contribute a distinctive character.

Described from six females bearing the label, "Huachi Rio Beni, Boliv. W. M. Mann, Aug., Mulford Biol. Exp., 1921-22." Holotype and allotype in the United States National Museum.

GERRIDAE.

A single male specimen was taken December, 1921, by W. M. Mann at Rurrenabaque, Beni, Bolivia. This specimen runs to *Liunogonus hyalinus* (Fabr.). The color markings and part of the structural details fit Champion's description. I find it difficult to understand the statement which he makes about the antennae: "Joint 1 slightly stouter, 1 and 3 subequal in length, 2 a little shorter than 1, 3 shorter than 2." In the specimen before me the segment 1 is plainly longer than any of the others. The first genital segment has ventrally a cone shaped elevation on its caudal half and the middle of the rear margin is provided with a curved hoop darkened anteriorly and paralleling the conate elevation.

SALDIDAE.

This family is represented by a single specimen, a male of *S. ventralis* Stal, Covendo, Bolivia, W. M. Mann. This insect fits very well Champion's figure of the species in his "Biologica Centrali-Americana."

OCHTERIDAE.

The three specimens of this family are all males and belong to two species, neither of which can be reconciled with the descriptions of any known species in the literature.

Ochterus brunneus, sp. new.

Size.—Length, 4.8 mm. Width across head, 1.4 mm. Greatest width, 2.5 mm.

Color.—The general color impression, brown. Head, black above. Disc of pronotum, scutellum and membrane of hemelytra, smoky-black with flecks of grey on scutellum and membrane. Lateral margin of pronotum and embolium, yellowish. Remainder of dorsal surface, rich brown flecked with bluish-grey. A smoky patch on each corium and bluish-grey figure at median base and tip of scutellum and five imperfectly quadrate spots on hemelytral margin. Entire surface sparsely covered with short golden hairs. Body beneath, dark frosted with grey. Legs and antennae, nearly white.

Structural characteristics.—Anterior tibia of male curved. Vertex of head not carinate. Anterior margin of pronotum narrower than the head. Lateral margins somewhat explanate and divergent. Third and fourth segments of antennae slender, the antennal formula being, 2d:3d:4th::5:11:11. Terminal antennal segment, slightly curved. Distal end of second segment fully twice the diameter of the third. Fourth, slightly thicker than third. The distal end of third segment reaching the lateral margin of the prothorax. Genital capsule of male as shown in figure 3.

Described from two males in the United States National

Museum bearing the label, "Huachi Rio Beni, Boliv. W. M. Mann. Sept. Mulford Biol. Expl. 1921-22."

Ochterus manni, sp. new.

Size.—Length, 4.1 mm. Width across head, 1.2 mm. Greatest width, 2 mm.

Color.—Color markings not strikingly distinct. The pattern composed of the usual mottling of bluish-grey on black. Lateral and rear margin of pronotum and lateral margin of hemelytra, yellowish.

Structural characteristics.—Anterior tibia of male curved. Antennal formula is as follows: 2d:3d:4th::5:9:9. Distal end of third antennal segment reaching the lateral margin of the pronotum. Genital capsule as shown in figure 1.

Comparative notes.—This species does not have a distinctive color as does *Ochterus brunneus* described above. It is much smaller and not marked with brown as in *Ochterus americanus* Uhler. It is about the size of some males of *Ochterus banksi* Barber, but the anterior lateral margins of pronotum are less expanded and the third and fourth segments of antennae are longer and more slender. It can not be any described species because it fails to agree in size, shape or color pattern with the species described in Central and South America.

Described from a single male in the United States National Museum bearing the following label: "Huachi Rio Beni, Boliv. W. M. Mann. Sept. Mulford Biol. Expl. 1921-22."

CORIXIDAE.

Two species of *Tenagobia* represent this family. *Tenagobia selecta* (White) is represented by two dozen specimens labeled "Ivon Beni, Bolivia. W. M. Mann, February." All the individuals of this series appear to have fully developed wings. I have, however, a series from the Amazon region, many of which lack entirely the second pair of wings.

Tenagobia pulchra, sp. new.

Size.—Length, 2.2 mm. Width of head 0.8 mm.

Color.—Greyish-yellow. Hemelytra with brownish irrorations, the margin bearing two smoky-brown maculations. The scutellum, orange with median longitudinal stripe and tip greyish-yellow. Venter, whitish.

Structural characteristics.—Synthlipsis broader than an eye. Head comparatively short. The relation of the lengths of the head, pronotum and scutellum is as 4:6:10. Wings are present. The distinctive characters of the male are shown in the accompanying plate. (See figures 5, 6 and 8.)

Described from a series bearing the label, "At Mouth of Rio Mapiri, Sept., Rio Beni, Boliv. W. M. Mann. Mulford Biol. Exp. 1921-22."

BELOSTOMATIDAE.

This family is represented by four specimens apparently belonging to three species, but in the present state of our knowledge of this family I do not care to venture names for them.

EXPLANATION OF PLATE.

- Fig. 1. Genital capsule of male of *Ochterus manni* sp. new.
 Fig. 2. Pala of male of *Tenegobia selecta* (White).¹
 Fig. 3. Genital capsule of male of *Ochterus brunneus* sp. new.
 Fig. 4. Right clasper of male of *Tenegobia selecta* (White).
 Fig. 5. Pala of male of *Tenegobia pulchra* sp. new.
 Fig. 6. Dorsal view of abdomen of male of *Tenegobia pulchra* sp. new.
 Fig. 7. Dorsal view of abdomen of male of *Tenegobia selecta* (White).
 Fig. 8. Left and right claspers of male of *Tenegobia pulchra* sp. new.
 Fig. 9. Left side view of male genital capsule of *Tenegobia selecta* (White).

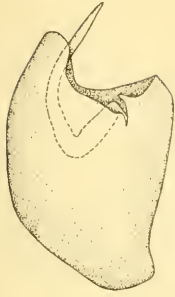
RESULTS OF A DAY'S WORK.

By W. SCHAUS, Bureau of Entomology, Department of Agriculture.

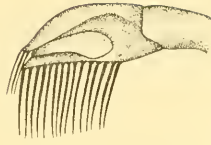
Early in August, at the invitation of Colonel Wirt Robinson, I spent a day with him at Wingina, Virginia, and selected a large number of Lepidoptera from his collection for the National Museum. Among the number were perfect specimens of *Papilio homerus* Fabr., ♂ and ♀; *P. thersites* Fabr., the male new to the collection; *P. bonhotci* Sharpe and *P. homothoas* Roths. and Jord.; a new Pierid described below; a fine melanic variety of *Argynnis aphrodite* Fabr.; also *Victorina steneles* Linn., form *stygiana* Schs. taken in Jamaica and agreeing perfectly with the type described from Costa Rica. There were many butterflies from South America, India, and the Philippine Islands, as well as a large number from the Balkans. Among the moths, special mention must be made of the rare *Sphinx frankii* Neum., and a new form of *Protoparce quinque-maculata* Haw., which I am describing. I was glad to obtain a perfect male and female of *Teinoletis simoenta* Guen., taken in Jamaica.

Many thanks are due Colonel Robinson for his great generosity.

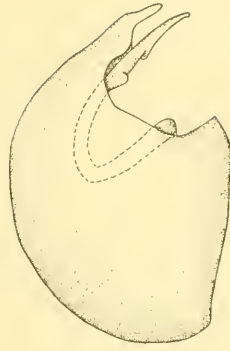
¹Note that the modified claw lies in a cavity in the outside of the pala in the male. In figure 5 this claw has been extended.



1.



2.



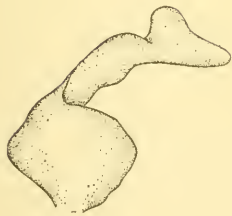
3.



5.



6.



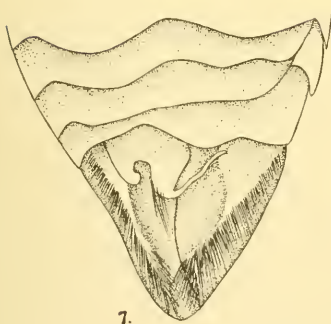
4.



8.



9.



7.

HUNGERFORD, HEMIPTERA.

Actual date of publication, December 10, 1927.

PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

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PROCEEDINGS OF THE
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VOL. 29

DECEMBER, 1927

No. 9

DESCRIPTIONS OF LARVAE OF THE GENERA *DIABROTICA* AND
PHYLLOBROTICA, WITH A DISCUSSION OF THE TAXO-
NOMIC VALIDITY OF THE SUBFAMILIES GALERUCINAE
AND HALTICINAE (COLEOPTERA: CHRYSOMELIDAE).

BY ADAM G. BÖVING, *U. S. Bureau of Entomology, Washington, D. C.*

This paper contains an illustrated, full description of the larva of the species *Diabrotica duodecimpunctata*, followed by a brief characterization of the larvae of *D. soror*, *D. balteata*, *D. longicornis*, *D. vittata* and a more detailed one of the larva of *Phyllobrotica quadrimaculata*, and it concludes with a discussion of the taxonomic position of the two genera *Diabrotica* and *Phyllobrotica*, whose larvae are closely related to the larvae of the Halticinae, particularly those of the genera *Systema*, *Epitrix* and *Psylliodes*.

ACKNOWLEDGMENT.

It is with great pleasure that I take the opportunity here to express the most sincere thanks to the generous friend for many years of the National Museum, the Danish Entomologist, J. P. Kryger. Among his numerous gifts of Coleopterous larvae to our collections is a larva in excellent condition and associated by rearing with the imago of *Phyllobrotica quadrimaculata*. But for the presence of this European species it had been impossible to consider the genus which it represents, as no *Phyllobrotica* larva from North America is preserved in the Museum and, to my knowledge, no larva of this genus has ever been treated in literature.

I also wish to thank most cordially Professor Carl J. Drake, head of the Department of Zoology and Entomology at Iowa State College, Ames, who kindly has supplied me with fresh larval material of *Diabrotica duodecimpunctata* and *Diabrotica vittata*, both determined by rearing. The present descriptions and drawings were made from the specimens sent by him.

Diabrotica duodecimpunctata (Fabricius).¹

MATURE LARVA.

(U. S. National Museum; one vial marked: "Eating corn

¹A good habitus figure in lateral view, made by Miss E. Hart, is found in "The southern corn rootworm," etc., by Philip Luginbill (U. S. Department of Agric. Farmers' Bull. No. 950, 1922).

roots; Lee County, Iowa, from C. J. Drake, Ames, Iowa, Reared.")

GENERAL ASPECT.

Larva (Figs. 10 D, 11 D, 17 D) about 12 mm. long and about $1\frac{1}{2}$ mm. in diameter, subcylindrical, somewhat curved, tapering slightly forward to anterior part of prothorax, the latter being posteriorly about one and one-half times as wide as the head; complete intersegmental belts are present between the abdominal segments; eighth abdominal segment only slightly shorter and narrower than the preceding abdominal segments; ninth abdominal segment much shorter and generally reduced, dorsally covered by a round shield with a pair of minute urogomphi; tenth abdominal segment ventral and forming a soft pygopod.

Head broadly oval in dorsal outline, hypognathous and slightly retractile into prothorax but not to the extent of being hidden below the prothoracic shield, when viewed from above; head capsule shining greyish brown with lateral parts of epicranium more roman sepia; frontal sutures light colored; the epistoma, a stiletto-like mark in the sagittal middle line of frons, the antennal ring and the margins of epicranium blackish brown; labrum, mandibles, and the chitinizations of the ventral mouthparts brownish; tip of mandibles very dark. Setae moderately long and yellow or brownish.

Body generally soft, whitish. Setae rather short and straw-yellow with darker basal cups; usually one, more rarely two, or several together, on very thin, hardly observable, small shining plates. A well-developed shield present on dorsal side of both prothorax and ninth abdominal segment; the thoracic shield shining, yellowish brown with somewhat darker, rather cloudy colored corners and speckled with many irregularly arranged small dark spots; the pygidial shield dark roman sepia, gradually becoming lighter anteriorly and toward the margins and also speckled with small, dark spots.

Legs inserted widely apart and attached to the end of small, dark, subtriangular hypopleural chitinizations; moderately strong and rather short, pale greyish brown with coxae mostly dark and the distal ends of the other joints with narrow darkening at the articulations.

Spiracles belonging to the annular or ring-shaped type, pale, small, easily overlooked, all of the same size and lateral; one mesothoracic and eight abdominal ones present, the mesothoracic situated in pre-epipleurum, the abdominal in the lower margins of the terga above the anterior end of the epipleural lobes.

DETAILS.

Head capsule (Fig. 6 D) with distinct, slightly curved frontal sutures (fs) and a median epicranial (es) suture about one-third as long as frons; frons large, subtriangular, not reaching to the occipital foramen, medianly with a frontal inner carina marked on the upper side by a stiletto-like, dark figure extending from the epistomal margin throughout the entire length of frons; epicranial dorsal hind margin rounded, not greatly produced. Setae of head moderately long, on each side situated as follows: On frons four, viz., one in the

epistomal margin midway between the frontal carina and the dorsal mandibular articulation (a), one in the dark antero-lateral corner of frons between the mandibular articulation and the basal skin of the antenna, one in the middle part of frons in the same distance from both of the two former setae, marking together with them an imaginary isosceles triangle, and one small seta near the posterior angle of frons. On epicranium around the antennal ring four setae, viz., one dorsal near the frontal suture, one ventral (Fig. 17 D) diametrically opposite, placed at the peristomal margin, and two lateral between these; on the dorsal epicranial face two setae at each end of an imaginary transverse, oblique line across the middle; on the ventral face of epicranium two setae.

Clypeus (Fig. 6 D) free, about four times as long as wide, posteriorly chitinized, with a single transverse series of minute setae, three or four on each side.

Labrum (Fig. 6 D) free, about as long and three-fourths as wide as clypeus, antero-laterally rounded; hind margin with a posterior projection in the middle line pushed into and concealed by clypeus. One long seta present in the middle of the lateral margin, one similar seta between this and the sagittal middle line, and a transverse series of densely set, small setae in the margin where labrum and epipharynx meet; a couple of these latter setae slightly longer, more slender than the rest, and pointing forward, the others directed toward the buccal cavity.

Ocelli lacking.

Antenna (Fig. 6 D) one-jointed with basal membrane (mb) whitish and very large, enabling a complete retraction of the antenna; the single joint (1) provided with a rather low, cylindrical chitinization and a top membrane carrying small sensory papillae and a supplementary tactile joint (at); the latter appearing as a true distal joint and consisting of a low ring-shaped basal chitinization tipped by a large, thin, light tactile conus.

Mandible (Fig. 3 D) palmate, inner face concave; distally with five teeth, the fifth exterior and ventral tooth smaller than the rest and the third the largest; the latter serrated on the inner margin, the others more or less entire; inner margin of mandible carrying about medianly a series of four stiff long, closely set bristles; exterior face with one seta.

Ventral mouthparts (Fig. 9 D) retracted, with maxillary articulating area (mart) rather large, subtriangular, thinly chitinized and separated from the submental-mental area by a groove.

Maxilla (Fig. 9 D) with cardo simple, transverse and situated between posterior corner of stipes and posterior end of hypostomal margin of epicranium. Stipes subtriangular, large, with inner margin slanting obliquely from basis of mala to exterior end of cardo. One large seta in the chitinized margin below mala, two large setae exteriorly in the broad anterior part and one seta in the attenuated posterior part of the chitinization. Mala transversely divided into a distal and a proximal part. The distal part thinly chitinized, carrying several irregularly distributed and rather short setae, a two-jointed peg (p) in the antero-interior corner and a darkly chitinized rim along the exterior margin. The proximal part of mala membranous, on the ventral surface with a single small seta, on the dorsal surface extended into an ear-shaped laciniar lobule (la) armed with a series of five strong, pointed, somewhat flat setae of

golden, glistening color.¹ Palpiger (pg) moderately large, exteriorly longer than interiorly, slightly chitinized, carrying two setae. Palpus three-jointed; basal joint short, cylindrical, about four times as wide as long, with a few sensory pits; second joint twice as long as basal joint and about as wide as long, with two short setae; apical joint conical; half as wide as second, about twice as long as wide, with one seta at basis and one sensory pit.

Gula not present.

Submental area (sm) posteriorly separated from the jugular membrane by a transverse, curved groove between the ends of the cardines, laterally from each maxillary articulating area by a longitudinal, straight groove and anteriorly completely fused with mentum (m). Mental-submental region sub-rectangular, slightly trapezoidal, thinly chitinized and light colored, in the central part of the region with a slightly darker, paired, more or less triangular spot close to the middle line; two setae, one in front of the other, near the anterior end of each of the triangular spots, and a third seta situated posteriorly in the submental portion.

Eulabium (lab. Fig. 9 D) limited behind by a band-like sublial chitinization; one seta present in the chitinization and another in front of it at the beginning of ligula. Labial palpus two-jointed; basal joint about half as long as wide; apical joint conical, somewhat longer than the basal, half as wide, and with one minute seta.

Ligula (li Fig. 9 D) soft, rather wide and broad, but indistinctly limited.

Epipharynx soft, finely papillose and without chitinizations.

Hypopharynx (hy, Fig. 9 D) soft, without transverse hypopharyngeal chitinization; anterior region, possibly representing dorsal side of ligula, indistinctly limited and provided with minute sensory papillae; paragnathae (pgn) present, developed as a low, soft lobe limited at basis by a longitudinal hypopharyngeal rod and densely beset with short, light hairs; ventral face of maxillary lacinia rising in front of described paragnathal lobe and at the anterior end of the longitudinal hypopharyngeal rod (hr). The latter posteriorly curved like letter S and here connected with the end of a similar rod in the wall of oesophagus (or).

Prothorax (Figs. 10 D, 11 D, 17 D) with tergal shield flat and smooth, formed as a broad escutcheon and separated in the sagittal middle line by a whitish looking suture extending throughout its entire length; no seta-bearing tubercles; on each side four setae present in the anterior margin of the shield, and three arranged in an imaginary triangle in the middle of it. Alar area (al) with two setae. Pre-epipleurum (e¹) with one seta close to the anterior end of the hypopleural chitinization; post-epipleurum (e²) with one seta. Hypopleurum (h) characterized by a subtriangular dark chitinization; no setae. Jugular membrane (j) possibly homologous with presternum, crescent-shaped; no seta. Eusternum separated from sternellum by an indistinct groove and marked in the middle line by an inverted V-shaped figure in front of the groove; one

¹This lobe projects into the buccal cavity in the interspace between the maxilla and the labrum, and is attached to both at basis. It is unquestionably homologous with the similarly located lobule present in many Anobiidae and Chrysomelidae larvae, and will be considered here as a lacinia.

seta present near each coxa. Sternellum medianly divided by a small, longitudinal, dark line; one seta on each side. Poststernellum (postl) triangular, large; without setae.

Mesothorax and metathorax (Figs. 10 D, 11 D, 17 D) much alike, mesothorax differing from metathorax mainly in having a fully developed spiracle in the pre-epipleural area, mesothorax having only a vestigial one. Dorsal part of tergum divided by a transverse groove into two areas, namely, prescutum (ps) and scuto-scutellum (s-sl); both of the two areas subdivided by faint longitudinal grooves into an unpaired median division (m and m*) and on each side an exterior division (ex and ex*); median divisions with a seta on each side, and each of the exterior divisions with one seta. Alar area (al) with two setae. Epipleurum divided into pre-epipleurum (e¹) with one seta and a large, triangular post-epipleurum (e²) with one seta. Hypopleurum (h) simple, characterized by its subtriangular chitinization; no seta. Sternum divided into the following areas, (1) presternum (pst) paired, lateral and subtriangular, (2) eusternum (st), (3) sternellum (stl) separated from eusternum by a somewhat V-shaped groove and (4) poststernellum (postl) wedged in between the presternal parts of the next segment; presternum and poststernellum without setae, eusternum and sternellum with one each.

First to seventh abdominal segments (Figs. 10 D, 11 D, 17 D), all alike in shape and size, separated from each other by an intersegmental, ring-shaped region (i); the latter formed above the ventro-lateral groove (V Fig. 17 D) by post-scutellum (psl) and below the groove probably by a fusion of post-sternellum (postl) and the presternum (ps) of the following segment. Setal arrangement as follows: Intersegmental ring without setae, prescutum (ps) with three setae in a transverse series, scutum (s) one seta, scutellum (sl) two setae, alar area (al) one and often an additional minute second seta, epipleural lobe (e) three setae, hypopleurum (h) three setae, eusternum one seta, sternellum (stl) two setae.

Eighth abdominal segment (Figs. 19 d, 20 d, 21 d) with the same number of setae as the preceding segments but not separated from the following segment by an intersegmental ring.

Ninth abdominal segment (Figs. 19 d, 20 d, 21 d) smaller than the preceding segments, almost semicircular in dorsal view. Pygidial shield flat, broadly ovate, somewhat shorter than wide; urogomphi ("cerci" auctorum) present, but very small, thorn-shaped, pointing upward and separated from each other by a distance of about three times their length; on each side with six well-developed setae in a single series, inserted either in, or slightly below, or somewhat inside of the margin of the shield, and two minute setae one in front of the other near the sagittal middle line in the central part of the shield. On the ventral side of the segment a transverse series of four small setae, two on each side, situated anteriorly to the pygopod.

Tenth abdominal segment (Figs. 20 d and 21 d) developed as a soft pygopod, laterally with a single dark mark and a minute seta. Anus in the center of the sucking surface, transverse, with short grooves radiating from the middle and dividing each anal lip into several small lobes.

Leg rather short and moderately strong, consisting of coxa, trochanter, fe-

mur, tibia (= tibio-tarsus, Snodgrass, 1927)¹ and at the end of tibia a small membranous part that anteriorly carries a claw (= dactylopodite, Snodgrass, 1927)¹ and posteriorly is prolonged into a bladder-like paronychial appendix (= empodium auct.) situated along the hind face of the claw. Coxa broadly inserted, with a strong, projecting coxo-hypopleural articulation and two articulating places for trochanter; anterior face of coxa almost covered by a subtrapezoidal plate distally strengthened by a margin carrying one of the coxo-trochanteral articulations; posterior face more fleshy, with a curved basal chitinization at first rod-like, but gradually becoming broader toward the ventral side, and opposite the coxo-hypopleural articulation enlarged into a spoon-shaped blade; posterior coxo-trochanteral articulation rather indistinct; a light-colored space present between the end of the blade and the anterior subtrapezoidal plate; distal end of coxa membranous and cushioned for the reception of trochanter and femur; the setal arrangement of coxa as follows: (1) On the anterior plate two or three setae near the coxo-hypopleural hinge, one in the middle of the plate, one near the light-colored space, and three setae at the distal margin; (2) on the posterior rod-shaped chitinization about three minute setae; (3) on the ventral spoon-shaped blade one large and one or two minute setae.

Trochanter well developed, annular, ventrally broadened; proximal margin subtriangular, carrying the anterior and posterior coxo-trochanteral articulations, dorso-medially a single articulation with femur and near the anterior coxo-trochanteral hinge a tongue-like projection for the attachment of the trochanteral extensor muscles. Setae, three large and four or five minute ones.

Femur rather short, cylindrical with oblique proximal end, dorsally twice as long as ventrally; distal margin well chitinized and carrying a single, dorsally situated articulation with tibia. Setae, five large arranged in a ring in the distal margin, and a single minute one in the middle of the dorsal side.

Tibia, about as long as femur, distally gradually attenuated. Setae not present in its proximal part; distal part armed with six setae situated more or less close to an imaginary cross section on the middle of tibia, three of these on anterior face and three on the posterior face; margin near the claw with two setae.

Claw (Fig. 7 D) curved, strong, with slender, pointed tip and enlarged basis bearing one strong seta. Paronychial appendix (Fig. 7 D) situated along the posteriorly facing side of the claw, as long as this and bladder-like with longitudinal, fine ribs radiating from basis.

Spiracle, circular, about as wide as the antennal joint, inside thickly beset with short spinules. Closing apparatus with two arms, the anterior arm two to three times as long as the posterior.

Diabrotica soror, LeConte.

(U. S. National Museum: One vial with three larvae from roots of *Zea mais*, marked "No. 5027; Alameda, California." Probably reared.)

¹Snodgrass, R. E.—Morphology and mechanism of the insect thorax (Smithsonian Miscellaneous Collections, Vol. 80, No. 1, 1927, pp. 72-98).

In size, the general aspect of the larva, the form and coloring of all anatomical details identical with *Diabrotica duodecimpunctata* (Fabricius) and can not be separated from it.

***Diabrotica balteata*, LeConte.**

(U. S. National Museum: One vial with one larva marked: "In sweet potato, Tammany, La., Nov. 7, 1919. C. E. Smith, Coll." Larva probably not identified by rearing.) Species (considering the specimen is correctly determined) not to be separated from the larva of *D. duodecimpunctata*.

***Diabrotica longicornis* (Say).**

(U. S. National Museum: (a) One vial with about a score of mature larvae from roots of *Zea mais*, marked "No. 2723, on roots of corn. Mankato, Kansas; June 29, 1900." (b) One vial with eleven larvae, eight pupae and nine imagines, marked "Tripton, Iowa, Sept. 8, 1891; H. R. Pandack.")

Larva (Figs. 14 l, 15 l, 16 l, and 22 l), about 10 mm. long, in general aspect and most of the anatomical details identical with *Diabrotica duodecimpunctata* (Fabricius) but differing from this larva in the following characters: Head capsule more elongate and with straighter sides, the pygidial shield without urogomphi (= cerci, auct.) and the small thin plates below the pygidial shield less distinct. The color of the chitinized parts is lighter and more yellowish, particularly of the head capsule, the prothoracic shield and the pygidial shield and the dark mottling of the prothoracic shield fainter.

***Diabrotica vittata* (Fabricius).¹**

(U. S. National Museum: (a) One vial with four larvae, marked "No. 2789, from box 13.165" (b) A series of vials containing eggs, first, second, third, fourth larval instars and the pupa from C. J. Drake, Ames, Iowa. Determination by rearing.)

Mature larva (Figs. 25 v, 26 v, 27 v and 28 v) about 10 mm. long, in general aspect and most details looking as *Diabrotica duodecimpunctata*, but differing from this larva in the following characters: Pygidial shield large, covering the dorsal side of ninth segment completely, in dorsal outline shaped like a shovel

¹A description and a good habitus drawing of this larva in lateral view has recently appeared in the paper by Dwight Isely: "The Striped Cucumber Beetle" (University of Arkansas, Agricultural Experiment Station, Bull. No. 216, 1927, 36 pages). On pp. 34-36 is found a list of literature concerning the species. On p. 8 the length of the full grown larva is given as "about 12 mm."

Another habitus figure of the larva, but in dorsal view and with detail drawings of head, thorax, leg and end of abdomen, is given by F. H. Chittenden in "The striped cucumber beetle and how to control it" (U. S. Dept. of Agriculture Farmers' Bull. No. 1322, 1923, 16 pages).

blade "paliform," brown with slight or no mottling; urogomphi present, larger than in *duodecimpunctata* (compare figures); the small plates below the pygidial shield also better developed than in this species.

The first and second larval instars differ somewhat from the mature (fourth) instar as the following brief characterizations will show.

First instar, 3-3½ mm. long. The small setae-bearing plates of the body are more visible than in the mature larva and light gray colored. Pygidial shield is proportionally as large and shaped as in the mature larva, except that the urogomphi are absent; the place where the urogomphi are located in the other instars is indicated by two dark-colored spots.

Second instar, 5 mm. long. The small setae-bearing plates less distinct than in first instar and only slight grey colored but not colorless as in the mature larva. Pygidial shield proportionally as large and shaped as in the mature larva, urogomphi present but small, corresponding in size to the urogomphi of *Diabrotica duodecimpunctata*.

Third instar, 7 mm. long; in other respects identical with the mature larva.

Phyllobrotica quadrimaculata Linnaeus.

MATURE LARVA.

(U. S. National Museum: One vial with one larva and one reared imago, marked "In the earth, 14.IV 1918.—Pupa 17.V, '18. Reared 1, VI, '18. Dyrehaven, Seeland, Denmark." Collected, reared and presented by J. P. Kryger.)

Larva (Fig. 4 P), about 7 mm. long, 1½ mm. wide, fleshy and whitish, similar to the larva of genus *Diabrotica*, but comparatively shorter and thicker, with head capsule almost circular, about as long as wide, prothoracic shield (Fig. 5 P) not so well chitinized, the different areas of the body segments more bulging, legs stronger and somewhat longer, the intersegmental regions between the abdominal segments present dorsally and ventrally, but not forming as complete a ring as in *Diabrotica*; ninth abdominal segment (Fig. 8 P) well developed, dorsally oval in outline, flat and chitinized thinly on the disc but without a definite pygidial shield and with the tergal margin fleshy and thick, urogomphi (= cerci) not developed; tenth abdominal segment a fleshy pygopod with anus in the sucking surface, as in *Diabrotica*.

Head capsule (Fig. 2 P) shining, reddish brown, changing in places to whitish; epistoma, the frontal siletto-mark, the antennal ring, ventral and posterior margins of epicranium blackish brown; the frontal sutures and the median epicranial suture appearing as light colored lines. Labrum, mandibles and the chitinizations of the ventral mouth parts brownish, tip of mandibles particularly dark. Head—setae moderately long.

Body (Figs. 1 P, 4 P and 5 P), with rather short, light straw-yellow setae in somewhat darker colored cups; setal arrangement as in *Diabrotica*.

Legs with five joints, trochanter being distinct; one claw, a paronychial appendix, chitinizations and setal arrangements also as in *Diabrotica*.

Spiracles circular, dark straw-yellow, like the setal cups.

TAXONOMIC COMMENTS.

The subfamily Galerucinae as commonly limited includes about a dozen tribes of which, however, only the following are represented by their larval stages in the National Museum: Diabroticini with larvae of the genus *Diabrotica*, Phyllobroticini with larvae of the genus *Phyllobrotica*, Coelomerini with larvae of the genus *Monocesta*, Atycini with larvae of the genera *Trirhabda*, *Lochmaea*, *Galerucella* and *Monoxia*, Agelasticini with larvae of the genus *Galeruca*, and Agelasini with larvae of the genus *Agelasa* (= *Sermyla*)

These known Galerucinae larvae belong to two, particularly in their general appearance distinct groups, the first group including the larvae of the tribes Diabroticini and Phyllobroticini, represented by the genera *Diabrotica* and *Phyllobrotica* treated in the present paper, the second group including the rest of the larvae.

The Diabroticini-Phyllobroticini larvae are elongate, with large intersegmental membranes between the abdominal segments, whitish, fleshy and without distinctly colored small setae-bearing plates; dorsally on the abdominal segments are three distinct transverse areas each marked by a transverse series of setae; the legs are rather slender and short, ocelli absent, and lacinia is armed with a short, longitudinal series of about five equally long, strong, glittering setae.

The rest of the known Galerucinae larvae are rather short, broad and, with exception of Agelastica, devoid of intersegmental membranes; the body possesses numerous distinct, usually brownish and often metallic-colored small plates; dorsally on the abdomen only two transverse areas, each mostly with a series of setae-bearing plates; the legs are strong and plump, there is one, well-developed ocellus on each side of the head, and lacinia is armed either with a long series of about ten long, flat setae or with many setae of different sizes, irregularly distributed over the whole surface.

While the Diabroticini and Phyllobroticini larvae in this manner can be separated without difficulty from the other Galerucinae larvae they agree in general form, color and all structural details with the larvae of the tribes Systemini, Crepidoderini, the latter represented in the National Museum by the genus *Epitrix*, and the Psylliodini, all belonging to the nearest subfamily Halticinae. Like the Diabroticini and Phyllobroticini, the larvae of these tribes are whitish, fleshy, elongate, either with (*Systema* and *Epitrix*), or without (*Psylliodes*), large intersegmental membranes; dorsally on the abdom-

inal segments are three transverse areas, each marked by a transverse series of setae, and the body is deprived of well-colored, small setae-bearing plates; ocelli are absent and lacinia is armed with a short series of long setae (Figs. 12 Ps, 13 Ps, 18 Ps, 23 Ps, 24 Ps, 29 Ps and 30 Ps, all copied from Prof. Geo. H. Carpenter's article, quoted in footnote below).¹

Near to this group of Halticinae tribes are the two tribes Aphthorini, with the genera *Longitarsus* and *Phyllotreta*, and the Chaetocnemini. Their larvae are more or less whitish, often elongate, always without intersegmental membranes; dorsally on the abdominal segments possessing three transverse areas, each marked by a transverse series of setae; small body plates are either present or absent, and ocelli are absent.

Gradually the larvae of the different genera included in the two latter, rather intermediate tribes approach those of the tribe Halticini. The Halticini larvae are well known, owing especially to William Colcord Woods' thorough bulletins from the Maine Agricultural Experimental Station, and often considered typical for the whole subfamily Halticinae. Nevertheless, in general aspect and structural details the Halticini larvae are more similar to the main bulk of Galerucinae larvae than these latter are to the Diabroticini and Phyllobroticini larvae and more than the Halticini larvae themselves are to the Halticinae tribes Systemini, Crepidoderini and Psylliodini. Halticini larvae are comparatively short, devoid of intersegmental membranes, possess numerous distinct brown- or blackish-colored plates, and dorsally the abdominal segments have only two transverse areas indicated by two series of setae-bearing plates; the legs are strong and plump, and lacinia is armed with a series of more than five, usually about ten, long, flat setae. Only in a single important character, the lack of ocelli, they differ from the majority of the Galerucinae larvae which, as mentioned, have a large ocellus on each side. However, a well-developed ocellus on each side of the head is present in the larvae of other Halticinae tribes, particularly the Arsipodini, including the genus *Mantura*, the Disonychini and the Aspicelini, with the genus *Phydanis*, but absent in the closely related Oedionychini, and all of these last mentioned tribes can

¹Consult the following literature: (1) Larva of *Systema blanda* Melsheimer described and figured by F. H. Chittenden (U. S. Dept. Agr. Div. Ent. Bull. (new series) No. 23, 1900, pp. 24-25), and also by John Marten (Forbes's 18th Illinois Report, 1894, p. 22); (2) Larva of *Epitrix parvula* Fabricius described and figured by Adam G. Böving in "Life history studies of the tobacco flea beetle by F. S. Chamberlin and J. N. Tenhet" (Journ. Agric. Research; Wash., D. C., vol. 29, No. 12, 1924, pp. 575-577); (3) Larva of *Psylliodes chrysocephala* (Linnaeus) described and figured by Geo. H. Carpenter (Journ. Econ. Biology, London, 1906, vol. 1, pp. 152-156).

without difficulty be connected with the Halticini. They deviate from them only in general appearance and a few structural details, especially in possessing small, wart shaped, setae-bearing tubercles instead of setae-bearing plates.

The larvae of the Mniophilini including the genera *Argopistes* and *Sphaeroderma* occupy a very isolated position among the Halticinae larvae, and the larvae of the *Blepharidini* present a type so distinctly different from all other Halticinae larvae that the tribe probably will prove itself misplaced in the subfamily.

Briefly summarized the results of the whole discussion of the taxonomic problems involved in the classification of the larvae of the *Diabroticini* and *Phyllobroticini* tend to show (1) that the two main groups of *Galerucinae* larvae, namely, the combined *Diabroticini-Phyllobroticini* tribes and the rest of the *Galerucinae* larvae are so closely related to the two corresponding main groups of *Halticinae* larvae, respectively, the combined *Systemini-Crepidoderini* *Psylliodini* and the *Halticini* with allied tribes, that they can not be separated by any valid characters, and (2) that at the same time the larvae of two of the tribes, at present placed in the subfamily *Halticinae*, are very deviating and distinct from the rest of the *Halticinae* larvae.

Consequently, the classification of the larvae does not substantiate the general conception of the *Galerucinae* and *Halticinae* in their present limitation as constituting two separate subfamilies, but indicates that a more logical systematic arrangement might be made by uniting them into one subfamily; and in this new subfamily the *Diabroticini* and *Phyllobroticini* should be placed near the tribes *Systemini*, *Crepidoderini* and *Psylliodini*. If, however, it is deemed advisable on account of the characters of the imagines to retain the two subfamilies *Galerucinae* and *Halticinae*, the *Diabroticini* and *Phyllobroticini* should be removed from the first and placed in the second, and at least one tribe, the *Blepharidini*, should be excluded from the *Halticinae*.

EXPLANATION OF PLATE.

(Drawings by the author, except the figures 12 Ps, 13 Ps, 18 Ps, 23 Ps, 24 Ps, 29 Ps and 30 Ps, which are copied from Professor Geo. H. Carpenter's article, quoted in the text on page 202.)

1 P¹ *Phyllobrotica quadrimaculata*. Ventral side of second and third abdominal segments: e—epipleurum; h—hypopleurum; I—intersegmental ring.

¹The capital letters D, P, and Ps, following the numbers of the figures are the first letters in the generic names of the larvae referred to, and the small letters d, l, and v are the first letters in the specific names of the larvae from which the parts are drawn.

- 2 P *Phyllobrotica quadrimaculata*. Head capsule.
- 3 D *Diabrotica duodecimpunctata*. Left mandible.
- 4 P *Phyllobrotica quadrimaculata*. Larva in lateral view.
- 5 P *Phyllobrotica quadrimaculata*. Dorsal view of head, prothorax and mesothorax.
- 6 D *Diabrotica duodecimpunctata*. Head capsule, dorsal view; a—mandibular articulation, at—tactile organ, es—epicranial suture, fs—frontal suture, mb—basal membrane of antenna.
- 7 D *Diabrotica duodecimpunctata*. Paronychial appendix (=empodium) on the posterior face of the claw.
- 8 P *Phyllobrotica quadrimaculata*. Eighth and ninth abdominal segments, dorsal view.
- 9 D *Diabrotica duodecimpunctata*. Dorsal side (to the left) and ventral side (to the right) of ventral mouthparts; ca—cardo, g—galea, hr—hypopharyngeal rod, hy—hypopharynx, la—lacinia, lab—labium, li—ligula, m—mentum, mart—maxillary articulating area, or—oesophageal rod, p—two-jointed appendix of galea, pg—palpiger, pgn—paragnatha, sm—submentum, st—stipes.
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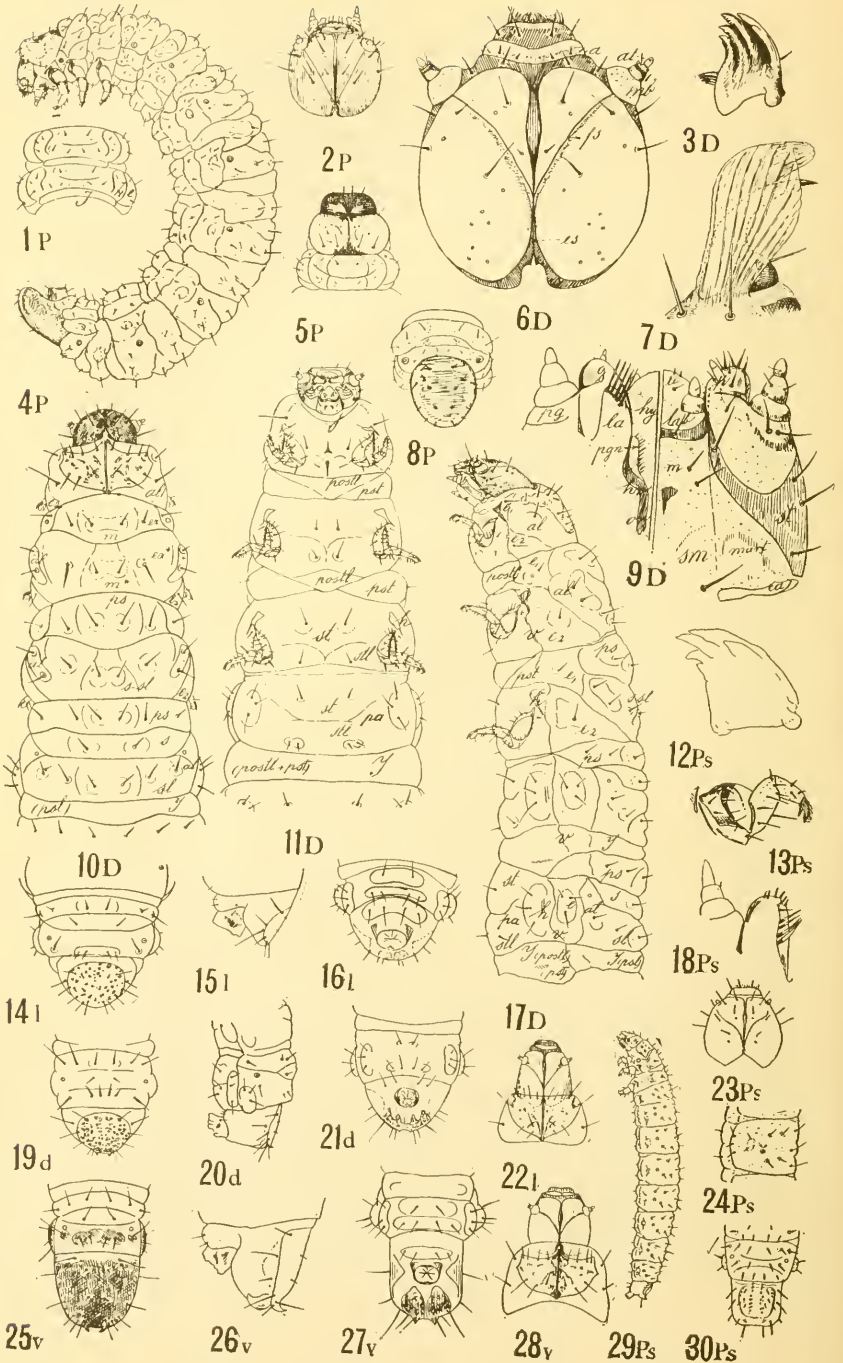
A NEW MIDGE INJURIOUS TO PINEAPPLES (DIPTERA, CERATOPOGONINAE).

BY O. A. JOHANNSEN.

Apelma brevis n. sp.

Male.—Eyes bare, strongly emarginate around the base of the antennae, contiguous above, separated below the mouth-parts by a distance equal to the width of the eye. Occiput blackish, hairs dusky. Face and proboscis dusky yellow, the latter about two-thirds the height of the head. Antennae dark with dark hairs; first basal segments large, nearly contiguous, transverse; second segment petiolate, slightly smaller than the third, petiole between the second and third about two-thirds as long as broad; segments three to ten nearly sessile and subequal in length, the third nearly spherical, the succeeding segments gradually diminishing in diameter to the tenth which is only slightly more than half as wide as the third and slightly shorter, segments eleven to fourteen increasing in diameter to the fourteenth, eleventh about twice as long as the tenth; twelfth, thirteenth and fourteenth slightly longer, subequal, the eleventh to thirteenth tapering, the fourteenth elongate oval, bearing a terminal papilla with constricted neck and with a shallow longitudinal apical furrow; second segment verticillate with hairs which are about three times as long as the diameter of the segment, segments three to ten verticillate with long hairs which lie nearly parallel to the antennal axis and extend almost to the tip of the antenna, segments eleven to thirteen with a verticil of projecting hairs at the base and some scattering hairs more distad, hairs of the fourteenth shorter. Palpi yellowish, projecting beyond the tip of the proboscis; first segment but little longer than broad; second nearly as long as the third; third segment with sensory pit, broader than the following, and as long as the two succeeding segments taken together.

Thorax blackish, slightly shining, with indistinct grayish pollen, sparsely pale haired in addition to a few black setae; humeri, upper portion of the pleura, extreme posterior angles of mesonotum, and scutellum yellow; pectus and metano-



tum blackish; scutellum margined with black setae. Abdomen blackish with sparse pale brownish hairs. Hypopygium of the same general character as described for other members of this genus (Cf. Saunders, Parasitology, 17:260, 1925) resembling most closely that figured for *A. edwardsi* with respect to form of the internal chitinized parts; the last tergite however has its posterior margin rather more pointed and covered with long stout setae whose bases show conspicuously even when the setae are rubbed off; side pieces of the claspers, which also are provided with long setae do not extend as far caudad as the tip of the tergite; the claspers are slender, slightly curved, broadest at base, tapering, slightly broadening again toward the tip where they become flattened and somewhat spoon-shaped.

Legs including coxae pale brown with hairs of a more yellowish sheen, longer hairs not sharply differentiated in color; first segment of the hind tarsus about equal to the combined length of the next three; last three segments subequal; claws large, simple, strongly curved; empodium vestigial. Wings 1 mm. long, width 0.33 mm., grayish hyaline, with slender decumbent hair-like scales which cover the wing surface, surface finely punctate, fringe hairs as long as those of the disc, with some scattered longer ones especially along the posterior margin on the basal half. Sub-costa indistinct; costa ends at 0.58 the wing length measured from the basal articulation or equidistant from the arculus and the wing tip; cells R^1 and R^{2+3} apparently subequal, the latter especially narrow; the r-m crossvein arched; M^1+^2 ending slightly nearer the wing tip than does M^3 ; base of M^3 evanescent; Cu forks opposite the tip of the costa. Halteres with yellowish white knobs; stem more dusky. Length of insect 1.3 mm.

Female.—Rather paler than the male. Occiput yellowish. Antennae dark with dark hairs; basal segment transverse, slightly broader than long; second segment nearly cylindrical, nearly 1.5 times as long as broad; third and fourth subequal, a fourth less in diameter than the second, two-thirds as long as broad; fifth, three-fourths as long as broad; sixth, seventh, eighth and ninth subequal, each slightly longer than third to fifth combined, broadest at base then tapering toward apex; tenth (terminal) slightly longer and broader than the ninth, cylindrical, tapering at tip, with terminal papilla as in the male. Palpi yellowish, about as long as the proboscis, segments subequal, except the third which is distinctly broader and a third longer than the next. Thorax brown, sparsely yellow haired, laterally with a few stout black setae; humeri, posterior angles of the mesonotum, scutellum, and upper portion of the sides yellow; pectus and metanotum brown. Abdomen dark brown, venter pale, with sparse pale brownish hairs. Legs dusky yellow, with fine yellowish hairs and longer, darker ones; empodium well developed, nearly as long as the claws. Wing 0.85 mm. long, 0.32 mm. wide; venation as with the male.

Larva.—Length 3.5 mm. Alcoholic specimens which are white in color including the head, possess the usual characteristics of the larvae of this genus having the axis of the head in line with that of the body and with small anterior and posterior prolegs. The head is 0.3 mm. long, about two-thirds longer than wide, eye spots indistinctly geminate, situated very slightly caudad of the middle of the head. Body provided with two or three pairs of long simple setae on each segment; the rubbed condition of the specimens prevents a more precise statement. Lateral setae not finned at the base. Posterior margin of

the penultimate segment with a pair of long bristles. Four simple blood gills, apparently not arranged in pairs, apices rounded. The lanceolate pale amber colored blade-like modified hairs with serrate margins situated at the apex of the abdomen are similar to those figured by Saunders (l. c.) for *A. edwardsi* but apparently relatively larger, measuring .075 mm. in length.

Pupa.—Length 2.5. Exuviae white. Head with two pronounced papillae situated on the median triangle. Prothoracic horns nearly cylindrical, tapering at the base, imbricate except toward the tip. Thorax with two pairs of small dorsal tubercles and inconspicuous pits. Each intermediate segment of the abdomen with a lateral spinose tubercle which in turn has a long seta anteriorly at the base, three pairs of ventro-lateral spinose tubercles, dorsally with two fine setae and more posteriorly two small tubercles one on each side of the median line. Genital sacks slender, tapering, the surface covered with small tubercles which give them an imbricate appearance; ventrally there is a small seta at the base of each.

This species resembles in many particulars *A. keilini* but differs from it as well as from other members of the genus in possessing the following combination of characters. Small size, wing length 1 mm. and eleventh antennal segment only slightly shorter than the twelfth in the male; in the female with but ten antennal segments. The simple not finned lateral setae, the white head two-thirds longer than wide and the four simple blood gills characterize the larva. The exuviae of the pupa are uncolored and there are two strong papillae on the median triangle.

It may require a study of the early stages of the type species of *Apelma* Kieffer and of *Enforcipomyia* Malloch to determine their relationships.

The holotype and allotype of this species have been deposited in the U. S. National Museum; paratypes in the Cornell University collection.

The specimens upon which the descriptions are based were collected in Hawaii by Dr. J. F. Illingworth who writes concerning the species: "This fly is a troublesome pest of pineapple plants. It breeds in the water-pockets in the axils of the leaves. The maggots make slight scars on the very tender, white tissue of the leaf, and bacteria entering these scars cause a rot of the whole plant."

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No. 1

NEW CACTUS BEETLES. II.¹

BY W. S. FISHER, *U. S. Bureau of Entomology.*

This is the second paper on the beetles received in connection with the prickly-pear insect investigations that are being conducted by the Commonwealth of Australia, at Uvalde, Texas. The specimens were sent for identifications by Leith F. Hitchcock, who is anxious to have names for these species to use in papers dealing with cactus insects. The species described in the present paper were collected in Mexico by E. Mortensen, and in the West Indies by Leith F. Hitchcock.

Moncilema (Collapteryx) opuntiae, n. sp.

Form small, elongate, moderately convex, vaguely ventricose; surface glabrous, nearly smooth, feebly shining, and uniformly black.

Head feebly, broadly depressed between the antennal tubercles, and with a narrow, longitudinal groove extending from the occiput to epistoma, but the groove more or less obsolete on the front, the surface rather densely, minutely punctate, with a few shallow, coarser punctures intermixed, and sparsely clothed with short, inconspicuous pubescence; clypeal suture vaguely impressed and abbreviated at the sides; labrum slightly reddish anteriorly. Antennae about two-thirds as long as the body, rather robust, and gradually tapering to the apex; first joint long, robust, truncate and widest at apex, and the surface minutely punctate; fourth joint feebly, broadly annulated with white pubescence at base.

Pronotum about one-fourth wider than long, the sides feebly expanded at the middle, more or less strongly constricted along the basal third, and without a distinct spine or tubercle; surface smooth, and without distinct punctures.

Elytra nearly twice as long as wide (male slightly shorter), oblong-oval, widest near middle, strongly convex, and the flanks rounded and not very abruptly deflexed; sides broadly rounded at humeral angles, and broadly subtruncate at the apex; surface vaguely ventricose, and without distinct punctures, except on the deflexed area near base, where the surface is coarsely punctate.

Abdomen beneath feebly convex, impunctate except the last segment which has a few coarse, obsolete punctures, and the surface sparsely clothed with very short, inconspicuous hairs; last segment entirely black, broadly, vaguely emarginate at the apex in the male, and broadly subtruncate in the female.

¹1. Proc. Ent. Soc. Wash., vol. 28, 1926, pp. 214-217.

Legs robust, more strongly expanded in the male, and the surface with a few scattered, coarse punctures; both sexes with the first three joints of the anterior tarsi spongy pubescent beneath; first joint of posterior tarsi spongy pubescent over almost the entire surface, the second and third joints densely so throughout, though divided by a fine line.

Length, male 10 mm., female 17 mm.; width, male 4.5 mm., female 7 mm.

Type locality.—San Luis Potosi, Mexico.

Type and allotype.—Cat. No. 40763, United States National Museum. *Paratype* returned to Mr. Leith F. Hitchcock, of the Australian Prickly Pear Investigations at Uvalde, Texas.

Described from three specimens, female type and male allotype collected at the type locality on *Opuntia* sp., June, 1927, by E. Mortensen, and a female paratype collected at the same locality during May.

This species is allied to *mexicanum* Fisher and *crassa* LeConte, but differs from both these species by having the upper surface practically impunctate.

Moneilema (Collapteryx) rugosipennis, n. sp.

Form rather large, elongate, strongly convex; surface glabrous, strongly shining, and uniformly black.

Head rather deeply and broadly depressed between the antennal tubercles, and with a narrow longitudinal groove extending from the occiput to epistoma, and the surface glabrous, densely, minutely punctate, with a few coarser punctures intermixed; clypeal suture broadly depressed but not sharply indicated. Antennae about two-thirds as long as the body, rather robust, and gradually tapering to the apex; first joint long, robust, gradually expanded to the apex, which is truncate, and the surface minutely punctate, with a few coarser punctures intermixed; fourth and fifth joints more or less annulated with white pubescence at base, especially on the underside.

Pronotum at most only slightly wider than long, the sides sinuate anteriorly, feebly expanded at the middle, more or less strongly constricted along basal third, and armed with a short, more or less acute tooth at the middle; surface very minutely punctured, with a few irregularly placed, coarse punctures along the base and anterior margin.

Elytra twice as long as wide, oblong-oval, widest at middle, strongly convex, and the flanks rounded and not abruptly deflexed; sides broadly rounded at the humeral angles, and broadly, transversely subtruncate at the apex; coarsely, irregularly punctate over entire surface, the punctures denser toward the base, where the surface is also more or less coarsely rugose.

Abdomen feebly convex, and densely, minutely punctate; last segment entirely black, broadly, arcuately emarginate at the apex in the male, and broadly rounded in the female. Legs robust, more strongly expanded in the male, and the surface with a few scattered, coarse punctures; both sexes with the first three joints of the anterior tarsi spongy pubescent beneath; first joint of posterior tarsi without spongy pubescence, but the second and third joints

nearly covered with spongy pubescence beneath, though broadly divided at the middle.

Length, 15-30 mm.; width, 7-10 mm.

Type locality.—San Luis Potosi, Mexico.

Type, allotype and paratypes.—Cat. No. 40764, United States National Museum. *Paratypes* returned to Mr. Leith F. Hitchcock.

Described from a large series of specimens (one type), collected at the type locality during May and June, 1927, by E. Mortensen, who writes that the adults were plentiful at the type locality, mostly on *Opuntia imbricata*, but that they will also feed on *Platyopuntia* sp. These adults are covered with a light powdery bloom when collected, but this is usually lost by abrasion.

In the specimens examined scarcely any variations were observed except in size. The species is closely allied to *armata* LeConte, but differs from that species in having the elytra coarsely punctured over the entire surface and more or less rugose, and the second joint of the posterior tarsi spongy pubescent over nearly the entire surface, whereas in *armata* the elytra are more sparsely punctured, the punctures only covering the basal two-thirds, and the second joint of the posterior tarsi has only a small spongy pubescent space on each side.

***Moncilema (Moncilema) vittata*, n. sp.**

Form elongate, moderately convex, vaguely ventricose, black, feebly shining, and each elytron ornamented with a broad, distinct vitta of very short, white pubescence extending from the middle to apex.

Head feebly, broadly depressed between the antennal tubercles, and with a narrow, longitudinal groove extending from the occiput to epistoma, but becoming more obsolete on the front, the surface rather densely, minutely punctate, with a few coarser punctures toward the sides, and sparsely clothed with very short, inconspicuous pubescence; clypeal suture vaguely impressed and abbreviated at the sides. Antennae about two-thirds as long as the body, rather robust, and gradually tapering to the apex; first joint long, robust, acute externally at apex, and the surface densely, minutely punctate, with a few widely separated, coarser punctures intermixed; fourth joint broadly annulated with whitish pubescence at the base, and the third with more or less whitish pubescence on the underside.

Pronotum about one-fifth wider than long (slightly wider in the female), the sides feebly expanded at middle, strongly constricted along basal third, and without a spine or tubercle; surface smooth, with a few irregularly placed coarse punctures along the posterior margin in the male (finely, densely punctate, with a few irregularly placed, coarse punctures over entire surface in the female).

Elytra nearly twice as long as wide, oblong-oval, widest at middle, strongly convex, and the flanks rounded and not very abruptly deflexed; sides very broadly rounded at humeral angles, and broadly, transversely sinuate at apex (slightly more subtruncate in the female); surface rather sparsely, coarsely punctate on basal half, the punctures becoming obsolete on apical half (vaguely entricose in the female), and rather strongly scabrous on the deflexed area near base.

Abdomen feebly convex, smooth in the male, vaguely punctate in the female; last segment reddish posteriorly, broadly, arcuately emarginate at the apex in the male, and broadly subtruncate in the female; last dorsal segment slightly reddish. Legs smooth and not distinctly punctate, and the femora of the female much less inflated than in the male; both sexes with the first three joints of the anterior tarsi spongy pubescent beneath; first joint of the posterior tarsi slightly spongy pubescent at the sides apically, the second and third densely so throughout, though divided by a distinct line at the middle.

Length, male 20 mm., female 26 mm.; width, male 8 mm., female 10 mm.

Type locality.—Aquascalientes, Mexico.

Type and allotype.—Cat. No. 40765, United States National Museum.

Described from two specimens, male type and female allotype, collected at the type locality on *Opuntia* sp., May, 1925, by E. Mortensen.

This species is closely allied to *appressa* LeConte and *nigriventris* Fisher. From the former it differs in having each elytron ornamented with a broad vitta of white pubescence on the apical half, and the first joint of the posterior tarsi with a small spongy pubescent space at the apex. From *nigriventris* it differs in having the last ventral segment of the abdomen reddish at the apex, and the first joint of the posterior tarsi with spongy pubescent spaces.

Gerstaeckeria (Gerstaeckeria) elegans, n. sp.

Black (antennae missing), and clothed with white, black, and brownish scales.

Head with the front not sulcate, but the entire front and basal fourth of the beak densely clothed with creamy white scales, with a browner patch over each eye; beak long, shining, densely, coarsely punctate, and strongly, longitudinally carinate posteriorly; eyes acutely rounded above, and separated from each other by two-thirds of the width of the beak at base.

Pronotum vaguely wider than long, widest near middle, with the sides feebly arcuately expanded from base to near middle, then strongly narrowed to the apex; surface moderately convex, longitudinally carinate at the middle, coarsely, confluent punctate, and rather densely clothed with dark brown and blackish scales, with a few yellowish-white ones intermixed, especially along the anterior margin, the black scales forming a more or less distinct longitudinal zigzag vitta on each side of the middle. Scutellum invisible.

Elytra oval, distinctly wider at base than pronotum, and about one-third wider at basal fourth than pronotum at middle, strongly constricted at base, but without a posthumeral prominence; interspaces with the alternate ones slightly wider and more densely scaly; striae punctures large, subquadrate, rather deep, each bearing a single scale at middle, and separated from each other by partitions not so high as the interspaces; surface rather densely clothed with brownish black scales, with alternate spots of black and brownish yellow scales on the first, third, and fifth interspaces, and ornamented with a distinct, narrow, transverse white fascia just before the apical declivity, a short transverse fascia at basal fourth, extending from near the humeri to middle of each elytron, and with a narrow area of the same colored scales along the sutural margins on apical declivity.

Abdomen beneath coarsely, densely punctate, and clothed with whitish and dark brown scales intermixed; second, third, and fourth segments about subequal in length. Femora unarmed, and densely clothed with creamy white scales, with a few darker ones intermixed; tarsal claws rather long, and strongly divergent.

Length, 11.5 mm.; width, 5.5 mm.

Type locality.—San Luis Potosi, Mexico.

Type.—Cat. No. 40766, United States National Museum.

Described from a single example collected at the type locality, June, 1927, on *Opuntia* sp., by E. Mortensen.

This species belongs to the subgenus *Gerstaeckeria*, and is closely allied to *alternata* Pierce. It can, however, be separated from that species by the front of the head not being sulcate, the pronotum not constricted at the apex, and the sides more parallel posteriorly, the elytra distinctly wider than the pronotum at base, and the sides constricted at the base, and the scales on the legs of a more uniform color.

Gerstaeckeria (Philopuntia) unicolor, n. sp.

Black, with the antennae reddish brown, and clothed with blackish brown and slightly paler brown scales intermixed.

Head with the front slightly sulcate, and the entire front and basal fourth of the beak densely clothed with brownish white scales; beak long, moderately shining, coarsely, densely punctate, and rather strongly, longitudinally carinate posteriorly; eyes rounded above, acute beneath, and separated from each other by less than one-half of the width of beak at base.

Pronotum nearly one-third wider than long, widest at middle, with the sides regularly, arcuately rounded; surface moderately convex, coarsely, confluent punctate, and rather densely clothed with erect, blackish brown and paler brown scales intermixed. Scutellum invisible.

Elytra oval, not wider at base than pronotum, but about one-third wider at middle than pronotum at middle, and without a post-humeral prominence; interspaces narrower than striae, and the alternate ones not more densely scaly; striae punctures large, round, rather deep, each bearing a single scale

at middle, and separated from each other by partitions, which are subequal in height to the interspaces; surface rather densely clothed with erect, blackish brown and slightly paler brown scales intermixed, without forming any distinct design.

Abdomen beneath coarsely, densely punctate, and sparsely clothed with brownish white scales; second segment slightly longer than the third or fourth segments. Femora unarmed, and densely clothed with scales similar to those on the abdomen; tarsal claws rather long, and strongly divergent.

Length, 5.5 mm.; width, 2.75 mm.

Type locality.—San Luis Potosi, Mexico.

Type.—Cat. No. 40767, United States National Museum.

Described from a single example collected at the type locality on *Opuntia* sp., during 1927, by E. Mortensen.

This species belongs to the subgenus *Philopuntia* Pierce, and is allied to *porosa* LeConte, but can be easily distinguished from all the known species of this genus by the scales on the upper surface being erect, and of a nearly uniform color.

***Gerstaeckeria (Philopuntia) insulana*, n. sp.**

Black, with the antennae piceous and densely pubescent; surface sparsely clothed with blackish scales, and ornamented with light brown and yellowish white scales.

Head with the front deeply depressed between the eyes, and the front and base of beak rather densely clothed with whitish scales, the scales becoming brown and less conspicuous on the occiput; beak long, shining, rather finely, sparsely punctate, and longitudinally carinate near the base; eyes rounded above, acute beneath, and separated from each other by about one-fourth of the width of the beak at base.

Pronotum only slightly wider than long, widest near the middle, feebly constricted along apical margin, and the sides arcuately rounded, but slightly more obliquely so posteriorly; surface coarsely, confluent punctate, more or less rugose, with a short, longitudinal carina at the middle, and sparsely clothed with inconspicuous black scales, with a few irregularly placed brownish yellow ones, which tend to form a median vitta in front and behind the median carina. Scutellum invisible.

Flytra oval, not wider at base than pronotum, but nearly one-third wider at middle than the width at median part of pronotum, and without a post-humeral prominence; interspaces wider than the striae, with the alternate ones more densely scaly; striae punctures large, round, moderately deep, each bearing a single scale at middle, and separated from each other anteriorly by partitions distinctly lower than the interspaces; surface (except on the alternate interspaces) sparsely clothed with inconspicuous blackish scales, with a few irregularly placed brownish yellow ones intermixed, and ornamented just in front of the apical declivity with a short vitta on the first, third, and fifth interspaces, composed of densely placed brownish yellow scales, with a few paler ones intermixed, and also with a few scattered scales of the same color on the alternate interspaces between the vitta.

Abdomen beneath rather densely, coarsely punctate, and rather densely clothed with uniformly colored brownish white scales; second, third, and fourth segments about subequal in length. Femora unarmed, and more or less mottled with picous black and whitish scales, but the scales becoming denser and more yellowish white on the tibiae; tarsal claws rather short and approximate.

Length, 6.5-8 mm.; width, 3-4 mm.

Type locality.—Port-au-Prince, Haiti.

Type and paratypes.—Cat. No. 40768, United States National Museum. *Paratypes* returned to Mr. Leith F. Hitchcock.

Described from six specimens (one type), collected at the type locality, January, 1927, by Leith F. Hitchcock.

This species belongs to the subgenus *Philopuntia* Pierce, and is allied to *porosa* LeConte. In *porosa*, however, the pronotum is more conspicuously clothed with whitish and yellowish scales, and is without a distinct smooth, longitudinal carina at the middle, the alternate interspaces of the elytra are not wider or more densely scaly, the striae are much wider than the interspaces, and the strial punctures are larger and subquadrate, the scales are more conspicuous and of a whitish color, and do not form distinct vittae on the first, third and fifth interspaces near the apical declivity, and the tarsal claws are long and strongly divergent.

Gerstaeckeria (Philopuntia) cubaecola, n. sp.

This species so closely resembles *insulana* Fisher that it is deemed necessary merely to give the differences:

Form more slender; pronotum with the brownish scales more uniformly distributed on the median part, and not forming a vitta in front and behind the median carina; elytra more sparsely scaly and the scales of a paler color, the alternate interspaces not wider or more densely scaly, the strial punctures very shallow, scarcely depressed on the disk, and the partitions separating them in the striae nearly subequal in height to the interspaces.

Length, 5.75-6.75 mm.; width, 2.8-3.25 mm.

Type locality.—Santiago, Cuba.

Type and paratype.—Cat. No. 40769, United States National Museum. *Paratype* returned to Mr. Leith F. Hitchcock.

Described from three specimens (one type), collected at the type locality, December 28, 1926, by Leith F. Hitchcock.

A NEW EUROPEAN SPECIES OF APANTELES PARASITIC ON THE GIPSY MOTH.

BY C. F. W. MUESEBECK,

Of the Bureau of Entomology, United States Department of Agriculture.

The species here described is a widely distributed European form, which is sometimes a parasite of the first importance on the gipsy moth, *Porthetria dispar* L. In literature and in museum collections it has been more or less confused with *viripennis* Haliday, and to a less extent with *lateralis* Haliday and *solitarius* Ratzeburg. From all of these, however, it is quite distinct; and in so far as I have been able to determine from a study of the literature and an examination of certain European collections, it is undescribed. It therefore seems necessary to describe it at this time in order to make the name available for use in other literature, and so to obviate the continuance of the confusion resulting from misidentification of the species.

***Apanteles porthetriae*, new species.**

Very similar to *viripennis* Haliday, but differing especially in the smoother plates of the 1st and 2d abdominal tergites, the denser pubescence of the mesonotum, and the more prominent ovipositor. From *liparidis* Bouche (= *fulvipes* of Authors, not Haliday), which it also very closely resembles, it can be distinguished by its denser mesonotal pubescence; the less polished propodeum and first and second abdominal tergites; the more steadily narrowing first tergite; and the darker markings of the posterior legs.

Female.—Length 3 mm. Head transverse; face broader than long, smooth and shining; malar space about as long as basal width of mandible; antennae fully as long as the body; the scape short and stout; the flagellar segments, except the apical four or five, very long; mesoscutum smooth and shining, minutely punctate anteriorly, posteriorly only with numerous faint setigerous punctures; the entire scutum closely pubescent, most thickly so posteriorly; scutellum moderately large, smooth and shining, pubescent laterally; propodeum shining, mostly smooth with scattered shallow punctures, sometimes with slight rugulosity along apical margin; mesopleura polished, with a shallow polished impression; hind coxae mostly smooth and shining; inner spur of posterior tibia fully half as long as the metatarsus; stigma of anterior wings rather large; radius perpendicular to anterior margin of wing and longer than intercubitus; abdomen about as long as the thorax, or very slightly shorter, strongly compressed; chitinized plate of first tergite fully two-and-one-half times as long as broad at base, narrowing gradually from base to apex, smooth and polished except apically, where it is weakly longitudinally punctato-aciculate; the chitinized plate of the second tergite triangular, about half as broad at base as long down the middle, and slightly less than half as broad at base as at apex, smooth and polished, except for a few faint aciculations inside the oblique grooves that

define the plate laterally; remaining tergites polished; hypopygium a little surpassing the apex of last tergite; ovipositor exerted about the length of the second tergite. Black; antennae entirely black; tegulae yellow; wings hyaline; stigma dark brown; anterior and middle legs entirely yellow, including the coxae; posterior coxae black; hind femora yellow, black at extreme tip; apex of hind tibiae blackish, usually broadly so; hind tarsi mostly blackish, except basal half of metatarsus, and sometimes base of the following segments; abdomen black; the broad membranous margins bordering the plates of the first and second tergites yellowish; sometimes a weak suggestion of reddish on the sides of the third tergite; sides and venter of abdomen yellowish on the basal half.

Male.—Like the female, except for the sexual differences usual to this group; the antennae are a little longer; the propodeum and the first and second abdominal tergites are even slightly less sculptured; and the blackish markings of the posterior legs are a little deeper.

Cocoon.—Chalky-white, solitary, normally attached lengthwise to the under side of the host larva.

Type.—Cat. No. 40833, U. S. N. M.

Type locality.—Olaszliszka, Hungary.

Host.—*Porthetria dispar* L.

Described from 5 female and 5 male specimens reared May, 1926, in the Bureau of Entomology, under Gipsy Moth Lab. No. E2-A5. This material was obtained in a heavy gipsy moth infestation, where the species was found to be a very abundant parasite of the small caterpillars, usually emerging from the third stage larvae.

The type, allotype, and six paratypes are in the United States National Museum; the two remaining paratypes are in the collection of the Gipsy Moth Laboratory.

DESCRIPTIONS OF FOUR SOUTH AMERICAN MOTHS.

By HARRISON G. DYAR, *U. S. National Museum, Washington, D. C.*

ZANOLIDAE.

Thelosia impedita, new species.

Small, frail, the fore wing scarcely pointed at apex, but otherwise with the structure and markings of *truncata* Schaus, *rectilinea* Dognin, *jorgenseni* Schaus or *minois* Schaus. Light reddish brown with bronzy reflection; a round dark brown discal dot, followed by a straight outer line from costa to inner margin; two lines beyond this, both wavy, forming arcs between the veins in reverse direction from each other. Hind wing pale yellowish, silky shining. Expanse, 18 mm.

Type, male, No. 894, Cornell University Collection, Teffé, Rio Solimoes, Brazil, February 14, 1920 (S. H. Parish).

DALCERIDAE.

Paracraga halophora, new species.

Fore wing white, with slight rusty tint and dusky irrorations; costa slightly more rusty; outer margin with black points at the ends of veins 3 to 8, those on 3 and 8 larger; a black point at the middle of vein 1. At upper angle of cell a narrow double dark brown line with slight included reddish shade; a line from upper angle of this, strongly bowed outward, reaching tornus; inner part of discal line continued across cell to median vein, the area thus included shining silvery with wavy surface, running almost to base below median vein and above vein 1. Hind wing white, with slight black dots at the ends of veins 2 and 3. Expanse, 24 mm.

Type, male, No. 896, Cornell University Collection, Pueblo Pardo, Col. de Perene, Peru.

General appearance of *argentea* Schaus, though the course of the lines is actually more as in *amianta* Dyar.

MEGALOPYGIDAE.

Malmis interlineata, new species.

Rather light brown, as in *fieldia* Schaus, the costal half a shade darker brown than the inner half; no transverse marks, all the veins pale yellowish lined, the interspaces also, the interspaceal lines a little thicker, but these do not quite reach the outer margin; the interspaceal line between veins 6 and 7 just beyond cell is thickened to form a short ray. Hind wing with the veins not lined, indicated only by pale spots in the fringe at the ends of the veins, as on fore wing. Body parts intermixed brown and yellow. Expanse, 49 mm.

Type, male, No. 895, Cornell University Collection, Lassance, Minas Geraes, Brazil, November 15, 1919 (R. G. Harris).

Megalopyge partheniata, new species.

Male marked as in *nuda* Cramer, the double lines on the veins confluent and smoky, broadly obsolete in the tornal area; larger, more robust than the male of *nuda*, but easily mistaken for that species. Female, wings dark gray, the double vein-linings faintly or not at all indicated. Body parts rusty brown, banded with dark gray. Larger and more robust than female *nuda*, the wings less narrowly drawn out. Much resembles the female of *Podalia pellucida* Möschler.

Types, two males and two females, Villa Rica, Paraguay, April 23, 1924 (F. Schade). *Type* No. 40774, U. S. National Museum.

Mr. Schade sends a colored drawing of the larva. The hairing is dense and white, arched, rather long, but even except four erect black slightly curling tufts along the dorsal line, one near each end, two in the middle, close together. Subventral hair short, mixed with orange and obliquely down-turned to a row of short black hairs. Head black. Very different from Stoll's figure of the larva of *nuda* (Plate xviii, figs. 2, 2c).

DESCRIPTIONS OF TWO NEW SPECIES OF SPINNING MITES.

BY E. A. MCGREGOR,

*Of the Bureau of Entomology, United States Department of Agriculture.****Tetranychus californicus***, new species.

This minute species is very distinct from other known tetranychids. The penis suggests a relationship with *T. salicicola* Zacher, *T. oregonensis* McG., *T. willamettei* McG., *T. monticolus* McG., and *T. flavus* Ewing, but other characters at once distinguish it from these.

Female.—Color pale yellowish, with a few slightly darker markings. Body considerably compressed dorso-ventrally. A series of 13 females averaged 0.255 mm. in length. Palpus rather short; claw abruptly pointed. "Thumb" of palpus wider than long, bearing at its tip a terminal "finger" which is nearly twice as long as thick, width of "finger" at base being about 1/3 width of "thumb" at tip. Two additional digituli arise terminally from the "thumb," dorsad of the terminal "finger"; at least two setae also arise from the "thumb." Legs relatively short and thick, femur about one-fifth again as long as tarsus. Relative length of joints as follows: Trochanter, 12; femur, 42; patella, 21; tibia, 22; tarsus, 35. Tip of tarsus bearing a claw, which is 6-cleft from a point somewhat proximad of the middle; the six claw divisions bent strongly ventrad from axis of basal (fused) portion. The usual four tenent hairs arise at the sides of the claw base. Viewed ventrally the main claw appears to split a short distance from the base into two closely appressed parts, each part bearing three of the claw spurs. (This is actually the usual condition with *Tetranychus*.) Collar trachea with paired units consisting of tubes of relatively uniform caliber, extending forward parallel to one another for about one-third their length, then deflected outward, downward, and forward, each ending in a slightly enlarged terminal chamber.

A series of 11 males averaged 0.218 mm. in length. The penis is rather simple in structure, the shaft is very gradually attenuated to a rather sharp tip; the distal third is slightly undulating; as viewed through some thickness of body tissues, there appears to be a rather weak, acute basilar lobe, located unusually near the proximal end of the inner lobe.

Type slide.—Cat. No. 960, U. S. N. M.

Abundant on *populus fremonti*, San Joaquin Valley, California, causing the trees to become nearly defoliated at times. Collected by the author, 8 miles northwest of Porterville, California.

PLATE I.

Tetranychus californicus.

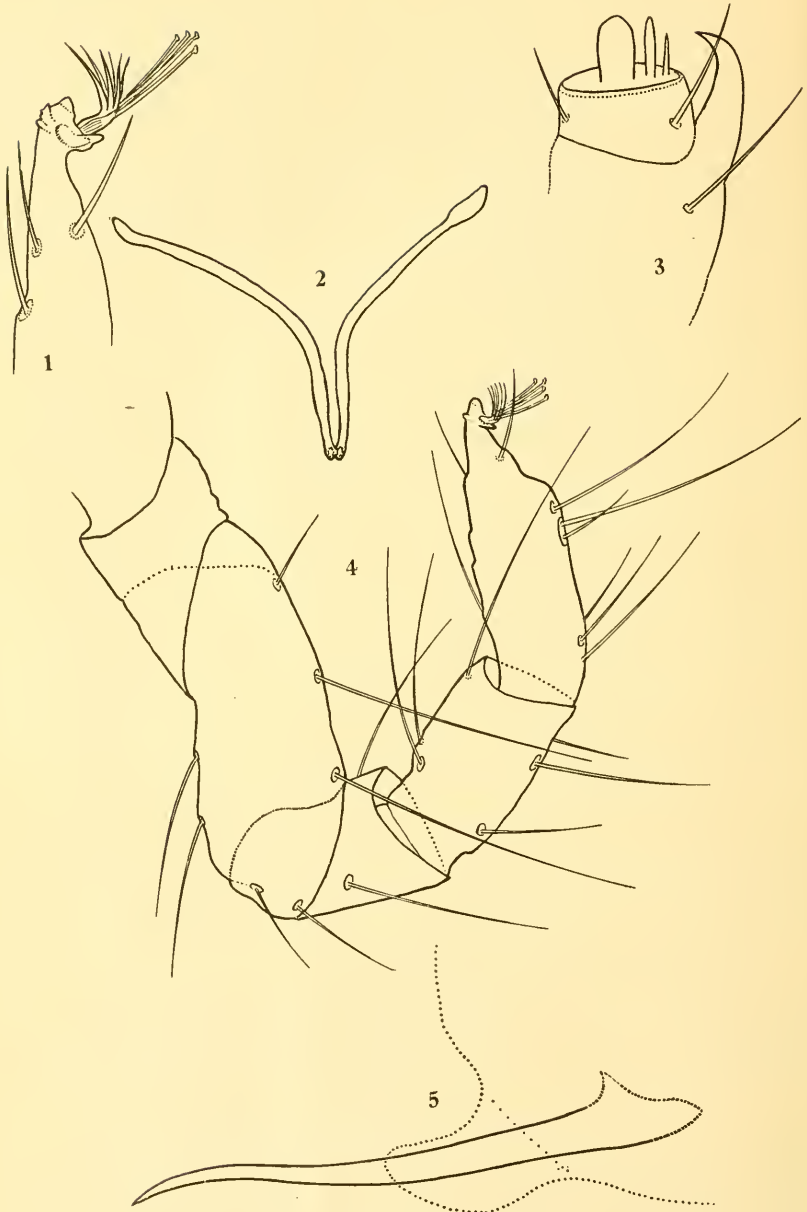
Fig. 1.—Tip of tarsus showing tarsal appendages.

Fig. 2.—Collar trachea (viewed dorsally).

Fig. 3.—Tip of palpus with terminal appendages (viewed through overlying tissues).

Fig. 4.—Foreleg (5 terminal joints).

Fig. 5.—Penis.



MITES—MC GREGOR.

Schizotetranychus fluvialis, new species.

This smallish mite is certainly referable to the genus *Schizotetranychus* Trägårdh, of which only a very few species have yet been discovered. In America the closest ally is probably *S. latitarsus* Ewing, which is readily distinguished from the present species by the former's shorter palpal "thumb," which lacks the digit, as well as by the slightly hooked palpal claw, long prominent dorsal setae, and strongly arched abdomen of *latitarsus*.

Female.—Color pale. Body rather elongate for its width, and somewhat compressed dorso-ventrally. A series of females averaged 0.335 mm. in length. Body setae very short and inconspicuous. Palpus unusually long and readily hinging ventrad; claw fairly well hooked, bluntly pointed. "Thumb" of palpus a trifle wider than long, exceeding the claw, bearing at its tip a digit which is twice as long as thick, and the width of which at base is about $\frac{1}{3}$ the width of "thumb" at tip; a second spine-like digit arises terminally, and three additional digituli arise from the dorso-distal aspect of the "thumb"; two shortish setae, also, arise from this terminal palpal joint. Legs relatively short; femur about 3 times as long as wide, almost two-thirds again as long as the tarsus; relative lengths of joints as follows: Trochanter, 10; femur, 25; patella, 12; tibia, 13; tarsus, 16. Tip of tarsus bearing a claw which is cleft for the greater part of its length into two divaricate, equal parts, which in profile are not strongly hooked; claw proper with no appendages. The four usual tenent hairs are present. Collar trachea extending downward and backward as a rather straight, even-calibered tube, then abruptly bent at nearly right angles into a very short, wider tube. Mandibular plate $2\frac{2}{3}$ as long as wide, sharply rounded anteriorly.

Male.—A series of measured males averaged 0.217 mm. in length. Penis with inner lobe rod-like, considerably longer than shaft; basilar lobe obtuse angled; shaft proximally thicker than inner lobe, and tapering rather abruptly distally; hook (with distal part of shaft) rather S-shaped, the shaft bent abruptly upward and again abruptly backward to form a pseudo-barb.

Type slide.—Cat. No. 961, U. S. N. M.

Common on the native grass *Epicampes rigens* Benth., commonly known as deer-grass, growing on the banks of the Kaweah River, near Lemon Cove, California. The leaf blades of this grass are very deeply fluted, and the mites live and feed in the interstices between the leaf ribs. (This habitat may account for the unusually long palpi which may have evolved through the need of reaching to the bottom of the leaf flutings; see Plate 2, fig. 9, A.)

Collected by the author.

PLATE 2.

Schizotetranychus fluvialis.

Fig. 1.—Tip of tarsus showing tarsal appendages (viewed laterally).

Fig. 2.—Tip of palpus with terminal appendages (viewed laterally).

- Fig. 3.—Tip of tarsus (viewed ventrally).
 Fig. 4.—Collar trachea (lateral view).
 Fig. 5.—Tip of tarsus (viewed latero-ventrally).
 Fig. 6.—Penis (ventral view).
 Fig. 7.—Lateral view of female, containing one mature ova (3 legs amputated; palpi well separated).
 Fig. 8.—Mandibular plate.
 Fig. 9.—Cross section of one-half of leaf blade of host plant ("A" shows diagrammatically position of mite when feeding).

**VESPULA REARS SUCCESSIVE BROODS IN THE SAME CELLS
 (HYMENOPTERA: VESPILAE).**

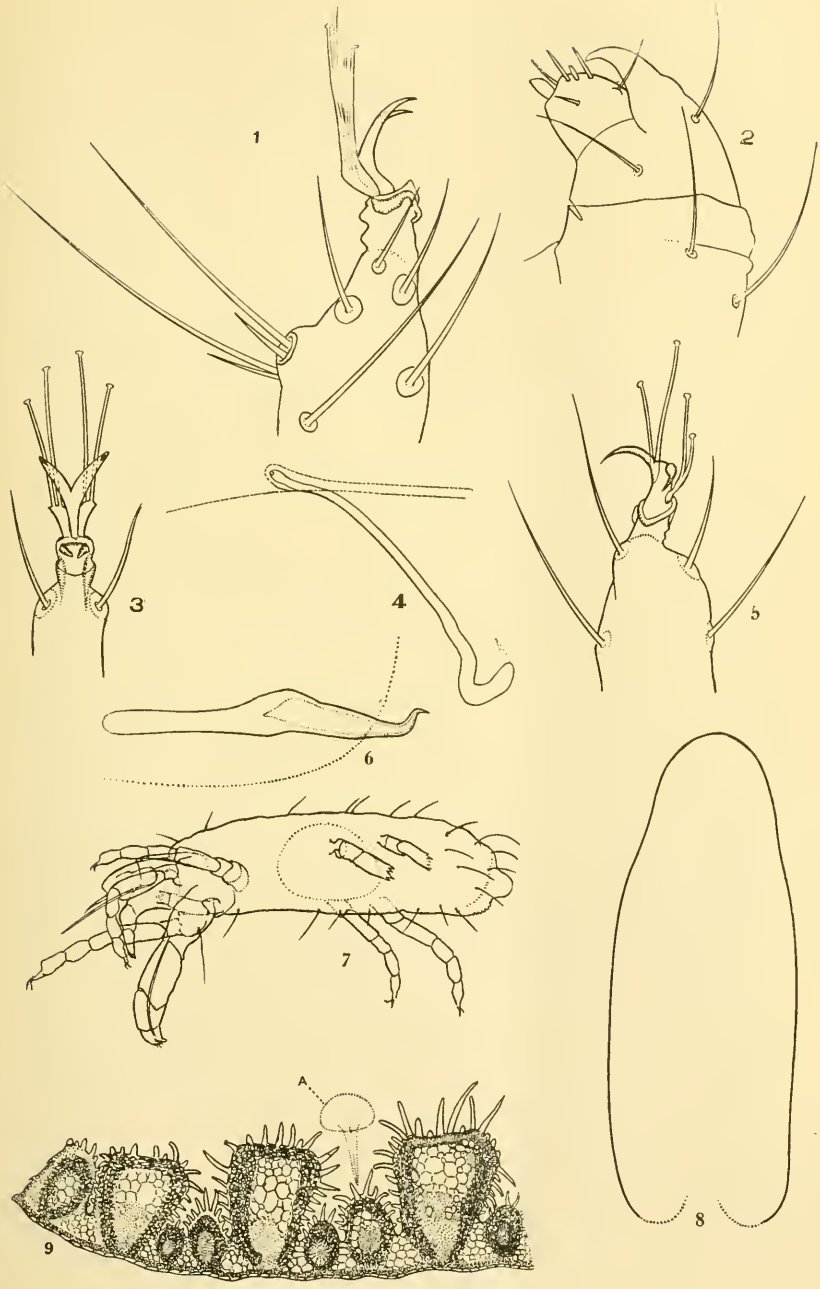
BY J. B. PARKER.

Some time ago I was asked whether the White-faced Hornet, *Vespula (Dolichovespula) maculata* (Linn.), rears more than a single young in the brood cells composing the paper combs within its nest. At the time I did not know and an inquiry seemed to show that no one had ever taken the trouble to find out. On November 11, 1926, I found a large nest of this species, and from it removed the combs, four in number, placed one above the other. In the lower combs were found several fully developed females, still alive but too weak to emerge. By taking the topmost comb, the one first constructed, and splitting the cells lengthwise with a section razor, I found the cells in the center of this comb had been used several times. Since each larva before transforming to the pupa spins about itself, within the cell, a tough silken cocoon, which remains in the cell after the adult has emerged, the number of these silken cocoons found in a cell indicated the number of larvae that have been reared in that cell. The greatest number found in any cell in this nest was five. Specimens of sectioned cells from this nest have been placed in the collection of the United States National Museum.

SUBGENERA OFTEN PREFERABLE TO GENERA.

BY W. L. McATEE.

It must be admitted that the normal conception of a genus under the binomial system of nomenclature is that of a group of species. The extreme generic splitter is working, even if unconsciously, toward a monomial nomenclature, the inexpediency of which needs no proving. If we are to remain binomial authors, the only type recognized by prevailing codes



MITES—MC GREGOR.

of nomenclature, we must adhere to the concept that as a rule genera are groups containing more than one species.

If the argument thus far is admitted, then it goes without saying that the establishment of genera for single species is, taxonomically speaking, contrary to public policy. Nevertheless in many cases among insects such action is justified by the very striking characters of a genotype but it should not be invoked in less conspicuous cases where the general habitus is that of an existing genus. In such cases one can well pass over variations in characters, even of those considered of great importance, in other cases. In entomological taxonomy seldom can criteria found valid in one group be applied in the analysis of another. If there is general agreement in characters and habitus, a single anomalous characteristic should not be used as a fulcrum to move the species from among its relatives.

A genus has been defined as a recognizable trend in evolution—a vague expression at best—and those attempting to apply it should remember that it is often more desirable to preserve the nomenclatorial ties with which we try to symbolize phyletic relationships than to sever them in attempting to recognize evolutionary trends.

In deciding upon the number of genera to be recognized, intergradation is the most useful criterion. If substantial inter-gradation exists either in the supposed generic characters or even by slightly shifting combinations of characters (and the world fauna should be taken into consideration), it is futile to force artificial separations, as they will not be maintained. It is not only futile but dangerous for taxonomy as it increases the risk of misidentifications.

A practical difficulty confronting one who in theory recognizes the validity of all that is said here is if he does not name obvious groups some one else will. He can, however, recognize them as subgenera, thus not disturbing practical nomenclature. By so doing he can protect his priority and establish vouchers for his acumen in research, while at the same time opposing both by precept and example the tendency to undue multiplication of genera.

There are taxonomists with whom perception of any group of species is at once followed by proposal of a generic name for it. Such systematists will not use subgeneric names saying they mean nothing. The retort to this process, of course, is reduction in rank by the next reviser of the names concerned. The lengthening series of synonyms we see in catalogues and revisions are clear evidence that the views of those who can not see the validity and practicability of the subordinate nomenclatorial categories are not likely to prevail.

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VOL. 30

FEBRUARY, 1928

No. 2

THE MAY BEETLES OF HAITI¹ (SCARABAEIDAE:
COLEOPTERA).

BY GEORGE N. WOLCOTT, *Port-au-Prince, Haiti.*

The agriculture of that island of the West Indies variously known as Saint Domingue, Santo Domingo, Hayti and Hispaniola, which is politically divided into the Republica Dominicana in the eastern two-thirds of its area, and the Republique d'Haiti in the remainder, is comparatively little affected by the attacks of white grubs or May beetles.

(3) This is in striking contrast to conditions in the near-by island of Porto Rico, where white grubs are the major insect pest of most agricultural crops. The common large May beetles of Porto Rico feed on the leaves of sugar-cane, and their larvae on its roots, and being thus independent of all other kinds of vegetation, are a most serious pest in the extensive cane fields of the "Isle of Enchantment." These large beetles, and other smaller species, also feed on the leaves of citrus trees and bananas, as well as on many other trees and plants, and their indiscriminating grubs attack the roots of all kinds of cultivated plants.

To one familiar with Porto Rican conditions, the usual complete absence of white grubs in Hispaniolan cane-fields that are being plowed, is most striking. In Haiti, sugar-cane is comparatively little grown, and in only a very few of the fields of the largest mill, Hasco, have grubs been found doing damage. From one of these grubs, collected in the summer of 1924, two Dexiid flies, *Ptilodexia harpasa* Walker, as determined by Dr. J. M. Aldrich, were reared.

At Cap-Haitien, in an extensive planting of pineapples,

¹In the preparation of this paper, the writer is greatly indebted to Mr. Andrew J. Mutchler, of the American Museum of Natural History, for having made copies of descriptions, or re-descriptions, of the four species of Phyllophaga recorded from Haiti; and in its revision, is under even greater obligations to Mr. S. A. Rohwer, of the U. S. National Museum, and to Mr. Barber, Dr. Morrison and Dr. Chapin, who critically examined the MS. in its original form, and to Dr. Guy A. K. Marshall, Director of the Imperial Bureau of Entomology, who confirmed their statements regarding the identity and distribution of these previously described species.—G. N. W.

partly in recently cleared land, injury by white grubs was reported, but more careful examination indicated that the grubs had caused little injury to the plants, being merely abundantly present in the soil, presumably feeding on humus or decaying vegetation remaining after the preliminary clearing. Even the largest grubs were of comparatively small size, and although they possessed the yellow heads that one thinks of as distinguishing Phyllophaga grubs, they could straighten out and crawl on a flat surface with ease, and upon being reared to adult proved to be the common Dynastid, *Cyclocephala notata* Illiger.

In the spring of 1927, the leaves of a large silk-cotton or kapok tree, *Ceiba pentandra*, near Port-au-Prince, were noted as being extensively eaten, presumably by May beetles, but on the nights when examinations were later made, no beetles were to be found. In June, complaints were received of May beetles stripping the leaves of apple trees and rose bushes at Kenscoff. The assistant sent to investigate, collected and destroyed thousands in a few nights, among which were six specimens that were larger than the others. Earlier in the spring, considerable numbers of two species of *Tiphia* wasps, which are parasitic on white grubs, had been collected on vegetation near Kenscoff, and this fall both species of wasps were even more abundant on the flowers of parsnip, *Pastinaca sativa* L. Later, the assistant attempted collection of May beetles in the Artibonite Plain, but reported no beetles to be found. The random and scattering nature of these notes well indicates the non-economic character of the Phyllophaga of Haiti.

Leng & Mutchler (2) record four species of *Phyllophaga* as occurring in Hispaniola: *fervida* Fabricius, *patruelis* Chevrolat, *hogardi* Blanchard and *neglecta* Blanchard.

The first of these records is undoubtedly erroneous, for concerning it, Dr. Marshall has written me: "It is by no means certain that *fervida* occurs there (in Hispaniola) at all. This species was described by Fabricius from North America, and is now included in the North American List. It is in the highest degree improbable that a North American species will be found in Haiti. As you know, Fabricius identified three different species under this name, and Burmeister's assumption that it applies to a tropical species can hardly be accepted in view of Fabricius' own statement that his original insect came from North America. In any case, Burmeister's statement that *fervida* came from both Jamaica and Haiti renders it probable that he himself had more than one species in front of him."

Regarding *patruelis*, Chevrolat (1) states: "Cette espèce habite Cuba, la Guadeloupe et Saint-Domingue, et varie de taille et

de couleur. Les individus de la dernière île sont petits, d'un testacé brillant, à prothorax d'un rougeâtre plus clair. La seule femelle de Cuba que je possède est double en grandeur des petits échantillons." The two Cuban specimens of *patruelis*, as determined by Mr. Fisher, which Dr. C. F. Stahl of the Tropical Plant Research Foundation Experiment Station at Baragua has sent me, have the pygidium almost impunctate, while in the Haitian specimens which correspond most closely to Chevrolat's description, it is closely, evenly and deeply punctate, to cite only the most obvious external structural differences between what are undoubtedly distinct species, despite their apparent similarity in color and texture.

This leaves but two valid species described from Haiti, and these are identified both by Mr. G. J. Arrow of the British Museum, and Dr. E. A. Chapin of the U. S. National Museum as the two common costal species. The two species from Kenscoff are larger than *hogardi*, while three species smaller than *neglecta* have been found at Port-au-Prince, two in considerable abundance. Descriptions of the five new species are here given, together with additional characters identifying *hogardi* and *neglecta*.

Despite their great difference in size (*kenscoffi* sp. nov. is five times as long as *minutissima* sp. nov.), in most of the more obvious external characters, the *Phyllophaga* of Haiti are surprisingly similar. Although differences can be noted, they can with difficulty be stated so that written descriptions are not to a large extent repetitions. Thus the plan of giving a single general description of the geographic group, with exceptions noted, followed by more particularized specific descriptions, is here adopted.

Type material of the species here described has been deposited in the National Museum, Washington, D. C., and duplicate material, if available, has also been sent to the British Museum and to the American Museum of Natural History, New York City. Of the commoner species, an abundance of the material obtained will be retained in the collection of the Department of Entomology, Service Technique, Port-au-Prince, Haiti.

PHYLLOPHAGA.

All Haitian species of *Phyllophaga*: oval, broadest behind, coarsely and closely punctate, most closely on head, glabrous, and except in the case of *mali*, *neglecta* and *latiungula* which have a plumbeous bloom, polished. Antennae 9-jointed, club elongate, but even in the male not as long as funiculus, except in *neglecta*, *minutissima* (and probably *latiungula*) in which the males have a longer club, the females a short broad club, scarcely half as long as funiculus. Clypeus feebly emarginate, margin reflexed, extending in front of

eyes. Pronotum (thorax) narrower in front, sides obtusely angulate, widest a little to the rear of the middle. Posterior third of sutural margins of elytra raised, squarely truncate at obtuse apex, except in *hogardi* which has the margins increasingly raised until they terminate in acute, outward-curving horns. Pygidium convex, closely punctate, posterior margin sharply reflexed and with a single row of hairs. Mesosternum densely punctate and hairy, the metasternum equally so, but the hairs less prominent, often darker and closely appressed mediad, except the smaller species which are the more nearly glabrous as they decrease in size. Anterior tibiae tri-dentate, a heavy spur on inside. Median tibiae squarely truncate, minutely serrate at apex, apical spurs sub-equal in length, the shorter being slightly broader. Posterior tibiae sub-triangular in median cross-section, with two short blunt spines on each upper margin subtending bristles, the single larger spine beneath with three bristles, the spines being decreasingly prominent in the smaller species, and almost disappearing in *minutissima*, except for the outer margin; squarely truncate and coarsely ciliate at apex, apical spurs broader in the female, upper spur one-third longer than lower. Tarsal claws curved, strongly toothed in middle, tooth nearer the base in the smaller species.

Phyllophaga kenscoffi, sp. nov.

Length 29-31 mm., width 14-16 mm., mahogany reddish-brown. Antennal club of male scarcely shorter than funiculus, that of female considerably shorter. Lateral margins of prothorax slightly reflexed, irregularly crenate in front, entire posteriorly. Humerus prominent, polished, impunctate, excavated beneath. Sutural costa prominent, scantily punctate, sub-marginal and two discal costae less distinct.

Genitalia of male with collar, or theca, open beneath, notched dorsally, most heavily chitinized about notch and on blunt teeth of lateral lobes; although somewhat narrowed and strongly deflexed above lobes, sub-equal in width, smoothly rounded and with gently curving margin. Median lobe consisting of three parts: (1) a lightly-chitinized, semi-cylindrical sheath beneath (2) heavily-chitinized, blunt-pointed, adnate armatures, which for over half their length are fused with (3) a slightly-curved, sharply-pointed spicule, which is greatly dilated and broadly rounded at base. (Fig. 1.)

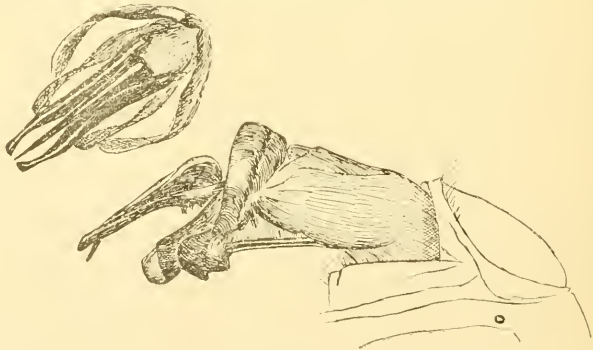


Fig. 1.

Of the female, the superior plates are fused, mostly membranous, their crescentric outer margins chitinized and hairy; the inferior plates are almost rectangular, confluent along median line, basal portions smooth, shining and heavily chitinized, apical portions thinner and somewhat wrinkled.

Described from two pairs (Haiti Acc. No. 129-27) collected July 7, 1927, at Kenscoff, Haiti (elevation 1,400 meters) by Emanuel Ducasse, on apple; an additional pair in the British Museum, deposited before this description was prepared. Type a male, with accompanying female, in the National Museum, Washington, the other pair in the American Museum of Natural History.

Type and allotype.—Cat. No. 40658 U. S. N. M. (also Haiti Acc. No. 129-27).

Phyllophaga mali, sp. nov.

Length 22-25 mm., width 11-12 mm., dull reddish-brown, elytra, and to a certain extent, the thorax, with plumbeous bloom, finely punctate, most closely on head. Antennal club of female somewhat shorter than that of male. Clypeus shining and polished. Anterior margin of thorax ciliate, lateral margins crenate, a single erect hair between teeth. Sutural and discal costae well marked, impunctate, sub-marginal costa hardly apparent. Pygidium somewhat wrinkled, scantily punctate, posterior margin reflexed and scantily ciliate.

Genitalia of male with collar, or theca, deeply notched dorsally, open beneath, sharply constricted laterally, forming broadly-rounded lobes dorsally, and bi-dentate and somewhat larger ones ventrally. The confluence of the inferior, semi-cylindrical sheath of the median lobe with the closely appressed armatures above the base is emphasized by heavy chitinization, the sharply-curved spicule is free except at base and at bi-dentate apex. (Fig. 2.)

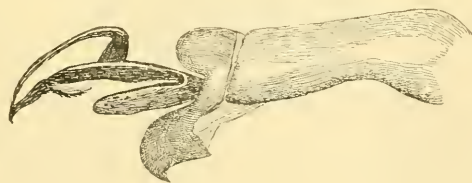


Fig. 2.

In the female, the superior plates are entirely fused, mostly membranous, chitinized in an evenly-curved, bi-lobed, outer margin, hairy at apices; the inferior plates are dull, uniformly colored, sub-quadrangular, longer than broad, with outer margins ante-apically recessed, outer margins straight, separated most broadly by membrane at apex.

Described from numerous specimens collected by Emanuel

Ducasse on apple and rose, during June and early July, 1927, at Kenscoff, Haiti (Haiti Acc. No. 200-27); type a male, accompanied by a female, in the National Museum, Washington, other pairs in the British Museum and the American Museum of Natural History.

Type and allotype.—Cat. No. 40659 U. S. N. M. (also Haiti Acc. No. 200-27).

***Phyllophaga hogardi* Blanchard.**

Re-description: Length 19-24 mm., width 10-12 mm., dark mahogany reddish-brown. Antennal clubs of male and female sub-equal. Sutural margin of elytra increasingly raised towards apex, *terminating in acute, outward-curving horns*. These horns are of such an obvious and distinctive character that it seems almost impossible that previous observers could have neglected to mention them.

In the genitalia of the male, the collar, or theca, is narrowed above, broadest laterally, narrowing abruptly to bi-dentate lobes. The apical tooth of each lobe is sharp and free, but the anterior teeth are rounded and connected by a smoothly-curving bridge that completely closes the collar below. The median lobe consists of an asymmetrical sheath, moderately chitinized, broadly recurved at apex, and on the right side partly covering a membranous portion which is greatly dilated and sharply truncated at apex, but folded and convoluted towards the middle. The median portion is densely covered with irregular rows of sharply pointed scales which also extend over three transversely-ridged, heavily chitinized, convex plates: the largest, an oval plate to the left and beneath, the second to the right and beneath, the smallest opposite the recurved apex of the sheath.

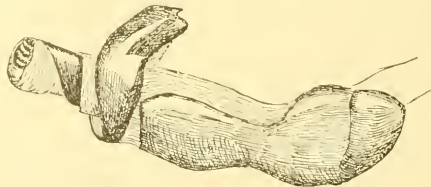


Fig. 3.

In the female, the superior plates are fused in a V-shaped fork, the rounded apices of the arms of which are hairy; the inferior plates are much larger, mostly membranous, but lightly chitinized towards the center, polished and ovate or sub-triangular.

Specimens collected February 13 to March 31, 1925, at light near Port-au-Prince, Haiti (Haiti Acc. No. 102-25), one specimen at light of automobile, May 21, 1925, north of St. Marc (Haiti Acc. No. 380-25), and two specimens at light near le Trou, June 4, 1927 (Haiti Acc. No. 183-27). Pairs deposited in the National Museum, Washington (Cat. No. 40660 U. S. N. M.), in the British Museum and in the American Museum

of Natural History. Additional fresh material first obtained in 1928 by André Audant at sunset, February 9th, one day after the beginning of the spring rains, in the Champ de Mars, Port-au-Prince; the females resting in closely-cut Bermuda grass, heads downwards, while the males flew circling about and descending to mate, all disappearing in the ground within quarter of an hour after the first observation.

Phyllophaga neglecta Blanchard.

Re-description: length 15-18 mm., width 7-9 mm., elytra dull yellowish brown, with plumbeous bloom, thorax more rufous, head darker; finely, evenly and only moderately densely punctate, more densely on head. Antennal club of male as long as funiculus, that of the female scarcely half as long. Lateral margins of thorax crenate and ciliate.

The genitalia of the male are somewhat similar to those of *mali*, which this species otherwise closely resembles structurally, although differing greatly in size and color. The median lobe differs in that the inferior portion, although somewhat depressed for the reception of the fused armatures, is laterally convex, heavily chitinized, and fully as long as the armature. The fused armatures are shorter than in *mali*, so that their recurved apices are exceeded by the free, curved, pointed tip of the spicule.

In the female, the chitinized, doubly-curved margin of the fused superior plates is hairy; the inferior plates are glabrous and polished, heavily chitinized, sub-quadrangular, with outer apical angles excised.

Common at light at Port-au-Prince during August and September, several specimens on March 21, 1925 (Haiti Acc. No. 245-25), one July 15. Specimens collected in September, 1927, bearing Haiti Acc. No. 245-25, deposited in the National Museum.

Phyllophaga audanti, sp. nov.

(This is undoubtedly the unnamed variety from Saint-Domingue which Chevrolat notes in his description of *Ancylonycha patruelis* from Cuba.)

Length 8-10 mm., width 4-5 mm., elytra polished yellowish-brown, coarsely and densely punctate, prothorax redder, its lateral margins entire and glabrous, head darker, somewhat more densely and fully as coarsely punctate as thorax, meso- and metasternum densely punctate, scantily hairy. Sutural costa of elytra distinct only towards middle, not a trace of discal or sub-marginal costae. Pygidium closely, evenly and densely punctate, contrasting with the very scanty and shallow punctation of the pygidium of *patruelis* Chevrolat of Cuba.

In the genitalia of the male, the collar, or theca, is open beneath, broader above, less than twice as long as broad, slightly constricted laterally before the bi-dentate lobes; median lobe largely membranous, the foot-shaped membrane being partly enclosed dorsally by a heavily-chitinized, semi-cylindrical plate, which bears on each of its outer lobed corners a single stiff hair. A

pair of stiff hairs on the dorsum of the membrane, which are crossed when it is not extruded. (Fig. 4.)

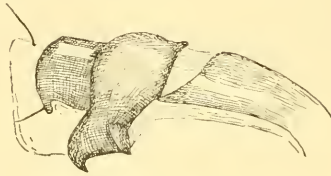


Fig. 4.

In the female, the superior plates are fused to form a V-shaped fork, of which the apices of the arms are hairy; the superior plates are ovate, shining and glabrous.

Described from an abundance of material collected at light at Port-au-Prince, Haiti, during February, March and April, and August and September (Haiti Acc. Nos. 84-24, 105-25, 8-26 and 252-27).

Type and allotype.—Cat. No. 40661 U. S. N. M. (also Haiti Acc. No. 252-27) in the National Museum, other pairs in the American Museum of Natural History and in the British Museum.

***Phyllophaga latiungula*, sp. nov.**

Length 8 mm., width 4 mm., dull yellowish-brown, head and thorax redder, glabrous and with a plumbeous bloom especially noticeable beneath, coarsely and closely punctate on head, scatteringly on thorax, evenly but scantily on elytra. Lateral margins of thorax entire and glabrous. Palpi and antennae light yellow, the antennal club about half as long as funiculus. Legs semi-transparent reddish-brown, apical spurs of median tibiae slender and of equal length, of posterior tibiae not so slender and sub-equal in length, tarsal claws widely spread, with two long bristles between.

Described from a single female collected at light at Hotel Mon Repos, Carrefour, Haiti (near Port-au-Prince), April 2, 1925 (Haiti Acc. No. 265-25). Type in National Museum, Washington.

Type.—Cat. No. 40662 U. S. N. M.

***Phyllophaga minutissima*, sp. nov.**

Length 6-7 mm., width 3-3.5 mm., clypeus mahogany brown, head darker, median portion of prothorax mahogany brown, laterally becoming yellowish-brown and semi-transparent, elytra semi-transparent yellowish brown, with pinkish-green iridescence of underwings showing through, becoming much darker and more opaque along margins, especially apically. Beneath, yellowish-brown, eyes black.

Antennae with a few coarse hairs, club longer than funiculus in male, about half as long in female. Lateral margins of thorax entire, scatteringly ciliate. Sutural costa well marked medially. Thorax beneath densely and coarsely punctate, scatteringly ciliate on prosternum, almost glabrous on meso- and metasternum. Median tooth of tarsal claws close to base.

In the genitalia of the male, the collar, or theca, is broadest laterally, more than twice as long as broad, constricted above, the superior tooth of the lateral lobes obtuse, the apical tooth large, sharp, heavily-chitinized and extended medially in a sharp declivent ridge; median lobe consisting of a somewhat chitinized, obliquely truncated, cylindrical sheath, surrounding a membranous lobe bearing three pairs of heavily-chitinized, recurved hooks. (Fig. 5.)



Fig. 5.

No freshly collected females available for examination of genital plates.

Described from an abundance of males and a few females collected at light at Port-au-Prince, Haiti, March 17 to May 5, and only males September 21 to 31, 1927 (Haiti Acc. Nos. 266-25 and 10-26). Type a male, with accompanying female, in National Museum, other pairs in American Museum of Natural History and in the British Museum.

Type and *allotype*.—Cat. No. 40663 U. S. N. M. (also Haiti Acc. No. 10-26, collected September, 1927).

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A REVIEW OF THE GENUS POLYPHYLLA (SCARABAEIDAE:
COLEOPTERA).By H. C. FALL, *Tyngsboro, Massachusetts.*

The Henshaw List, including supplements (1885-1895), following Horn's paper of 1881, credits the fauna of the United States with seven species of this genus. The Leng List, following Casey's Review of 1914, enumerates 32 species and 14 subspecies. The wide difference between the seven names considered sufficient by Drs. LeConte and Horn, and the forty-six deemed necessary to properly tag the "taxonomic units" of the Casey collection is not due, of course, in any large degree to the more thorough exploration of our territory in the intervening years, but is chiefly the result of a radically different conception as to what constitute specific characters.

Casey's 1914 paper is in all respects typical of his work of recent years. The descriptions are run in tabular form, a method used by him almost exclusively during the past twenty years or more, and one which after the first few broader subdivisions, becomes discouragingly difficult to use. In his *Polyphylla* paper, as is usual elsewhere with this author, more than half of the new names are based on uniques, and the assumed specific characters are frequently so trivial as to make it highly probable that they are either merely individual or at most racial in nature.

As indicated above, fourteen of the new names proposed by Casey are acknowledged by him to be subspecific, but this concession to what he calls "the present state of opinion in regard to the meaning of the word species" evidently goes against the grain, for he immediately expresses the belief that a study of the "complex genitalia" of these forms would prove many of them entitled to specific standing.

In this connection one is tempted to wonder why the author, instead of presuming the existence of such sexual differences, did not make a few dissections and test out his theory. This, however, so far as I know, is a kind of investigation which Casey never attempted. Had he done so in this instance he would have found the male genitalia to be of quite simple type, and, with few exceptions, almost as similar throughout as the traditional peas in a pod. This fact I have established by dissections in my own collection, and more recently Mr. Buchanan, at the National Museum, called my attention to a note in the *Jour. N. Y. Ent. Soc.*, Vol. 27, p. 248, in which Mr. Mutchler reports that after making some fifty dissections in the genus, "the result was not favorable to the retention of many names." As a matter of fact, the form of the male copulatory sheath in the *10-lineata* and *crinita* groups, which comprise the greater number of the forms described as new by

Casey, are so closely similar as to be scarcely distinguishable except for a little more evident sub-apical sinuation of the sides and a slightly broader apex in the latter. In *cavifrons*, the form varies but little from that in *crinita*, while in *hammondi* and *variolosa* it becomes progressively a little wider. In *occidentalis* the departure is most marked, the organ becoming notably broad and stout. Of *gracilis* I am unable to speak, having but a single male, which is in too fragile a condition to permit dissection.

In May of the present year (1927) I took to Washington, among other things, a series of *Polyphylla* for comparison with the types in the Casey collection. My investigation convinced me that a large proportion of the names which he proposed are based on characters of such trifling nature or so poorly substantiated as to be valueless and therefore quite superfluous. A small number of Casey's species are fairly certain to prove distinct; a few others may in time with the accession of more material be granted subspecific standing. My conclusions after going over the Casey material in connection with my own are as follows:

None of the so-called species or subspecies created at the expense of *hammondi* are valid: the small differences in vestiture, the terminal palpal joint, etc., are in no sense specific in nature. The foregoing remark applies also to *P. oklahomensis*, recently unwisely described from a unique female by Mr. Hatch.¹ The description contains absolutely nothing on which to base a reasonable hope of specific standing, and as the specimen was taken at a point intermediate between the type localities of *hammondi* and *subvittata* the chances are extremely slim that it differs in any essential from one of these, which are indeed only slight modifications (in vestiture) of a single species.

P. diffracta Csy. is a good species. *Austa* Csy. and *fuscula* Fall are synonyms of this. The error in the case of *fuscula* was due to an entirely different species in my collection, having been erroneously determined as *diffracta* by a high authority many years ago.

P. opposita Csy. I am uncertain as to the status of this species and am therefore letting it stand as placed by Casey. The small size, small antennal club, and broken elytral vittae suggest relationship with *diffracta*. It is represented by a single specimen said to be from Oregon, but Casey doubts the correctness of the locality.

P. crinita Lec. Under this species must be included, I think, the following names of Casey: *nigra*, *mystica*, *modulata*, *incolumis*, *relicta*, *robustula*. None of these seem to me to be worthy of retention, even in a subspecific sense. *Incolumis*

¹Oklahoma Acad. of Science VI (1926), p. 145.

is characterized by Casey chiefly on its shorter antennal club and smaller size, and *modulata* by the broader scales of the intervals between the elytral vittae, all of which characters are known to be unstable within specific limits. The length of the antennal club as a specific character is likely to prove unsatisfactory except, of course, where the disparity is very marked. Unfortunately the author nowhere indicates how his measurements have been made, whether along the curve of the lamellae, or in a straight line from base to tip. Again his statements are sometimes so vague as to be nearly valueless; for example, in the case of *crinita* he says the club is "large, nearly as in *modulata* and *10-lineata*." Turning to the description of *modulata*, the club is said to be "more than twice as long as the stem," but in *10-lineata* it is described as three to four times as long as the stem.

P. rugosipennis Csy. This species, which occurs throughout the mountainous parts of Southern California and northern and western Arizona, differs from *crinita* by its average smaller size, shorter (though variable) antennal club, shorter and less numerous erect hairs of the prothorax, and slightly but probably definitely different form of the copulatory sheath, which is here a little more sinuate on the sides with the apex slightly dilated, scarcely sinuate or dilated in *crinita* or *10-lineata*. Casey, in his table, places this species with those in which "the pronotum is without erect hairs except in some instances a few medially toward the apex." This is not true, all specimens in good condition showing the erect hairs more or less widely dispersed over the disk, and these are in fact detectable in Casey's unique type, which, however, is not in the best of condition. I refer here without much hesitation the species *laevicauda* of Casey which was foolishly described from a poor, dilapidated unique, without antennae or tarsi, and with no character to go on except the almost bare pygidium, which considering the condition of the specimen is probably denuded.

P. sobrina Csy. This is closely allied to the preceding species, but judging from the unique type and from six examples in my own collection it seems to differ constantly by its ferruginous brown color. The pronotum is virtually devoid of erect hairs except near the front margin, and the male genital organ has the lateral sinuation and apical dilatation a little more pronounced and is considerably less deeply divided medially than in *rugosipennis*. The type is from El Dorado County, California. My specimens bear labels El Dorado Co., Tahama Co., and Yosemite in California, and one example from Nevada, doubtless from the western part of the State.

P. arguta Csy. This is the first of the restricted *10-lineata* group, which latter is characterized by the entire lack of erect hairs on the pronotal disk, the long or relatively long antennal

club and the generally even and clear cut elytral vittae. In the present form the elytral vittae are less perfect than in those which follow, and in this respect it forms a transition from *rugosipennis* and *sobrina* to the more typical forms of the *10-lineata* group. The body in *arguta* is unusually narrow and cylindric, and the pygidium is clothed throughout with nearly uniform white appressed scales without intermixture of fine hairs. The male intromittent organ is indistinguishable from that in *10-lineata* if two males in my collection from Bakersfield, California, are the same as the unique Provo, Utah, type, which they appear to be, and it may well be doubted if *arguta* merits anything higher than subspecific standing.

In his description Casey says that in addition to the two normal apical teeth, the anterior tibia has on its outer edge a very short and acute vestigial tooth just beyond the middle of the length. Oddly enough one of my two males shows just such a vestigial tooth on the front tibiae, but in the other there is no trace of it. The presence in the male of this structure, which is normal in the female, must, I think, be fortuitous.

P. 10-lineata Say. This species, with small variations, is very widely distributed from the plains adjacent to the Rocky Mountains to the Pacific Coast. I have been quite unable to discover any characters that seemed to me specific in nature, and the genitalic structure so far as investigated is identical throughout. The Pacific Coast specimens are of average larger size, and if one wants to consider this as of subspecific import, the coast forms may be given subspecific standing under the oldest name—*pacifica*. My own inclination, however, is to merge all the following names of Casey under *10-lineata*: *parilis*, *laticauda*, *reducta*, *pacifica*, *squamotecta*, *ruficollis*, *castanea*, *oregona*, *perversa*.

P. matrona Csy. This was described from a single female from Oak Creek Canon, Arizona. Three examples in my own collection (2 ♂, 1 ♀) from the Chiricahua Mountains, Arizona, are, I think, the same thing. Their chief peculiarity consists in the entire lack of fine erect hairs on the head, these being always present in *10-lineata*, and for this reason I am tentatively holding the species to be distinct. The genitalia are not appreciably different from *10-lineata*.

Of the Atlantic Coast species, *variolosa*, *occidentalis* and *gracilis* are so distinct and well known as to need no discussion. *P. comes* Csy. is closely related to *variolosa*, differing only in its slightly stouter form and longer antennal club. Their genitalia are practically alike. *Comes* represents *variolosa* in the mountainous regions of North Carolina, Kentucky, and Tennessee; it perhaps should rank as no more than a subspecies of *variolosa*. In accordance with the foregoing notes I would arrange our species as follows:

1. *P. cavifrons* Lec.
2. *P. hammondi* Lec.
squamicauda Csy.
molesta Csy.
verecunda Csy.
oblita Csy.
impigra Csy.
subvittata Lec.
bisinuata Csy.
sejuncta Csy.
proba Csy.
diffusa Csy.
pimalis Csy.
oklahomensis Hatch.
3. *P. diffracta* Csy.
fuscula Fall.
adusta Csy.
4. *P. opposita* Csy.
5. *P. rugosipennis* Csy.
laevicauda Csy.
6. *P. sobrina* Csy.
7. *P. crinita* Lec.
nigra Csy.
mystica Csy.
modulata Csy.
incolumis Csy.
relicta Csy.
robustula Csy.
8. *P. arguta* Csy.
9. *P. speciosa* Csy.
acomana Csy.
latifrons Csy.
10. *P. 10-lineata* Say.
parilis Csy.
laticauda Csy.
reducta Csy.
pacifica Csy.
squamotecta Csy.
ruficollis Csy.
castanea Csy.
oregona Csy.
perversa Csy.
11. *P. matrona* Csy.
12. *P. occidentalis* L.
13. *P. variolosa* Hentz.
14. *P. comes* Csy.
15. *P. gracilis* Horn.

Key to the Species of Polyphylla.

1. Anterior tibiae tridentate in both sexes.....2
Anterior tibiae bidentate in the male (tridentate in type of *arguta*), tridentate in the female (bidentate in *occidentalis*).....3
Anterior tibiae unidentate in the male, bidentate in the female; size small, elytra not distinctly vittate (Florida).....*gracilis*
2. Antennal club but little longer than the head, prothorax relatively finely and densely punctate.....*cavifrons*
Antennal club much longer than the head, prothorax sparsely and more coarsely punctate.....*hammondi*
3. Prothorax with more or less numerous erect hairs on the disk.....4
Prothorax without erect hairs on the disk.....7
4. Antennal club of male small, not or but slightly longer than the head; elytral vittae very poorly defined or even subobsolete.....5
Antennal club generally much larger, though rather short in some examples of *rugosipennis*.....6
5. Elytral vestiture nearly unicolorous.....*diffracta*
Elytral vestiture bicolored, the scales of the vittae white, those of the intervals pale yellow.....*opposita*
6. Elytral vittae less perfect, their edges generally uneven and sometimes

quite ragged or even disintegrated; copulatory organ of the male sinuate on the sides before the slightly widened apex.

Black, thorax often more or less rufous, penis cleft for half its length.....*rugosipennis*

Brownish ferruginous, penis cleft for distinctly less than half its length.....*sobrina*

Elytral vittae even and regular, nearly as in *10-lineata*; copulatory organ of male tapering gradually from base to apex.....*crinita*

7. Form more narrow and cylindrical, elytral vittae somewhat uneven.....*arguta*

Form broader and less cylindrical, elytral vittae regular and clean cut (except *variolosa*).....8

8. Head with fine erect hairs in addition to the scaly vestiture.....9

Head devoid of erect hairs.....10

9. The short line of white scales behind the humeral umbo disconnectedly continued posteriorly; scales of pygidium broader, the erect hairs longer; size very large, color typically brownish castaneous, penis divided for less than half its length, the sides subparallel apically.....*speciosa*

The short line of white scales behind the humeral umbo not disconnectedly prolonged backward; pygidium with narrower lanceolate scales and shorter erect hairs; penis gradually narrowed from base to apex and divided for half its length.....*10-lineata*

10. Clypeal margin bisinuate, thoracic vestiture squamiform, elytra with regular sharply defined white vittae.....*matrona*

Clypeal margin arcuate, the lateral angles rounded; thoracic vestiture hair-like.....11

11. Elytra with white vittae.....*occidentalis*

Elytra with irregular blotches of whitish squamiform hairs, which sometimes show a partially linear arrangement.

Form narrower, antennal club of male not much longer than the head.....*variolosa*

Form broader, antennal club of male longer.....*comes*

TWO UNDESCRIBED APHELINID SCALE PARASITES FROM DELAWARE (APHELINIDAE: HYMENOPTERA).

By H. L. DOZIER, *Entomologist, Delaware Agricultural Experiment Station.*

As almost all of the coccid parasites are of more or less economic importance it is interesting to record the following two undescribed species. One of these is a primary parasite of a scale which is very injurious at times and the other represents an *Azotus*, a genus which is here reported for the first time from the New World, and whose members appear to be more tropical in distribution having been described from France, Spain, Africa and Australia.

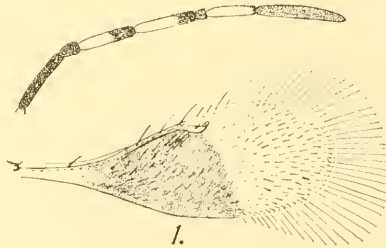
Azotus americanus, new species.

Nearest to *marchali* and *semifuscipennis* both of which have the forewings with infuscation from base to stigmal vein but differing distinctly in coloration of antennae and other details.

Male.—General color brownish-black. Antennae brownish, the basal half of funicle joints one and two and the entire fourth joint whitish. Legs brown except the knees and distal ends of tibiae which are whitish. Forewings hyaline, the basal half uniformly infuscated except just before the base.

Head as wide as thorax, eyes prominent. Antennae filiform, seven-jointed, there being no division of the club into two segments; scape long and rather slender, pedicel short, first and second funicle joints sub-equal in width and length and very slightly longer than the fourth; third funicle joint extremely short, about as broad as long; club composed of a single joint which is about twice as long as the last funicle joint. Marginal cilia of forewings rather long, distinctly longest along the outer, lower margin. Body and appendages appear distinctly reticulated under high power of microscope. All tarsi five-jointed.

Length .50 mm.; expanse, exclusive of cilia, 1.22 mm.; greatest width of forewings 0.18 mm.



AZOTUS AMERICANUS.

Fig. 1.—Antenna and forewing of male *Azotus americanus* Dozier, greatly enlarged.

Described from two males mounted separately on slides in balsam, reared by the writer from branches of *Sorbaria stellipila*, heavily infested with the San Jose scale, *Aspidiotus perniciosus* at Newark, Delaware, March 26, 1927. On these branches were also a few specimens of *Lepidosaphes ulmi* and *Lecanium corni* although most probably this parasite issued from the San Jose scale material. The last named scale produced large numbers of its primary parasite, *Prosaltella perniciosi* Tower, and it is possible that the *Azotus* may prove to be secondary upon this beneficial parasite.

Type No. 40785, United States National Museum.

Prospaltella forbesi, new species.

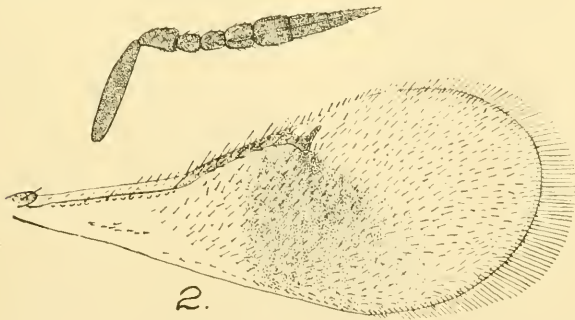
Belongs to the group of *Prospaltella* in which the last segment of the antennal club is decidedly pointed, including *murtfeldtii*, *maculata*, *fasciiventris* and *fuscipennis*. Nearest to *fuscipennis* Girault but differing at once by its lack of the prominent general silvery-white color of the latter and the different infuscation of the wings.

Female.—General color light brown, the whole abdomen dusky, the basal margins of its segments slightly lighter. Antennae a uniform light brown with exception of the extreme tip of last club segment which is slightly lighter. Forewings hyaline, with a broad cloud-like infuscation across the middle; this infuscation deepest just beneath the stigmal vein. Legs not as distinctly banded as in *murtfeldtii*, brown with basal and distal tips of tibiae pale.

Head wider than thorax, the latter distinctly and polygonally reticulated; mesonotum with a row of six setae running longitudinally each side of a light median longitudinal stripe, the apical pair more prominent than the others; there are three of these minute setae arranged along the upper portion and a larger seta placed farther down and near the outer margin on each side; scutellum with a prominent seta near the basal margin and another near the distal each side of the median longitudinal indication. Antennal scape longer than pedicel and first two funicle joints combined; pedicel wider and longer than first funicle joint; funicle joints increase gradually in length and width, the club tapering to a point; first club joint distinctly the largest and almost as long as the second, the apical joint the longest and tapered to a point. Forewings broad, well and uniformly covered with fine cilia except on extreme basal portion, the fringe rather short. Legs longitudinally reticulated. Ovipositor not protruding beyond tip of abdomen.

Length 1.18 mm.; expanse, exclusive of cilia, 1.75 mm.; greatest width of forewings 0.30 mm.

Male unknown.



PROSPALTELLA FORBESI.

Fig. 2.—Antenna and forewing of female *Prospaltella forbesi* Dozier, greatly enlarged.

Described from a single female mounted in balsam on slide, reared by the writer from the cherry scale, *Aspidiotus forbesi*, on bark of apple tree trunk at Camden, Delaware, April 24, 1926.

Type retained in author's collection.

PREOCCUPIED NAME IN HYMENOPTERA.

BY S. A. ROHWER, *U. S. Bureau of Entomology.*

Dr. Bradley has just called my attention to the fact that the name *propodealis* which I assigned to a species from the Philippines had previously been used by Saunders for a species which he described from Algeria in 1901. The following new name is proposed:

Scolia (*Scolia*) *luzonica*, n. n.

Scolia (*Scolia*) *propodealis* Rohwer, 1921, Phil. Journ. Sci., vol. 19, p. 83; not
Scolia (*Discolia*) *propodealis* Saunders, 1901, Trans. Ent. Soc. London, p. 536.

"BIOLOGICAL SPECIES" FROM THE STANDPOINT OF THE INSECT TAXONOMIST.

BY W. L. McATEE.

"Biological species" are defined as segregates that can be recognized only from knowledge of their life-history. The concept may be necessary in bacteriology where strains similar in appearance may be most certainly identified by their reactions to cultural processes, but even here, be it noted, the so differing forms are called strains, not species.

If for the sake of argument we admit that biological species may exist among insects, we would still assert that the suggestion that they should be recognized in insect taxonomy at this date very premature. If ever necessitated, such a movement should be one of the last refinements of taxonomy, and the study of a phylum like insects where the unknown so far exceeds the known, and where in almost every group we find a wealth of structural characters which as yet have been only comparatively little studied, the introduction of a concept, so recondite, as that of biological species, seems altogether untimely and inadvisable.

The greatest advance ever made in the classification of

animals was the replacing of the older natural historic or more arbitrary groupings by others based on structural relationships. It was then that the day when the whales were classed with the fishes passed into its twilight. The proposal to recognize "biological species" among insects, which in other words means giving great weight to habits, in a way is a return to the whalefish era of nomenclature.

The systematic entomologist must deal with material the bulk of which represents forms of unknown life history. He handles it with no thought as to details of biology, and should continue to so handle all that comes to him, by a uniform method of patient investigation of structure, comparison, and evaluation of the characters, and building from them an acceptable classification.

If biological considerations were given much weight, we should be in doubt as to the status of all species having a variety of food plants, of all parasites with more than one host, of all species having more than one brood annually and therefore possible seasonal forms, and finally of all those of unknown life-history, that is to say, of the majority. The concept of biological species would raise the question as to whether there can be more than one species of parasite of a given group upon the same host, or more than one species of plant louse, or other phytophagous segregate upon a single plant species.

Contrast these doubts with the confidence we have attained respecting species resting upon a structural basis. The San Jose scale, for example, lives upon many scores of food plants of the utmost diversity, it is not a different species on each; the bedbug is frequently an abundant inhabitant of poultry houses, it is the hemipteron most often received for determination from zoological gardens, and it will bite men of every creed and color, but it is a single species nevertheless; the housefly pervades almost all lands, but it remains the housefly. We are confident of these things because we rely upon the verifiable identities of structure and attach little importance to the shifting phases of biological detail.

The so-called "Biological species" may be the beginnings of structurally differentiated species, but until they actually enter this latter category they should not be taxonomically recognized. Knowledge of the biology of insects may in a small proportion of cases be a corrective to, or corroborative for, entomological classification, but for ages, if not for ever, it will be too scant and uncertain for practical every-day use. Classification must go on without it in most cases and can in all. In the house of insect taxonomy it must be the servant not the master.

JOHN HARTLEY DURRANT

1863-1928

Through the death at his home in Putney, near London, January 19th, of John Hartley Durrant, the Entomological world has lost a diligent and distinguished worker and his associates a genial and helpful friend.

Durrant's most active scientific period was from 1886 to 1914, during his association with the late Lord Walsingham at Merton Hall near Norfolk, England. As Lord Walsingham freely asserted, Durrant did the major part of the work on the many pretentious publications, bearing Lord Walsingham's name, such as the large volumes on the Microlepidoptera of the Hawaiian Islands and the excellent volume 4 of the *Biologia Centrali Americana*. His exceptional knowledge of the entomological literature made him especially authoritative on questions of nomenclature and he was Secretary of the British National Committee on Entomological Nomenclature from 1913 to 1924.

Durrant was a most painstaking and industrious student and he was liberal in helping others with his fund of information, even at very considerable sacrifice of labor and time. In the files of the U. S. Bureau of Entomology are numerous letters, many of them from 20 to 40 pages, filled with concise notes on hundreds of specimens submitted to him and Lord Walsingham for identification by American workers.

When the extensive Walsingham collection was transferred to the British Museum, Durrant followed it as Curator and continued his labors there until his death.

During the war he engaged in Red Cross work and his arduous labors there together with the untimely death of his young, only daughter, at this time apparently undermined his health and hastened his death.

His scientific work remains a permanent influence in Entomology and we cherish the memory of a genial and ever helpful friend.

A. B.

CORRECTION.

Volume 30, No. 1, Jan., 1928, page 14 (under plate 2, Fig. 6) "ventral" should be changed to "lateral."

Actual date of publication, March 24, 1928.

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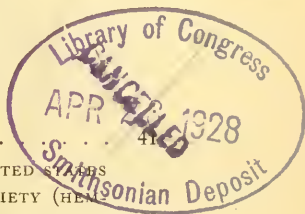
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PROCEEDINGS OF THE
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VOL. 30

MARCH, 1928

No. 3

SYNONYMIC NOTES ON DIPTERA.

By J. M. ALDRICH.

The following notes have accumulated in the course of work on the National Museum collection of Diptera. Some have been in manuscript several years and the revised nomenclature has been used in identification for others; hence it seems important that the explanation should be published.

Genus **ANACHAETOPSIS** Brauer and Bergenstamm.

Anachaetopsis Brauer and Bergenstamm, Zweifl. Kais. Mus., part 4, 1889, p. 106; part 6, 1893, p. 148.—Brauer, Verhandl. Zool.-Bot. Ges., 1893, p. 490.—Baer, Die Tachinen, 1921, pp. 82, 146.—Aldrich, Ent. News, 34, 1923, p. 53.—Stein, Archiv. f. Naturgesch., 90, Heft 6, 1924, p. 123.—Lundbeck, Dipt. Danica, 7, 1927, p. 366.

Tortriciophaga Townsend, Proc. U. S. N. M., 49, 1916, p. 625.

The type of the genus is *Tachina ocypterina* Zetterstedt of Europe, the only species originally included; that of *Tortriciophaga* is *Pseudomythyria tortricis* Coquillett, originally designated.

Anachaetopsis tortricis Coquillett.

Pseudomythyria tortricis Coquillett, Jour. N. Y. Ent. Soc. 3, 1895, p. 55.

Hypostena tortricis Coquillett, Revis. Tachin., 1897, p. 60.

Tachinophyto tortricis Brehme, Ent. News, 26, 1915, p. 473.—Greene, Proc. U. S. N. M., 60, art. 10, 1922, p. 11.

Anachaetopsis vagans Aldrich, Ent. News, 34, 1923, p. 54.

Hypostena columbia Curran, Canad. Ent., 57, 1925, p. 154.

I am indebted to Mr. Curran for pointing out to me the synonymy of my *vagans*, and also of his own *columbia*. The single type specimen of *tortricis* was from Southern California, bred from a supposed tortricid larva on *Solanum*. It has since proved to be a widespread form, and has been reared many times from larvae of Microlepidoptera.

Genus **BLAESOCHAETOPHORA** Czerny.

Blaesochaetophora Czerny, Wien. Ent. Zeit., 23, 1904, p. 206; Konowia, 6, 1927, 44, syn.

Camaterus Aldrich, Ins. Ins. Menst., 14, 1926, p. 97.

There is only one known species, which is the genotype of both genera. The type of Bigot was from Patagonia, mine from Chile.

Blaesochaetophora picticornis Bigot.

Leria picticornis Bigot, Miss. Scient. Cap Horn, 6, 1888, dv. 35.

Blaesochaetophora picticornis Czerny, Wien. Ent. Zeit., 23, 1904, 206.

Camaterus cichaeta Aldrich, Ins. Ins. Menst., 14, 1926, 98.

Genus **ARRHINOMYIA** Brauer and Bergenstamm.

Arrhinomyia Brauer and Bergenstamm, Zweifl. Kais. Mus., part 4, 1889, p. 105; part 6, 1893, pp. 151, 152.—Baer, Die Tachinen, 1921, p. 152.—Stein, Archiv. f. Naturgesch., 90, 1924, p. 144.—Lundbeck, Dipt. Dan., part 7, 1927, p. 364. Type *Tachina separata* Meigen (equals *Tachina luctuosa* Meigen), the sole original species.

Methypostena Townsend, Tax. Muscoid Flies, 1908, 67. Type designated, *Hypostena barbata* Coquillett (equals *luctuosa* Meigen).

Torynotachina Townsend, Ins. Ins. Menst., 3, 1915, p. 102. Type designated, *quinteri* new species.

Odonosoma Townsend, Proc. U. S. Nat. Mus., 49, 1916, p. 633. Type designated, *Celatoria spinosa* Coquillett (equals *luctuosa* Meigen).

In the preceding bibliography, Stein and Lundbeck do not include the type species *luctuosa* (or *separata*), and consequently there is doubt as to the correctness of their definition.

Arrhinomyia luctuosa Meigen.

Tachina luctuosa Meigen, Syst. Besch., 4, 1824, p. 186.

Tachina separata Meigen, Syst. Besch., 4, 1824, p. 406.

Hypostena medorina Schiner, Fauna Austr., 1, 1862, p. 538.

Arrhinomyia separata Brauer and Bergenstamm, Zweifl. Kais. Mus., part 4, 1889, p. 105; part 6, 1893, p. 152.—Baer, Die Tachinen, 1921, p. 152.

Hypostena barbata Coquillett, Jour. N. Y. Ent. Soc., 3, 1895, p. 57; Revision Tachin., 1897, p. 62.

Celatoria spinosa Coquillett, Revis. Tachin., 1897, p. 60.—Essig, Ins. West. N. A., 1926, p. 529.

Arrhinomyia barbata Cole, Ent. News, 34, 1923, p. 206.

Hypostena oelleti Curran, Canad. Ent., 57, 1925, p. 150.

The European synonymy is by Professor Bezzi, partly published in vol. 3 of the Palaearctic Catalogue; he afterward became convinced that *luctuosa* is the prior name for *separata*, and sent me specimens so labeled, besides mentioning the synonymy in a letter. He provided the National Museum with both sexes of *luctuosa*, from which I decided that our species is the same.

When Coquillett described *barbata* in 1895 he made some mistakes which he tried to correct in 1897. According to the

correction, the first paragraph of 1895 refers to two females, which he says really belong to *Hypostena vanderwulpi*. I readily found these specimens under *vanderwulpi* in the collection labeled "Los Angeles Co., Cal." They are really males with large orbital bristles, but they do belong to *vanderwulpi*. His second paragraph of 1895, to which he restricts the name *barbata* in 1897, he says are males, not females as indicated in 1895; these are from New Hampshire, and one is still in the National Museum collection. This is the type of *barbata* from the White Mountains. In his 1897 correction, he says the true female of *barbata* is what he described in 1895 (p. 58) as *Hypostena pusilla*, from Illinois and Southern California. The only one of the three original types now standing under the name *pusilla* is the one from Algonquin, Illinois. It does not belong to *barbata*, and Townsend has made it the genotype of the new genus *Opsomeigenia* (Proc. U. S. Nat. Mus., 56, 1919, p. 577). The specimens from Southern California have been lost to view, possibly placed under another species. I will not attempt at present to discuss this species further.

Coquillett made one more mistake, as he failed to note the minute orbital bristles in the male of his *barbata*, and described the same species again, this time with the correct female, as *Celatoria spinosa*. The type material was a male and three females from White Mountains, New Hampshire, and a male from Los Angeles Co., California. All of these are in the National Museum now.

To bring the comedy of errors to a climax, Townsend made a new genus for *barbata* and another for *spinosa*, as well as a third for a closely related species.

The male of *luctuosa* is a small, slender black fly, recognizable by the unique orbital bristles, which are hairlike and inconspicuous, and stand almost in the row with the frontals, from which they are distinguished mainly by being proclinate. The female is less elongate, and is easily distinguished by the ovipositor, which has the form of a flat, transverse scraper or hoe-like organ, usually rather prominent, and always visible enough to identify the species when it has once been recognized. Another female character is the presence of stubby spines on the ends of the second and third abdominal tergites where they come almost together on the venter; but the tips of the tergites turn in when the abdomen is collapsed after the deposition of the eggs, so in many specimens they can not be seen.

The National Museum has, besides the type specimens already cited, 15 specimens of both sexes from Mt. Holyoke Gap, Mass. (Townsend); one male Cranbrook, British Columbia (Garrett); one Woburn, Mass. (Townsend); one female Melrose Highlands, Mass. (Townsend); one male each from Summit Station, Mont., Mt. Moscow, Idaho, and Fairbanks, Alaska

(Aldrich); one male, Riverhead, New York (Huckett); one male, Battle Creek, Michigan (Aldrich); seven specimens of both sexes from the vicinity of Washington, D. C. (McAtee, Shannon, Townsend); one female from Georgia; one female, Palm Springs, California; one female, Mt. Holly, Pennsylvania; two females and a male from Hell Canyon, New Mexico (Townsend). Three males and a female from Federal District, Mexico may be a distinct species.

Arrhinomyia quinteri Townsend appears to be distinct, a somewhat larger species; except for the straightness of the last section of the fourth vein, the characters given by Townsend to distinguish his genus and species occur in *luctuosa* as well as *quinteri*. I have had great difficulty in deciding whether *quinteri* is a valid species, but the second abdominal tergite has no stubby spines at the ends of the venter, so the species should stand at least until more material has been studied.

Genus **EUPOGONA** Rondani.

Eipogona Rondani, Atti Soc. Ent. Ital., II, 1868, p. 588. Type, *Masicera setifacies* Rondani, sole species.—Curran, Bull. Brooklyn Ent. Soc., 22, 1927, p. 148.

Eupogona Brauer and Bergenstamm, Zweifl. Kais. Mus., part 4, 1889, p. 88; part 6, 1893, p. 112.—Bezzi, Palaeart. Kat., vol. 3, p. 261.

Eupogona obscura Coquillett.

Winthemia obscura Coquillett, Revis. Tachin., 1897, p. 124.

Blepharipeza pollinosa Reinhard, Annals Ent. Soc. Amer., 14, 1921 (1922), p. 333, pl. 28, figs. 7, 8.

Eipogona americana Curran, Bull. Brooklyn Ent. Soc., 22, 1927, p. 148.

The synonymy is from Coquillett's type, compared with a paratype from Reinhard and one from Curran. Curran's material was reared from *Papilio asterias* at Sioux City, Iowa. A male in the National Museum was reared from *Papilio polyxenes* at Nantucket, Massachusetts, by R. T. Webber. The European genotype *setifacies* was also reared from a *Papilio*; a specimen of this fly is in the National Museum, which shows that Mr. Curran was correct in placing our species in the genus. I follow the emended spelling, as the original seems an obvious misprint.

Genus **PLECTOPS** Coquillett.

Plectops Coquillett, Revis. Tachin., 1897, p. 57. Type and sole species, *melisopodis*, new.

Goliathocera Townsend, Proc. Biol. Soc. Wash., 28, 1915, p. 21. No description, type designated, *Clausicella antennalis* Coquillett (equals *Lophosia setigera* Thomson).

Lophosiocera Townsend, Proc. U. S. Nat. Mus., 49, 1916, p. 623. Type designated, *curriei*, new.

Phylacteropoda Townsend, ibidem, type designated, *Clausicella tarsalis* Coquillett.

Besides the genotypes mentioned, *Plectops* contains *pruinosa* Malloch (Proc. Ent. Soc. Wash., 29, 1927, p. 91). I also refer here *Hypostena aenea* Coquillett (Jour. N. Y. Ent. Soc., 3, 1895, p. 57; Revis. Tachin., 1897, p. 62). In the single female type, the penultimate joint of the arista is really elongated, but its junction with the last joint is so smooth as to be imperceptible except under a high power. The Museum contains a second specimen from Koehler, New Mexico, collected by W. R. Walton.

Genera allied to **GYMNOCHAETA.**

In my paper on the metallic green genera allied to *Gymnochaeta* (Ins. Ins. Menst., 14, 1926, pp. 51-58), there is an error in the key, as the item about the large pteropleural bristle is in the wrong couplet. Lundbeck has noted this in his Dipt. Danica, part 7, 1927, p. 415. On reexamining the material it appeared that a different grouping of the characters would be better, hence I offer the following improved key, adding the genus *Eucomus* Aldrich (Proc. U. S. Nat. Mus., 69, art. 22, 1926, p. 22; type *strictus*, new, from China).

Key to Metallic Green Genera allied to *Gymnochaeta*.

- 1. Parafacials with long pile.....*Eucomus* Aldrich
Parafacials bare.....2
- 2. Third and fourth sternites with heavy, blunt spines; pteropleural large; posterior dorsocentrals four, sternopleurals two; front prominent, nearly parallel with lower edge of head (type *fuscipennis*, new, equals *Gymnochaeta immsi* Tothill).....*Scologaster* Aldrich
Abdominal sternites without blunt spines.....3
- 3. Posterior dorsocentrals four; bend of fourth vein with long appendage; back of head shining, somewhat bulging, with several rows of black hairs and only a small ruff of pale ones.....*Gymnochaeta* Robineau Desvoidy
Posterior dorsocentrals three; back of head pollinose, more flattened, with not more than one row of black hairs behind the orbital cilia above, the ruff of pale hairs more dense and conspicuous; fourth vein without appendage or at most a mere trace.....4
- 4. Pteropleural bristle of striking size, larger than the hind sternopleural; epistoma not very prominent.....*Chrysotachina* Brauer and Bergenstamm
Pteropleural bristle smaller than hind sternopleural; epistoma strikingly prominent.....*Chrysosomopsis* Townsend

In this connection I should note another synonym under *Gymnochaeta*, which is *Parachrysosoma* Becker, Nova Acta, 104, 1918, p. 142. It was proposed to take the place of *Chrysosoma* Macquart, preoccupied. This item was kindly furnished me by Professor Bezzi in 1926.

A NEW BICOLORED SPECIES OF MEGARIS
(PENTATOMIDAE).

By W. L. McATEE AND J. R. MALLOCH.

A specimen received since our synopsis¹ of Megaridinae was in press is the second bicolored species of the group known; it is herewith described.

Megarisa biguttata, new species.

Runs to caption 3 of our key; it is a bicolored species which differs from *M. trinotata* Dist. in size, color, and structural details.

Piceous, scutellum with a discal pair of obliquely elliptical pale orange spots, separated by an area of the ground color somewhat wider than either spot; legs, antennae and beak castaneous. The pronotum of holotype is damaged, but apparently there was no color spot, at least not one similar in size and position to that of *trinotata*.

Front margin of head truncate medially, then sinuate to eye, vertex with scattered coarse punctures, fewer posteriorly than anteriorly; pronotum rather numerous punctate except for callosities, and an area paralleling posterior margin, punctures somewhat finer discally than laterally; scutellum in profile slightly elevated from anterior margin to middle then quite suddenly descending almost vertically to hind margin, copiously punctate around sides, the punctures coarsest near antero-lateral angles, anterior disk with finer punctures, the color spots impunctate; clavus indistinctly gashed-punctate; corium with one row of large, deep punctures; propleurum less than half as densely punctate as meso- and meta-pleura; sternites punctate along incisures. Length, 2.25 mm.; width, 2 mm.

Holotype, male, Brazil, Signoret Collection (Vienna Museum).

This specimen is labelled "*biguttatus* det. Signoret," but so far as we know this is a ms. name.

NEW SPECIES OF LEPIDOPTERA IN THE UNITED STATES
NATIONAL MUSEUM.

By W. SCHAUS, Bureau of Entomology, U. S. Department of Agriculture.

RHOPALOCERA.

PAPILIONIDAE.

Papilio belus camposia, new subspecies.

Male.—Body black, the abdomen dorsally white. Fore wing black suffused with blackish green except a streak in cell and interspaces adjoining cell. Hind wing, including fold along inner margin, silky blackish green; a small patch of

¹Proc. U. S. Nat. Mus., 72, Art. 25, pp. 4-11. Pl. 1. Feb., 1927.

white scaling on costa just beyond middle; a greenish white subterminal small oval spot above vein 6; cilia on interspaces white. Underside as in *P. belus* Cramer.

Expanse 92 mm.

Habitat.—Baños, Ecuador.

Type.—Cat. No. 33452, U. S. N. M.

Named in honor of Prof. F. Campos.

NYMPHALIDAE.

MORPHINAE.

Morpho cora, new species.

Male.—Wings of the same blue as *M. adonis* Cramer. The white spots on costa of fore wing as large as those of *M. uraneis* Bates. Underside with the intermediate white bands broader, especially the post-medial which reaches the subterminal dark band.

Expanse 113 mm.

Habitat.—Peru.

Type.—Cat. No. 33453, U. S. N. M.

A cotype in collection of Mr. F. Johnson.

Named in honor of Cora, wife of Mr. Frank Johnson, who presented the specimen to the National Museum.

RIODINIDAE.

Hermathena dativa, new species.

Female.—Body mostly white, showing a black background on thorax and abdomen dorsally; light buff tufts laterally on metathorax. Wings white, the base narrowly dark mouse gray irrorated with pearl gray and with subbasal white spots in and below cell of fore wing and on costa and below median of hind wing. Fore wing: a black point beyond cell between veins 4 and 5; a thick black subterminal line cut by veins from below costa to vein 5, also spots above and below vein 3; similar black lines terminally and on cilia at apex, from vein 6 to vein 4, and from above vein 3 to vein 2. Hind wing: two subterminal black spots below costa; terminal black spots at tips of veins extending on cilia. Underside similar, but without the basal markings.

Expanse 40 mm.

Habitat.—Volcan Sta. Maria, Guatemala, at 7,000 feet.

Type.—Cat. No. 33455, U. S. N. M.

A single specimen taken at 7,000 feet, settling under leaves

of a tree beyond reach; after an hour's wait was induced to fly lower.

Sarota estrada, new species.

Male.—Head and thorax black. Abdomen fuscous above, grayish underneath. Wings above fuscous somewhat mottled terminally with dark grayish. Wings below light purplish gray; subterminal metallic blue scaling on interspaces, outwardly edged with short black streaks and more broadly with coral red, the marginal line coral red outwardly edged by a fine black line; cilia yellow ocher; postmedial black spots on interspaces edged with coral red. Fore wing: coral red bands across cell and discocellular, separated by metallic blue, partly spotted with black; two similar spots below cell. Hind wing: coral red spots containing black streaks and separated by metallic blue antemedially and medially from costa to inner margin.

Expanse 23–26 mm.

Habitat.—Cayuga, Guatemala and Guatemala City.

Type.—Cat. No. 33460, U. S. N. M.

Four specimens in collection.

Panara brevilinea, new species.

Male.—Body and wings velvety blue-black. Fore wing: a scarlet fascia beyond middle from above vein 2 to inner margin, rounded in front, expanding to inner margin. Hind wing: a similar scarlet fascia from below costa to below vein 2. Wings below blue-black; an elongated orange buff spot on inner margin of fore wing postmedially.

Expanse 29 mm.

Habitat.—Chanchamayo, Peru.

Type.—Cat. No. 33459, U. S. N. M.

Two males in collection.

Chalodeta speusippa, new species.

Female.—Body and wings snuff brown, the lines fuscous. Fore wing: sub-basal and antemedial lines in and below cell; a medial line on discocellular; postmedial line wavy, from below costa to vein 3, inset from vein 3 to vein 1; a subterminal wavy silver line outwardly edged with fuscous at middle of interspaces; cilia white at middle of interspaces. Hind wing with the lines similar, the white on cilia reduced. Wings below drab, the lines black, interrupted; a subterminal darker shade and marginal black points on interspaces; no silvery line.

Expanse 25 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 33458, U. S. N. M.

Described from four specimens.

Xenandra desora, new species.

Male.—Body entirely black. Fore wing dark bluish-black, the veins black, but not prominently so; a scarlet elongated spot on inner margin from near base to middle. Hind wing: a large scarlet spot from base to middle of wing, not quite so broad on inner margin, the outer edge rounded from costa at one-third from base and upbent near inner margin; termen broadly black. Wings below black, the terminal interspaces green-blue slate color; spot on inner margin of fore wing orange buff, the basal spot of hind wing orange buff partly suffused with flame scarlet.

Expanse 30 mm.

Habitat.—Colombia.

Type.—Cat. No. 33462, U. S. N. M.

Emesis cronina, new species.

Male.—Wings orange cinnamon with short silvery lines. Fore wing: costa bulging at base as in *E. emesia* Hewitson; costa thickly striated with deep olive; subbasal, antemedial and medial lines in and below cell, the medial lines partly broken; a line on discocellular; postmedial lines on interspaces oblique and placed in an outcurved position beyond cell; an outer series of lines parallel with termen; subterminal small black spots on interspaces. Hind wing: the lines placed as on fore wing. Wings below cinnamon buff, the lines sepia, a few edged with silver, those on discocellulars entirely silver.

Expanse 23 mm.

Habitat.—Sapucay, Paraguay.

Type.—Cat. No. 33456, U. S. N. M.

Three males and two females in the collection.

The smallest species of the group with silver lines.

Emesis vimena, new species.

Female.—Costa sinuous. Body mikado brown. Wings dark vinaceous, the lines black, fine; apical third of costa dark orange cinnamon, also the basal third of wing; a subbasal line in cell, and a short inset line below cell; antemedial and medial lines in and below cell, parallel; a line on discocellular; an outcurved postmedial lunular line; traces of a darker outer line; subterminal fuscous points on interspaces; a brighter orange cinnamon patch on costa beyond postmedial line; cilia orange cinnamon. Hind wing dark vinaceous, the lines as on fore wing; orange cinnamon spots at base; termen narrowly dark orange cinnamon. Wings below zinc orange, the lines sepia, all interrupted, the postmedial forming oblique streaks on interspaces; the outer line and subterminal points more distinct. A male and two females have the termen of fore wing dark orange cinnamon and similar shading between the postmedial and outer lines.

Expanse, male, 25 mm.; female, 28 mm.

Habitat.—Cayuga, Guatemala; Bugaba, Panama.

Type.—Cat. No. 33457, U. S. N. M.

Stalachtis trangeri, new species.

Female.—Body above black; a lateral orange spot at and below shoulder; a sublateral orange line on abdomen edged with black and again with white above; a white streak ventrally. Wings hyaline with a faint bluish tinge, the veins finely black. Fore wing: a broad marginal orange band from just above vein 6 to tornus edged with black, the inner edge irregular owing to a broad black fascia from costa oblique to marginal band between veins 3 and 4; a narrower black line from base of vein 4 to inner margin; costa, apex and inner margin to above vein 1 black. Hind wing: an evenly curved marginal orange band edged with black; costal margin black. Wings below similar, but an orange streak on basal half of costa.

Expanse 40 mm.

Habitat.—Colombia.

Type.—Cat. No. 33461, U. S. N. M.

Named for Mr. Tranger, from whom the specimen was received.

The species comes nearest to *S. phaloe* Staudinger.

HETEROCERA.

AMATIDAE.

Trichaeta boguimil, new species.

Male.—Antenna fuscous tipped with cadmium yellow. Head and thorax fuscous; tegulae cadmium yellow except tips; a yellow spot on metathorax. Abdomen above and below cadmium yellow crossed by six fuscous bands; anal segment fuscous. Legs fuscous, white streaks on fore legs below. Fore wing fuscous, the markings cadmium yellow; an antemedial small spot in cell and larger quadrate spot in end of cell; a streak below cell from near base to below vein 2 postmedially; some yellow scaling along base of inner margin; an outer spot from vein 3 and stalk of veins 4 and 5, extending into base of 4 and 5; a spot between veins 6 and 7. Hind wing fuscous; some yellow at base of inner margin. Fore wing below as above. Hind wing below fuscous; a yellow streak from base below cell to inner margin, not extending beyond end of cell; a yellow spot at cell between veins 2 and 5.

Expanse 19 mm.

Habitat.—Casiguran, Luzon, Philippine Islands.

Type.—Cat. No. 33469, U. S. N. M.

Trichaeta democedes, new species.

Male.—Head and thorax fuscous; frons and tegulae except tips apricot yellow; a yellow spot on metathorax. Abdomen above apricot yellow crossed by five black lines; anal segment fuscous; underneath and legs fuscous. Fore wing fuscous, the markings apricot yellow; an antemedial small spot in cell, and a larger round spot in end of cell; a broad streak between median and vein 1 from near base to below vein 2; a large spot beyond cell from vein 3 to vein 7.

Hind wing apricot yellow, the costal margin to median, apex and termen to anal angle fuscous; some fuscous scaling on vein 2. Wings below similar but the yellow on hind wing upbent postmedially to close to costal edge.

Expanse 23 mm.

Habitat.—Batuan, Philippine Islands.

Type.—Cat. No. 33468, U. S. N. M.

***Amata democles*, new species.**

Male.—Body above purplish black; palpi buffy brown; frons cream white; femora and base of tarsi streaked with white; legs benzo brown; collar and streak on tegulae orange; an orange buff spot on metathorax; abdomen crossed by seven narrow orange lines; abdomen below white partly crossed by black lines. Wings purplish black, the markings orange. Fore wing: a wedge-shaped spot in end of cell; an almost quadrate spot below cell near base followed by a black bar and an oblong spot, downbent on its upper edge; elongated spots between veins 3 and 5, and one between veins 6 and 7. Hind wing: a long spot from base below cell before inner margin; a large spot beyond cell between veins 2 and 5. Wings below with the spots all larger, sometimes partly confluent on hind wing.

Expanse 26 mm.

Habitat.—Catbalogan and Surigao, Philippine Islands.

Type.—Cat. No. 33472, U. S. N. M.

Allied to *A. xanthostidsa* Hampson.

***Amata democharis*, new species.**

Male.—Head black; frons buff yellow. Collar mostly cadmium yellow; a spot on tegulae and transverse spot on metathorax cadmium yellow. Abdomen black with transverse dorsal and sublateral cadmium yellow lines. Wings purplish black, the markings cadmium yellow. Fore wing: a triangular spot at base below cell limited by a black bar and followed by a nearly quadrate spot, oblique above, the angle touching an almost quadrate spot in end of cell; a large spot beyond cell from vein 3 to vein 7, its outer edge somewhat rounded. Hind wing: a large spot at base below cell to close to inner margin and anal angle limited by a black bar slightly broken at lower angle of cell; a large spot beyond cell between veins 2 and 6. Underside of hind wing with the outer spot almost reaching costa proximally. Some specimens have the bars below broken, the yellow at base reaching costa, and the abdomen below with faint whitish transverse lines.

Expanse 28–31 mm.

Habitat.—Surigao (type specimen) and Luzon, Philippine Islands.

Type.—Cat. No. 33473, U. S. N. M.

Allied to *A. pactolina* Walker.

***Amata dapontes*, new species.**

Male.—Head and thorax black; neck behind, two spots on collar, a small spot on shoulders capucine yellow; a large yellow spot on metathorax. Abdomen fuscous black; six transverse capucine yellow lines on dorsum, the basal line broader; faint yellowish lateral points; yellow scaling at sides of pectus and base of abdomen; throat at fore femora baryta yellow; legs drab inwardly streaked with whitish. Wings dull violet black, markings capucine yellow. Fore wing: an antemedial round spot below cell; an almost quadrate spot in end of cell, and a medial oblique spot below cell; a large postmedial spot from vein 3 to vein 7, the outer edge slightly indentate between veins 5 and 6. Hind wing: a small spot below cell near base and another beyond lower angle of cell; termen upcurved over margin of wing. Wings below as above; the outer spot on hind wing slightly larger.

Expanse 24 mm.

Habitat.—Virac, Luzon, Philippine Islands.

Type.—Cat. No. 33470, U. S. N. M.

***Amata artapha*, new species.**

Male.—Body dull violet black. Frons cream white; tegulae in front and a large spot on metathorax cream white; abdomen encircled by seven cream colored lines; throat, lateral spots on pectus and lines on femora cream white. Wings benzo brown with hyaline spots. Fore wing: a wedge-shaped spot filling outer half of cell; a smaller wedge-shaped spot at base below cell, limited by a transverse bar followed by a small almost quadrate spot; an elongated spot beyond cell between veins 6 and 7; light gray dusting below costal edge on basal half, and cream yellow scaling above subcostal; a white point at base of cell. Hind wing: a large triangular spot from base below cell and smaller spots near cell between veins 2 and 5. Wings below slightly paler.

Female.—Frons, vertex, and collar cream color; a large spot on mesothorax, one on metathorax, and tegulae except tips cream color; neck behind, and thorax partly fuscous. Abdomen cream color encircled by fuscous lines. Wings paler than in the male, almost light cinnamon-drab, the hyaline spots slightly yellowish.

Expanse, male, 29 mm.; female, 34 mm.

Habitat.—Surigao, Mindanao, Philippine Islands.

Type.—Cat. No. 33471, U. S. N. M.

Somewhat like *A. extensa* Walker.

Three males and four females in collection.

***Amata eleonora*, new species.**

Male.—Antenna fuscous. Body fuscous; frons, vertex in front, tegulae, and a large spot on metathorax white; abdomen encircled by six narrow white bands; a large cream white dorsal spot on basal segment; throat and streaks on fore femora white, the legs dusky drab. Wings thinly scaled, semihyaline, Naples yellow, the veins rather broadly, termen narrowly and cilia fuscous.

Fore wing: a small antemedial fuscous spot below cell. Discocellular more heavily marked than veins on both wings.

Expanse 27 mm.

Habitat.—Surigao, Philippine Islands.

Type.—Cat. No. 33474, U. S. N. M.

Three specimens in the National Museum.

Allied to *A. elwesi* Rothschild.

***Amata subaana*, new species.**

Male.—Antenna black tipped with white. Body orange; thorax in front and laterally black; abdomen encircled by six fine black lines, the second line from base broader; throat orange; legs dusky drab. Wings hay's brown suffused with dull Indian purple, the markings semihyaline irrorated with deep mouse gray, also partly suffused with indian purple. Fore wing: an elongated spot at base below cell, partly orange; a wedge-shaped spot in outer half of cell; an oblique spot from below middle of cell to near tornus; elongated spots above veins 3 and 4, and above vein 6; cilia partly black. Hind wing: an orange spot at base from cell to inner margin; a faint small spot above vein 2 at cell. Wings below with all the markings irrorated with buff yellow.

Expanse 23 mm.

Habitat.—Subaan, Philippine Islands.

Type.—Cat. No. 33475, U. S. N. M.

***Amata banguia*, new species.**

Male.—Body fuscous black; frons, neck, a spot on metathorax, and seven lines encircling abdomen white; legs deep mouse gray. Wings black, the markings hyaline white. Fore wing: a wedge-shaped spot at base below cell, and a similar spot in outer half of cell; an oblique spot from below middle of cell not reaching tornus; elongated spots above veins 3 and 4, and a longer spot above vein 6. Hind wing: a long spot from base below cell along inner margin; a round spot between veins 3 and 5. Wings below duller, the spots as above.

Expanse 18 mm.

Habitat.—Bangui, Philippine Islands.

Type.—Cat. No. 33476, U. S. N. M.

MIDARA, new genus.

Antenna minutely serrate. Palpi short, porrect, hairy, the third joint blunt. Hind tibiae with short spurs. Fore wing: veins 2 and 3 from well before lower angle; 4 and 5 from angle; 6 from near upper angle; 7, 8, 9, 10, 11 stalked. Hind wing: veins 2 and 3 close together well before angle; 4 and 5 from angle; 6 absent.

Type.—*M. bengueti*.

Midara bengueta, new species.

Male.—Antenna black with white tip. Body black; frons, some hairs at base of antenna, neck, a large dorsal spot at base of abdomen, and six lines encircling abdomen, cream white; legs hair brown. Wings fuscous black. Fore wing: cell except at base, space below cell from base to near termen, spots between veins 3 and 5 at cell, and an elongated spot above vein 6 hyaline white, the last three outwardly irrorated with whitish yellow; the discocellular black edged with black in cell; a white spot at base of cell; a semihyaline streak below costal edge to above discocellular. Hind wing: a long spot in cell; a large spot from base below cell and at inner margin to near termen; a large spot from vein 3 to vein 5.

Expanse 24 mm.

Habitat.—Baguio, Province of Benguet, Philippine Islands.

Type.—Cat. No. 33477, U. S. N. M.

Four specimens in the National Museum.

Midara balbalasanga, new species.

Male.—Body fuscous black; frons, neck laterally, two spots on collar, metathorax laterally and tegulae partly, cream white. Abdomen: a dorsal spot at base and seven encircling cream white lines. Legs hair brown, the femora with white scaling. Fore wing hyaline; veins, apex, termen and inner margin fuscous; a fuscous bar from middle of cell to inner margin; costal edge fuscous black; hyaline streak on costal margin irrorated with fuscous; space between veins 5 and 6 fuscous; the fuscous on termen expanding slightly between veins 2 and 3. Hind wing hyaline; inner margin whitish yellow with black cilia; costa and termen narrowly fuscous; narrow space between veins 2 and 3 fuscous, also median vein, discocellular and vein 4. Wings below as above.

Expanse 29 mm.

Habitat.—Balbalasang, Philippine Islands.

Type.—Cat. No. 33478, U. S. N. M.

VULSINIA, new genus.

Male.—Antenna serrate. Palpi short, porrect, hairy. Legs smooth; hind tibiae with short spurs. Fore wing: vein 2 well before angle; 3 near angle; 4 absent; 5 from angle; 6 below upper angle; 7 and 9 absent; 8 and 10 stalked from cell; 11 free or stalked with 8. Hind wing: vein 2 well before angle; 3 near angle; 4 absent; 5 from angle; 6 and 7 coincident.

Type—*V. socorra*.

Vulsinia socorra, new species.

Male.—Antenna purplish fuscous, terminal third white. Body fuscous; frons maize yellow; collar and tegulae orange; abdomen above and laterally crossed by five narrow orange lines, and a broad sixth line; the lines on venter very fine. Fore femora maize yellow. Legs inwardly streaked with yellowish white.

Wings fuscous, the markings deep chrome. Fore wing: a streak on costa from base to near middle; a line below cell from near base, expanding into a broad fascia to well beyond middle of wing; a small spot in end of cell; a large outer spot from vein 2 to vein 6. Hind wing: a large spot at base narrowing above to near anal angle; a round outer spot from vein 2 to vein 5. Wings below browner, the markings as above but paler.

Expanse 26 mm.

Habitat.—Socorro, Philippine Islands.

Type.—Cat. No. 33479, U. S. N. M.

Three specimens in the National Museum.

Chrostosoma mediana, new species.

Female.—Body dull black; crimson spots on shoulders and metathorax. Wings hyaline faintly dusted with dark scales, the veins black. Fore wing: a broad medial black band. Hind wing: termen broadly black.

Expanse 21 mm.

Habitat.—Paraguay.

Type.—Cat. No. 33465, U. S. N. M.

Allied to *C. nigrizona* (*Pseudomya*) Schaus, which has no red on body, and the venter partly white. *C. melanthoides* (*Pseudomya*) Schaus from Guatemala has the crimson spots as in *C. mediana*, but also has the vertex crimson.

Chrostosoma dhamis, new species.

Male.—Body black; the venter whitish; a crimson spot on shoulders. Wings semihyaline, the veins black; a broad black medial band on fore wing; more than outer half of hind wing black. Female with medial band of fore wing broader than in male.

Expanse, male, 19 mm.; female, 21 mm.

Habitat.—Para, Brazil; British Guiana.

Type.—Cat. No. 33464, U. S. N. M.

According to Mr. H. W. Moore who has bred the species, the larva feeds on lime, cacao, coffee and other plants.

Pseudomya bartshi, new species.

Male.—Antenna: shaft blue-black, the tips and pectinations ochraceous orange. Body and legs dark metallic blue; two white spots on collar; lateral white spots under tegulae; lateral white spots at base of abdomen, lateral white points on other segments forming streaks on second and third segments extending sublaterally; legs with white points on femora, the hind tarsi tipped with white. Fore wing deep metallic blue with white spots; spot at base of costa and larger subbasal spot below cell; a small antemedial spot below cell, and a large quadrate spot medially below cell; a small quadrate spot at end of cell below subcostal; large spots between veins 3 and 5 from cell, and a point

above vein 5. Hind wing black suffused with dark blue; an elongated white spot below cell from near base, and a fine short streak in cell; a postmedial white fascia from below costa outbent to near termen above vein 2; cilia white at middle, and below apex. Wings below metallic blue, the spots as above.
Expanse 27 mm.

Habitat.—Bahamas.

Type.—Cat. No. 33463, U. S. N. M.

Collected by Dr. P. Bartsch.

More brilliant in color than *P. mimma* Grote, the spots larger, the palpi without any white.

Macrocneme apollinairei, new species.

Male.—Antenna, palpi, and head black, frons metallic green. Collar metallic green, fringed with carmine medially. Thorax black, a metallic green spot on metathorax. Abdomen black with subdorsal and sublateral metallic green spots; two dorsal carmine spots at base. Body below black; a large carmine spot on and below throat; ventral valve golden green. Legs black; hind tarsi orange yellow. Wings above suffused with dark bluish green; metallic green scaling at base of fore wing. Wings below duller, the basal half irrorated with metallic green.

Expanse 42 mm.

Habitat.—Vergara, Colombia.

Type.—Cat. No. 33454, U. S. N. M.

Named in honor of Frère Apollinaire.

Differs from *M. xantholopha* Dognin in having crimson spots instead of yellow.

Aethriopsis serrana, new species.

Male.—Antenna black. Palpi black above, empire yellow below. Body black; frons empire yellow; a capucine yellow spot on shoulders and a line on tegulae; abdomen with a broad lateral capucine yellow line, the venter the same color except on terminal segment; fore femora broadly empire yellow, the other femora, joints of tibiae, and underside of hind tarsi also yellow. Fore wing hyaline, the veins black; apex, termen and inner margin narrowly black; a fine black line on discocellular; a capucine yellow spot at base of costal margin. Hind wing hyaline; costal margin white to near apex; apex broadly black, the termen more narrowly so not reaching anal angle. Costa of hind wing below mostly capucine yellow.

Expanse 23 mm.

Habitat.—São Paulo, S. E. Brazil.

Type.—Cat. No. 43466, U. S. N. M.

Received from Mr. Pohl.

Eucereon pittieri, new species.

Female.—Antenna with white shaft. Head and thorax mostly white; palpi partly, frons, a spot on vertex, front of collar and shoulders deep mouse gray. Abdomen above fuscous, the anal hairs pinard yellow; underneath white except last segment; legs mouse gray with white markings at joints. Fore wing deep brownish drab; base of costa white; subbasal white points on costa and below cell; a broken white streak below fold and a similar streak along inner margin; a faint white streak in cell; a deeply outangled white line from costa at four-fifths, inbent to near middle of wing at line below fold, and widest at costa, cut throughout by the dark veins; large terminal white spots on interspaces; cilia white. Hind wing hair brown, the cilia tipped with white at apex. Wings below grayish hair brown; termen above vein 2 white becoming broad at apex and costa, crossed by some irregular subterminal dark markings; veins 2-7 fuscous.

Expanse 25 mm.

Habitat.—Caracas, Venezuela.

Type.—Cat. No. 43467, U. S. N. M.

Received from Mr. Pittier.

SYSSPHINGIDAE.

Citheronia johnsoni, new species.

Male.—Palpi and head brazil red, the upper part of frons yellowish white. Collar and thorax buff yellow, the tegulae dorsally edged with red. Abdomen above brazil red, basal segment buff yellow and similar segmental lines, also a dorsal line; the last segment mostly buffy yellow. Fore wing dark vinaceous gray, the veins on basal and terminal areas brazil red, also veins 1 and 2 medially; a maize yellow point at base of costa and a round spot at base of cell; outer edge of basal area deeply incurved between veins; medial area consisting of buff yellow spots, partly coalescent; a round spot on inner margin; elongated spots from vein 1 to vein 4, crossed by a diffuse brownish drab shade; an oval spot at end of cell crossed on either side of discocellular by brazil red spots; trigonate yellow spots from cell between veins 4 and 6, above vein 5 with some brownish drab diffuse shading, separating them from elongated buff yellow spots increasing in size to costa; small buff yellow and brazil red subterminal spots on interspaces; cilia brazil red. Hind wing maize yellow; a large round brazil red spot on inner margin near base; a quadrate morocco red spot on discocellular; an outer dentate brazil red line to inner margin above anal angle adjoining a triangular spot with its apex close to angle. Wings below buff yellow; fore wing with costa vinaceous slate, the subcostal vein black, edged with brazil red; a quadrate brazil red spot at discocellular, the terminal area as above, but whitish at tornus; hind wing with only the discal spot and outer line as above, the latter finer.

Expanse 73 mm.

Habitat.—Rio Grande do Sul.

Type.—Cat. No. 33291, U. S. N. M.

Quite distinct from any of the forms of *C. laocoon* Cramer.

Adelocephala rorerac, new species.

Male.—Body above ochraceous orange; abdomen with small lateral black spots on basal half; body below purplish vinaceous. Fore wing ochraceous orange, the base and termen suffused with light grayish vinaceous; some neutral gray irrorations beyond cell and on terminal area; lines hair brown, the ante-medial finely wavy, outcurved, the outer line from costa near apex crenulate, incurved to near middle of inner margin; two small white spots on discocellular. Hind wing ochraceous orange; a dark line from apex to below middle of inner margin, the termen suffused with light grayish vinaceous. Wings below light buff, the terminal areas suffused with light grayish vinaceous; fore wing above cell to costa and apex suffused with ochraceous salmon; a fine dark line from near apex to vein 3; hind wing with basal half suffused with light ochraceous salmon, the outer line as above. Another male has the medial area of fore wing and basal half of hind wing cinnamon rufous, the terminal area pale brownish drab.

Female.—Body and wings cinnamon buff, the lateral spots on abdomen larger extending subdorsally. Wings more thickly irrorated with dark striae; tornus of fore wing and terminal area of hind wing pale grayish vinaceous.

Expanse, male, 39 mm.; female, 56 mm.

Habitat.—Macas and Guayaquil, Ecuador.

Type.—Cat. No. 33289, U. S. N. M.

The costal margin of hind wing evenly curved and rounded at apex and termen to anal angle. Named in honor of Mrs. E. W. Rorer.

Adelocephala bellardi, new species.

Male.—Head and thorax, base of abdomen dorsally, and terminal segment ochraceous salmon, the abdomen otherwise orient pink; body below pinkish vinaceous, anal hairs orange rufous, legs vinaceous lilac. Fore wing: base and terminal area brownish vinaceous, the medial area deep chrome with a few faint tawny striae; lines fine, brownish olive; basal space limited by a line outbent and angled in cell, then inbent to near base of inner margin; outer line from apex to middle of inner margin; a brownish vinaceous spot on discocellular. Hind wing ochraceous buff with some rufous shading on inner margin at outer line, this latter faint, light russet vinaceous. Wings below antimony yellow, the outer lines fine, more distinct; fore wing largely suffused with apricot buff, with a fine line on discocellular; the termen light vinaceous lilac, narrowly from vein 5 to tornus. Costa of hind wing convex at base, oblique to apex.

Expanse 43 mm.

Habitat.—Valera, Venezuela.

Type.—Cat. No. 33290, U. S. N. M.

Named in honor of Mr. E. P. deBellard, who kindly presented the specimen to the National Museum.

THE GENUS EREMOCORIS IN THE EASTERN UNITED STATES,
WITH DESCRIPTION OF A NEW SPECIES AND A NEW
VARIETY (HEMIPTERA-LYGAEIDAE).BY H. G. BARBER, *Roselle, N. J.*1. *Eremocoris depressus*, n. sp.

Color dark castaneous, with head, anterior lobe of the pronotum, pleurae and scutellum subshining black. Rostrum and antennae testaceous, the latter infuscated apically. Legs, region of the acetabuli and venter ferrugineo-castaneous.

Form much depressed and nude except for a very few hairs on head and pronotum. Head black, apically ferrugineous, finely, sparsely punctate. Antennae less incrassate than those of *E. ferus*; second segment about twice as long as basal, third one-fourth longer than second, infuscated fourth a trifle shorter than third. Pronotum somewhat elongate but little wider than long ($2\frac{1}{2}$:3), the lateral margins not at all parallel, strongly converging anteriorly; anterior lobe finely and sparsely punctate, this nearly twice as long as the more coarsely and closely punctate posterior lobe; the sinus between the lobes shallow and provided with a series of coarse punctures; the narrowly explanate lateral margin ferrugineous with the edge straight; the humeral tubercle quite distinct. The pleurae closely and finely punctate. The strongly incrassate fore femora armed with a large pre-apical tooth between which and apex are a few smaller teeth; before the larger tooth armed with a double series of quite regular smaller teeth. The anterior tibia in the males are strongly curved and as in the other two species armed with a short, stout pre-apical tooth. The scutellum smooth, sub-shining, sparsely, finely punctate; carinate apically. The corium is uniformly dull castaneous, finely, sparsely punctate with no conspicuous paler marks. Membrane fuliginous with inner and outer basal angles slightly paler. Venter shining ferrugineous castaneous, very finely, obsoletely punctate and sparsely setose apically. Length 6-7 mm.; hemeral width 1.75 mm.

Type male.—Southern Pines, North Carolina (A. H. Manee), same retained in author's collection. *Paratypes: males*.—Shreeveport, La. (Nathan Banks); Agricultural College, Miss., June 21, 1915 (feeding on squash—J. W. Bailey); Cape May Court House, N. J., Mch. 24, 1923 (F. M. Schott); *females*.—Dunn Loring, Fairfax Co., Va., Aug. 30, 1916 (from *Pinus virginiana*—W. L. McAtee); Wilmington Beach, No. C, Apr. 6, 1914 (H. G. Barber).

This species may be readily differentiated from our common *E. ferus* by its difference in coloration, shape of the pronotum and its nudity. Seen from the side it is quite markedly more depressed. It is apparently a southern species ranging at least as far north as southern New Jersey.

2. *Eremocoris plebejus* Fallen var. *setosus*, n. var.

Head, pronotum and scutellum black. Corium dark castaneous with pronotal and costal margins testaceous brown. The two lobes of the pronotum concolorous and not so sharply separated as in *ferus*; the anterior lobe is relatively longer than in that species. The dorsal and ventral parts as well as the legs provided with a rather dense coating of erect long tawny hairs. The fuscous membrane with conspicuous sordid white marks at inner and outer angles; the apex narrowly bordered with white.

This species long known from Europe is remarkable in the genus by reason of its dense coating of soft hairs. As our specimens have seemingly a denser coating of hairs than is usual in all of the European specimens which I have seen I have preferred to call this a var. of Fallen's species. It has a wide range in the United States. I have found it abundant near Vienna, Va., in sifting dead leaves in or about the woods.

Type male.—Vienna, Va., Aug. 16, 1922, same retained in author's collection. *Allotype*: same data. Essex Co. and Tyngsboro, Mass. (H. M. Parshley); Sea Cliff, Long Island, N. Y. (Nathan Banks); Little Neck, Long Island, N. Y., Mch. 23, 1924 (F. M. Schott); Rockaway Beach, Long Island, N. Y. (C. E. Olsen); Staten Island, Apr. (W. T. Davis); Columbus, Ohio, Mch. 31, 1917 (Carl J. Drake); Posey Co., Ind., Oct. 3, 1903 (W. S. Blatchley); Falls Church, Va. (Nathan Banks); Rock Creek Park, Washington, D. C., Apr. 12, 1908 (H. G. Barber); Clayton, Ga., July, 1910 (W. T. Davis); Gainesville, Fla. (J. R. Watson).

3. *Eremocoris ferus* Say.

Readily distinguished by the characters given in the key. It is our commonest and most widely distributed species most frequently met with in sifting dead leaves. To the records given in Van Duzee's Catalogue I am able to add the following: Nova Scotia, Edmonston, Albt.; Minn., Mich., Wis., Ind., Kans., Mo., La. and N. M.

Key to species of Eremocoris.

1. Body and legs with a rather dense coating of long erect hairs.....
plebejus var. *setosus* n.
- Body and legs nude or sparsely pilose.....2
2. Form rather narrow. Pronotum but little wider than long; distinctly depressed, nude and sub-shining.....*depressus*, n. sp.
- Form relatively broader and not depressed. Pronotum distinctly wider than long, dull, sparsely pilose.....*ferus* Say

Actual date of publication, April 24, 1928.

PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

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APRIL, 1928

No. 4

NEW PINE MOTHS FROM JAPAN.

BY CARL HEINRICH, *U. S. Bureau of Entomology.*

(Plate 3.)

The following new species were received from Dr. A. Kariya, Director of the Imperial Plant Quarantine Service, Yokohama Customs, Yokohama, Japan. He reports the larvae of all as injurious to the young shoots of *Pinus thunbergii* Parl in the vicinity of Yokohama. In addition to the new species there was also one specimen of *Dioryctria splendidella* H-S., also from *Pinus thunbergii*.

Salebria laruata, new species.

(Fig. 5.)

Palpus and head blackish fuscous, with some slight dusting of white on head. Thorax glossy, grayish lavender. Fore wing with a narrow white inner line, outwardly angulate at middle and running from near basal third of costa to just beyond outer third of dorsum and with a similar more vertical outer line running from outer fifth of costa to outer fifth of dorsum; basal area (to inner line) ferruginous ochreous on dorsal half, darker red above heavily shaded with blackish fuscous and with a faint white dusting in middle; area between inner and outer lines blackish fuscous except for outer half of dorsal area which is ferruginous; on lower half of dark median area near inner line a rather larger blotch of white scaling; a smaller white spot near end of cell; area beyond outer line ferruginous with some faint white dusting bordering termen; terminal edge black; extreme costa blackish fuscous for entire length; culia pale smoky fuscous, shining and with a very faint median white line. Hind wing pale brownish fuscous, somewhat glossy; cilia paler, with a dark basal band.

Male genitalia figured from type.

Alar expanse 22 mm.

Type.—Cat. No. 40788, U. S. N. M.

Type locality.—Yokohama, Japan.

Food plant.—*Pinus thunbergii*.

Described from male type dated July 6, 1924.

Similar in pattern, color and general appearance to *Pinipestis delectella* Hulst, but with the structural characters of *Salebria*.

Rhyacionia dativa, new species.

(Fig. 3.)

Antenna with basal joint blackish, otherwise gray. Palpus and face fuscous brown with paler dusting on inner side of palpus. Head sordid ochreous.

Thorax amber brown with posterior half of tegula and scaling of metathorax semimetallic silvery gray. Fore wing amber brown, irregularly cross banded with semimetallic silvery gray, with some whitish scaling along the margins of the outer bands and with the metallic scales (on wing and thorax) tipped with white; the cross bands numbering five running from costa to dorsum and one paralleling termen from tornus and terminating below apex; the three basal bands rather indistinct; the fourth and fifth fusing near their middle to form a somewhat irregular M and the fifth touching at its base the base of the terminal band; terminal pale band scalloped; an obscure median longitudinal blackish shading extending from middle of cell to terminal gray band and lying entirely in the brown areas (not cutting the transverse gray bands); cilia pale semilustrous fuscous, paler toward base. Hind wing smoky fuscous; cilia slightly paler with a still paler, dark-margined basal line.

Male genitalia of type figured.

Alar expanse 19.5 mm.

Type.—Cat. No. 40789, U. S. N. M.

Type locality.—Yokohama, Japan.

Food plant.—*Pinus thunbergii*.

Described from male type dated July 11, 1925.

Close to the European *pinicolana* Doubleday and with somewhat similar genitalia; but with decidedly browner ground color of fore wing and with the transverse pale bands more irregular and not so well separated or clearly defined.

Rhyacionia simulata, new species.

(Fig. 1.)

Palpus, face and head brownish fuscous, the scale ends tipped with sordid white. Thorax blackish gray. Fore wing from base to well beyond middle blackish gray, dusted and cross banded with silvery gray and white; the blackish ground extending as far as tornus on dorsum and almost to apex on costa and on disk to end of cell; the silvery gray and whitish dustings forming an obscure, pale basal patch covering basal third of wing and a faint pale, slightly oblique transverse band just beyond middle, the latter separated from the pale basal area by a band of the dark ground color; on outer half of costa four narrowly elongate white spots; the inner two of these produced into silver gray dashes which fuse at top of cell to form the postmedian pale fascia; outer fourth of wing yellowish brown shading to deep brownish red toward termen and apex, and broken by a paler (more yellowish) band extending from third costal spot to tornus and by a shorter pale band extending from outer costal spot; cilia gray shaded with white. Hind wing smoky fuscous; cilia paler with a dark basal band.

Female genitalia of type figured.

Alar expanse 16 mm.

Type.—Cat. No. 40790, U. S. N. M.

Type locality.—Yokohama, Japan.

Food plant.—*Pinus thunbergii*.

Described from female type dated July 5, 1924. This is the species that has been determined by Walsingham and others as the European *duplana* Hübner. It is close to *duplana* but apparently distinct and separable on differences of color and genitalia. The ground color of thorax and basal portion of fore wing is much darker, the reddish shading toward termen deeper and more distinctly red, the signa much shorter, the chitinization about genital opening differently shaped and the chitinized areas of seventh abdominal segment stronger and considerably darker. These genitalia differences are shown in figures 1 and 2.

Petrova insignis, new species.

(Fig. 4.)

Antenna brown, very faintly and narrowly banded with white. Palpus ferruginous, whitish toward apex and on inner side. Face ferruginous. Head ferruginous shading to ochreous above. Thorax a dark rich amber brown with some whitish scaling on posterior half of tegula. Fore wing dark amber brown; basal area more or less blotched with dull silvery with a few interspersed black scales; near middle a broad, irregular, pale fascia consisting of two vertical silvery metallic bars separated by a median vertical bar of brownish ochreous; ocelloid patch conspicuous, consisting of two vertical silvery metallic bars enclosing three longitudinal black dashes on a brownish ochreous ground (inner vertical ocelloid bar broad, about twice as large as outer one); above ocelloid patch and reaching from just beyond cell to termen two narrow horizontal black streaks; outer half of costa with four pairs of short, narrow, white dashes continued more or less in metallic scaling, that of the second pair reaching to upper margin of inner vertical bar of ocellus; cilia shining fuscous, slightly darker (more leaden hued) toward base. Hind wing a shining satiny brown, paler than fore wing; cilia but slightly paler, with dark basal band and with the extreme tips of the outermost scales white.

Male genitalia figured from type.

Alar expanse 15 mm.

Type.—Cat. No. 40791, U. S. N. M.

Type locality.—Yokohama, Japan.

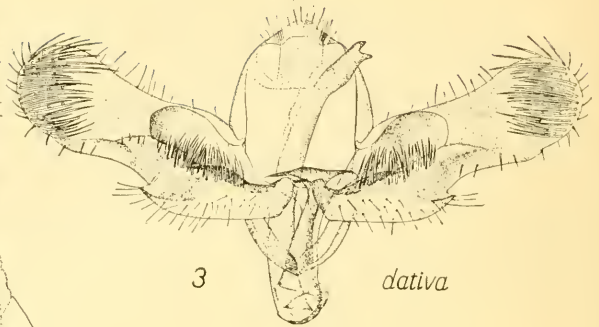
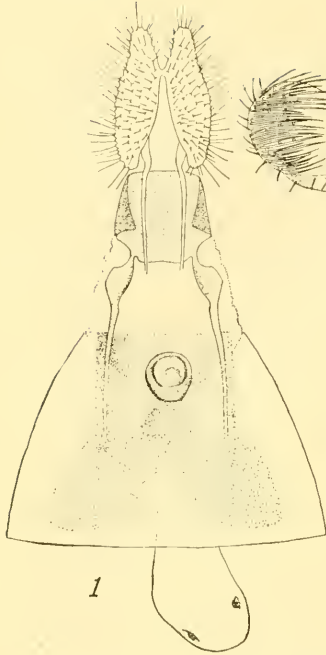
Food plant.—*Pinus thunbergii*.

Described from male type dated August 27, 1924. A striking species easily distinguished by the shining satiny brown hind wing and the strongly marked ocelloid patch of forewing.

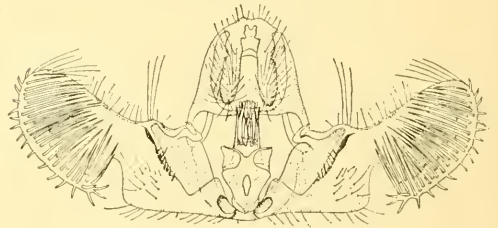
EXPLANATION OF PLATE.

Drawings made under the author's supervision by Miss Mary Foley of the Bureau of Entomology.

- Fig. 1. *Rhyacionia simulata*, n. sp., female genitalia.
- Fig. 2. *Rhyacionia duplana* Hübner, female genitalia.
- Fig. 3. *Rhyacionia dativa*, n. sp., male genitalia.
- Fig. 4. *Petrova insignis*, n. sp., male genitalia.
- Fig. 5. *Salebria larvata*, n. sp., male genitalia.

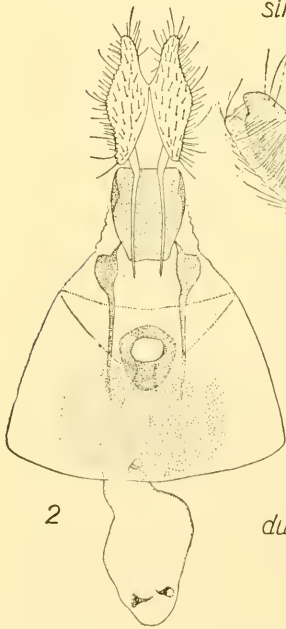


dativa

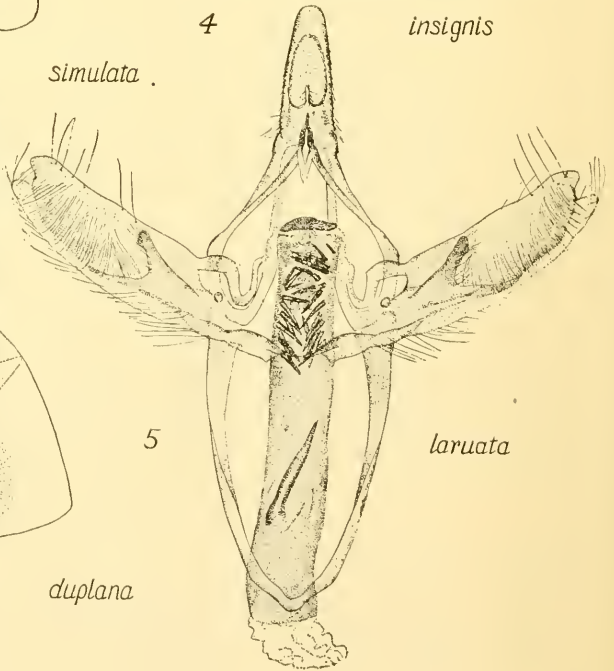


insignis

simulata .



duplana



laruata

THE NORTH AMERICAN SPECIES OF *HOLOTROCHUS ERICHSON* (COLEOPTERA: STAPHYLINIDAE), WITH DESCRIPTIONS OF TWO NEW SPECIES.

BY EDWARD A. CHAPIN, *Associate Entomologist, Taxonomic Investigations.*

Two species of this genus have heretofore been described from North America. A third species from the mountains of Arizona has for many years remained undescribed in the Hubbard and Schwarz collection and recently a fourth species was collected by Dr. W. E. Hinds at Baton Rouge, La. This last is of considerable interest as it was taken from borings in an insulated electric cable.

The following dichotomous table will serve to elucidate the more salient characteristics of these species:

1. Abdominal segments with fine but distinct remnants of lateral marginal lines; median length of pronotum less than length of elytral suture (ratio of pronotal length to elytral suture length 25:33).....*laevicauda* Lec.
Abdominal segments with no trace of lateral marginal lines; length of pronotum equal to or greater than length of elytral suture.....2.
2. Length of pronotum greater than length of elytral suture (ratio of pronotal length to elytral suture length 23:20); elytra rugose-punctate.....
brachypterus Fvl.
Length of pronotum equal to length of elytral suture (by measurement); elytra simply punctate.....3.
3. First to third abdominal sternites virtually impunctate; length 2.5 mm.....
parvulus, n. sp.
Second and third abdominal sternites coarsely and sparsely punctured; length 3.7 mm.....*arizonicus*, n. sp.

Holotrochus laevicauda (Leconte).

Lispinus laevicauda Lec., 1866, Proc. Acad. Nat. Sci. Philadelphia, Vol. 18, p. 376.

Holotrochus laevicauda (Lec.) Lec., 1877, Trans. Amer. Ent. Soc., Vol. 6, p. 216.

This species is represented in the National Museum collection by eight specimens from Grand Ledge, Michigan, collected by Hubbard and Schwarz and by a single specimen from Frankfort, Kentucky, Aug. 18, H. Soltau.

Holotrochus brachypterus Fauvel.

Holotrochus minor Leconte, 1877, Trans. Amer. Ent. Soc., Vol. 6, p. 216. (nec *minor* Fvl.).

Holotrochus brachypterus Fvl., 1905, Rev. d'Ent., Vol. 24, p. 136. (*minor* Lec. nec Fvl. renamed).

Five specimens of this species are in the Museum collection, one of which (Enterprise, Florida, June 7, Hubbard and Schwarz) was determined as this species by Fauvel; other

specimens are from Cedar Keys, Florida, June 6, and Crescent City, Florida (both Hubbard and Schwarz), New Orleans, Louisiana, Dec. 2, H. Soltau, and Cape Henry, Virginia, May 22, 1927, H. S. Barber. This last specimen greatly extends the known geographical range of the species.

Holotrochus parvulus, n. sp.

Castaneous, dorsum of abdomen darker. Head finely, sparsely but distinctly punctured above, sides and underpart coarsely alutaceous, impunctate. Eyes small, hardly prominent, above each three or four coarse punctures. Antennae shorter than head and thorax combined, first segment stout and twice as long as thick, second shorter but of equal thickness, third as long as first but more slender, fourth and fifth globose and equal, sixth to eleventh incrassate, eleventh conical. Pronotum broader than long (length-width ratio 23:27), lateral margins feebly curved, surface deeply, finely and sparsely punctured, punctures less frequent and more fine near lateral margins. Scutellum with a few coarse punctures. Elytra slightly broader across humeri than length of suture (length-width ratio 23:26), sutural stria of each entire, punctation rather fine and sparse, lateral margin sharp and evenly curved from base to apex, epipleura shining, minutely punctulate. Abdominal tergites and fourth and fifth sternites sparsely but coarsely punctate, surface of tergites shining, of sternites strongly alutaceous, fifth segment as long as third and fourth together. Legs short, femora stout, tibiae incrassate distally, anterior tibiae with a few spinules on outer margin, inner margin sinuate.

Length: 2.5 mm.

Type and paratype.—U. S. N. M., No. 40888, Baton Rouge, La., Jan. 28, 1928, boring in insulated electric cable, W. E. Hinds, collector.

Holotrochus arizonicus, n. sp.

Piceous, elytra, antennae and legs castaneous. Head finely and sparsely punctured, the punctures of two sizes intermingled, above each eye a group of coarse punctures, sides and underpart alutaceous. Antennae not as long as head and thorax together, first segment stout and as long as the second and third together, second shorter than third, fourth to eleventh incrassate, eleventh conical. Pronotum broader than long (length-width ratio 31:39), lateral margins arcuate in anterior three-fifths, straight in posterior two-fifths, posterior angles slightly obtuse, rounded. Surface very sparsely and finely punctate, with an ill-defined depression within each posterior angle. Scutellum impunctate, rarely with one, two or three coarse punctures. Elytra broader across humeri than length of suture (length-width ratio 30:37), punctures coarse and sparse, surface slightly irregular. Just inside the lateral margin there is a row of punctures which are more coarse and deep than the others. Epipleura smooth, impunctate. Abdominal segments without trace of lateral margins, surface coarsely alutaceous, sparsely set with coarse, shallow punctures. Underparts of thorax coarsely alutaceous laterally, metasternum with a few fine punctures. Legs moderately long (for the genus), femora stout

but not conspicuously swollen, tibiae incrassate distally, anterior tibiae with a row of spinules, of which the apical two are larger, on the outer margin, inner margin sinuate.

Length: 3.7 mm.

Type and seventeen paratypes.—U. S. N. M., No. 40887, Santa Rita Mountains, Arizona, May 21, Hubbard and Schwarz collection.

With the above lot of specimens I have associated a single individual from the Chiricahua Mountains, Ariz., July 3, Hubbard and Schwarz. The following differences have been observed between it and the type specimen of *H. arizonicus*: Length 4 mm., punctures of elytra slightly less conspicuous, pronotum slightly longer proportionately. It does not appear to deserve a specific name.

HESPEROLABOPS PERISCOPIIS, A NEW PERISCOPIIC BUG FROM SALVADOR, WITH A NOTE ON THE TEXAS MEMBER OF THIS GENUS (HEMIPTERA, MIRIDAE).¹

BY HARRY H. KNIGHT, *Ames, Iowa.*

The writer has recently received from Mr. W. L. McAtee for identification, a remarkable Mirid which he aptly called a periscopic bug. I find it to be an apparently undescribed species belonging in the genus *Hesperolabops* Kirkaldy. This genus is remarkable in that the species have the eyes elevated on long, more or less erect peduncles, producing in effect what might be termed periscopic eyes.

Hesperolabops periscopis, new species.

Differs from *gelastops* Kirk. in the more strongly elevated and less divergent eyes, narrower vertex, and in the coarsely punctate pronotum; sanguineous, of the dorsum only the apical half of clavus, inner angles of corium and the membrane blackish.

♀. Length 6.2 mm., width 2.7 mm. Head: width across outer margins of eyes at top 1.15 mm., between inside margins at top .68 mm., width between peduncles at base .33 mm., from vertex to top of eye .62 mm., lateral width of eye .33 mm., height of an eye from lateral aspect .56 mm. Rostrum, length 2.6 mm., reaching to fifth ventral segment, sanguineous like the head with only tip black. Antennae: segment I, length .62 mm., red, becoming darker near apex; II, 1.92 mm., black, nearly equal to segment I in thickness, finely and closely pubescent; III, broken. Pronotum: length 1.18 mm., width at base 1.92 mm.; coarsely and closely punctate on disk and basal half of propleura, collar flattened and with punctures above; calli strongly convex, impunc-

¹Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

tate, connecting with lateral margin of collar by an elevated ridge; a flat transverse impression before each callus, a similar rounded impression above coxal cleft, while a much larger and more ellipsoidal impression occupies middle of propleura; these impressions have a finely granulate surface of whitish color. Scutellum with a large granulate impressed area occupying basal half while a much smaller but similar area occurs on each basal angle.

Henelytra dull, opaque, finely and shallowly punctate, each puncture with a minute and closely appressed sericeous hair; embolar margins sinuate on basal half, embolium thickened, elevated but with rounded edge. Cuneus large, only slightly deflexed, fracture rather shallow. Membrane and veins black, with a single large cell in each wing, the rounded apex of which just attains apex of cuneus. Hind femora more slender than front pair. Sanguineous, antennae except first segment, distal half of clavus, inner angles of corium, membrane, tibiae and tarsi, black.

Holotype.—♀ December 6, 1927, La Union, Salvador (E. Mortensen); U. S. National Museum collection. *Paratype*.—♀, taken with the type "on Opuntia"; author's collection.

This species was found commonly on both *Cerei* and *Opuntia*.

***Hesperolabops picta* (Hunter, Mitchell & Pratt).**

Stylopidea picta Hunter, Mitchell & Pratt, U. S. Bur. Ent., Bul. 113, 1912, p. 22.

This insect was described as follows: "*Stylopidea picta* Uhler is a slender hemipterous insect about 6.5 mm. long. The head and thorax are bright crimson and the wing covers slate color but with narrow yellowish borders. The eyes are placed at the end of the stalk-like prolongations of the head. The underparts are dark brownish."

"The species has been collected on *Opuntia* from San Antonio, Tex., to the coast and southward to Brownsville, Tex."

The authors of the bulletin cited evidently believed that Uhler had already described this insect but we have been unable to find that he ever did. The description here quoted was sufficient to validate the generic name as well as that of the species, therefore *Stylopidea* H. M. & P. becomes a synonym of *Hesperolabops* Kirk., but the species is evidently distinct from *gelastops* Kirk. Back in 1921 Dr. Bergroth informed the writer that *picta* from Texas was distinct from *gelastops* Kirk. described from Mexico. After comparing specimens with Kirkaldy's (1902) description, and the redescription by Reuter (1912), I can readily believe that this may be true, hence the name of the peculiar cactus bug from Texas becomes *Hesperolabops picta* (Hunter, Mitchell & Pratt).

AN INJURIOUS CHINESE NUT CURCULIO (COLEOPTERA:
CURCULIONIDAE).BY F. H. CHITTENDEN, *United States Department of Agriculture.*

In a paper published in 1913 by Dr. A. L. Quaintance¹ on the injurious insects of other countries he mentions *Balaninus nucum* L. as injurious to the hazel nut or fibert, *B. elephas* Gyll. as attacking chestnuts, and *B. cerasorum* Hbst. as attacking cherries. There are still other noxious species the introduction of which into this country should be guarded against, including *B. camelliae* Roelofs and *B. macula-nigra* Roelofs, and the species considered in this paper.

During April and June, 1923, the Federal Horticultural Board of the United States Department of Agriculture received through Mr. H. J. Gouldman and others a lot of chestnuts (*Castanea* sp.) from Hai-tong Range, Yun-nan, China, which were infested by nut curculio larvae. These proved on being reared to belong to the genus *Curculio*, of which *Balaninus* is a synonym, and to species not represented in the U. S. National Museum collection. After the perusal of all available literature the writer fails to find a description of any species which entirely fits the form under discussion, although it is obviously so closely related to *B. haroldi* Faust, described from Peking, China,² as to be with little doubt that species. The form under discussion resembles the latter in size, shape of prothorax, elytral markings and vestiture generally. A technical description of these specimens has been made to conform with those of our native species recently treated by the writer.

***Curculio haroldi* Faust.**

Balaninus haroldi Faust, *Deutsch. Ent. Zeit.*, 1890, p. 292.

Slender cylindrical subovate, distinctly more than twice as long as wide; reddish brown, rostrum polished deep brown, antennae pale yellow brown. Vestiture of dorsum mostly spectrum red, of ventral surface whitish; elytra with a wide transverse median black or brown fascia and behind that a shorter whitish fascia.

Rostrum ♀ as long as the body, very slender, scarcely wider at the base, otherwise of uniform diameter; moderately arcuate in distal two-thirds, nearly straight in proximal third. Antennae inserted at about basal third, scape distinctly longer than first three funicular joints, funicular joint 1 about 1/5 longer than 2, 2 1/5 longer than 1, 3 fully 1/4 longer than 4.

Prothorax about as wide as long, strongly restricted, but not tubulate to apex, basal half with sides subparallel, base subtruncate. Vestiture of disc sparse, squamules lanceolate, so overlapping as to form a network pattern,

¹Remarks on some injurious insects of other countries, *Proc. Ent. Soc. Wash.*, 1913, p. 80.

²*Deutsche Entomologische Zeitung*, 1890, p. 262.

beneath which the coarse rugosely punctate surface is visible; sides with shorter more or less oblong or various shaped gray squamules; longer gray squamules at the extreme base. Scutellum shield-shaped,¹ slightly longer than wide, covered with very fine whitish scales.

Elytra subtriangular, though a little longer than wide, base sinuate, wider than prothorax, still wider a little behind the gradually rounded humeral angle, from which point the sides converge in a nearly straight line, not quite attaining the apex; each elytron separately rounded at apex. Surface moderately convex, crenately striate; striae narrow, of moderate depth, each with a single row of narrowly separated whitish squamules; intervals feebly elevated. Vestiture composed mainly of red squamules, which are short, closely-set and more or less imbricated; first or median transverse fascia black and of irregular shape, very large, extending from the first or second to the sixth or seventh interval, not united at the suture; second whitish mixed with red, third dark, scarcely larger than a dot.

Lower surface with vestiture composed of short, fine cuneate and elongate ovate squamules, whitish in color. Fifth ventral segment concave. Legs long and slender; femora strongly clavate, strongly dentate, with denticles strongly produced, extending acutely distally. Tibiae also long, rather feebly sinuous; prothoracic and abdominal segments with gray squamules like prothoracic. Fifth ventral segment moderately concave.

Rostrum ♂ half as long as the entire body, more strongly arcuate than in ♀ and more thickened at apex. Antennae inserted at apical third; pygidium terminating in a somewhat tube-like tuft of hairs.

Length 6.0-7.0 mm.; width 2.4-2.9 mm.

POLYPHYLLA SPECIOSA CSY.

By H. C. FALL, *Tyngsboro, Massachusetts.*

The following note on this species was accidentally omitted from the manuscript of my article on the genus *Polyphylla* published in the February, 1928, number of this journal:

Polyphylla speciosa Csy. With this I place *acomana* Csy. and *latifrons* Csy. as synonyms. The last named takes page precedence over the other two, but the type is so defective as to have led to its being misplaced by Casey in his table: it is therefore, in my opinion, better to consider *speciosa* the type of the species even if by so doing we slightly transgress the letter of the law of priority.

Speciosa is very close to *10-lineata*, but differs from that and all our other species by normally having the oblique dense line of white scales behind the humeral umbo disconnectedly prolonged posteriorly, the disconnected part, however, having a tendency to become obsolete. In my single male the genital organ was slightly injured in being removed, but it seems to differ a little from that in *10-lineata* by being more parallel

¹More or less like the shield of the United States.

sided apically (more convergent in *10-lineata*) and by being less deeply divided medially. The color is typically reddish brown, and the size in the larger females is rather in excess of any other species in our fauna.

POTATO BEETLE SEPTICEMIA, WITH THE PROPOSAL OF A NEW SPECIES OF BACTERIUM.

BY G. F. WHITE, *Bureau of Entomology.*

The Colorado potato beetle, *Leptinotarsa decemlineata* Say, commonly known as the "potato bug," suffers a mortality from a bacterial disease. In the summer of 1921 larvae, some sick and others dead of the disease, were found by W. H. White at Arlington, Va., and by Doris H. Blake in Washington, D. C. During the two summers following many individuals were collected by the writer in Washington.

The sick larvae die in different instars. Those attacked by disease may be found clinging to the potato plant; the dead ones are usually on the ground. The general reddish color of healthy larvae changes soon after death from this disease to a brownish gray. As decay and drying continue, the color of the remains turns to a brown which finally deepens almost to black, and the form becomes a much shriveled mass. The body wall is intact throughout these early processes of decay and is not easily torn at any time.

In the blood of larvae manifesting early symptoms of the disease, a bacterial species is found whose numbers increase with the advance of the disease. As the malady is characterized in a marked way by septicemia the name "potato beetle septicemia" is suggested and used for the disease.

While there is much to be learned about the etiology of the disease, the bacterium of the septicemia is considered to be the immediate cause of death of the larvae. The species is a short, actively motile, non-spore bearing, gram-negative rod that grows readily on artificial media. Many of the carbohydrates are fermented by it with the production of acid and some of them with the formation of gas also. Gas production takes place slowly and usually only a small quantity is formed.

The name *Bacillus leptinotarsae*, n. sp. is here given to the bacterium. It belongs to a large group of organisms in which occur *Bacillus (Coccobacillus) acridiorum*¹ d'Herelle, *B. sphingidis*² White, *B. noctuarum*³ White, and a number of other

¹d'Herelle, F. Sur la propagation, dans la Republique Argentine, de l'epizootie des sauterelles du Mexique. Compt. Rend. Acad. Sc. T. CLIV, pp. 623-625, 26 Fevrier, 1912.

²White, G. F. Hornworm Septicemia. Jour. Agr. Res. Vol. XXVI, No. 10, Dec. 8, 1923. P. 479.

³White, G. F. Cutworm Septicemia. Jour. Agr. Res. Vol. XXVI, No. 10, Dec. 8, 1923. P. 488.

described species. In choosing the name *B. leptinotarsae* for the species the custom generally practiced by those making earlier studies on members of the group has been followed. When this group of organisms has been more fully studied the classification of the species within it probably will be somewhat changed.

In many ways this disease is peculiarly an interesting one. A fuller discussion of it will follow this preliminary announcement.

AUTOMATIC NOMENCLATURE.

By W. L. McATEE.

The writer is glad to be engaged in research in a field (systematic entomology) where there is so evident a desire to work out the fairest and best principles of nomenclature, independently if need be of existing codes, weakened as they are by exceptions, and trammelled by special rulings.

The number of organisms with which systematic entomologists must deal—probably more than ninety per cent of all animals above the rank of nematodes—in itself demands that the practices of naming them, and of dealing with their names shall be simplified as much as possible.

To handle the names of the almost hopelessly vast phylum of insects we need rules each of which can yield only one result no matter by whom applied. We need such rules, but in view of the complexity of the subject and human failings, probably can hope for no more than approximations to them. Approximate only as they may be let us have rules which so far as possible will bring uniform results, regardless of where, when, or by whom applied, rules which, if you please, may be called automatic.

Specific names we will select on the basis of priority, of course, so far as priority can be satisfactorily determined. A specific name has its only really satisfactory basis in the genuine holotype specimen. All other vouchers for a name are more or less questionable and considering the great number of groups of insects in which there are species so closely related that descriptions do not suffice for distinguishing them, it may be necessary in the long run to reject a high proportion of names, the actual holotypes of which are not extant, or have not been studied by a reviser and so adequately keyed or figured that there is practically no question as to their identity.

Priority is an automatic principle for selecting specific names, but there will be cases in which potential priority will have to be ignored, because of the impossibility of positive identifica-

tion. Such exceptions, however, will arise no more often under an automatic, than under prevailing systems of nomenclature.

Only from among thoroughly established names can we select genotypes, and regardless of what may be feasible in other fields of zoology, in entomology we can not recognize genera without species. In our field genera are so numerous and so rich in species that the only practicable way of handling them is on the genotype system.

The practice for selecting genotypes that has been very generally followed in entomology, namely, that of choosing the oldest included species, is an example of automatic nomenclature. There can be only one such species in a genus and any one can determine what it is. If a genotype eventually proves to be one of the unidentifiable species alluded to previously, then the generic name based upon it falls, and another must be supplied.

An automatic rule relating to genera, that has won recognition practically throughout zoological taxonomy, is the "one-letter rule." Generic names are available if they differ (positively known typographical errors excepted) from any existing generic name by as much as one letter.¹ This rule means that we do not reject generic names because they differ, apparently only by terminations indicating gender. This is the only practicable usage in the case of names derived from every language source, barbarous as well as classical, many of which also are pure inventions, or as it is commonly expressed, "arbitrary combinations of letters."

Under these conditions it is impossible to determine the gender of a generic name by its form. We have, therefore, to accept a statement on the subject by the author of the name if he made one, or determine the matter by the form in which he cast specific names in the genus. It is conceivable that this latter process might be a baffling one especially if the specific names themselves happened to be "arbitrary combinations of letters."

The gender of a genus evidently can not be determined by inspection, and it may be difficult to settle by any other process. Here is a point that needs attention if we are to have an automatic code of nomenclature, and the writer would suggest that gender be thrown out of consideration. This is but another detail of automatic nomenclature to which we shall eventually be forced if we do not adopt it voluntarily.

Generic names, like others, have their ups and downs and according to the authority handling them may have generic or subgeneric rank. According to custom the subgeneric name

¹For a fuller discussion of this rule see *Amer. Nat.* 55, pp. 89-96, Jan.-Feb., 1921.

is written in parentheses between the generic and the specific name, for example—*Galgupha* (*Euryscytus*) species. Now *Galgupha*, according to the specific names originally associated with it, is of feminine, and *Euryscytus* by the same token, is of masculine gender. We have no right to alter a subgeneric to make it agree with a generic name, so we must be inconsistent whichever name we allow to control the gender of the specific names. Is it not evident that we can rid ourselves of another embarrassing nomenclatorial quandary by giving up the idea that genera have gender and that specific names should agree with the generic in gender?

General usage, current practice, and the one-letter rule all permit us to form a generic name in any way we please. Regardless of its origin we treat it as an arbitrary combination of letters, i. e., as having no necessary meaning, and if differing by only a single letter, as distinct from prior generic names. This means that in reality we give up the idea that systematic nomenclature is the Latin or any other definite language. There is therefore no intrinsic reason for assigning gender to generic names. If assigned it must in most cases be arbitrary and as previously shown, involves us in difficulties when names are subordinated to others of different gender.

A good rule tending toward automatic nomenclature therefore is: Generic names shall have no gender. The corollary of this is that specific names need have no ending indicating gender. In effect this is practically true now, for a specific name may be a technical nominative in apposition to the generic name, thus opening the way for the use of almost any word in its original form. In fact, for specific names as well as generic, arbitrary combinations of letters are freely proposed and accepted. For example of the variety of form of specific names used in a single genus we cite some of those applied to native species of *Tabanus*: *abdominalis*, *actaeon*, *acutus*, *alcis*, *alene*, *allynii*, *angustifrons*, *ater*, *baal*, *bigoti*, *calens*, *chionostigma*, *comastes*, *dorsifer*, *fronto*, *fur*, *haematopotoides*, *leucomelas*, *nova-scotiae*, *ohioensis*, *phaenops*, *sagax*, *tener*, *unicolor*. From inspection of the preceding list it is evident that the variety of terminations of specific names will hardly be increased by dropping any connotation of gender.

If generic names differing by one letter are regarded as distinguishable and acceptable, why can not specific names be regarded in the same way? If we cease amending them to agree with supposed gender of some generic name they will have definite and distinctive form and be just as recognizable by one-letter differences as are generic names.

The arguments one sometimes encounters in opposition to such usage, namely, difficulty of memorizing, and confusion in writing, are hardly acceptable, in view of the impossibility

of trusting memory to any extent now in dealing with a myriad of insect names, and in view of present acceptance of a one-letter difference for generic names which also number their tens of thousands.

To recapitulate then, so far as we have outlined automatic nomenclature:

Generic and subordinate names in entomological nomenclature shall be regarded from every point of view as arbitrary combinations of letters. Unless spelled exactly alike (proved typographical errors excepted) they shall be regarded as different. They shall be treated as having no gender and there shall be no requirement as to agreement in ending of subordinate names to superior ones.

Priority shall be respected in so far as it can be thoroughly established. A genus in every case must rest upon a valid species, the genotype, which in cases henceforth to be decided must be the oldest species originally in the genus, or in case all are of the same age, shall be the first included species. Specific names shall be validated primarily by single type (holotype) specimens. When no such specimen exists and published description or illustrations of authentic representatives of the species do not suffice for positive identification, the name shall be dropped.

Taxonomists deal mostly with generic or subordinate names and if the handling of those can be made practically automatic, the battle for simplified nomenclature will be won, for it is easily possible to form all super-generic names automatically. This being so, and opinion differing so multifariously with regard to the number and scope of such groups to be recognized, the question of authority and date for them becomes academic; in reality each reviser is his own authority.

To (the stem of) the oldest generic name of any group of genera considered a desirable segregate, we need add only -ini for a tribe, -inae for a sub-family, -idae for a family, and -oidea for a super-family; for example, Cimex, Cimicini, Cimicinae, Cimicidae, Cimicoidea. Use of such names prevails in systematic entomology now, the only innovation being full acknowledgment that these name forms are wholly standardized, and that any one can make them as needed. There being no originality in the names themselves it is immaterial who used them first.¹ The composition of the groups covered by the names used by various authors is of interest but it can never

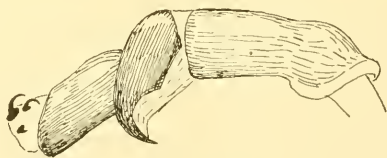
¹From this point of view the question of priority in family names ceases to be the controversial question it now is. A paper showing the difficulty or impossibility of determining priority among equally deserving but differently formed family names appears in Journ. Wash. Acad. Sci., 11, No. 10, 1921, pp. 230-235.

be gleaned from citation of name, authority, and date, but only from actual consultation of the memoirs involved.

Differences in point of view as to the content of groups all the way from orders down to varieties are inevitable, as are also conflicts of opinion as to the identification of described groups and in some cases even as to priority among them. These sources of discord, however, affect the operation of all codes of nomenclature. This exception understood, the suggestions herein made for a nearly as possible automatic code of nomenclature are, we believe, only extensions of clearly visible trends in entomological taxonomy, and that if followed out they would rid the subject of some of the at present most disturbing factors.

PHYLLOPHAGA MINUTISSIMA WOLCOTT, A CORRECTION.

Through the error of the author in numbering the illustrations for his article entitled "The May Beetles of Haiti," by G. N. Wolcott, Proc. Ent. Soc. Wash., Feb., 1928, p. 21-29, the figure of *P. hogardi* Blanchard was published as the figure of *P. minutissima* Wolcott. Therefore figure 5, occurring on page 29 of that issue, should be transferred to page 26 and the figure printed below substituted in its place.



Genitalia of *Phyllophaga minutissima* Wolcott.

The figure printed on page 26 as *P. hogardi* should be deleted.

—Editor.

PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
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No. 5

A PRELIMINARY KEY TO THE LARVAE OF FIFTEEN
 SPECIES OF THE MITE GENUS *TROMBICULA*,
 WITH DESCRIPTIONS OF FOUR NEW SPECIES.

H. E. EWING, *Bureau of Entomology.*

A key is here given to larvae of fifteen species of *Trombicula*, including all those that are in the United States National Museum. This key is entirely a preliminary one, and as other species are studied will doubtless need some modifications in regard to both the characters used and the category groupings.

Two of the four new species, whose descriptions follow the key, are from Africa, while the remaining two are from North America.

Key to the Larvae of Fifteen Species of Trombicula.

- | | |
|--|---------------------------------|
| 1. Palpal claw simple..... | <i>T. thomasi</i> (Oudemans) |
| Palpal claw not simple..... | 2 |
| 2. Palpal claw divided into two elements distally..... | 3 |
| Palpal claw divided into three elements distally..... | 10 |
| 3. Outer element of palpal claw the stouter..... | 4 |
| Inner element of palpal claw the stouter..... | 6 |
| 4. First palpal seta (on palpal femur) simple..... | <i>T. panamensis</i> Ewing |
| First palpal seta with one or more barbs..... | 5 |
| 5. Inner prong, or element, of palpal claw almost equal to outer..... | |
| <i>T. irritans</i> (Riley) | |
| Inner prong of palpal claw decidedly smaller than the outer..... | |
| <i>T. brasiliensis</i> Ewing | |
| 6. First palpal seta simple..... | 7 |
| First palpal seta with barbs..... | 8 |
| 7. Palpal claw curved about uniformly throughout its length. Oriental species..... | <i>T. deliensis</i> Walch |
| Palpal claw more strongly curved toward tip of large inner prong. North American species..... | <i>T. harperi</i> , new species |
| 8. First palpal seta with not more than three barbs..... | 9 |
| First palpal seta with more than four barbs..... | <i>T. bruyanti</i> (Oudemans) |
| 9. Dorsal abdominal setae twenty..... | <i>T. hirsti</i> Sambon |
| Dorsal abdominal setae more than twenty..... | <i>T. insularis</i> Ewing |
| 10. One of the two accessory prongs to the palpal claw much shorter than the other and situated at the base and laterally to the main claw element.... | |
| <i>T. nigeriensis</i> , new species | |

- Accessory prong not so arranged.....11
11. First palpal seta with not more than two barbs.....12
- First palpal seta with more than two barbs.....13
12. With thirty-two or more dorsal abdominal setae. Occurring in Asia.....
 T. akamushi (Brumpt)
- With less than thirty-two dorsal abdominal setae. Occurring in North
 America.....*T. microti*, new species
13. Dorsal plate as long as broad and angulate posteriorly.....14
- Dorsal plate not as long as broad and broadly rounded posteriorly.....
 T. autumnalis (Shaw)
14. Body setae of usual size, being shorter than dorsal plate.....
 T. centropodis, new species
- Body setae very long, longer than dorsal plate.....*T. ardeae* (Trägårdh)

DESCRIPTIONS OF NEW SPECIES.

Trombicula nigriensis, new species.

Palpi somewhat angulate on outside margin of the large second segment. First palpal seta with several barbs; second seta with one to two barbs. Palpal claw trifurcate; inner and middle element much stouter and longer than either accessory prong; dorso-lateral prong medium in length and stoutness between the other two; ventral accessory prong much the smallest and situated ventrolaterally at the base of the whole claw. Fang of chelicera somewhat attenuated toward the tip, and very sharp; dorso-apical tooth present, very sharp; ventral tooth apparently wanting. Dorsal plate much broader than long, posterior margin broadly and almost evenly rounded; pseudostigmata situated nearer the anterior margin of the plate than the posterior margin; pseudostigmatic organs flagelliform and each with several prongs, or barbs. Dorsal abdominal setae medium, over thirty in number. Anterior pair of legs longer than the second pair but not equal in length to the body of the unengorged larva.

Length of unengorged larva, 0.31 mm.; width, 0.18 mm.

Type host—*Funisciurus auriculatus oliviae*.

Type locality—Nigeria, Africa.

Type slide—Cat. No. 981, U. S. N. M.

Described from many specimens taken by Dr. A. S. Pearse in Nigeria, from the following hosts: *Funisciurus auriculatus aliviae* (Nos. 39, 143 and 366), *Funisciurus anerythrus* (Nos. 408 and 364), *Lemniscomys striatus* (No. 397). The arrangement of the three prongs, or spurs, of the trifurcate palpal claw is the most distinguishing characteristic of this species.

Trombicula centropodis, new species.

Palpi not angulate laterally on the margins of large second segments; first palpal seta with several barbs; second palpal seta also with barbs. Palpal claw trifurcate, the accessory prongs arising from near the middle; inner accessory prong longer than the outer and reaching almost to the tip of claw proper. Chelicera with stout fang, only slightly curved. Dorsal plate as long

as broad, front margin slightly incurved, posterior margin strongly arched outwardly and forming an angle at the median line. Pseudostigmata situated near the middle of dorsal plate; pseudostigmatic organs very long, setiform, basal half simple, distal half with barbs. Eyes situated about one-half the width of the dorsal plate laterally from the margins of the same; front eyes almost twice the diameter of the hind ones. Dorsal abdominal setae twenty in number, medium in length and tapering toward their tips. Front pair of legs longer than the second pair and about equal in length to the body of the unengorged larva.

Length of unengorged larva, 0.34 mm.; width, 0.23 mm.

Type host.—Cuckoo, *Centropus*, sp.

Type locality.—Gbanga, Liberia, Africa.

Type slide.—Cat. No. 982, U. S. N. M.

Described from several specimens taken from a cuckoo, *Centropus* sp. (No. 4) at Gbanga, Liberia, September 26, 1926. The dorsal shield of this species is of an unusual shape, being similar to that of *T. ardeae* (Trägårdh). *T. centropodos* differs from this species in having much shorter body setae.

***Trombicula harperi*, new species.**

Palpi evenly rounded on outside margin of large second segment. First palpal seta simple, never with as much as a single barb; second palpal seta also simple. Palpal claw divided into two elements distally, the inner being much the longer and stouter. Dorsal plate broader than long, front margin slightly and irregularly incurved, posterior margin very strongly outcurved, tending to produce a median angle; pseudostigmata situated nearer the posterior margin of dorsal plate than the front margin; pseudostigmatic organs flagelliform, with a row of small barbs on one side. Front and rear eyes subequal and both situated about their diameters laterally from posterior angles of dorsal plate. Dorsal abdominal setae twenty-six in number, moderate and somewhat blunt pointed. Anterior legs only very slightly longer than the second ones and not longer than the body of an unengorged larva.

Length of unengorged larva, 0.28 mm.; width, 0.15 mm.

Type host.—*Napaeozapus insignis*.

Type locality.—Heart Lake, Essex County, New York State.

Type slide.—Cat. No. 983, U. S. N. M.

Specimens as follows: By F. Harper, at Adirondack Lodge, Essex County, New York, from *Tamias striatus lysteri*, July 21, 1925, and August 10, 1925; by F. Harper, Heart Lake, Essex County, New York, from *Napaeozapus insignis*, July 28 and August 1, 1926; by F. Harper, from *Evotomys gapperi*, Indian Lake, Hamilton County, New York, July 17, 1925, Heart Lake, Essex County, New York, July 23, 1926, Mt. MacIntyre, New York, July 27, 1925; by R. J. Holt, from *Sciurus hudsonicus*, Long Lake, New York, July 26 and August 1, 1926.

***Trombicula microti*, new species.**

Palpi not angulate laterally; first palpal seta simple, without as much as a single barb; second palpal seta simple. Palpal claw trifurcate, inner accessory prong slightly larger than outer. Fang of chelicera with a very sharp, backwardly directed, ventro-lateral tooth and a smaller dorsal, subterminal tooth. Dorsal plate broader than long, front margin almost straight, posterior margin broadly and almost evenly outcurved. Pseudostigmata situated slightly behind the middle of dorsal plate; pseudostigmatic organs with a few barbs, all on one side. Eyes situated about their diameters away from the rear corners of dorsal plate; front eyes subequal to hind ones. Dorsal setae of abdomen moderate, about thirty in number. First pair of legs barely longer than second, and scarcely as long as the body of an unengorged larva.

Length of unengorged larva, 0.29 mm.; width, 0.18 mm.

Type host.—*Microtus richardsoni macropus*.

Type locality.—Wyoming.

Type slide.—Cat. No. 984, U. S. N. M.

Described from several specimens taken from type host at Gravel Creek, tributary of Pacific Creek, Lincoln County, Wyoming, August 13, 1927, by O. J. Murie, and one specimen taken from ears of *Microtus modestus*, Jackson County, Colorado, July 14, 1926, by S. C. McCampbell (Colo. Acc. No. 4223). This species is very near the kedani mite, *T. akamushi* (Brumpt), and probably is the American representative of that form. It has fewer dorsal setae than the kedani mite.

**THE MANNER OF OVIPOSITION AND THE PLANIDIUM OF
SCHIZASPIDIA MANIPURENSIS N. SP. (HYMEN.,
EUCHARIDAE).¹**

By CURTIS P. CLAUSEN, *Entomologist, Bureau of Entomology, U. S.
Department of Agriculture.*

In 1923 the writer (2) published an account of the biology of *Schizaspidia tenuicornis* Ashm., parasitic upon the mature larvae and pupae of *Camponotus* in Japan. In the case of this species the eggs are laid en masse in the buds of certain deciduous trees and the winter is passed in that condition. The planidia which continue the generation are from eggs enclosed in buds which die during the winter. These buds, therefore, do not expand at the time growth starts in the spring but gradually dry out, the scales then separating sufficiently to permit of the later escape of the planidia.

An opportunity was recently presented of observing the habits of another eucharid near Imphal, Manipur State, Assam, India. Specimens referred to Mr. A. B. Gahan of the Bureau

¹Contribution No. 41 of the Japanese Beetle Laboratory, Moorestown, N. J.

of Entomology were determined as a new species of *Schizaspidia*, which is here described by the writer under the name of *Schizaspidia manipurensis*. This species was first observed in September, 1926, when several individuals were seen flying about the foliage of various shrubs in a lightly forested area. A more intensive search of the locality finally resulted in the finding of several females ovipositing in the large and loosely formed buds of *Flamingia latifolia* var. *grandiflora*. Unlike *tenuicornis*, however, *manipurensis* deposits its mass of eggs under the outer scales rather than in the interior of the bud. Collections were made of buds of this shrub at random, and a considerable proportion were found to contain eggs. An extended examination of the nests of various species of ants in the immediate locality failed to yield any evidence of parasitism such as was found in collections early in May, 1927.

Oviposition takes place much after the manner of *S. tenuicornis*. The eggs, about one thousand in number, are all inserted under the bud scale at one operation, a process covering a period of twenty or thirty minutes. A surprising amount of force is employed by the female at this time, as the space beneath the bud scale is frequently too small to accommodate that number of eggs without pressure. In one instance a ribbon of eggs 2.5 mm. in length and 1 mm. in width was seen to be forced out from beneath the edge of the scale at a distance of 2 mm. from the point of insertion of the ovipositor.

The egg masses collected in September, 1926, were taken to Shillong, the writer's headquarters at that time, and set aside for supposed hibernation. Upon examination two weeks later, a number of planidia were observed moving about among the eggs. All of the eggs hatched within a period of three weeks even under the relatively low temperature conditions prevailing at Shillong in October. It is probable that under the climatic conditions existing during that season of the year at the lower elevations this stage would extend over a period not exceeding two weeks.

It was possible, because of more material being available, to make a closer examination of the habits of the planidia of *S. manipurensis* than was the case with *tenuicornis* in Japan. Because of their minute size they are indistinguishable to the naked eye even upon a white surface. Under the binocular they were observed to move about readily in a looping manner, the sucker-like organ of the last abdominal segment and the mouth serving alternately to maintain a hold upon the surface. When in a resting position the body remains nearly horizontal with the surface, but when awaiting the approach of the host it is at right angles to the plane of attachment, with the caudal sucker functioning and the terminal abdominal segments braced by the long ventral spines (see fig. 1, C.).

In this stage the larvae are positively phototropic and move rapidly towards the source of light. This reaction under normal conditions would tend to bring them largely to the upper sides of the leaves and buds, in which position the chances of coming in contact with the host are enhanced. They readily attach themselves to any object which comes in contact with them, in fact seem able to sense the presence of moving objects in their neighborhood, as the placing of a bristle or needle in their immediate vicinity always results in increased activity and a swaying of the body back and forth as though endeavoring to find the moving object.

The chances of the planidium becoming attached to the adult of the host species and being transported to the nest are largely dependent upon the length of time it is able to exist in this mobile stage without feeding. Experiments in the laboratory upon this point gave twenty-four days as the maximum length of life possible without food.

In the case of *S. tenuicornis* it was shown that the transformation from the planidium to the second larval stage occurred while the host was still in the larval stage, and that transference of the parasite from the cast skin to the host pupa took place in the parasite's second larval stage. With *manipurensis*, however, such experiments as were possible indicate that this change of position is accomplished by the planidium itself. Individuals of this stage were placed upon a series of ten mature larvae of *Camponotus* which had already formed cocoons and consequently were approaching transformation to pupae. Attachment took place invariably in the thoracic regions, usually dorsally, and feeding progressed until the moulting of the host, though without noticeable increase in size. The change in position was observed in each case under the binoculars, and it was seen that, as the larval skin of the host was split dorsally and was drawn backwards over the body of the propupa, the planidium was for a time carried with it. The point of previous feeding had produced a well-defined hole in the derm of the host, and as this was stretched successively over the spaces between the legs and between the thorax and abdomen the aperture became enlarged and the planidium dropped through upon the propupa beneath. In nine out of the ten cases observed the transfer took place in this way, while the tenth planidium maintained its attachment to the cast skin.

The early hatching previously mentioned was a development entirely unlooked for, as it had been anticipated that development would follow much the course of that of *S. tenuicornis*. While the host was not known it was felt that, because of the size of the parasite, one of the several species of *Camponotus* would most probably fill this rôle. Laboratory nests were made,

and colonies of two of these secured, as well as of several other genera of sufficient size, and one to four planidia of *S. manipurensis* placed upon each of four hundred or more mature larvae. They were observed to attach themselves to the host quite readily, usually in the thoracic regions. These overwintering cages were then set aside for development and observation. Some of the planidia upon *Camponotus* larvae remained alive and healthy, though without apparent growth, until April 1, 1927, a period of nearly six months from the time of hatching and attachment to the host larvae. The *Camponotus* and other ant larvae upon which planidia had been placed formed their cocoons early in the spring, but not a single *Schizaspidia* developed beyond the primary stage. The life history studies were thus brought to a close and it was not possible to secure specimens of the latter larval stages for examination.

From these experiments, and from such observations as it was possible to make in the field, it appears that *S. manipurensis* must have several generations each year, and that the winter is passed in the primary larval stage upon the host rather than in the egg stage in the buds of trees. Although the above experiments did not prove this latter point conclusively, the known very short duration of the succeeding stages in related species makes this course of development the most probable.

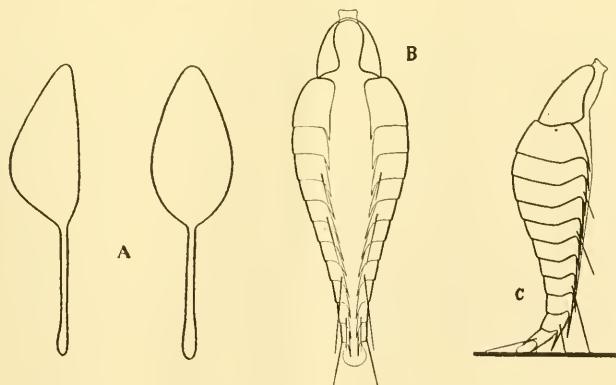


Fig. 1.—*Schizaspidia manipurensis*

DESCRIPTIONS OF THE EGG AND PLANIDIUM.

The body of the egg proper is 0.17 mm. in length and 0.08 mm. in maximum width, with the stalk 0.15 mm. in length. The ventral side of the egg is nearly flat, with the dorsum greatly arched and the anterior end quite pointed (Fig. 1, A). The egg is white when laid but later becomes a jet black due to the developing larva within. The stalk remains turgid at all times until hatching.

The planidium (Fig. 1, B and C) is twelve-segmented, the length when fully extended 0.16 mm., when resting 0.12 mm. and with the maximum width 0.06 mm. The body is jet black by reflected light and a deep amber by transmitted light, with the head capsule slightly lighter in color than the body. A single pair of spiracles is situated at the anterior margin of the first thoracic segment.

The head bears two pairs of light spots dorsally, which may represent sensoria. The mouthparts with a sucker-like disk and the usual comma-shaped mandibles. The posterior margin slightly emarginate.

The body segments with chitinized plates, which extend ventrally and terminate in pleural plates, the tips of which are prolonged into a point extending caudad, these points increasing in length upon the successive segments. The first body segment much the longest, with the remainder subequal. The caudal segment bearing a sucker-like disk, which is ambulatory in function. Five pairs of heavy ventral spines are situated on the third thoracic and the second, fifth, seventh, and eighth abdominal segments, respectively, the first pair being shortest and the third longest. The third and fourth pairs serve as braces for the body when in the upright position. In this position the ventral surface of the body between the ventral margins of the chitinized plates is distinctly convex, the extrusion of the head and mouthparts apparently necessitating a pronounced constriction of the body segments.

COMPARISON OF THE PLANIDIUM WITH THAT OF OTHER EUCHARIDAE AND PERILAMPIDAE.

The planidium of *Perilampus hyalinus* and *P. chrysopae* var. are well known through the studies of H. S. Smith (4, 5) and several of undetermined relationship have been recorded from various hosts. Of the Eucharidae, they have been described for *Orasema viridis* Ashm. by W. M. Wheeler (6), *Psilogaster fasciventris* Brues by C. T. Brues (1), *Schizaspidia tenuicornis* Ashm. by the writer (2) and recently that of *Stilbula cynipiformis* Rossi by H. L. Parker and W. R. Thompson (3). In the cases of *Stilbula* and *Psilogaster* the descriptions are from cast skins only. A comparison of the planidia of these species as well as of a number presumably belonging to the Perilampidae show a fundamental similarity in structure, with the variations within each family as great as that which separates the two. In both groups a marked difference occurs in the form of the pleural plates and the teeth and spines borne by them.

The number of body segments seems to be quite variable with *P. hyalinus* and several other perilampids having thirteen, *P. chrysopae* var. twelve, *Orasema viridis* fourteen, *Psilogaster fasciventris* twelve, *Stilbula cynipiformis* nine, *Schizaspidia tenuicornis* nine and *S. manipurensis* twelve segments. From what is known of the primary larvae of the Chalcidoidea in general, thirteen may be taken to represent the normal number.

The planidia of both families have the characteristic looping

manner of locomotion and stand in an erect position when awaiting the approach of the host. In the case of the Eucharidae the planidia attach themselves to the worker ants and are thus carried to the larvae in the nests, whereas *Perilampus* upon its first attachment has reached its goal, though still, when in the rôle of a secondary, under the necessity of searching about through the body of the secondary host for the parasite larva which it attacks.

OVIPOSITION IN THE EUCHARIDAE AND PERILAMPIDAE.

In the single case in which oviposition by *Perilampus (chryso-pae* var.) has been observed (Smith, 5) this took place upon foliage in the immediate vicinity of the host, and the eggs hatched in approximately twenty days. *Schizaspidia tenuicornis* deposits its eggs en masse in the buds of trees, wherein they pass the winter, while *S. manipurensis* on the contrary places its mass of eggs under the outer bud scales, and these hatch in two to three weeks. Thus in the latter case a closer approach to the habit of *Perilampus* is presented, both as to position and to duration of the stage, and it is probable that further forms will be found which will tend to bridge the gap separating the two families.

Of interest in this connection is the recent note by W. M. Wheeler (7) recording the observation by W. M. Mann of the mating of *Orasema* sp. in the nests of *Pheidole* sp. in Lower California, which is believed by Dr. Wheeler to support the theory of oviposition within the nest. In 1923 the writer collected a number of females of *Orasema* sp. upon vegetation at Mukden, Manchuria, but an extended search failed to reveal oviposition upon plants. The point at which this species was found most abundantly was more than one hundred yards distant from the nearest trees or shrubs. Unfortunately the limited time available made an extended search for ovipositing females impossible. An examination of the ovipositors of various species of *Orasema* in the collection of the United States National Museum reveals them as having this organ heavy, curved and strongly barbed, thus fitting them for penetration of bud scales or other plant tissue.

Schizaspidia manipurensis, n. sp.

This species differs from *S. tenuicornis* Ashm. in the uniform pitting of the parapsides and episternum, the presence of a pubescence on the thorax, the heavy longitudinal striations on the petiole of the abdomen, and the presence of hairs uniformly over the costal cell of the fore-wing. More closely related to *S. convergens* Walk. from Ceylon, but separable by the striations on the petiole.

Male.—Length 4.5–5.0 mm., and alar expanse 11–12 mm. Head, thorax, coxae and petiole of abdomen metallic green in color, the abdomen black, the antennae brownish with the basal segments yellowish, and the legs yellowish.

Head three times wider than long, the post-ocellar line equaling the ocell-ocular line, face with fine longitudinal striations, the front smooth, with the vertex, occiput and between the eyes and the scrobes rugose. Antennal scrobes deep. Antennae 12-segmented, 5.0 mm. in length and filiform, scape twice longer than wide, pedicel as wide as long, first flagellar joint longest.

Thorax foveopunctate, including parapsides and episternum, and with a sparse, fine white pubescence. The bifurcate scutellum with the prongs short, flat and broad. Fore-wing 4.2 mm. in length and 1.5 mm. in width, with the veins in the ratio of 3:2:1. Stigmal vein at right angles to the marginal, with the terminal knob very small. Costal cell broad and uniformly hairy. A very slight darkening in color in the region beneath the stigmal vein.

The abdomen compressed, triangular, and with only two visible segments. The petiole equal in length to the rest of the abdomen and to the hind femora, with pronounced striations extending the full length, and not dilated at the middle.

Female.—Length 4.5 mm., and alar expanse 10.5 mm. Head, thorax, coxae and petiole of abdomen metallic blue-green in color, the abdomen black, with the posterior margins of the segments brownish. Petiole of abdomen shorter than the hind femora. Ovipositor barbed on the distal half.

Other characters as in the male.

Type locality.—Imphal, Manipur State, Assam, India.

Type.—Cat. No. 40973, U. S. N. M.

Described from 5 males and 1 female (antennae broken) collected by C. P. Clausen, October, 1926.

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AMERICAN PSYCHODIDAE—II (DIPTERA).

BY HARRISON G. DYAR.

Psychoda nigra Banks.

(Plate 4).

Psychoda nigra Banks, Can. Ent., xxvi, 331, 1894 (♀).*Psychoda bicolor* Banks, Can. Ent., xxvi, 333, 1894 (♂).*Psychoda bicolor* (Banks) Aldrich, Cat. N. A. Dipt., 106, 1905.*Psychoda nigra* (Banks) Aldrich, Cat. N. A. Dipt., 107, 1905.*Psychoda bicolor* (Banks) Haseman, Trans. Am. Ent. Soc., xxxiii, 314, 1907.*Psychoda nigra* (Banks) Haseman, Trans. Am. Ent. Soc., xxxiii, 314, 1907.*Psychoda nigra* (Banks) Banks, Proc. Ent. Soc. Wash., viii, 149, 1907.*Psychoda nigra* (Banks) Johnson, List, 45, 1925.*Maruina nigra* (Banks) Dyar, Ins. Ins. Mens., xiv, 111, 1926.

Psychoda nigra was described from a female, *P. bicolor* from a male. The sexual difference consists in that the male has white hair on the thorax instead of dark, and the basal part of the wing bears elongate scales (Fig. 4) intermixed with the hairs, giving a thickly scaled appearance. The aspect of the two sexes is therefore quite different and has led to their separate description. The antennae (Fig. 1, female, 2, male) are 16-jointed in both sexes; but the last joint is more or less distinctly double and is followed by a "spike," so that probably the antennae should be called 18-jointed. The male hypopygium (Fig. 3) has the upper appendages large, fringed with irregular and more or less widened hairs the whole length of the under side. Lower appendages two-jointed, basal joint short and stout, apical joint narrow and excavate claw-like at tip. There is an elliptical plate from base with notched tip, and a pair of long curved horns arising on either side of it.

A "type" specimen of *bicolor* (paratype?) is before me, kindly presented by Dr. Banks, and also specimens of *bicolor* and of *nigra*, both determined by Banks. Localities are: "N. Y." (N. Banks); Washington, D. C., August 25, —; September 23, 1909; May 22, 1914 (F. Knab); Cabin John Bridge, Maryland, May 16 and August 22, 1909 (F. Knab); Plummers Island, Maryland, July 26, 1909 (F. Knab); Falls Church, Virginia, May 7, — (N. Banks); Glencarlyn, Virginia, May 9, 1909 (F. Knab); Lafayette, Indiana, August 31, 1917 (J. M. Aldrich).

Psychoda marginalis Banks.*Psychoda marginalis* Banks, Can. Ent., xxvi, 333, 1894 (♂).*Psychoda marginalis* (Banks) Johnson, Ent. News, x, 220, 1899.*Psychoda marginalis* (Banks) Aldrich, Cat. N. A. Dipt., 106, 1905.*Psychoda apicalis* Banks, Proc. Ent. Soc. Wash., viii, 150, 1906 (♀).*Psychoda marginalis* (Banks) Haseman, Trans. Am. Ent. Soc., xxxiii, 311, 1907.*Pericoma orillia* Curran, Can. Ent., lvi, 218, 1924 (♀).

Psychoda varitarsis Curran, Can. Ent., lvi, 220, 1924. (♂).

Pericoma apicalis (Banks) Dyar, Ins. Ins. Mens., xiv, 149, 1926.

This species shows a sexual dimorphism, much less marked than in *nigra*, but still sufficient so that Banks and Curran each described the sexes separately. The male has the tarsi more yellowish than in the female, although this is not always apparent; there are elliptical black scales on the basal part of the wing intermixed with the hairs, and a long black patch on the inner margin, absent in the female. Nevertheless the sexes are in general similar, the male perhaps with more erect white hairs toward base of wing, so that it seems less black than the female. Differs from *nigra* in the apical white wing-fringe.

Antennae with the structure of *nigra* (Figs. 1 and 2). Male hypopygium also similar to that of *nigra*, the upper appendages with thickened hairs only on the outer half, the basal ones being less distinctly thickened. Second joint of lower appendages longer, mesially constricted, and with shorter terminal finger.

Localities before me are: Megantic, Quebec, June 18, 1923 (C. H. Curran, paratype of *varitarsis*); Orillia, Ontario, June 26, 1926 (C. H. Curran, determined as *orillia*); Orono, Maine, June (Cornell University Collection); Franconia, New Hampshire (Mrs. A. T. Slosson); Long Island, New York (N. Banks, type of *marginalis*); National Park, New Jersey, May 6, 1905 (———); Cuyhuga Falls, Ohio (W. V. Warner); Plummers Island, Maryland, May 10, 1905 (Barber & Schwarz); Falls Church, Virginia, May 3, — (N. Banks).

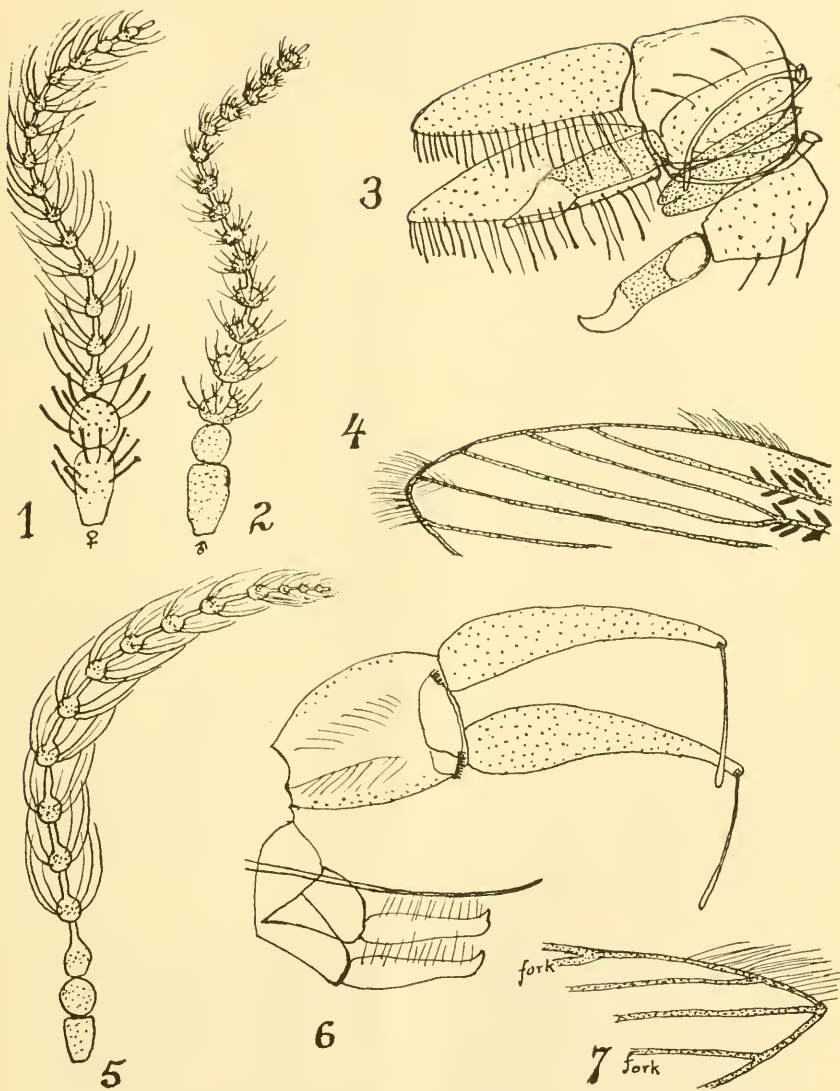
Psychoda interdita, new species.

A small brownish gray species, entirely dark mouse-gray without markings. Antennae similar in the sexes (Fig. 5), 16-jointed; basal joint slightly widened, second spherical, third to thirteenth with basal enlargements and long necks with whorls of long hair; last three joints small, well separated, the sixteenth joint with a thick terminal spike. Male hypopygium (Fig. 6) with the upper appendages on a large separated basal plate, each with a single terminal filament, haired except at tip. Lower appendages separated, small, the basal joints short and semi-consolidated; terminal joints transversely pointed and weakly haired on upper side. Lower free vein terminating in tip of wing (Fig. 7).

Fifteen specimens of both sexes, Ithaca, New York, September 5, 1916 (.....), received from Professor O. A. Johannsen of Cornell University. Eight specimens have been returned to the Cornell University collection.

Type—No. 40516, U. S. Nat. Mus.

The description of *Psychoda uniformata* Haseman might apply to this species except that he describes the antennae as 15-jointed. Furthermore the male of *uniformata* is unknown, and may prove to be different.



DYAR—PSYCHODIDAE.

EXPLANATION OF PLATE

Fig. 1 Female; Fig. 2 male antennæ; Fig. 3 male hypopygium; Fig. 4 wing of *P. nigra*.; Fig. 5 antenna; Fig. 6 male hypopygium; Fig. 7 wing tip of *P. interdicta*.

DESCRIPTION OF A NEW SPECIES OF *LIXUS* FROM THE
PACIFIC REGION OF THE UNITED STATES
(COLEOPTERA: CURCULIONIDAE).

By F. H. CHITTENDEN, *Bureau of Entomology, Department of Agriculture.*

Lixus blakeae, n. sp.

Robust subcylindrical, about two and three-fifths times as long as wide; black with reddish tinge, prothorax shining black, antennae red, tibiae and tarsi reddish; surface very densely coated with gray squamules, with reddish yellow hue. Rostrum robust, not longer than the prothorax, cylindrical, feebly arcuate, not distinctly carinate, finely and very densely punctate; interocular fovea distinct, elongate. Antennae ♀ inserted about one-fourth from apex; second funicular joint slender, slightly longer than first, a little longer than the next two together. Eyes large, prominent, widest at vertex, rather coarsely granulated. Prothorax nearly as long as wide, comparatively wide at apex, sides nearly straight, disc shining black, with moderately large punctures, sparsely set and interspersed with fine punctules, very closely set; at middle widely, variably sulcate, at base especially deep and with an impressed line also at middle; surface with a few slight asperities, covered with fine long pilose squamules, becoming dense in the sulcus and at the sides. Elytra at base very little wider than the prothorax, sides subparallel in basal two-thirds; discal striae nearly regularly punctate at base, punctures of moderate size, less regularly set and, when covered with natural coating, not so well defined at extreme apex, at sides closely placed; apices distinctly but not strongly divergent; surface with much denser vestiture composed of short, pale gray squamules, mottled with nearly white areas of squamules interspersed. Pygidium strongly, evenly rounded at apex, coated with dark yellow recumbent hairs. Ventral surface, including legs, with fine elongate pubescence, of abdominal segments and metathorax rather strongly ocellate. Metasternum with linear impression at middle.

Rostrum ♀ a little shorter than prothorax. First ventral segment feebly convex at middle.

Rostrum ♂ slighter, shorter than ♀. First ventral segment feebly and narrowly concave at middle.

Length 8.5-13.0 mm.; width 3.2-4.0 mm.

Type ♀ Cat. No. 28821, U. S. National Museum, type, allotype, and 135 paratypes in National Museum; 4 paratypes in the Canadian National collection, Ottawa, Canada, 4 in the University of Kansas, Lawrence, Kans., and 48 in the collection of the author.

Reared by Mrs. D. H. Blake, for whom it is named, from the stems of *Polygonum muhlenbergii* in October, also collected by Piper on the same plant in July.

Closely related to *terminalis*, from which it differs as follows: Much more robust with stouter rostrum, apex of pronotum a little wider; elytra as a rule less distinctly bisinuate, with vestiture dense throughout. The elytral striae with their natural

coating are not so well defined at the apex, but when the coating is removed the difference is not so apparent. There is little apparent difference in the rostrum in the sexes, whereas in *terminalis* the female organ is noticeably longer and more slender. The pygidium also agrees in the sexes. *L. terminalis* averages a little smaller, although ranging from 8.5 mm. occasionally to 11.0 mm.

Stanford University, Calif., August, 1927 (Mrs. D. H. Blake); Stratford, Wash., August 25, 1923 (M. C. Lane); Wahawai, Wash. (C. V. Piper); Medicine Hat, Alberta, Canada (F. S. Carr); Montana.

With a large series of specimens for study this species displays great variability. In many partially denuded individuals the pronotum is seen to be very strongly, widely, and very irregularly sulcate. In some specimens from Washington the elytra are black. Fresh specimens taken in the field at Stratford, Wash., are as a rule darker in color, with the elytra more strongly mottled. The vestiture is intact, whereas in the case of reared specimens that have been immersed with others in alcohol or roughly handled the vestiture is apt to be more or less abraded. A single specimen is nearly covered with bright yellow pollinose coating. At the apex of the rostrum there is frequently a more or less indistinctly impressed line, probably normal but sometimes obsolete or wanting.

A NEW APPLE MOTH FROM MANCHURIA (LEPIDOPTERA: OLETHREUTIDAE).

BY CARL HEINRICH, *U. S. Bureau of Entomology.*

The following species has been received by the Bureau of Entomology from Mr. A. Shino of the Kwantung Agricultural Experiment Station, who states that it is a very bad pest on the fruits of apple and *Crataegus* in China

Grapholitha inopinata, new species.

Palpus pale fuscous, sordid whitish beneath and on inner side. Head, thorax and fore wing brown with several of the scales on fore wing tipped with whitish ochereous, the pale scale ends showing (under magnification) as a fine, regularly lined, whitish ochereous dusting, especially noticeable on middle near dorsum and in outer area below costa; costa with seven or eight short whitish dashes (the first five or six broken into pairs by a median dark line and the basal one very obscure); between these the brown color extends in rather long streaks unshaded by pale scaling; from the first white streak beyond middle an obscure leaden-blue metallic line slants outwardly to end of cell and thence vertically to dorsum, forming the inner bar of the obscure ocelloid patch; a similar sub-parallel leaden line extends from the third white costal dash from apex; between these two metallic bands are a couple of obscure black dots just below costa and

a row of four strong black dots paralleling termen and occupying the ocellar area; near apex another small black dot; termen with a slight notch below apex; cilia pale, shining, semimetallic brownish fuscous. Hind wing concolorous with fore wing; cilia paler, with a dark basal band; veins 3 and 4 connate.

Genitalia figured from male type and female paratype. Male abdominal tufts consisting of short, broad, flattened scales.

Alar expanse 9.5-10.5 mm.

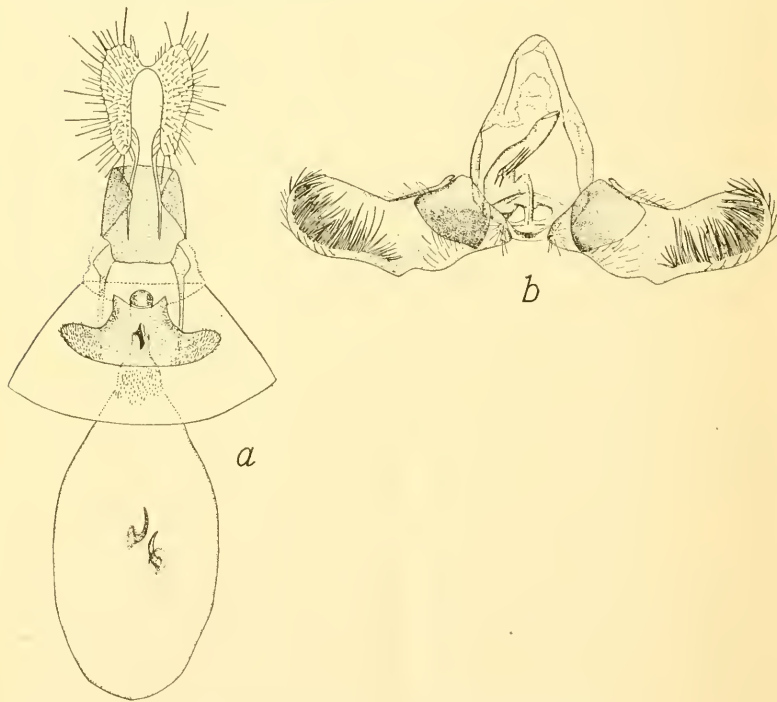
Type. Cat. No. 40787, U. S. N. M.

Type locality. Kinshu, South Manchuria, China.

Food plant.—Apple, *Crataegus*.

Described from male type and two male and two female paratypes, all from the type locality and dated August 4, 1927.

Similar in general appearance to the European *G. roseticolana* Zeller but with quite different genitalia.



Genitalia of *Grapholitha inopinata*, new species

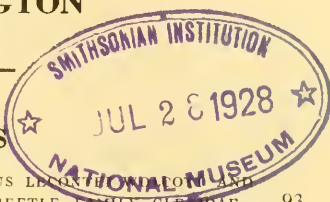
A = female.

B = male.

Actual date of publication, June 16, 1928.

PROCEEDINGS
 OF THE
ENTOMOLOGICAL SOCIETY
 OF WASHINGTON

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PROCEEDINGS OF THE
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No. 6

THE LARVAE OF ENOCLERUS LECONTEI WOLCOTT AND
CALLIMERUS ARCUFER CHAPIN, OF THE
BEETLE FAMILY CLERIDAE.

By ADAM G. BÖVING.

The subsequent descriptions and figures deal with two clerid larvae, not described in former papers by A. B. Champlain and myself, treating on clerid larvae,¹ namely, the larva of *Enoclerus lecontei* Wolcott (= *Thanasimus nigriventris* LeConte) from the western and middle western parts of the United States and *Callimerus arcufer* Chapin from the Fiji Islands.

Enoclerus lecontei Wolcott.

(= *Thanasimus nigriventris* LeConte auctt.;
Enoclerus nigriventris (LeConte), preoccupied.)

(Plate 5, Figs. 1-11.)

Material in U. S. Nat. Mus., Washington, D. C., is as follows:

A.—Marked "Hopk. U. S. 16809d, 1-5; in yellow pine, *Pinus ponderosa*; predacious on *Dendroctonus brevicomis*; Northfork, Calif., collected and reared by H. L. Person, U. S. Bur. of Ent." In jar containing

- 1.—One hatching larva inside of eggshell,
- 2.—Two mature larvae one of which is preserved in the cell made for pupation,
- 3.—One pupa in pupal cell,
- 4.—One reared imago with cast larval and pupal skins,
- 5.—Four reared imagines.

B.—Marked "Hopk. U. S. 16312 B; Aug. 7—1919; in *Pinus ponderosa*; from Ips galleries; Coeur d'Alene, Idaho, collected and reared by T. C. Evenden, U. S. Bur. of Ent." In vial

- ¹1920. Böving, A. G. and Champlain, A. B.—Larvae of North American beetles of the family Cleridae in Proc. U. S. Nat. Mus., vol. 57, No. 2323, p. 575-649. (On pp. 629-630 the seasonal history and biology of the species in question is treated by A. B. Champlain.)
1922. Böving, A. G. and Champlain, A. B.—The larva of the North American beetle *Zenodosus sanguineus* Say in Proc. Ent. Soc. Wash., vol. 24, pp. 9-10.

containing two larvae, one of which is dissected and mounted on two sides, kept in the collection of slides, U. S. Nat. Mus.

C.—Marked “Hopk. U. S. 13361; Aug. 13—1917; in galleries of *Dendroctonus brevicornis* in *Pinus ponderosa*; Ashland, Oregon, collected by A. W. Wagner.” One specimen mounted on slide, kept in U. S. Nat. Mus.

D.—Marked “Hopk. U. S. 15776b; *Pinus*; Ashland, Oregon.” One cast skin.

Mature larva (described from the larvae marked above as “B”) (Fig. 8). Total length of body about 11 mm., extreme width about 2 mm.

Corneous parts of head capsule and prothoracic and pygidial shields shining, reddish brown; the more thinly chitinized parts, namely, the meso- and metathoracic plates and the legs, more yellowish; membranous parts unicolorous and pink, ventrally paler.

Setae reddish or pale yellowish, moderately long, delicate, often silky; particularly numerous on the chitinous parts, the sides of the body, and the fleshy portion of the ninth abdominal segment.

Frons (Fig. 1) finely aciculate anteriorly with a few small pits each with a seta at the bottom; median carina indicated in the posterior two-thirds of frons by a dark line. Epicranium with dorsal surface finely, mostly crosswise aciculate, without protuberances and rugosities. Ocelli on each side five, rather small, all of the same size and arranged in two subparallel, upward and backward directed rows, anterior row with three, posterior with two ocelli. Antenna (Fig. 1) with the length of basal, second, and apical joints proportioned about as four, to one, to one, supplementary appendix half as long as apical joint. Mandible (Fig. 3) with retinaculum well developed, rounded, about as wide at base as high, located near middle of inner margin; inner margin between retinaculum and top of mandible somewhat expanded, thin and leaf-like; concavity on the ventral side completely exposed; two setae exteriorly placed.

Ventral mouthparts (Fig. 2) moderately large, with length of maxilla from end of palpus to articulating corner of cardo in proportion to galea about as one to one. Galea digitiform, carrying well developed setae and a tactile papilla at the outer end of a curved tube-like canal, not much wider than the base of the papilla; maxillary palpus three-jointed with basal, second, and apical joints proportioned about as two, to one, to one; palpiger low, broad, with a semi-annular chitinization, and two setae. Submentum (Fig. 2) with a square chitinization between the cardines, and having a pair of short setae. Labial palpus (Fig. 2) two-jointed; joints about of the same length as the second and terminal joints of the maxillary palpus.

Prothoracic sternal plate (Fig. 2) lanceolate. Meso- and metathoracic dorsal plates (Fig. 8) distinct. Legs of moderate size.

Abdomen with intersegmental membranes forming narrow rings; dorsal ampullae absent.

Pygidial plate slightly shorter than frons, a trifle wider than long. Urogomphi (Figs. 4, 5, 6, 9, 10, 11) in proportion to the middle line of the pygidial plate about as long as one to one and one-half, corniform, terminally bent toward the sagittal line, rugose, somewhat swollen near apex; apex recurved and slightly contracted.

Spiracles (Fig. 7) present in mesothorax and first to eighth abdominal segments; all bifore with annualr mouthpiece and a pair of short, finger-shaped tubes, pointing toward the hind end of the body.

Taxonomic comments:

A. B. Wolcott (in "Field Museum of Natural History, publication 144, Zool. series; vol. VII, No. 10, 1910; p. 359") states for the imagines that "it seems probable that *Thanasimus* will have to give way to *Clerus*, as some known species seem to bridge over the generic differences. The name *nigriventris* is preoccupied in *Clerus* by *C. nigriventris* Blanchard * * *. Should the species be reassigned to the genus *Clerus*, the specific name of *lecontei* is suggested for it." In a later paper by the same author (in "Transactions of the American Entomological Society, vol. XLVIII, pp. 67-78, 1922") the following remark occurs on page 68: "*Enoclerus lecontei* Wolcott (*nigriventris* LeConte, preoccupied)." According to the characters of the larva, Wolcott is right that the species can not be placed with the species of *Thanasimus* of which the larvae are known, namely, *T. formicarius* Linnaeus, *T. dubius* Fabricius and *T. repandus* Horn. In these species the urogomphi are cylindrical, rather slender, distally not swollen and with recurved but not contracted apex. In *Enoclerus* larvae, however, the urogomphi are either conical with slightly recurved apex or subcylindrical and distally either slightly or much swollen and with apex either slightly or abruptly and strongly contracted. In *Enoclerus nigripes* Say¹ the urogomphi are subcylindrical, distally somewhat swollen, and apex slightly contracted exactly as in the here-described larva of *Enoclerus lecontei*, and the only conspicuous difference between the urogomphi of these two species is that they are about as long as the longitudinal middle line of the pygidial plate in *nigripes*, but, as described above, considerably shorter in *lecontei*. Thus this character of the larva indicates not only that the species in question can not be placed in the genus *Thanasimus* (of which, however, we only know the larvae of three species) but must be considered as a distinct species of *Enoclerus* and hardly can be considered even as a "bridging form" between the two genera.

Callimerus arcufer Chapin.

(Plate 6, Figs. 12-30.)

The material in U. S. Nat. Mus. as follows:

¹Wrongly determined by nearly all writers—Böving and Champlain included—as *E. quadriguttatus* Olivier, whose occurrence, within the faunal limits of North America, according to Wolcott, "is so extremely doubtful that it would be better removed from our lists."

- 1.—One vial with three larvae in first stage, one vial with four larvae in second stage, one vial with three larvae in third stage, one vial with five pupae, all the larvae and pupae preserved in formalin.
- 2.—One larva in first stage, mounted in toto on a slide.
- 3.—One larva in third stage dissected and mounted on four slides.

The entire material comes from Suva, Fiji, and has been collected, reared, and presented to Dr. E. A. Chapin, U. S. Bur. of Entomology, by R. W. Paine, Assistant Entomologist, Levuana campaign, Fiji Dept. of Agriculture.

Mature larva (Figs. 12 and 15). Total length of body 11 mm., extreme width about $1\frac{1}{2}$ mm.

Corneous parts of head capsule yellowish-brown with posterior four-fifths of frons and adjacent longitudinal, narrow region of epicranium blackish-brown; prothoracic dorsal shield blackish-brown with somewhat lighter and more yellowish-brown touch anteriorly; prothoracic sternal plate very thinly chitinized and light pale yellow, presternal chitinizations not developed; meso- and metathoracic dorsal plates yellowish-brown; pygidial shield and urogomphi strongly chitinized and deep blackish-brown; thoracic hypopleural chitinizations blackish-brown; legs whitish with exterior surface of coxa brownish, claw whitish. Membranous parts of body creamy white (according to specimens preserved in formalin) with alar and spiracular areas of metathorax deep purple colored and the corresponding areas in the second, fourth, sixth and seventh segments of abdomen also deep purple (Figs. 12 and 15).

Setae numerous, blackish-brown, stiff and pointed; generally moderately long but with many long, strong setae between (Fig. 12); in each parasternal (= coxal) area (*past*) of abdomen a single, very long, capitate seta inserted in an oblique, rather strong setal cup (Figs. 25, 27, 28), an egg-shaped, membranous cushion close to the outer side of the cup.

Head capsule (Fig. 17) trapezoidal, posteriorly wider than anteriorly, somewhat wider than long, smooth and with numerous setae. Frons (Fig. 17) posteriorly limited by a short, transverse line; coronal (= median epicranial) suture completely absent. Ocelli (Fig. 18) five in number, arranged rather closely together in two transverse rows, three in front row and two in hind row. Antenna (Fig. 18) with second joint much shorter than basal and apical joints; length of basal, second and apical joints proportioned about as two, to one, to three; supplementary appendix (*sa*) half as long as apical joint. Mandible (Figs. 21, 22) with posterior half of inner margin strongly convex but without distinct retinaculum, inner margin between convex part and tip of mandible low, thin and convex; exterior border of concavity on ventral side covered by a thin, narrow, overhanging ledge; one long and numerous short setae present exteriorly.

Ventral mouthparts (Fig. 19) rather small, length of maxilla from end of palpus to posterior articulating corner of cardo in proportion to gula as one to one and one half. Galea (*g*, Fig. 23) digitiform, carrying setae and a tactile papilla at the outer end of a tube-shaped canal; basal, second and apical joints of

three-jointed maxillary palpus proportioned in length as two, to one, to two; palpiger (*pg*) rather large, carrying two setae. Basal and apical joints of labial palpus proportioned in length as one to one.

Legs long and slender with femur about one and one-half times as long as coxa and tibia as long as femur. Claw (Fig. 24 and *cl*, Fig. 28) short, pointed and curved. Paronychial appendix (Fig. 24, and *pon*, Fig. 26) equilaterally triangular, not extending beyond tip of claw.

Abdomen (Fig. 12) with normally developed, narrow intersegmental bands; dorsal ampullae absent. Ninth abdominal segment (Figs. 12, 13, 14) almost covered above by a strong (in dorsal view) subtrapezoidal pygidial shield extended into a pair of straight, conical and pointed, somewhat diverging urogomphi, in length about equal to the median longitudinal line of the shield; shield and urogomphi densely beset with long setae.

Spiracles (Figs. 29, 30) small, bifore with large annular mouthpiece and two short tubes pointing backward both on the thoracic and abdominal spiracles. Atrium beset with long hairs.

Taxonomic comments:

The genus to which this species belongs possesses all the characteristics of the larvae of the subfamily Hydnocerinae, namely, a frons limited posteriorly by a transverse line, five ocelli, the second antennal joint considerably shorter than the basal and apical joints, mandible without distinct retinaculum and with a partly covered ventral concavity, numerous stiff, pointed and strong setae, bifore spiracles with annular mouthpiece and a pair of short air-tubes. The genus is distinct and separable from the genus *Hydnocera* by having a large paronychial appendix located behind each claw (a unique character in the Cleridae), by long, pointed, conical urogomphi and by a long, capitate seta in the parasternal areas of the abdomen (also a unique character in the Clerid larvae).

EXPLANATION OF PLATES.¹

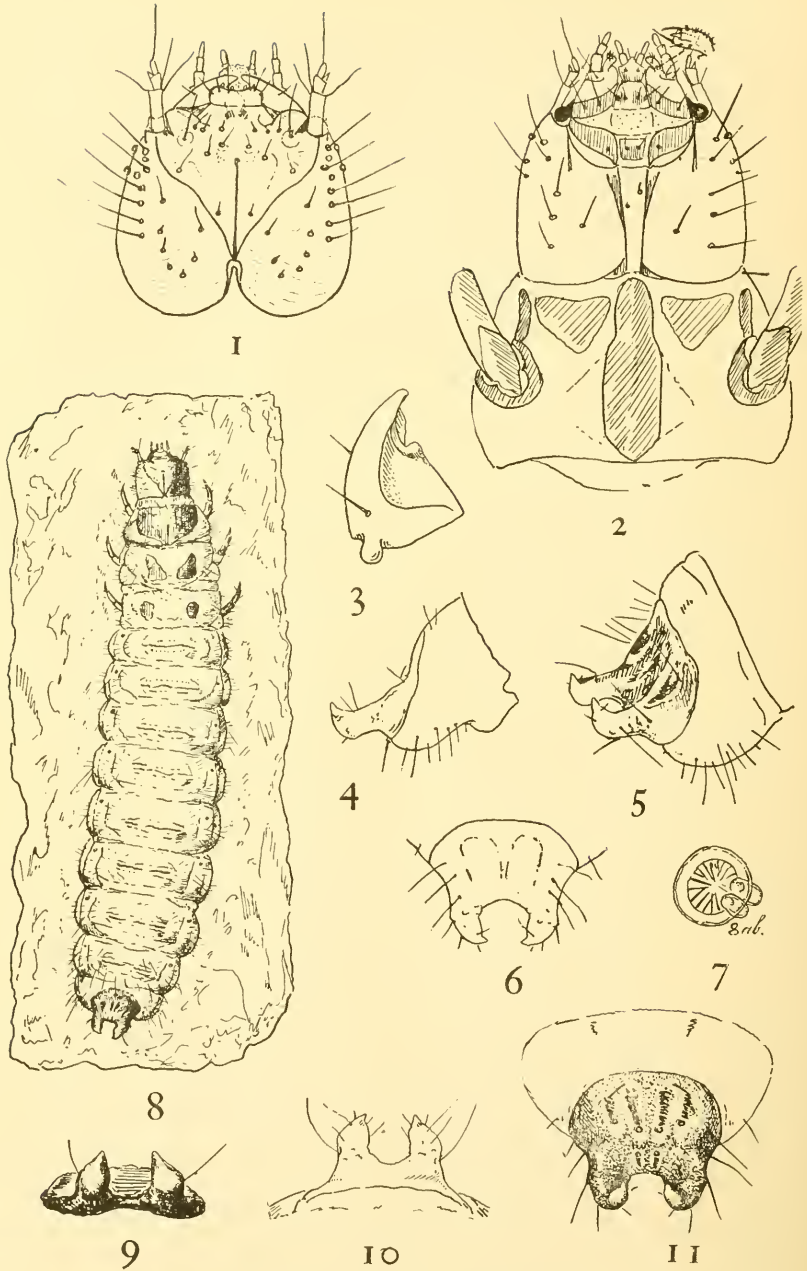
Plate 5.

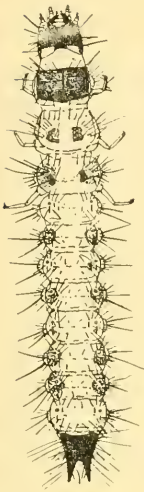
Enoclerus lecontei Wolcott.

(= *Thanasimus nigriventris* LeConte.)

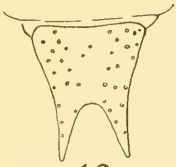
- Fig. 1. Head. Dorsal view.
- Fig. 2. Head and prothorax. Ventral view.
- Fig. 3. Mandible. Ventral side.
- Fig. 4. Urogomphus. Lateral view.
- Fig. 5. Urogomphi. Dorso-lateral view.
- Fig. 6. Pygidial plate and urogomphi. Dorsal view.
- Fig. 7. Spiracle of eighth abdominal segment.
- Fig. 8. Larva. Dorsal view.
- Fig. 9. Tip of urogomphi to show the swollen distal end.
- Fig. 10. Urogomphi. Ventral view.
- Fig. 11. Ninth abdominal segment. Dorsal view.

¹All figures drawn by the author.

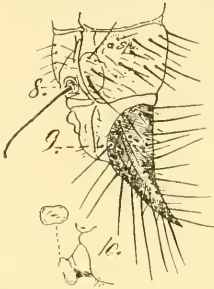




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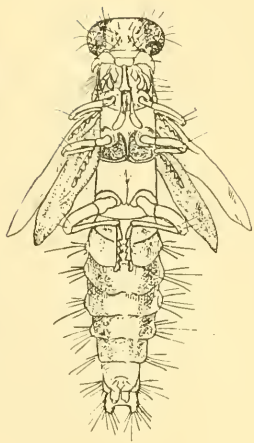
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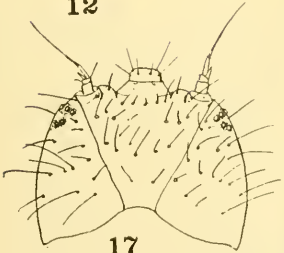
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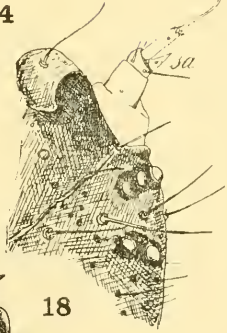
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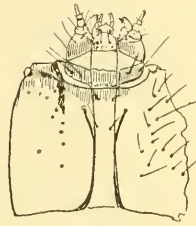
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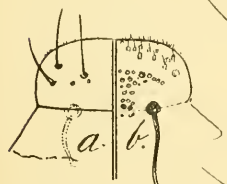
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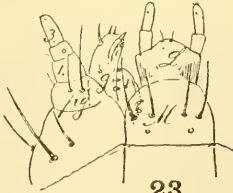
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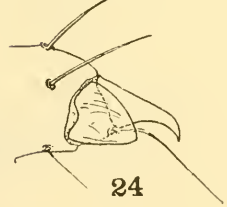
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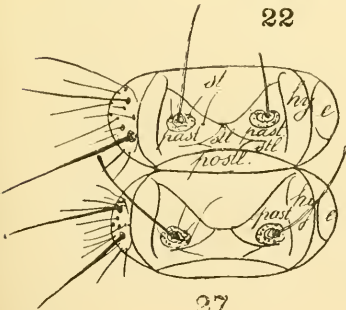
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24



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28



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26



30

Plate 6.

Callimerus arcufer Chapin.

- Fig. 12. Larva. Dorsal view.
 Fig. 13. Pygidial shield and urogomphi. Dorsal view.
 Fig. 14. Eighth and ninth abdominal segments, with separate figure of extended tenth abdominal segment. Lateral view.
 Fig. 15. Anterior part of body. Lateral view.
 Fig. 16. Pupa. Ventral view.
 Fig. 17. Head. Dorsal view.
 Fig. 18. Right antenna and five ocelli in two groups on the right side of the head.
 Fig. 19. Head. Ventral view.
 Fig. 20a. Clypeus and labrum. Dorsal view.
 Fig. 20b. Epipharynx.
 Fig. 21. Right mandible. Ventral view.
 Fig. 22. Left mandible. Dorsal view.
 Fig. 23. End of right maxilla; mentum and labium. Ventral view. *g*-galea, *L*-labium, *M*-mentum, *pg*-palpiger.
 Fig. 24. Distal end of leg. Posterior view.
 Fig. 25. Seta in parasternal area.
 Fig. 26. Distal end of leg. Paronychial appendix and claw bent to each side. *cl*-claw, *pon*-paronychial appendix (= empodium).
 Fig. 27. Sixth and seventh abdominal segments. Ventral view. *e*-epipleurum, *hy*-hypopleurum, *past*-parasternum (= coxal area), *postl*-postterellum (= intersegmental band), *st*-eusternum, *stl*-sternellum.
 Fig. 28. Seta in parasternal area.
 Fig. 29. Spiracle with spiracular mouthpiece, atrium and trachea. *A*-atrium, *Tr*-spiracular trachea.
 Fig. 30. Spiracle showing (1) mouthpiece with annular opening and pair of short tubes, (2) atrium. Exterior view. *A*-atrium.

THREE NEW SPECIES OF THE GENUS PEDINASPIS (HYMENOPTERA, FAM. PSAMMOCHARIDAE).

By J. R. MALLOCH.

Two of the species described herein were found amongst the miscellaneous unidentified material sent in by one of the field agents of the Biological Survey for the reference collection of that Bureau. As this collection is essentially intended for comparative purposes in the identification of insects found in the stomachs of birds, mammals, etc., and rare or new species are not ordinarily necessary to that end, the type specimens are deposited in the collection of the United States National Museum. The third species belongs to the United States National Museum and was given to me for description by Mr. S. A. Rohwer, being recognized by him as an undescribed species.

Pedinaspis albocaudata, new species.

Male.—Black, shining, with a violet tinge. Head with black hairs above, decumbent white hairs on face from above bases of antennae, through which the erect black hairs are evident; occiput with dense decumbent griseous, and sparse erect black hairs. Thorax and abdomen with dense violet black appressed tomentum; pronotum with some sparse erect hairs, the fine decumbent hairs on hind margin grey; pleura with a few short erect hairs; propodeum without white hairs. Third abdominal tergite with a narrow band of white decumbent hairs on dorsal portion of its hind margin, the following four tergites each with similar hairs on their entire dorsal aspect, the erect sparse black hairs longest on apical tergites. Legs violaceous black. Wings fuscous.

Head with a rounded hump on vertex behind and between ocelli; posterior ocelli separated from each other by same distance as either is from eye; clypeus rounded in front; antennae as long as thorax. Propodeum well rounded out behind, smooth. Abdominal sternites without abnormal armature. Venation as in *mariae*.

Length, 11 mm.

Type locality.—Higley, Arizona, June 27, 1917 (E. G. Holt).
Type.—Cat. No. 27432, U. S. N. M.

Pedinaspis bucephala, new species.

Male.—Similar in coloration to the preceding species, but the hairs on middle of face are brownish, not white, as are also some of those on occiput, the pronotum lacks the pale hairs on the hind margin, the tomentum of mesonotum and most of that on the dorsum of abdomen is brown, and not violet black, and there are no white hairs on abdomen at apex.

Structurally the two species are quite similar, but the head in this species is more noticeably humped on vertex than in the preceding one, and the antennae are shorter and thicker.

Length, 12 mm.

Type locality.—Palm Springs, Lakeside, Calif., August 9, 1917 (E. G. Holt).

Type.—Cat. No. 27431, U. S. N. M.

Pedinaspis brimleyi, new species.

Female.—Black, shining where abraded, otherwise dull because of the dense tomentum; abdomen with a large orange-yellow mark on dorsum of second tergite which extends from anterior margin about three-fourths of its length, and is slightly notched in middle of its posterior outline.

Head a little wider than thorax, vertex slightly raised above eyes; posterior ocelli distinctly proximad of upper margin of eyes, separated from each other by about three-fourths as great a distance as either is from eye; central depressed line faint; clypeus broadly rounded, flat on disc, a quite large conspicu-

ous depression around bases of antennae which is rather abrupt on its lower margin, extending over upper margin of clypeus; second, third, and fourth, flagellar segments subequal. Propodeum but slightly concave posteriorly, no obvious angle on sides of hind margin; no submedian angles on hind margin of mesosternum. Abdomen as in *mariae*. Third submarginal cell subquadrate. Length, 20 mm.

Type locality.—Raleigh, N. C., July 2, 1921 (C. S. Brimley).

Type.—Cat. No. 27433, U. S. N. M.

Named in honor of the collector.

This species superficially resembles *Psammocharis* (*Lophopompilus*) *atrox* (Dahlb.). It runs to *texanus* in Banks' key to the species of this genus but differs in having only the second abdominal tergite largely reddish, the depressions at bases of antennae much larger, and the hind margin of mesosternum more rounded

A NECESSITY FOR TAXONOMIC WORKERS.

By HARRISON G. DYAR.

Aside from generic difficulties and type fixation, it is clear when we get down to fundamentals, that the species is the ultimate unit. Nothing can be done in nomenclature without a specific name, and no specific name can be held valid without a description. A description may become inadequate in the light of future researches; but it is adequate at the time it was proposed, provided the author is competent to describe at all. In fact it would be possible to get along in taxonomy very well with nothing but specific names, provided we could think of enough different ones, using generic names only in catalogues, as we now use subfamily and family names and higher categories.

The most important thing, therefore, for taxonomic workers is the specific names based on the original descriptions. In what state do these stand? Surely in a very unsatisfactory one. Descriptions are published in every language under the sun, not only in western European tongues using the original Latin alphabet, but in the Greek languages such as Russian. We have not come across any descriptions in Arabic or Turkish, though no doubt they will arrive; but we have before us several papers describing new species purely in Japanese. The condition has been reached, theoretically at least, that every taxonomic worker must be able to read every written language on the face of the earth or he is not in a position to handle the emergencies of his subject alone, and translators are often difficult and expensive to find.

We submit that this is a hardship unnecessarily imposed upon the taxonomist, and a date should be set for it to cease, since the remedy is so simple. After a certain date, no specific description should be considered valid that is not accompanied by a Latin diagnosis. Latin is the basis of our biological system, and why have we departed from it? There are only two reasons: First ignorance and the unwillingness to learn even the smattering of Latin necessary to make a specific description, and second race-pride in wishing to see science published in one's own tongue. To the ignorant we would say, which is easier, to learn a little Latin or two hundred languages and dialects written in every conceivable form of character? To the latter, we would recall the fact that Latin is a dead language and treads on no one's patriotic toes. Besides, the Latin diagnosis can be followed by any amount of enlargement in the language of one's choice.

Following this line of thought, it appears that what we want is not an "automatic nomenclature" which Mr. McAtee recently advocated, but exactly the opposite, a return to the Latin base. All names should be in Latin form or Latinized, and this gives us no trouble with specific names, since names not proposed in adjective form can be considered nouns in apposition to the generic name. All generic names should be considered to have gender, and where this can not be determined the good old rule should apply that the genus is feminine. All specific names should agree in gender with the generic name and should be altered when transferred to a genus of another gender. We think also that generic names differing only in gender endings should not stand. Thus our present rules and codes, which have been so carefully thought out need not be discarded, but their importance is enhanced by the obligatory use of the Latin language in all original descriptions.

ON THE SYSTEMATIC POSITION OF THE ORTHOPTEROUS
GENERA *CNEMOTETTIX* CAUDELL AND *PHO-*
BEROPUS SAUSSURE & PICTET.

By A. N. CAUDELL.

A recent reexamination of the type material of *Cnemotettix pulvillifer* Caudell shows the posterior metatarsus to possess distinctly doubled pulvilli and the posterior femora to have an angle at the base on the outer side, characters diagnostic for the subfamily Stenopelmatinae. As the genus *Cnemotettix* was established as a member of the subfamily Rhabdophorinae, it is thought well to record this correction. The accompanying figure (Fig. 1) shows one of the posterior legs of *C. pulvillifer*, illustrating the above mentioned characters.

Saussure and Zehntner¹ erected their genus *Phoberopus* as a member of the subfamily Stenopelmatinae, but from their description and figures it seemed likely that it was really a Rhaphidophoriid. At the request of the writer the type species of that genus, which is in the British Museum, was examined by Doctor Uvarov, who finds the posterior metatarsus to be provided with a single undivided pulvillus and the hind femora to be without a basal angle on the outer side, thus conclusively proving the genus *Phoberopus* to belong to the subfamily Rhaphidophorinae.

The separation of the subfamilies Stenopelmatinae and Rhaphidophorinae is not a difficult matter when the diagnostic characters are understood and sufficient care exercised in examination. The presence of an inserting angle on the outer side of the base of the posterior femora is not a constant character of the Stenopelmatinae, as it is not present in the genus *Stenopelmatus* or *Cyphoderris*, comprising two of the three Nearctic genera of Stenopelmatinae. The presence of two pulvilli, or a distinctly divided single one, on the posterior matatarsus in the Stenopelmatinae is a more constant character, and one present in all genera of that subfamily examined by the writer. In the Rhaphidophorinae the metatarsus is either without pulvillus or with a single one, usually short and apical. A few of the Rhaphidophoriid genera, as *Hadenococcus* and *Tropidischia*, have the posterior femora much longer than the body, while none of the Stenopelmatiid genera, as far as known to the writer, have them any longer than the body. The two subfamilies may be readily separated by the following resumé of characters:

- Posterior metatarsus with two pulvilli on the under surface, or with a single one very distinctly divided (Fig. 1, p. p.); posterior femora no longer than the body and usually with an inserting angle on the outer side at the base (Fig. 1, a) or basally more or less elongated below (Fig. 2).....
 Stenopelmatinae.
- Posterior metatarsus without pulvilli or with a single, usually apical, one; posterior femora generally no longer than the body, but sometimes much longer, and without an inserting angle on the outer side at base, being there usually broadly and evenly rounded but sometimes more or less elongated below as in figure 3.....Rhaphidophorinae.

In the system of Brunner the genus *Cnematettix* falls in the group Mimmermites, in the keys of that author running out to the African genus *Onosandrus* Stal, from which Old World genus it is readily separable by having the anterior tibiae unarmed dorsally except apically. This genus is the only New World representative of this group since the removal from this subfam-

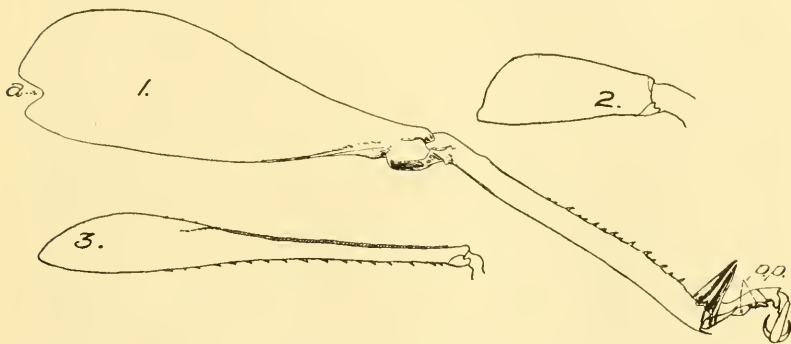
¹Biol. Cent.-Amer., Orth., Vol. I, p. 297 (1897).

ily of the genus *Phoberopus*, which is above shown to belong to the Rhabdiphorinae.

Recently there had been found in the National collection an additional specimen of *Cnemotettix pulvillifer*, an immature male from Santa Rosa Island, one of the islands lying off the coast of southern California, about one hundred miles north of San Clemente Island, the type locality of this insect. This specimen, like those of the original lot, is from collections made long ago, and was found in a miscellaneous lot of exotic material where it had been inadvertently placed.

EXPLANATION OF FIGURES.

- Fig. 1.—Left posterior leg of *Cnemotettix pulvillifer* Cdll. ♀ (Allotype).
 Fig. 2.—Left posterior femur of *Stenopelmatus intermedius* D. & S. ♂ (Paratype).
 Fig. 3.—Left posterior femur of *Tropidischia xanthostoma* Scudd. ♂.



PLASTOPHORA CRAWFORDI COQ. AND PLASTOPHORA SPATULATA MALLOCH (DIPTERA: PHORIDAE), PARASITIC ON SOLENOPSIS GEMINATA FABR.¹

By M. R. SMITH, *A. & M. College, Mississippi.*

Ants perhaps have fewer true parasites than almost any other group of common insects. A number of reasons may no doubt be assigned for this, but probably the most important factors contributing toward their freedom from parasites are: (1), their remarkable agility; (2), their subterranean life, and (3), their habit of frequently cleaning and licking themselves. Of the few insects attacking ants, probably their most persistent parasites in North America are the various species of flies belonging to the family *Phoridae*.

The first account published in this country of the relationship between one of these parasitic flies and its host, was that by the late Theodore Pergande, an accomplished formicologist.

¹A Contribution from the Mississippi Agricultural Experiment Station.

His interesting account of the biology of *Apocephalus pergandei* Coq. a parasite of the common black carpenter ant, *Camponotus herculeanus* subsp. *pennsylvanicus* DeGeer, was published in the Proceedings of the Entomological Society of Washington, Vol. 4, pp. 497-502, for December, 1900. Pergande found that the fly oviposited on the head of the carpenter ant (worker) and that the resulting larva entered through the occipital foramen and fed on the interior of the head of its host, finally severing it from the body. Wheeler in speaking of this very aptly remarks that the fly causes the ant to literally lose its head.

Nothing more was published on the biology of the Phorid flies that attack North American ants until Coquillett described a species as *Pseudaceton crawfordi* from 10 specimens taken by J. C. Crawford and W. D. Pierce at Dallas, Texas, from around nests of the fire ant, *Solenopsis geminata* Fabr. (Can. Ent., Vol. 39, pp. 207-208, 1907). Coquillett states that Pierce and Crawford found the flies in company with the ants and that these observers noted that "one of the females was observed to apparently deposit an egg in the head of an ant, *Solenopsis geminata*." The flies collected by these men remained in the U. S. National Museum as *Platophora crawfordi* Coq. until J. R. Malloch, while classifying the specimens of Phorid flies in the Museum, found among these specimens one female with an ovipositor of such a peculiar and different shape from the rest that he appropriately named it *spatulata*.

So far as the writer is aware no one has since published anything on these species, hence the observations which he has made on these two flies during the past two years may be of some interest to others. The most complete notes in the writer's possession were made at Vicksburg, Mississippi, on July 6, 1927. The notes are as follows: At 3:30 P. M. the writer was fortunate enough to find a colony of fire ants which were in the process of taking their nuptial flight. The afternoon was very warm and clear and the ground dry, as no rain had fallen for several days. Numerous workers of the fire ant were running rapidly over the nest and for some distance into the grass surrounding it as they gave vent to their excitement. Near the entrance to the nest were a number of winged males and winged females which were crawling here and there; the majority of the sexed forms, however, had not yet emerged from the nest. Almost half an hour had elapsed from the time the writer began to make observations on the colony before the sexed forms began to pour forth from the nest in large numbers and to run around excitedly. Many of these crawled upon blades of grass and flew off into space. A few of the heavier-bodied queens were not so successful in their flight and were soon forced down within a few feet of the nest.

While making observations on the ants the writer happened to note several extremely small or gnat-like flies that were hovering over the nest, and appearing to be much interested in what was going on below. There were at least five or six of these flies in the air at a time. Occasionally one of them would swoop toward the surface of the ground and strike a worker ant. As to how the fly struck the ant or just where the ant was hit was difficult to ascertain owing to the thickness of the grass surrounding the nest and to the speed of the fly as she struck the ant. As best the writer could determine the fly struck the ant toward the anterior part of the body apparently in the head. When an ant was struck by a fly it would fall over on its side and lie in an apparently stupefied or paralyzed condition for several seconds before rising to its feet. During this time the ant made a struggle to get up but seemed to be unable to coordinate its leg movements. When the ant finally did regain its feet it ran away as briskly as ever. That the ants despise these parasites seems evident, for time and again the ants were seen to lunge at the flies with open mandibles and no doubt would have killed them had the ants been able to catch them, but the flies were entirely too agile and wary. In no case was a fly seen to attack the male or female ants although many of these were exposed to their attacks and no doubt were more conspicuous to the flies than the small workers. Was this just a coincidence or not? It would appear that the male and female ants, because of their larger size, would furnish the fly larva more nourishment than would the workers. Another question which came to mind was this, do the flies always attack the ants at the time when the sexed forms are taking their nuptial flight? It is certainly true that at such a period more workers are exposed to the flies than would probably be the case at any other time. The writer regrets that he can not answer this question and that he has not been able to find anything bearing on this point in the article by Coquillett previously referred to. At Greenwood, Mississippi, during late September, 1926, the writer witnessed a similar attack of Phorid flies on a colony of fire ants. Although no specimens were obtained the writer has every reason for believing that the species concerned in this attack were the same as at Vicksburg. When the writer came upon the nest at Greenwood no sexed forms were to be found, but numerous workers were running over the ground in such a state of excitement that it is quite possible the sexed forms had already taken flight and disappeared.

The flies did not always hover over the nest as previously described. After they had flown for some time over the nest they occasionally came to rest on leaf blades or other objects above the surface of the soil. Here they remained for a short

while before resuming flight. While a number of the flies were in this position four specimens were captured. On introducing these into a vial the flies were extremely active, flying around the vial so swiftly that it was impossible to determine their appearance. The four flies taken at Vicksburg were divided into two lots of two specimens each and one lot sent to Dr. C. T. Brues and the other to Mr. J. R. Malloch. Dr. Brues reported that only one specimen reached him and this was in very bad condition, but appeared to be *Plastophora crawfordi* Coq. Mr. Malloch also received one specimen which he determined as *Plastophora spatulata* Malloch. According to Mr. Malloch, it is not unusual for several species of these flies to be found around an ant nest at the same time, as is illustrated here by the collections made at Dallas and Vicksburg. The writer succeeded in taking a number of the ants which had been struck by the fly and were therefore probably parasitized but unfortunately every one of these specimens escaped from the vial in which they were confined, and an excellent opportunity to make a further contribution on the biology of these flies was lost.

The listing of *Plastophora curriei* Malloch as a parasite of the fire ant (Proc. U. S. Nat. Mus., Vol. 43, p. 413, 1908) was undoubtedly a slip of the pen. This species was described by Malloch (Op. cit., p. 501) from four specimens taken by Rolla P. Currie at Kaslo, British Columbia, as they were "hovering over ant galleries in stump." Mr. Currie's diary, kept during the collecting trip to British Columbia in 1903, contains these entries, among others, for August 6: "I went alone for an all-day trip to Mirror Lake. Partly cloudy but no rain. Opened up ants' galleries in an old stump on the way. Found small myriapods, a mite, and some Collembola in their galleries. Several specimens of a tiny fly were darting about. Watched them for some time, thinking they might be parasites of the ants, but was unable to determine."

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A NEW LASPEYRESIA FROM FLORIDA (LEPIDOPTERA:
OLETHREUTIDAE).

By CARL HEINRICH, *U. S. Bureau of Entomology.*

Laspeyresia palmetum, new species.

Palpus, face and anterior part of head pure white; posterior part of head grayish fuscous. Thorax and fore wing a very dark glossy brown finely cross-streaked with metallic purple scales and with a conspicuous, rather large, clear white, semicircular spot on mid dorsum of fore wing; a dark angulate basal patch, an oblong patch on mid costa and a rather broad band from costa near apex to mid termen, all very faintly indicated by some black dusting on the brown ground; cilia blackish. Hind wing semilustrous brownish fuscous, considerably paler than fore wing; cilia slightly paler, without basal band.

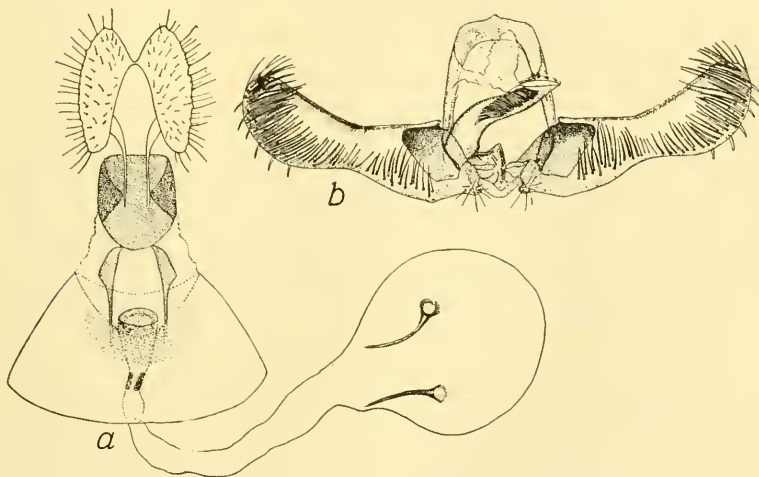
Genitalia figured from type and paratype.

Alar expanse.—12-14 mm.

Genitalia of *Laspeyresia palmetum*, new species.

A = female.

B = male.



Type and paratypes.—Cat. No. 40786, U. S. N. M.

Type locality.—“Near Royal Palm State Park, Florida.”

Food plant.—Small berry-like fruit, identified by Dr. Frederick V. Coville as possibly *Icacorea paniculata*.

Described from male type and one male and two female paratypes from the type locality, reared by Mr. Frank Morton Jones (“III-8,” 1927).

A striking species resembling, somewhat, *albimaculana* Fernald and *americana* Walsingham. Distinguished from the former by its darker ground color and from the latter by its paler hind wings and from both by its genitalia.

WATER-BEARING PLANTS OF PANAMA WHICH HARBOR
MOSQUITOES, WITH A NEW SPECIES OF WYEOMYIA
(DIPTERA: CULICIDAE).

BY HARRISON G. DYAR.

The appearance of the "Flora of the Panama Canal Zone" by Paul C. Standley (Smithsonian Institution, United States National Museum, Contributions from the United States National Herbarium, Vol. 27, 1928), makes it convenient to note those of the plants listed that hold water in their leaves or bracts in which mosquitoes breed. These mosquitoes, as is well known, are peculiar to the several plants, and occur nowhere else, so that the problem is one of scientific interest and not of any economic importance in any instance as yet known. The adults frequent their special plants, never occur in large numbers, and while some species are occasionally found in houses, no serious amount of annoyance has been reported from any of them. The following are the plants, arranged by families, and the species of mosquitoes which inhabit them:

Family ARACEAE.

Genus *PISTIA* Linn.

This floating water plant has a number of mosquito larvae which are associated with the roots. *Mansonia titillans* Walk. is commonly associated, the larvae getting air from the vascular roots which they cut with their air-tubes. *Culex aikenii* Aik. also commonly occurs among the roots, which, however, are not pierced. *Culex egcymon* Dyar has also been so found, but it has other habitats as well.

CALADIUM Vent. and COLOCASIA Schott.

Dendromyia melanocephala D. & K. is a characteristic inhabitant of the water in the leaf-axils of these plants, and as these are often cultivated around houses, the little white-footed mosquito may be frequently seen. It is much preyed upon in the larval state by the larvae of *Goeldia longipes* Fab., which inhabit these plants as well as others. *Dendromyia prolepidis* D. & K. has also rarely been found in "elephant's ear."

XANTHOSOMA Schott and MONOTRICHARDIA Crüger.

These plants harbor *Miamyia ypsipola* Dyar, *Dendromyia prolepidis* D. & K., *Dendromyia complosa* Dyar and presumably *Dendromyia jocosa* D. & K., which has not yet been bred. They are preyed upon by the larvae of *Goeldia longipes* Fab. and *Isostomyia espini* Mart., the latter often taken indoors as adults, presumably seeking shade.

Family BROMELIACEAE.

Genus ANANAS Adans.

Ananas magdalenae André has been much overlooked as to its mosquito fauna until lately with the work of Mr. C. H. Bath. *Dendromyia intonca* D. & K., described from *Tillandsia*, has been found to be only accidental in that plant, but at home in *Ananas*. A new species of *Wyeomyia* was discovered by Mr. Bath, to be described as follows:

WYEOMYIA (WYEOMYIA) CHARMION Dyar, new species.

Male.—Proboscis about as long as the abdomen, swollen at tip; prothoracic obes dark bronzy brown, of the color of the mesonotum; abdominal colors separated on the sides in a straight line; legs bronzy black, mid tarsi brassy white on one side; hind tarsi marked with white at base of the third joint below and all but the tips of the fourth and fifth; outstanding scales of the wing linear. Hypopygium: Clasper with long slender stem; mid lobe moderate with central point and shoulder on each side, a row of fine long hairs running on a ridge to tip; outer arm with large basal shoulder, slender, with two setae; inner arm thick, rather large, hooked; core arm large, about as large as mid lobe though shorter, hairy on its basal angle only.

Larva.—Abdominal hair tufts stellate, in about eight; lateral comb of the eighth segment of about 24 large scales in a straight row; air-tubes subfusiform, tapered at tip, about seven times as long as wide at base, with scattered single hairs, the basal ventral one double; dorsal hairs of anal segment a long one on each side, lateral hair double, long, subventral tuft short, multiple.

Type, male, No. 41,103, U. S. Nat. Mus.; bred from water in the leaves of *Ananas magdalenae* growing at the head of Stream No. 7, Agua Clara Reservoir, near Gatun, C. Z., January, 1928 (C. H. Bath).

In *Ananas* also occur *Culex imitator* Theob. and *Anopheles cruzii* D. & K., also inhabitants of the large *Tillandsia* and *Vriesia*. Some predator doubtless occurs also, but has not been discovered.

Genera AECHMEA R. & P., VRIESIA Lindl. and TILLANDSIA Linn

These plants harbor *Wyeomyia celaenocephala* D. & K., *W. scotinomus* D. & K., *W. guatemala* D. & K., *W. simmsi* D. & K., *W. melanopus* Dyar, *Dendromyia phroso* H., D. & K., (probably), and *Dendromyia circumcincta* D. & K. With them are associated *Culex imitator* Theob., *C. jenningsi* D. & K., *C. daumas-tocampa* D. & K., those peculiar little *Culex* breeding nowhere else and comprised in the subgenus *Microculex*, and *Anopheles cruzii* D. & K., Dr. Lutz's celebrated vector of "forest malaria," which Dr. Davis has lately shown to be probably harmless. These are preyed upon by *Megarhinus superbus* D. & K. larvae, which are inhabitants only of these plants.

Family MUSACEAE.

Genus **HELICONIA** Linn.

The flower-bracts of the species of *Heliconia* whose flowers are upright contain gummy water in which live *Dendromyia chalicephala* D. & K., *D. ulocoma* Theob. and *D. pseudopecten* D. & K. They are preyed upon by the larvae of *Goeldia longipes*.

Family CANNACEAE.

Genus **CALATHEA** Meyer.

The flower-bracts of these plants hold water much as in *Heliconia*. Here the following species find their larval home: *Dendromyia eloisa* H., D. & K. and *D. canonus* H., D. & K. They are preyed upon by the larvae of *Isostomyia magna* Theob. (*dicellaphora* H., D. & K.).

This makes 23 species of mosquitoes which inhabit solely the water in living plant tissues in the Canal Zone, 18 Sabethids, 3 *Culex*, 1 *Megarhinus* and 1 *Anopheles*. There are known 17 other species of Sabethids in the Canal Zone or nearby Panama, of which 13 are known to live in the water in dead plant tissues such as tree-holes, nut-husks and broken bamboo-joints. Of the four species whose life-history is unknown, *Sabethes tarsopus* D. & K. and *Miamyia florestan* Dyar probably live in tree holes or husks, leaving only *Dendromyia clasoleuca* D. & K. and *Goeldia leucopus* D. & K. as possible additional species to the list of those inhabiting living plant tissues.

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A NEW GENUS AND SPECIES OF APHIDIDAE
(HOMOPTERA).¹

A. A. GRANOVSKY, *University of Wisconsin.*

When Walsh (5), in 1862, erected the genus *Calaphis* he based it upon his new species *betulella*, the type of the genus. The main generic characters were based upon the relative length of antennae, absence of radial sector, heavy anal veins, type of cornicles and thoracic segments.

Until 1910 only one species was listed under this genus. In that year Gillette (3) transferred to *Calaphis* two of Fitch's species, *C. castaneae* and *C. betulaeacolens*. In 1916 Baker (1) added two new species, *C. alni* and *C. castaneooides*, while Patch (4), in 1923, added the new species *C. myricae* and included *C. annulata* (Koch). Up to this date a total of seven American species have been referred to *Calaphis*. In the meantime the generic characters of *Callipterini* became more crystallized and definitely established. Baker's contribution (2), to our knowledge of the generic classification of aphids, removes a great deal of misunderstanding and confusion. A new set of characters was introduced for separation of genera belonging to the tribe *Callipterini*. The types of caudae and anal plates were found to be very stable generic characters and exceedingly useful ones, when employed in connection with other characters, such as the type of cornicles, antennae, sensoria, antennal tubercles, wing venation, etc., together with biological characters of related species.

On several occasions in recent years a species of aphid was taken in Wisconsin on white paper birch, *Betula papyrifera* Marsh. It approaches very closely to *Calaphis*, yet its radial sector is complete and it has a very markedly knobbed cauda in the shape of a spatula and a somewhat more deeply cleft anal plate than is the case with the typical species belonging to *Calaphis*. The type of cauda resembles that of *Callipterus juglandis* Frisch, yet it is distinctly not a *Callipterus* species.

Upon close examination of all the species of *Calaphis* it was found that *C. myricae* Patch from sweet fern has a similar

¹Contribution from the Department of Economic Entomology, Wisconsin Agricultural Experiment Station.

cauda and anal plate and resembles this undescribed species from birch, in several other respects, with the exception of radial sector which is absent.

The birch species was referred to Doctor P. W. Mason at Washington, D. C., and it was also submitted for examination to Doctor C. P. Gillette, Miss M. A. Palmer and Professor H. F. Wilson. In their opinions it is an undescribed species and is worthy of having a new genus erected for it. In accordance with this opinion, the writer has a singular pleasure in erecting a new genus *Cepegillettea* in honor of his highly esteemed teacher, Doctor C. P. Gillette, whose contributions to the knowledge of the aphid family are many and of great value.

CEPEGILLETTEA, new genus.

Antennae of six segments, longer than the body, armed with oval sensoria and liberally provided with prominent capitate hairs; sensorium at the base of unguis long, oval and fringed with several large auxiliary sensoria. Distinct frontal tubercles present. Head, thorax and body with a few stout, clavate hairs. Cornicles truncate, broader at the base, somewhat constricted in the middle and distally imbricated. Cauda spatulate, long, broadly rounded at the tip, deeply constricted about half way from the base, and distinctly imbricated. Cornicles and cauda finely ornamented with minute striae in lineal arrangement. Anal plate large, moderately cleft with broad indentation. Both cauda and anal plate with conspicuous, stout hairs. Fore wings with media twice branched; radial sector either present or totally absent; hind wings with media and cubitus present. Veins heavy and usually bordered. Forms robust and more or less solitary in habit. Antennae of apterous and oviparous females provided with oval sensoria.

Genotype: *Cepegillettea betulaefoliae*, new species.

This genus can be easily separated from other genera of the tribe *Callipterini* by the large spatulate cauda and its ornamentation which is also present on cornicles.

In the structure of cauda this genus resembles the type species of *Callipterus*, yet the genus *Callipterus* is characterized by the deeply bilobed anal plate, the lack of antennal tubercles, the hairy cornicles and the very short unguis. *Cepegillettea* differs from *Callipterus* in having the anal plate only shallowly notched, the very robust and prominent antennal tubercles, the cornicles free from hairs, but imbricated and ornamented as well as the long unguis, which is longer than the base of segment VI.

The genus *Cepegillettea* is closely related to *Calaphis* in a number of characters such as the type of antennae, the presence of frontal tubercles, truncate cornicles, indented anal plate and general appearance of the insect. It differs decidedly,

however, from it by having very long, spatulate cauda (Figs. 8 and 9), broad, somewhat deeper indented anal plate, with imbrications and ornamentation on cornicles and cauda as well as the presence of conspicuous capitate hairs on antennae, frons, thorax and body in which respect it resembles *Macrosiphum*. The typical *Calaphis* species have cauda very short and knobbed (Fig. 18).

Cepgillettea evidently represents the phylogenetic link between the tribes *Callipterini* and *Macrosiphini*.

Two species can be included in the genus *Cepgillettea* at present. No doubt that further study will reveal additional species. The species *C. betulaefoliae* is used for the type of the genus in preference to the older species *Calaphis myricae* Patch, because the writer had the opportunity to collect and study living specimens of the former species, while *C. myricae* was studied only from preserved material through the kindness of Doctor E. M. Patch and the U. S. Bureau of Entomology.

The following keys will separate these species:

Key to the alate viviparous females of Cepgillettea.

- 1. Antennae black; antennal segment III with 22 to 30 oval sensoria; unguis about four times as long as the base of the sixth segment; radial sector absent.....*myricae* (Patch)
- Antennae irregularly dusky brown; antennal segment III with 14 to 17 oval sensoria; unguis about two times as long as the base of the sixth segment; radial sector present.....*betulaefoliae* n. sp.

Key to the apterous viviparous females of Cepgillettea.

- 1. Antennal segment III with 13 to 20 circular sensoria; unguis about four times as long as the base of the sixth segment.....*myricae* (Patch)
- Antennal segment III with 10 to 15 circular sensoria; unguis about two times as long as the base of the sixth segment.....*betulaefoliae* n. sp.

***Cepgillettea betulaefoliae*, new species.**

Alate viviparous female. (Plate 7, figures 1, 9, 10 and 13.)

Length of body from frons to the tip of cauda about 2.944 mm. Head orange yellow, with greenish tinge. Eyes large, red. Antennae on prominent frontal tubercles. Length of antenna 5.219 mm. Comparative average lengths of antennal segments as follows: I—14.0; II—8.0; III—86.87; IV—83.00; V—68.00; VI—21.80 plus 44.53. Unguis about two times as long as its base. Antennae pale yellow with black annulations at the distal ends of each segment and with irregular dusky brown to black shadings which are distributed as follows: The base of segment III on the inner margin with a triangular dusky brown annulation; the sensorated area of segment III deeply shaded with dusky brown; the basal half of segment IV with light and distal half with heavy irregular, almost spiral dark brown shadings, which become black toward the end of the segment; the entire segment V with the exception of the

base, deeply shaded with dark brown to black; the base of segment VI and the entire unguis dusky brown, the tip of the base of segment VI black. The entire length of antennae, with exception of segments I and II, finely imbricated, —this imbrication is more pronounced distally. Antennae with prominent capitate hairs. Segment III with an irregular row of from 13 to 20, usually 15 to 17, oval, widely margined, large secondary sensoria, placed somewhat in the middle of the segment, but more toward the base. Segment V with a long primary sensorium without fringe and the primary sensorium at the base of the unguis with several large auxiliary sensoria. Frons and head with several pairs of capitate hairs. Rostrum with its black tip reaches up to the second pair of coxae.

Thorax pinkish yellow-orange and with a few capitate hairs; thoracic lobes with very light brown shading. Legs very long, greenish yellow and clothed with capitate hairs. Apices of all femora usually touched with narrow, small blackish patches. The bases and tips of tibiae are ringed with black; occasionally in older individuals the tibiae may be slightly margined and striated on the outer sides with dusky brown; tibial hairs are capitate with the exception of distal ends of tibiae, which are clothed with stout, simple hairs. Tarsi and claws black; empodium present. Fore-wings large; veins heavy and slightly bordered with light brown; stigma yellow; media twice branched; radial sector complete or slightly faded basally. Hind wings with media and cubitus present; hooklets three.

Abdomen yellowish green with a few irregular dark green patches around the cornicles and anterior end of the abdomen. Lateral tubercles small, each provided with a capitate hair. Body hairs on several posterior segments, near cauda, long and capitate. Cornicles about 0.160 mm. long, truncate, broader at the base, somewhat constricted in the middle, imbricated and ornamented with fine lineal striations, the apices of cornicles are black. Cauda—yellow, long, spatulate, broadly rounded at the tip and deeply constricted about half way from the base, distinctly imbricated and transversely ornamented with fine lineal striations. The length of the base of cauda about 0.176 mm. and the spatulate part about 0.192 mm., total length being about 0.368 mm. Anal plate yellow, large, granulated, and moderately bilobed with a broad indentation. Both anal plate and cauda provided with long lash-like stout hairs.

Described from 12 specimens collected at Sturgeon Bay, Wisconsin.

Apterous viviparous female. (Plate 7, figures 2, 8 and 11.)

Length of body from frons to the tip of cauda about 3.040 mm. Head yellowish green. Eyes red. Antennae with conspicuous capitate hairs and are placed on prominent antennal tubercles. Length of antenna 5.019 mm. Comparative average lengths of antennal segments as follows: I—14.00; II—8.00; III—87.45; IV—76.47; V—61.55; VI—21.00 plus 40.87. Coloration and imbrication of antennae as in the alate viviparous females, only irregular shadings are somewhat lighter, especially along the sensorated area of segment III,

which has from 10 to 15 oval with wide margins secondary sensoria. They are placed in a somewhat irregular row about the middle of the segment. Primary sensoria as in the alatae. Frons and head with several stout capitate hairs. The tip of rostrum black, reaching slightly beyond the second pair of coxae.

Thorax greenish yellow to orange and is clothed with a few capitate hairs. Legs long, hairy, and are colored as in the alate viviparous females.

Abdomen yellowish green, with similar dark green irregular patches as in the alatae. Abdomen conspicuously armed with stout clavate hairs, each arising from small lateral and body tubercles. Cornicles about 0.160 mm., truncate, wider at the base, constricted in the middle, imbricated and ornamented with transverse fine lineal striations, especially at the distal ends, which are marked with dusky brown to black. The cornicles are stouter than in the alate viviparous females. Cauda and anal plate identically colored, shaped, sculptured and imbricated as in the alatae. The cauda is slightly larger and measures as follows: The base about 0.192 mm. and the spatulate part about 0.224 mm., total length being about 0.416 mm. Both anal plate and cauda hairy.

Described from 19 specimens taken in Wisconsin.

Apterous oviparous female. (Plate 7, figures 3, 6, 7 and 12.)

Length of body from frons to the tip of cauda about 3.216 mm. Head greenish yellow to light green. Eyes dark red. Antennae armed with prominent capitate hairs and placed on distinct frontal tubercles. Length of antenna 5.107 mm. Comparative average lengths of antennal segments as follows: I—14.0; II—7.0; III—82.50; IV—76.10; V—66.00; VI—22.12 plus 45.00. Coloration and imbrication of antennae as in the apterous viviparous females. Segment III armed with from 10 to 14, usually 10 to 12 oval wide-margined secondary sensoria. They are placed in an irregular row about the middle of the segment, but more toward the base as in the preceding forms. The primary sensoria on segments V and VI as in the alate viviparous females. Frons and head with prominent capitate hairs. The tip of rostrum black; reaching beyond the bases of the second pair of legs.

Thorax yellow to very light orange, provided with a few stout, clavate hairs. Legs hairy, long, yellow with greenish tinge; distal ends of femora with faint blackish markings; tibiae ringed with black at the bases and distal ends; tarsi black. Hind tibiae only very slightly swollen at basal halves, and armed with numerous small circular sensoria, which cover proximal two-thirds of the tibiae.

Abdomen deep yellow, arched, especially in older individuals. Area between the eggs is greenish. Clavate hairs over the body present. Cornicles as in the apterous viviparous females only more conspicuously marked with black toward apices. Ovipositor slightly drawn out. Cauda broadly conical with slight constriction toward the base. Anal plate rounded, entire. Both anal plate and cauda armed with stout simple hairs.

Described from 5 specimens collected in Wisconsin.

Alate Male.

On two occasions alate males were taken, but on account of their swift habits they escaped before collecting box was closed.

Host plant.—White paper birch, *Betula papyrifera* Marsh.

Type locality.—Sturgeon Bay, Wisconsin.

Cotypes and *paratypes* in the U. S. National Museum; and in the collections of Doctor C. P. Gillette and the writer.

Habit of feeding.—This interesting species feeds singly or sometimes in small groups on the lower sides of the leaves and also infests the young succulent birch sprouts and terminal shoots near the ground. It is usually found in dense foliage, and is evidently a shade and moisture loving species. It is extremely difficult to collect because it is very active, and as soon as leaves are only gently touched all of the adult individuals and older nymphs drop off their feeding places, while young nymphs are running away to the ground.

Oviparous females invariably were taken not more than one foot from the ground, where they deposit their deep yellow eggs near buds of young birch sprouts. Later the eggs turn black in color.

The following collections were taken by the writer on *B. papyrifera* Marsh:

June 30, 1923, Egg Harbor, Wis.	1 apterous viviparous female.
August 10, 1925, Sturgeon Bay, Wis.	1 alate and 1 apterous viviparous female.
August 11, 1925, Sturgeon Bay, Wis.	2 alate and 4 apterous viviparous females, some nymphs.
August 13, 1925, Sturgeon Bay, Wis.	6 alate and 3 apterous viviparous females.
September 16, 1925, Sturgeon Bay, Wis.	1 immature oviparous female.
October 6, 1925, Sturgeon Bay, Wis.	2 oviparous females and 2 immature oviparous nymphs.
July 23, 1927, Sturgeon Bay, Wis.	4 apterous viviparous females and several nymphs.
July 27, 1927, Sturgeon Bay, Wis.	2 apterous and 2 alate viviparous females, several nymphs.
August 2, 1927, Sturgeon Bay, Wis.	2 apterous and 1 alate viviparous females, 5 nymphs.
September 7, 1927, Spider Lake, Wis.	2 apterous viviparous and 1 immature oviparous female.

September 16, 1927, Sturgeon Bay, Wis.3 oviparous females and 2 immature oviparous females.

Distribution records of this species besides Wisconsin are known from Merritt, British Columbia, Canada, as the specimens of two apterous viviparous females in a balsam slide, received through the kindness of Miss A. P. Macdougall, agree in all respects with this species, collected at Wisconsin. They were taken August 10, 1924, on *Betula occidentalis* Hook.

Cepegillettea myricae (Patch.)

Calaphis myricae Patch, Hemiptera of Connecticut, Sta. Geol. & Nat. Hist. Surv. Bul. 34, 1923, p. 275-277.

Alate viviparous female. (Plate 7, figures 4, 14 and 17.)

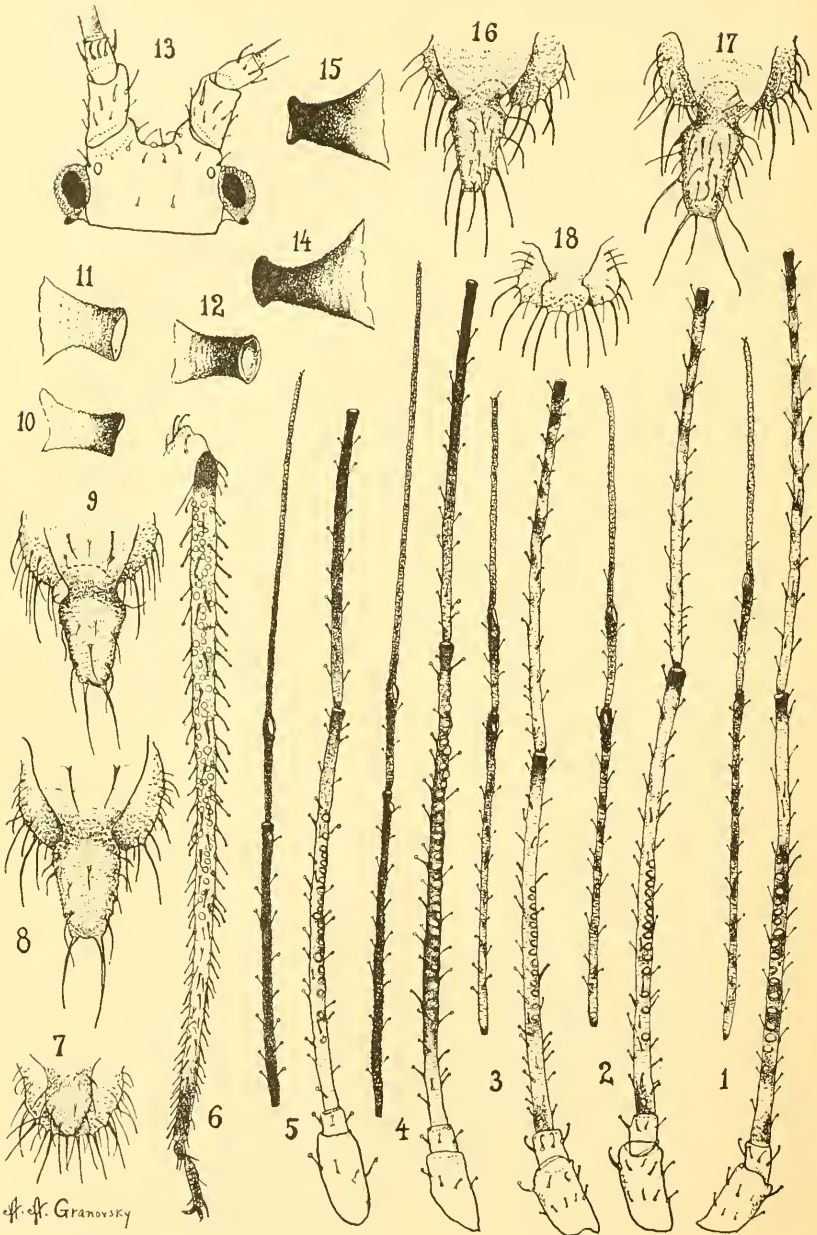
Apterous viviparous female. (Plate 7, figures 5, 15 and 16.)

Only alate and apterous viviparous females of this species are known from sweet fern, *Myrica asplenifolia*. They can be readily separated from *betulaefoliae* by the key to the respective forms given above.

Acknowledgments and appreciation are due to Doctor E. M. Patch and the U. S. National Museum for the loan of specimens of *C. myricae*; to Miss A. P. Macdougall for a slide of *C. betulaefoliae* from British Columbia; to Doctor C. P. Gillette, Doctor P. W. Mason, Miss M. A. Palmer and Professor H. F. Wilson who have very kindly examined specimens of *betulaefoliae* and rendered their opinions.

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H. H. Granovsky

EXPLANATION OF PLATE.

Cepegilletta betulaefoliae, n. sp.

Alate viviparous female:

1, antenna; 9, cauda and anal plate; 10, cornicle; 13, head.

Apterous viviparous female:

2, antenna; 8, cauda and anal plate; 11, cornicle.

Oviparous female:

3, antenna; 7, cauda and anal plate; 12, cornicle; 6, hind tibia.

Cepegilletta myrica (Patch).

Alate viviparous female:

4, antenna; 14, cornicle; 17, cauda and anal plate.

Apterous viviparous female:

5, antenna; 15, cornicle; 16, cauda and anal plate.

Calaphis betulaecolens (Fitch).

18, cauda and anal plate of alate viviparous female.

NOTE.—Drawings on this plate are made to the following scales.—

1, All antennae, head and tibia are drawn to the same scale.

2, All drawings of caudae, anal plates and cornicles are made to the same scale.

All measurements of relative lengths of antennae can be transferred into millimeters by using the following scale: 1.0 = 0.016 mm.

NOTES ON THE BETHYLINAE WITH DESCRIPTIONS OF
ONE NEW CUBAN AND TWELVE NEW NORTH
AMERICAN SPECIES (HYM.).

BY ROBERT FOUTS.

This study is based principally on material preserved in the collection of the United States National Museum. Several species are described from specimens in my own collection and one, *Bethylus amoenus*, is based on material sent to me by Dr. J. C. Bradley of Cornell University.

In preparing the keys to *Pseudisobrachium* and to *Goniozus* all of Ashmead's type material was carefully studied and more recently collected specimens compared with it. Kieffer's species are placed according to the information given in his descriptions and in his own keys.

Genus **PSEUDISOBRACHIUM** Kieffer.

Key to the North American Species.

- | | |
|---|------------------------------|
| 1. Females..... | 2 |
| Males..... | 7 |
| 2. Abdomen shorter than the thorax..... | <i>myrmecophilum</i> Ashmead |
| Abdomen longer than the thorax..... | 3 |
| 3. Abdomen about one and two-thirds times as long as the thorax; head one and one-fourth times as long as wide (from anterior margin of clypeus | |

- to posterior margin of head).....*montanum* Ashmead
 Abdomen at the most one and two-fifths times as long as the thorax.....4
4. Pronotum smooth, alutaceous, with several small indistinct punctures laterally.....*paucipunctata* Fouts
 Pronotum with quite a number of fairly large, distinct punctures.....5
5. Thorax mostly yellow or yellowish-brown; coxae bright yellow.....
flavicoxis Fouts
 Thorax dark brown; coxae not bright yellow.....6
6. Abdomen one and one-fifth times as long as the thorax; head one and one-eighth times as long as wide.....*mandibulare* Ashmead
 Abdomen one and one-tenth times as long as the thorax; head one and one-sixth times as long as wide.....*rufiventre* Ashmead
7. Frons finely alutaceous, the punctures very distinct; wings whitish, subopaque.....*montanum* Ashmead
 Frons more strongly alutaceous, the punctures, in places at least, obscured by the sculpture; wings not whitish.....8
8. Ocelli very large and prominent.....*flavinervis* Fouts
 Ocelli normal, not prominent.....9
9. Mesopleurum coriaceous and punctate.....12
 Mesopleurum delicately reticulate with a few punctures.....10
10. Species robust; wings rather deep brownish; punctures on mesonotum, especially on sides, numerous and clearly defined.....*puncticeps* Fouts
 More slender; wings lighter in color, not hyaline but not strongly tinged with brown; punctures on mesonotum sparse and not clearly defined.....11
11. Abdomen, except part of first segment, dark brown.....*mandibulare* Ashmead
 Abdomen yellowish in large part, the apical edges of all segments yellowish.....*rufiventre* Ashmead
12. Antennae and legs dark brown, not tinged with rufous.....*rugosulum* Fouts
 Antennae and legs not dark brown, reddish in part at least.....
myrmecophilum Ashmead

***Pseudisobrachium flavicoxis*, new species.**

Female.—Length, 3.94 mm. Head about one and one-ninth times as long as wide, about one and one-fourth times as wide as the thorax across middle, punctate as in all the North American species; pronotum, mesonotum laterally, mesopleura above anteriorly, and propodeum laterally, with scattered fairly large punctures; thorax across the middle about one and one-fifth times as wide as the pronotum, not quite one and one-half times as wide as the propodeum; head brown; antennae brown; thorax yellowish-brown, the pronotum and the propodeum yellow; first segment of abdomen, second, fifth and sixth basally, and last segment entirely, yellow; venter of abdomen brownish, becoming yellowish toward apex; legs brownish, the coxae bright yellow.

Type locality.—Baldwin, Kansas. (Coll. Fouts.)
 Described from one specimen.

***Pseudisobrachium paucipunctata*, new species.**

Female.—Length, 3.20 mm. Head 1.27 times as long as wide, about one and one-fifth times as wide as the thorax (across middle), sculptured as in

flavicoxis; dorsum of thorax alutaceous, without punctures except for several small ones on the pronotum; head and thorax dark brown; scape brown; flagellum light reddish-brown; abdomen colored as in *flavicoxis*; legs yellowish, the posterior pair brighter in color.

Type locality.—Salt Lake, Utah. (Coll. Fouts.)
Described from one specimen.

***Pseudisobrachium flavinervis*, new species.**

Male.—Length, 4.58 mm. Head as wide as the thorax, a little longer than wide; frons and vertex strongly alutaceous, with scattered punctures, the former more delicately sculptured medially; cheeks finely alutaceous with a few punctures; occiput finely aciculate; eyes a little more than one and one-half times as long as head behind them; ocelli very large, circular, protuberant; interocellar line twice as long as the lateral ocellar, as long as the ocellular line; pronotum and mesonotum finely alutaceous, the former with a few small scattered punctures, the latter with the punctures a little larger and much more numerous, especially laterally; scutellum with a few small punctures; propodeum typical of the genus, not margined posteriorly, with a strong median carina nearly to the apex of the superior face; anterior half of propodeum strongly alutaceous, with a few indistinct and interrupted transverse carinae; behind this the propodeum is finely alutaceous, without striae or carinae; mesopleurum finely alutaceous above and behind, more strongly so and with scattered punctures below and in front; venation typical (see figure in Das Tier., Lief. 41, 1916, p. 472) except that the discoideus is not present, not even as a faint line; black; antennae and mandibles rufous; legs yellowish-brown; abdomen dark brown, reddish-yellow at margins of first tergite and ventrally and laterally toward base and apex; venation yellowish except the subcosta toward the apex which is brown.

Type locality.—Lone Star, California. (IX-21-1927.)

Type.—Cat. No. 41217, U. S. Nat. Mus. Paratype in Coll. Fouts.

Described from three specimens. The data accompanying them is as follows: "Insects taken from soil containing an infestation of grown larvae and pupae of the Dried Fruit Beetle."

***Pseudisobrachium puncticeps*, new species.**

Male.—Length, 4.32 mm. Head one and one-eighth times as wide as long, as long as the thorax is wide; frons and vertex strongly alutaceous, the punctures numerous, and, though rather shallow, very distinct; interocellar line scarcely longer than the lateral ocellar; ocellular line twice as long as the interocellar; eyes one and one-third times as long as head behind them; pronotum and mesonotum alutaceous, more finely sculptured than the frons, the former with scattered shallow punctures, the latter with the punctures deeper and more numerous, especially laterally; scutellum polished, with a few punctures laterally; propodeum reticulate and with a median carina on anterior half, transversely aciculate on posterior half; mesopleurum very

delicately alutaceous, shining, with a few punctures along anterior margin; discoideus indicated by a brown line; thorax two and one-eighth times as long as wide; black; pronotum reddish in part; abdomen yellowish on margins of the first and second tergites and on most of venter; antennae and legs reddish-brown, the former darker distally; wings brownish.

Type locality.—Glen Echo, Maryland. (VIII-19-1916.)
One specimen collected at light by the author.

***Pseudisobrachium rugosulum*, new species.**

Male.—Length, 4.37 mm. Head as wide as long, as wide as the thorax, sculptured as in *puncticeps*; interocellar line about as long as the lateral ocellar, less than a third as long as the ocellular; head behind the eyes a little longer than the eyes; pronotum alutaceous, sparsely punctate, slightly wrinkled anteriorly; mesonotum likewise alutaceous and punctate but the punctures larger and much more numerous, especially anteriorly and laterally; scutellum shining, faintly alutaceous, with a few punctures along its margin; mesopleurum strongly alutaceous, polished above medially and with numerous large punctures anteriorly; propodeum as in *puncticeps* except that the posterior face is transversely wrinkled; thorax not quite two and one-half times as long as wide; venation as in *puncticeps*; black; scape very dark brown; flagellum fuscous; legs rather dark brownish; wings tinged with brown.

Type locality.—Mount Holly Springs, Pennsylvania. (VIII-12-1920.)

One specimen swept from wheat stubble by the author.

***Pseudisobrachium myrmecophilum* Ashmead.**

I have in my collection seven male specimens from Glen Echo, Maryland. They were captured on August 7, 1921, and September 17, 1924.

Genus **HOLEPYRIS** Kieffer.

***Holepyris floridanum* (Ashmead).**

Isobrachium (?) *floridanum*, Ashmead, Ent. Amer., Vol. 3, 1887, p. 76, male.—

Ashmead, Bull. 45, U. S. Nat. Mus., 1893, p. 39, male.

Pseudisobrachium floridanum (Ashmead) Kieffer, Gen. Ins., fasc. 76, p. 24.—

Kieffer, Das Tier., Lief. 41, 1914, p. 478, male.

The type has been examined and found to be a female. The following brief description may help to identify the species: Head seen from in front about one and one-fourth times as long as wide, widest half way between the eyes and the posterior margin; frons convex, uniformly shagreened and with numerous minute punctures; head behind eyes somewhat longer than the greatest length of the eyes; pronotum and mesonotum sculptured like the frons; pronotum subconvex, about one and two-fifths times as wide as long; notauli briefly indicated anteriorly; propodeum subconvex dorsally, margined laterally

and posteriorly, with five longitudinal carinae; the median carina extends to the ridge separating the superior from the inferior face; the outer carinae are abbreviated posteriorly, about three-fourths as long as the median one; the other two carinae are slightly shorter than the others just mentioned; the whole upper surface of the propodeum is strongly transversely striate; between the longitudinal carinae the striae are somewhat irregular and indistinct; inferior face of propodeum without distinct sculpture; wings normally developed; stigma linear, dark brown apically, white medially, and light brown to the junction of the subcostal and basal veins; radius long and curved, originating near the apex of the stigma.

Redescribed from the type, Cat. No. 14048, U. S. National Museum.

This species differs from *subapterus* Melander & Brues in having the wings normally developed. From *punctifrons* Fouts, to which it is very closely related, it differs in having the eyes smaller and the punctures on the frons, pronotum, and mesonotum smaller and much more numerous.

***Holepyris marylandicus*, new species.**

Female.—Length, 3.00 mm. Differs from *subapterus* Melander and Brues in having the eyes about seven-ninths as long as the head behind them, and in having the mesonotum but one-third the length of the pronotum. Head evenly convex above, uniformly finely alutaceous and rather closely covered with small punctures; head 1.36 times as long as wide, 1.25 times as wide as the thorax; pronotum subconvex, about as wide as long, sculptured like the head; mesonotum delicately alutaceous, impunctate; scutellum similarly sculptured but with a few small punctures, with a transverse groove at base; propodeum with three longitudinal carinae, the lateral ones extending a little past the middle of the sclerite; transverse striae very small, wavy, and indistinct; inferior face of the propodeum alutaceous, without a carina; wings just attaining the apex of the superior face of the propodeum, brownish; abdomen 1.10 times as long as the thorax; black; antennae and legs reddish-brown, the tarsi a little lighter.

Variations.—Length, 3.60 mm.; last abdominal segment and part of the preceding one yellowish.

Type locality.—Glen Echo, Maryland.

Two specimens collected by the author May 18, 1926.

Paratype in Coll. U. S. National Museum, Cat. No. 41218.

Genus **ANISEPYRIS** Kieffer.

***Anisepyris cubensis*, new species.**

Female.—Length, 6.00 mm. Head slightly wider than long, about as wide as the thorax; frons deeply and rather thickly punctate, with a groove anteriorly extending as far posteriorly as the base of the eye; malar space extremely short, not more than one-eighth or one-ninth as long as the eyes; head behind the eyes about as long as the eyes; scape flattened, sharply curved before the middle, a little longer than the four following joints together; flagellar joints a little

longer than wide; mandibles widened apically, with five teeth; thorax about one and four-fifths times as long as wide; pronotum and mesonotum sculptured like the frons but faintly alutaceous and the punctures are not so numerous; pronotum a little over twice as long as the mesonotum, margined anteriorly and laterally, the lateral margins not strongly marked; scutellum faintly alutaceous, with a few punctures except medially; propodeum transverse, with five longitudinal ridges, the median one extending to the petiole; the ridges next to the median one extend five-sixths the length of the anterior face; the other two extend from the base one-third the length of the anterior face; area between ridges transversely wrinkled; rest of anterior face alutaceous, slightly wrinkled anteriorly; stigma about twice as long as wide, the sides parallel; discoideus and brachius represented by white lines; nervulus curved at middle; head and thorax (except propodeum) brilliant metallic green; propodeum metallic blue; clypeus black; mandibles and antennae reddish-brown; anterior coxae dark brown; abdomen black, the last three segments rufous; anterior wings dark brown, slightly paler at apices; posterior wings hyaline.

Type locality.—Nagua, Oriente, Cuba. (July 7, 1922.)

Paratype localities.—Pico Turquino, Cuba. (July 22, 1922.)
Sierra Maestra, Cuba, 3000–3500 ft. (July 10–20, 1922.)

Seven females collected by S. C. Bruner and C. H. Ballou.

Type.—Cat. No. 41219, U. S. National Museum. Three paratypes in Coll. Fouts.

Anisepyrus pulchellus, new species.

Female.—Length, 4.61 mm. Runs to *fasciipennis* Kieffer in Kieffer's key (Das Tier., Lief. 41, 1914, p. 435) and differs in having the legs rufous and in having fine sparse punctures on the pronotum. Head as wide as long, a little wider than the thorax; frons and vertex alutaceous, evenly and fairly thickly covered with moderate-sized punctures; interocellar line a little longer than the lateral ocellar, less than half as long as the ocellular; eyes two and one-fourth times as long as the head behind them; frons and dorsum of thorax, except propodeum, covered with fairly long, erect, reddish-colored hairs; pronotum, mesonotum, and scutellum alutaceous, with fine scattered punctures; mesopleurum with three sunken areas, anterior, superior, and posterior, separated from each other by flat raised ridges; these sunken areas alutaceous, not punctate; propodeum transversely striate, with seven longitudinal ridges; the median ridge and the second from the outside attain the apex of the anterior face; these latter ridges are curved outwardly and inwardly on apical half; the other ridges extend to the apical one-third of the segment; posterior face of propodeum transversely striate, more strongly so below, with a median longitudinal ridge; black; head and thorax faintly coppery in color; antennae rufous, darker above beyond the fifth joint; legs rufous, the posterior femora a little darker; tegulae rufous; wings brownish, the veins uniformly dark brown.

Type locality.—Glen Echo, Maryland. (VIII-1-1921.)

One specimen collected by the author.

This species is typical of the genus in every respect.

Genus **BETHYLUS** Latreille.

Bethylus amoenus, new species.

Female.—Length, 3.53 mm. Head, 1.30 times as long as wide, 1.57 times as wide as the thorax; frons scaly reticulate, with sparse, scattered, fairly large punctures; ocelli rather small, close together, arranged in a right angled triangle; head behind the eyes 1.23 times as long as the eyes; antennae filiform, all the flagellar joints a little longer than wide; thorax about two and seven-tenths times as long as wide, sloping forward and backward from the anterior margin of the mesonotum; pronotum and scutellum finely reticulate, with a few scattered punctures; mesonotum scaly reticulate like the frons, roughened slightly posteriorly and laterally but without distinct punctures; notauli and lateral grooves on mesonotum absent; propodeum fairly long, very finely reticulate, seen laterally its upper surface evenly arcuate, the anterior face not distinguished from the posterior face; all pleurae like the propodeum finely reticulate; wings vestigial, extending about to the basal one-seventh of the propodeum; abdomen about one and three-fifths times as long as the thorax; black; abdomen very dark brown, lighter brown anteriorly and below except in middle; antennae brown; legs dark brown; anterior tibiae and all tarsi yellowish-brown.

Male.—Similar to the female except in secondary sexual characters. Head 1.19 times as long as wide, not quite one and one-half times as wide as the thorax; head behind eyes one and one-fifth times as long as eyes; antennae more attenuate than in the female, the flagellar joints nearly twice as long as wide; thorax three times as long as wide; wings as in the female; abdomen 1.56 times as long as the thorax; color as in the female except that antennae are lighter brown and the mandibles are yellowish, the teeth reddish.

Type locality.—Slaterville-Caroline, New York. (June 14, 1904.)

Type.—In Cornell University.

One female and one male submitted to me for identification by Dr. J. C. Bradley of Cornell University.

Genus **GONIOZUS** Forster.

Key to the North American Species.

1. Keel on clypeus rounded or flattened; no keel on frons above clypeus or if there is one it is flattened.....2
Keel on clypeus and on frons above clypeus sharp and distinct.....4
2. Radius not curved upward at tip; frons extremely delicately alutaceous, with a few, not more than nine or ten, scattered punctures.....
politus Ashmead.
Radius curved upward at tip; frons more strongly alutaceous, with more punctures.....3
3. Mandibles very thick and strong, about as wide as the clypeus is long....
megacephalus Ashmead.
Mandibles not so thick, narrower than the clypeus is long.....
brevinervis Fouts

4. Propodeum margined posteriorly..... 5
 Propodeum not margined posteriorly..... 6
5. Legs yellow to light yellowish-brown..... *hubbardi* Howard
 Coxae and femora black to dark brown..... *platynotae* Ashmead
6. Legs light yellowish-brown..... *flavipes* Fouts
 Legs mostly darker..... 7
7. Branch of basal vein about as long as the upper abscissa of the basal vein 8
 Branch of basal vein very short, not as long as the upper abscissa of the
 basal vein..... 9
8. Head about one and one-fifth times as long as wide; eyes about one and
 one-fourth times as long as the head behind them; antennae reddish-
 brown, the scape and terminal four or five joints darker; all antennal
 joints distinctly longer than wide..... *longinervis* Fouts
 Head one and one-half times as long as wide; eyes somewhat shorter than
 the head behind them; antennae red; pedicel as wide as long; third and
 fourth joints thin, wider than long; tarsi red..... *clarimontis* Kieffer
9. Head in female about one and one-half times as long as wide; head be-
 hind eyes a little longer than the eyes; head in male a little less than
 one and three-tenths times as long as wide; eyes about one and one-
 tenth times as long as the head behind them..... 10
 Head in female about one and one-fifth times as long as wide; eyes a
 little longer than the head behind them; head in male slightly more than
 one and one-sixth times as long as wide; eyes about one and one-third
 times as long as the head behind them..... *columbianus* Ashmead
10. Keel on clypeus reaching about opposite the middle of the eyes; pronotum
 about one and one-third times as long as the mesonotum.....
occipitalis Kieffer
 Keel on clypeus reaching a little past the lower margins of the eyes; pronotum
 about one and one-half times as long as the mesonotum.....
electus Fouts

Goniozus brevinervis, new species.

Female.—Length, 2.88 mm. Head about one and one-sixth times as long as wide, as wide as the thorax, the sides straight for a short distance behind the eyes; eyes a little longer than head behind them; frons smooth, alutaceous, with scattered punctures, the latter not very numerous, about one to every square half millimeter; antennae filiform, the flagellum narrowing slightly basally and apically; pedicel and third joint subequal in length, the former somewhat thicker; following seven joints a little longer and wider than the third, narrowing and shortening gradually distally; eleventh and twelfth joints about as long and as wide as the third; last joint slightly longer, acute at tip; all antennal joints longer than wide; none of them, however, more than one and one-third times as long as wide; pronotum, mesonotum, and scutellum alutaceous and punctate like the head; mesonotum with a row of punctures across it near the apex, this row (of about seven or eight punctures) curving upward on the sides; otherwise the mesonotum is impunctate; pronotum more or less distinctly transversely depressed across the posterior third; scutellum

feebly convex, with several punctures laterally; radius curved upward at apex; black; scape dark brown; flagellum light brownish on proximal half, darker distally; anterior tibiae and all tarsi yellowish-brown; middle tibiae dark brown basally, lighter apically; posterior tibiae brown on basal half, light brown on apical half; wings, veins light brown, the costa, pro- and parastigma dark brown.

Male.—Length, 2.13 mm. Similar to the female. Head about one and one-fourth times as long as wide, as wide as the thorax; frons alutaceous, with several widely scattered punctures laterally; flagellum moniliform, the joints subequal, a little longer than wide; pronotum and mesonotum as in the female but with the punctures smaller and fewer; no depression on the pronotum; scutellum alutaceous, with one small puncture on each side; color as in the female.

Type locality.—Wooster, Ohio.

Type.—Cat. No. 41220, U. S. National Museum. Five paratypes in Coll. Fouts.

Host.—*Coleophora* sp.

Eight females and three males reared by J. S. Houser from case-bearing insect larvae found on the side of a barn.

Goniozus hubbardi Howard.

Goniozus hubbardi Howard, Kieffer, Das. Tier., Lief. 41, 1914, p. 529.

Dr. Howard's type from Crescent City, Fla., has not been located in the National Collection. Ashmead had assigned a type number but did not label the specimen.

The National Collection contains a series of five females labelled "Perrine, Fla., C. F. Moznette, Coll., June 1, 1923, Ex. larva on Avocado." The identification was made by Mr. S. A. Rohwer.

Goniozus platynotae Ashm.

Goniozus platynotae Ashm. Kieffer, Das Tier., Lief. 41, 1914, p. 528.

Goniozus euliae Fouts, Proc. Ent. Soc. Wash., Vol. 28, 1926, p. 167.

This species occurs in the District of Columbia, in Virginia, Maryland, Florida, Mississippi, Tennessee, Pennsylvania, Arizona and Arkansas.

The following records are new for the species: Maryland: Glen Echo, June 29, 1917, one female, Coll. Fouts; Cabin John, summer, 1917, two females, Coll. Fouts; Cabin John, July 24, one female reared from *Cacaecia rosaceana* Harris. Washington, D. C.: August 5, 1920, Chittenden No. 6810, three females and one male reared from *Archips* sp. on blackberry; August 2, 1920, Chittenden No. 6875, two females reared from ? *Coelostathma discopunctata* Clemens; August 20, 1920, Chittenden No. 6245, one female reared by M. T. Van

Horn from a Pyralid larva on blackberry. Mississippi: Utica, one female. Tennessee: Nashville, 3/27, one female collected by C. C. Hill; Nashville, Webster No. 11331, three females reared by W. H. Larrimer from *Sparganothis sulfureana* Clemens. Pennsylvania: Carlisle, July 16, 1920, one female collected on flower of wild carrot. Illinois: Olney, July 22, 1905, small series of females reared from *Archips* sp., submitted to me for identification by Dr. T. H. Frison and all but two of them returned to him. Arkansas: Bentonville, July 21, 1918, Quaintance No. 1639, two males reared from *Canarsia* by D. Isely. Virginia: Winchester, July 28, 1926, one female reared by W. S. Hough from a larva of the Red-banded Leaf Roller, *Eulia velutinana* Walker. Arizona: Tempe, Webster No. 7205B, three females reared by R. M. Wilson from *Platynota flavedana* Clemens.

The National Collection contains the following specimens included in the type series (Cat. No. 2193): one female (type) and one male (allotype) labelled: Par. on *Platynota idaeusalis* Walker (these two specimens were, presumably, collected in the District of Columbia by Dr. C. V. Riley); one female labelled: Va., Aug. 31/89; one female labelled: M. E. Murtfeldt, Aug. 5/86; one female from Cedar Point, Md.; and one female from Jacksonville, Fla. All these specimens have been carefully compared with one another and are apparently conspecific. Of the allotype only the abdomen remains, the rest of the specimen having been lost.

Goniozus flavipes, new species.

Female.—Length, 2.54 mm. Head about one and one-seventh times as long as wide, slightly wider than the thorax; eyes about one and one-seventh times as long as the head behind them; frons sculptured as in *platynota*, the punctures fairly numerous; clypeus with a sharp keel, the keel short and somewhat rounded above the clypeus on the frons; scape thick, curved, about twice as wide as the pedicel, somewhat shorter than the three following joints together; pedicel about one and one-half times as long as wide, a little shorter than the two following joints together; flagellar joints about as wide as long; dorsum of thorax alutaceous like the frons, with a few scattered punctures; propodeum alutaceous and finely transversely wrinkled, the anterior face with a broad median longitudinal area which is polished, entirely without sculpture; wings hyaline, the veins yellowish-brown, the pro- and pterostigma dark brown; basal vein interrupted above the center by a short branch which is shorter than its upper abscissa; radius curved upward at its apex, distant from the apex of the wing by about its own length; dark reddish brown; legs and antennae light yellowish-brown; mandibles brownish.

Male.—Length, 1.62 mm. (terminal abdominal segments retracted). Proportions of head about as in the female. Frons more delicately alutaceous than in the female, the punctures few and widely scattered; pedicel about as

long as joints three and four together; flagellar joints about as wide as long. Color as in the female.

Type locality.—Junction City, Kansas.

Two specimens collected, August 10, 1927, by the author.

Goniozus longinervis, new species.

Female.—Length, 2.70 mm. Very closely related to *clarimontis* Kieffer. The notes given in the preceding key will serve to distinguish the species. Frons alutaceous, punctate, about five or six punctures to the square one-tenth millimeter; pronotum, mesonotum and scutellum similarly sculptured, but the punctures less numerous; branch of basal vein nearly straight, about as long as the upper abscissa of the basal vein; radius curved upward at apex, distant by about its own length from the apex of the wing; mandibles black, venation brown, the pro- and pterostigma darker.

Male.—Length, 2.15 mm. Similar to the female. Head about one and one-fifth times as long as wide; eyes about one and two-fifths times as long as the head behind them; head and thorax as in the female but a little more delicately sculptured; scape thickened, about as long as the two following joints together; all flagellar joints a little longer than wide; color as in the female except that only the pedicel and the following three or four flagellar joints are yellowish-brown.

Type locality.—Halsey, Nebraska.

Type.—Cat. No. 41221, U. S. N. M.

Host.—*Rhyacionia frustrana bushnelli* Busck.

Three females and one male labelled as follows: Hopk. U. S. 17508, on *Pinus ponderosa*, and *Pinus divaricata*, emerged July 3-5, 1925. L. G. Baumhofer, Coll.

Goniozus columbianus, Ashm.

Goniozus columbianus Ashm. Kieffer, Das Tier., Lief. 41, 1914, p. 530.

Goniozus foveolatus Ashm. Kieffer, *ibid.*, p. 531.

Goniozus hortorum Brues, Kieffer, *ibid.*, p. 528.

I have selected as type of *foveolatus* a female specimen from Jacksonville, Fla., labelled *Goniozus foveolatus* Ashm., in Ashmead's handwriting, and type No. 2172, U. S. N. M. The male specimen from Georgiana, Fla. (see Ashmead in Monogr. Proct., p. 75), belongs to a species as yet undescribed. No specimens from the District of Columbia were found in the type series.

Two specimens of *hortorum* Brues are in the National Museum labelled "TYPE" and "Type No. 26528, U. S. N. M." They are both mounted on tags on the same pin and are, contrary to Professor Brues' statement in his original description, both males.

The species occurs in the District of Columbia, in Virginia, New York, and Pennsylvania.

The following records are new for the species: Virginia: Roslyn, bred from *Cercis*, one female; Bousack, Sept. 1, 1927, Ex. (*Laspeyresia*) *Grapholitha molesta*, one male; Arlington, Oct. 23, 1916, five females reared by August Busck from the larvae of *Laspeyresia*, Quaintance No. 7785. Washington, D. C., one female collected by the author. New York: Quoque, Long Island, Quaintance No. 6276, three females and three males. Pennsylvania: North East, parasite of the Grape Berry Moth, *Polychrosis vitiana* Clem., Quaintance Nos. 10916, 11077, 11099, 14428, 14469, fifteen females and five males reared by R. A. Cushman in 1916; Waynesboro, Aug. 24, 1923, one female bred from the Apple Leaf Sewer, (*Ancylys*) *Anchylopera nubeculana* Clemens, J. R. Stear Coll.

Goniozus electus, new species

Female.—Length, 2.30 mm. Differs from Kieffer's description of *occipitalis* as follows: keel on clypeus shorter, not reaching to the middle of the eyes; scape and terminal seven antennal joints brown; joints two to seven yellow; pronotum about one and one-half times as long as the mesonotum.

Male.—Length, 2.10 mm. Head and dorsum of thorax alutaceous as in the female, the punctures on frons not quite so numerous; scape thickened, curved, twice as wide as the flagellar joints, about as long as the two following joints together; pedicel somewhat wider than the third joint, about one and one-third times as long as wide, about as long as the two following joints together; third joint a little longer than wide; joints four to seven a little wider than long; terminal joints slightly longer than wide; colored like the female.

Type locality.—Bogalusa, Louisiana.

Type.—Cat. No. 41222, U. S. N. M. Two paratypes in Coll. Fouts.

Host.—*Rhyacionia frustrana* Comstock.

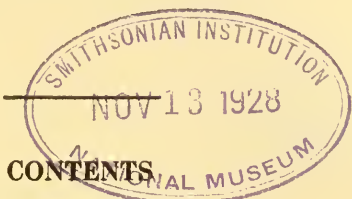
Description based on one female (type) and four males collected in April, 1925, by R. A. St. George.

Goniozus longiceps, Kieffer.

Goniozus longiceps Kieffer. Kieffer, Das Tier., Lief. 41, 1914, p. 530.

I have not included this species in the preceding key because Kieffer neglected to indicate the comparative length of the branch of the basal vein. The species runs to couplet 9 and differs from *longinervis* and *columbianus* in having the head one and one-half times as long as wide. From *clarimontis* it differs in the color of the legs. It differs from *occipitalis* in having the keel of the clypeus not extending past the bases of the antennae; and, finally, it differs from *electus* in having the pronotum distinctly shorter than the mesonotum and scutellum together.

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NOTES ON CACTUS MOTHS ALLIED TO MELITARA, WITH
TWO NEW GENERA AND ONE NEW SPECIES.

BY HARRISON G. DYAR.

In *Ins. Ins. Mens.*, xiii, 224, I commented upon the structure of the palpi in *Melitara*, *Olyca* and *Cactobrosis*. My conception of *Olyca* was founded upon *pectinatella* Hampson, since the type of the genus, *phryganoides* Walker was not then before me. I have now several specimens of the species. The male palpi are upturned, the first joint moderately tufted at tip, the third joint short, about one-third the second. In the female the palpi are long, porrect and downturned, the first joint only with a tuft at tip, much as in *Cactoblastis* female. The antennae are simple in both sexes, ciliate in the male. *Olyca pectinatella* does not share these characters, and I am therefore removing it to a new genus as below.

Mr. A. P. Dodd has referred to the food plants and habits of many of the species here mentioned in a paper entitled "The Biological Control of Prickly Pear in Australia," Commonwealth of Australia, Council for Scientific and Industrial Research, Bulletin No. 34, Melbourne, 1927.

Genus **MELITARA** Walker (*prodenialis* Walker).

The palpi are long and porrect in both sexes, occasionally oblique, the first joint with an apical tuft, the second joint with slight tuft in the male, distinct in the female; third joint long in the male. Antennae pectinate in both sexes.

Melitara prodenialis Walker.

Melitara prodenialis Walker, *Cat. Lep. Het. Brit. Mus.*, xxvii, 137, 1863.

Atlantic coast region from New Jersey to Florida, more abundant southward.

Melitara prodenialis bollii Zeller.

Zophodia bollii Zeller, *Verh. zool.-bot. Ges. Wien*, xxxii, 550, 1872.

Smaller than *prodenialis*, whiter and smoother, from Texas; but I hesitate to give it full specific rank, although Mr. A. P. Dodd does so.

Melitara dentata Grote.*Zophodia dentata* Grote, Can. Ent., viii, 158, 1876.

The antennal pectinations are shorter in both sexes than in *prodenialis*. I have specimens from Colorado, Texas and Arizona.

Melitara doddalis Dyar.*Melitara doddalis* Dyar, Ins. Ins. Mens., xiii, 13, 1925.

Close to *dentata* Grote, but generally more white-suffused. The specimens are from Texas, New Mexico and Arizona.

Melitara parabates Dyar.*Melitara parabates* Dyar, Proc. U. S. Nat. Mus., xlv, 322, 1913.

The male antennae are quite lengthily pectinated, but those of the female are simple. The type was from San Luis Potosi, Mexico. I have a series of specimens from the coast of southern California and from Arizona.

Genus **OLYCELLA** Dyar, new (*junctolineella* Hulst).

Antennae pectinated in both sexes as in *Melitara*; female palpi smooth and porrect with tuft on first joint as in *Olyca*; male palpi upturned, tufts on first and second joints, the third joint quadrate and nearly as long as second.

Olycella junctolineella Hulst.*Melitara junctolineella* Hulst, Can. Ent., xxxii, 173, 1900.*Olyca pectinatella* Hampson in Ragonot, Mem. sur les Lep., Romanoff, viii, 35, 1901.

I have specimens from Colorado, Texas and Mexico (Monclova, Coahuila, September, 1926, E. Mortensen and Jalapa, type of *pectinatella*).

Olycella nephelepasa Dyar.*Olyca nephelepasa* Dyar, Ins. Ins. Mens., vii, 55, 1919.*Olyca subumbrella* Dyar, Ins. Ins. Mens., xiii, 14, 1925.

Specimens from Mexico and New Mexico do not differ. Darker than *junctolineella*, but very similar.

Genus **OLYCA** Walker (*phryganoides* Walker).*Olyca phryganoides* Walker.*Olyca phryganoides* Walker, Cat. Lep. Het. Brit. Mus., xi, 726, 1857.

This variably colored species occurs in Haiti and Santo Domingo.

Genus **CACTOBLASTIS** Ragonot (**cactorum** Berg).

Male palpi upturned with large tufts at apices of first and second joints, the third joint long; antennae of the female long, porrect, scarcely tufted. Antennae simple, ciliate in the male. Maxillary palpi broadly fan-shaped as in the preceding genera.

Cactoblastis cactorum Berg.

Zophodia cactorum Berg, An. Soc. Cien. Arg., xix, 276, 1885.

Specimens are before me from Argentina and Uruguay.

Cactoblastis leithella, new species.

Mr. Leith F. Hitchcock of the Australian Prickly Pear Investigations collected a number of specimens in Curacao (Danish West Indies), Venezuela and Colombia, which he sent me for identification. These were unfortunately lost in the mail and a single female from Curacao only remained, which is before me. It agrees well with the female of *Cactoblastis cactorum*; but upon sending this identification to Mr. Hitchcock, he replied as follows: "The habits of this insect are very distinct from *Cactoblastis cactorum* from Argentina and Uruguay. In the first place the larva is a different color, resembling *Olyca* more than *Melitara* and totally distinct from *Cactoblastis*. In the second place the larva in question is solitary, while *Cactoblastis* is gregarious; it also pupates singly inside the joints, while *Cactoblastis* pupates in numbers outside the joints."

Type, female, No. 41184, U. S. Nat. Mus.; Curacao, D. W. I.

Cactoblastis bucyrus Dyar.

Cactoblastis bucyrus Dyar, Ins. Ins. Mens., x, 16, 1922.

The specimens are from Argentina.

Genus **CACTOBROSIS** Dyar (**elongatella** Hampson = **fernaldalis** Hulst).

In this genus the maxillary palpi are slender, filiform. It is the only genus so characterized among those here mentioned.

Cactobrosis fernaldalis Hulst.

The synonymy has been given in Ins. Ins. Mens., xiii, 223, 1925. Specimens are before me from Arizona and several points in Mexico. The antennae of the male are strongly pectinated, simple in the female. The palpi in both sexes are strongly upcurved, slender, without or with but slight tufting at the joints.

Cactobrosis maculifera Dyar.

Cactobrosis maculifera Dyar, Proc. U. S. Nat. Mus., xlvii, 407, 1914.

The antennae are serrate and fasciculate rather than pectinate in the male, simple in the female. From Oaxaca, Mexico.

Cactobrosis insignatella Dyar.

Cactobrosis insignatella Dyar, Proc. U. S. Nat. Mus., xlvii, 407, 1914.

I have yet to see a male. These may be only large plainly colored specimens of *fernaldalis*. From the same locality in Mexico as the male *maculifera*, but they do not look like the same species.

Cactobrosis phoenicis Dyar.

Cactobrosis phoenicis Dyar, Ins. Ins. Mens., xiii, 223, 1925.

In this and the following species the male antennae are very shortly serrate and ciliate. The male type only before me, Palm Springs, California.

Cactobrosis interstitialis Dyar.

Cactobrosis interstitialis Dyar, Ins. Ins. Mens., xiii, 223, 1925.

Cactobrosis strigalis Barnes & McDunnough.

Euzophera strigalis Barnes & McDunnough, Can. Ent., xlv, 127, 1912.

Cactobrosis leuconips Dyar.

Cactobrosis leuconips Dyar, Ins. Ins. Mens., xiii, 224, 1925.

This and the three preceding species have been discussed in the preceding reference.

Cactobrosis creabates Dyar.

Olyca creabates Dyar, Ins. Ins. Mens., xi, 29, 1923.

I have only the single male type. The antennae are simple, ciliate. The palpi are upturned, thicker than in *Cactobrosis*, yet distinctly more slender than in *Olycella* and with less pronounced tufts at the joints. It is intermediate between the two genera in wing-shape also.

Cactobrosis (?) *ponderosella* Barnes & McDunnough.

Olyca ponderosella Barnes & McDunnough, Cont. Nat. Hist. Lep. N. A., iv, 175, 1918.

This is known from a single female from the same locality as *Cactobrosis phoenicis*. They may be sexes of one species, though the wing-shape of *ponderosella*, as shown in the figure, seems too broad. The female has white hind wings as with *phoenicis*.

Genus **PAROLYCA** Dyar, new (*asthenosoma* Dyar).

Male antenna with one row of long pectinations, decreasing to obsolescence at three-fourths, the other row of short pectinations. Labial palpi upturned, slender, the first joint with a large projecting tuft, third similar to the second and over half as long. Maxillary palpi slender, slightly bristly with narrow scales at tip.

Parolyca asthenosoma Dyar.

Olyca asthenosoma Dyar, Ins. Ins. Mens., vii, 55, 1919.

The single male type from French Guiana is the only specimen known.

SOME NEW MOTHS FROM ARIZONA.

By E. V. WALTER, *Associate Entomologist, U. S. Bureau of Entomology.*

DESCRIPTION OF A NEW GENUS.

By H. G. DYAR.

For seven years previous to October, 1926, the writer operated a trap light at the U. S. Entomological Laboratory at Tempe, Arizona. During this time a large number of new species of moths were collected.

A few of the more conspicuous and outstanding new species are described below. All specimens used in these descriptions were collected at this one light, except those credited to other localities. The latter were found among the undetermined material in the U. S. National Museum and turned over to the writer by Dr. H. G. Dyar for description.¹

The description of the new genus *Callostolis* Dyar was given to the writer by Dr. Dyar to be published in this paper.

***Lygranthoecia viridens*, n. sp.**

Head and thorax white, tegula with a median longitudinal green band; abdomen light ochereous. Frons and palpi light ochereous. Fore wings pale olive green crossed by three white bands, the first strongly angulated outward to the black discal spot and edged inwardly on lower three-fifths with black; the second slightly curved, narrow in front, widening back of vein 5 and edged outwardly with black; subterminal line narrow; terminal row of well separated crescent-shaped black dots; fringe greenish. Hind wings white with broad terminal band of pale green flecked with black. Under side of fore wings white; discal spot black, more distinct than above; terminal band green; subterminal band green strongly peppered with black; a third

¹After descriptions were made and before types could be deposited in the National Collection dermestids damaged some of the specimens, but in no case to such an extent as to make the types unrecognizable.

bar from costa to vein 5 also green flecked with black. Under side of hind wing white with a greenish patch at apex.

Wing expanse 29 mm.

Described from female type, Tempe No. 5844, Tempe, Arizona.

Type.—Cat. No. 41018 U. S. Nat. Mus.

***Pseudacontia unicolor*, n. sp.**

Female.—Head, thorax and fore wings light yellow, frons brownish yellow, palpi yellow tipped with light reddish brown, antennae light reddish brown, under parts of thorax white. Fore and median legs light red on outside, light yellow on inside. Hind legs almost white with a red suffusion near the distal end of tibiae. Fore wings an even shade of light yellow without markings; hind wings white with light yellowish cast; under side of all wings white, shading to very light yellow near the costa of the fore wing.

Wing expanse 29 mm.

Described from female type, Tempe No. 5603, Tempe, Arizona.

Type.—Cat. No. 41019 U. S. Nat. Mus.

CALLOSTOLIS, new genus.¹

A genus of Noctuidae, Acronyctinae, with dimorphic venation in the sexes.

The head has a conical prominence with small raised rim and a slight prominence in the center. Legs without special armature. In the female, veins 3, 4 and 5 arise at the lower angle of the cell, vein 6 from above the middle of the cell, 7 to 10 stalked from the upper angle of the cell; no areole; 11 before the middle of the cell. In the male, vein 6 arises below the middle of the cell, and has a long vesicle at its base; an elliptical areole from the upper angle of the cell, its lower vein swollen and vesicular; veins 7, 8 and 9 long-stalked from the end of the areole; 10 from the end of the areole close to the stalk of 7-9; 11 from close to the end of the cell, curving over the vesicular areole.

Type.—*Callostolis polyrrhoda* Walter.

***Callostolis polyrrhoda*, n. sp.**

Male.—Head and fore part of thorax red mixed with a few yellow scales; hind part of thorax and first three segments of abdomen above a rich golden yellow; remainder of abdomen above red with a few yellowish brown scales at tip; abdomen below smoky brown. Palpi red above, yellow below. Legs yellowish brown lightly suffused with red on outer side. Fore wing rich golden yellow crossed by two broad red bands; the median band touching the outer end of the cell and separated from the terminal band by a band of yellow of about equal width; costa red, edged near the tip with yellow; fringe brown. Hind wings smoky suffused with brown; a small red suffusion near the end of

¹Described by H. G. Dyar.

vein 3. Under side of both wings smoky brown with a darker spot at the end of the cell and a red shade along the costa.

Female.—The female differs from the male in its larger size, the absence of the dark spot on the under side of the primaries, and the presence of a little more red on the legs and under parts of the thorax and abdomen.

Wing expanse, male 15 mm., female 18 mm.

Described from male type and one male paratype from Tempe, Arizona, and one male and one female paratype from San Bernardino Ranch, Cochise Co., Arizona.

Type.—Cat. No. 41020 U. S. Nat. Mus.

***Abrostola mariana*, n. sp.**

Head, palpi, legs and under parts of thorax dark fuscous gray. Thorax above dark fuscous gray thickly sprinkled with white-tipped scales. Abdomen somewhat banded with dark gray and white; tuft on abdomen fuscous tipped with black. Fore wing irregularly mottled with many shades of dark gray and brown, with many black and white scales scattered through without distinct pattern. Base of wing light fuscous with many white-tipped scales; discal spot irregular oblong, light fuscous; a smaller irregular spot of the same shade just beyond; remainder of wing dark fuscous gray shading to light fuscous gray on outer third and with a dark gray patch running from the tip backward and inward to vein 6; a narrow black crescent on the lower outer third of the wing. Hind wings gray shading outwardly to dark gray, darker in female than in male; fringe white-tipped. All wings beneath gray, shading outwardly to darker gray and darker in fore wing than in hind wing, also darker in female than in male. A distinct dark gray discal spot in all wings below.

Wing expanse, male 15 mm., female 16 mm.

Described from male type and one female paratype, Tempe No. 5651, Tempe, Arizona.

Type.—Cat. No. 41021 U. S. Nat. Mus.

***Tolyte nigrocristata*, n. sp.**

Male.—White with dark gray markings, eyes bordered with black; palpi white with a few black scales on outside. On the metathorax is a small tuft of metallic blue-black flattened scales; abdomen tipped with a tuft of brownish hairs. Fore wings white, crossed by seven dark gray or blackish lines closely resembling those in *Tolyte brevicrista* Dyar; the three basal lines narrow, and somewhat indistinct except on the costa where they are well marked; the fourth, fifth and sixth lines quite distinct with the sixth shading to almost black on outer edge; the terminal line lighter. The lines are repeated on the under surface of the wing but are there much lighter. Hind wings white with a small gray spot at anal angle.

Female.—Similar to male, differing chiefly in having more brown at the tip of the abdomen and the terminal line on the under side of the primaries completely washed out with white.

Wing expanse, male 45 mm., female 45 mm.

Described from male type and one female paratype, Tempe No. 5128, Tempe, Arizona.

Type.—Cat. No. 41022 U. S. Nat. Mus.

***Egesta minutalis*, n. sp.**

Head, thorax and abdomen light ocher; frons and palpi lighter, almost white; legs and under parts white. All wings above light ocher, crossed by a very narrow white line beginning on the costa at the outer fifth, curving outward, then backward, and continuing on the hind wing to the anal angle; fore wing shading at the apex to dark fuscous. A terminal row of black dots appears on the fore wing and the front half of the hind wing; fringe fuscous. Wings below slightly lighter than above and all markings repeated slightly fainter than above.

Wing expanse 12 mm.

Described from female type and one female paratype, Tempe Nos. T-5578, T-5793, Tempe, Arizona.

Type.—Cat. No. 41023 U. S. Nat. Mus.

***Loxostege kearfottalis*, n. sp.**

Frons, palpi and antennae light fuscous; eyes fringed with white. Thorax fuscous above, light gray fuscous on the sides. Abdomen light gray tipped with light fuscous. Fore wings dark fuscous crossed by two lines, the basal line white, narrow at the costa and spreading posteriorly; the outer line broad, irregular, white, shading to fuscous inwardly and divided by a fine irregular dark fuscous line having a deep indentation on vein 8 and two deep indentations near the inner margin. Two very dark almost black dots appear on the cell, separated by a rectangular white spot; the inner dot almost round and the outer crescent shaped. Fringe fuscous checkered with dark fuscous and white at the base. Hind wings light fuscous crossed by a very faint darker fuscous line. Under side of all wings light fuscous, with the dots and dark fuscous line on fore wing repeated.

Wing expanse, male 23 mm., female 27 mm.

Described from male type, Tempe No. 5388, Tempe, Arizona; one male paratype, Glenwood Springs, Colorado, and one female paratype, Phoenix, Arizona.

Type.—Cat. N. 41024 U. S. Nat. Mus.

The name *kearfottalis* was attached to the specimens from Glenwood Springs, Colorado and Phoenix, Arizona, as a manuscript name by Fernald, but apparently was never published.

***Loxostege unipunctalis*, n. sp.**

Male.—Head, thorax and fore wings light ocher yellow. Labial palpi slightly darker on the outside, white beneath. Under parts of thorax white. Legs white. Fore wings marked just beyond the end of the cell with a single

small indistinct dark spot, which is repeated below. Hind wings white. Under side of fore wings very pale yellow shading to white toward posterior margin. Underside of hind wing white except for a very pale yellow suffusion along the costal margin.

It differs from *flavalis* in having a single spot on fore wing which is nearer the end of the cell than the dots on *flavalis* and in the lack of yellow on the hind wings above.

Wing expanse 18 mm.

Described from one male type, Tempe No. 5127, Tempe, Arizona.

Type.—Cat. No. 41025 U. S. Nat. Mus.

✓ ***Honora palloricostella*, n. sp.**

Head, thorax and abdomen ochereous. General color of fore wings ochereous overlaid with ashy gray and dark gray scales; costa and tip of the wing ashy gray; subterminal line dark ochereous bordered on either side by ashy gray; a broad indistinct band of dark gray zigzags across the center of the cell and spreads along the hind margin. Male darker than female, showing less ochereous on the fore wings and having a dark line from the center of the cell to the subterminal line. Hind wing a uniform fuscous. Under side of all wings a uniform light fuscous.

Wing expanse, male 20 mm., female 23 mm.

Described from male type and one female paratype, Tempe No. 5857, Tempe, Arizona.

Type.—Cat. No. 41026 U. S. Nat. Mus.

***Ephestia arizonella*, n. sp.**

Head, palpi, thorax and abdomen above dark fuscous gray, legs and under parts of thorax and abdomen lighter. Fore wings dark gray, the basal two-fifths lighter, almost fuscous in some specimens; outer three-fifths quite dark crossed subterminally by a white line which is somewhat denticulate on the discal veins; terminal area somewhat lighter; fringe gray checkered with black at the base; two very small indistinct black dots, sometimes united, appear at the end of the cell. Hind wings light fuscous gray in the female, almost white in the male. Fore wings beneath an even shade of light fuscous gray without markings, hind wings lighter.

Wing expanse, male 15 to 17 mm., female 18 to 20 mm.

Described from male type, Tempe No. 5300, one male paratype, No. T-5300, and one female paratype, No. T-5359, all from Tempe, Arizona.

Type.—Cat. No. 31027 U. S. Nat. Mus.

Type and female paratype damaged, other seven specimens used in original description totally destroyed.

NOTES ON SYNONYMY OF DIPTERA.

By J. M. ALDRICH, *U. S. National Museum.*

1. Coquillett described *Thryptocera atripes* in his revision of North American Tachinidae, 1897, p. 58. The single type specimen he called a female, and stated that it was collected by Dr. Garry deN. Hough at New Bedford, Mass. Examination of the type convinced me long ago that it was misplaced in the genus *Thryptocera*, but although it looked familiar, I did not until recently get it located in the proper genus. It belongs to *Phantasiomyia* Townsend (Journ. N. Y. Ent. Soc., vol. 23, 1915, p. 225, the type and sole original species being *gracilis*, new, from Beulah, N. M.). The Coquillett type is a male, not a female, but otherwise agrees with the description, except that the trochanters are conspicuously yellow. It has two labels, "Mas." and "Collection Coquillett." The latter label is quite uniformly used for material that Coquillett brought to Washington with him when he came from Los Angeles about 1893. As the species has not been found in the East since its publication, and Townsend's *gracilis* occurs in the Southwest only, it is very probable that the "Mas." label was put on this specimen by mistake, and it really came from Southern California. Townsend's *gracilis* was described from three males taken at Beulah, N. M., two of which are now in the National Museum; we also have three males collected later by Townsend in Cave Creek Canyon, Chiricahua Mts., Ariz., and one female collected by him at Cherry Creek Buttes, Ariz. The two species under discussion are very much alike; *gracilis*, however, has the front slightly more prominent at the antennae, the tip of the wing in male not distinctly infuscated, and the abdomen not red at sides.

Skinner reported *Thryptocera atripes* Coq. from Beulah, N. M., in his list of the insects of that place (Trans. Amer. Ent. Soc., vol. 29, 1903, p. 105). The material was identified by Coquillett, and was collected by both Cockerell and Skinner. Mr. Cresson recently informed me, in response to an inquiry, that no specimens under that name are to be found in the Academy of Natural Sciences. Since one of the types of *Phantasiomyia gracilis* in the National Museum was collected by Cockerell in 1902, it may fairly be presumed that the record properly belongs to this species.

Townsend places the genus, I think correctly, in the tribe Minthoini, of which our most common North American species is *Paradidyma singularis* Tns.

2. In Stettiner Entomologische Zeitung, vol. 88, 1927, pp. 102-109, Dr. Enderlein has published No. XIX of his "Dip-

terologische Studien." Several of his new genera are American; and a few may appropriately be commented upon here. He proposes *Cliochloria* n. g., designating *Chrysomyza aenea* Fab. as type. This is a cosmopolitan species mentioned as such by Knab, Bull. Brook. Ent. Soc., xi, 1916, 42, fig., who reports it from Louisiana. His excellent figure of the wing of *demandata* Fab. (type of *Chrysomyza*) and of *aenea* Fab., shows how very slight the difference is between the open and the petiolate apical cell, which is the only character mentioned by Enderlein for his new genus. In my opinion *Cliochloria* is a synonym of *Chrysomyza*.

He proposes *Polphopsis* n. g. on p. 107, designating *Richardia telescopica* Jaennicke as type. He examined Jaennicke's type, and says that the widening of the head reached 11 mm. when the body length is only 7.5 mm. In a series of eleven males and two females in the National Museum (Panama, Costa Rica, collected by Busck, Schaus, Mann) the width of the head in the male varies from 3.5 to 9.8 mm. while in the female it is only 2.4 mm. or barely wider than the thorax, and about the same as in other species of *Richardia*. Enderlein's new genus therefore rests upon a highly variable male character, which is evidently insufficient.

On page 108 he proposes *Cnemoplegas* n. g., designating *Desmometopa latipes* Mg. (originally *Agromyza*) as type. Hensel designated the same species as type of his new genus *Prodesmometopa* in Suppl. Ent., no. 3, Jan., 1914, p. 97; and in Ent. Mitteil., vol. 8, 1919, p. 200, he makes this a synonym of his earlier genus *Hypaspistomyia* (Wien. Ent. Zeit., xxvi, 1907, 240, type *coquilletti*, new, from Arabia). This genus is admittedly very similar to *Desmometopa*; if it has any sufficient basis at all, it is the protuberant "prelabrum," or middle of face, the other characters being negligible, as I would think. I have not seen *coquilletti*, but I have compared the genotype of *Desmometopa* with *latipes*.

On page 108 he has *Euestelia* n. g. with *Rhinoessa coronata* Lw. designated as type. Williston established the genus *Pelomyia* for this species (as *occidentalis* n. sp.) in North American Fauna No. 7, 1893, p. 259. Sturtevant has discussed the synonymy and generic relations fully in Amer. Mus. Novitates, No. 76, 1923, p. 6.

On page 109 he proposes *Clorismia* n. g. with *Psilocephala ardea* Fab. (originally *Rhagio*) designated as type. This genus includes all species of *Psilocephala* having the fourth posterior cell petiolate. Cole says about this character in *Psilocephala* (Proc. U. S. Nat. Mus., vol. 62, art. 4, 1921, p. 8): "The cell M-3 is open or closed, there being a certain amount of variation here, but the character usually holds for the species." He does not use it in his keys to North American *Psilocephalas*,

except as a secondary character for certain females. Kröber says (*Genera Ins.*, 148 fasc., 1913, p. 4, transl.): "The fourth posterior cell is in the same species sometimes open, sometimes closed in the margin, and sometimes long petiolate, so that the genera and even species based on this character are untenable." The opinions of such revisers should be respected. Dr. Enderlein states that the type species of *Psilocephala* is *Thereva nigripennis* Ruthe, overlooking Coquillett's designation of *Bibio imberbis* Fall. in 1910 (*Proc. U. S. Nat. Mus.*, 37, p. 597); this discrepancy however does not affect the generic question, as both species go into the same group.

3. In *Insecutor Inscitiae* Menst., vol. 12, 1924, p. 145, I stated that Townsend's *Charapemyia calida* is the male of his earlier *Neotrafoia incarum*, as indicated by additional material in the National Museum. My conclusion is contradicted by Townsend in a recent article in *Journal of the N. Y. Ent. Soc.* (vol. 36, 1928, p. 91). He states that he has never obtained the female of *Charapemyia calida*, but has obtained the male of *Neotrafoia* in three localities in Peru, in which country the types of both species were obtained by him. Without giving any description of the male of *Neotrafoia*, he goes on to say,—“There are no less than thirteen important generic distinctions between *C. calida* and *N. incarum*, the two most striking being in the ocellar bristles and the proboscis. Throughout the Muscoidea, the direction in which the ocellars is inclined is always practically the same in the two sexes. The proboscis of *Charapemyia* is much stouter and shorter than that of *Neotrafoia* and of quite distinct type. The wings of *Neotrafoia* are conspicuously blackish on costa from stigma to tip of R3, while in *calida* they are perfectly clear. This last character easily separates the two species.”

In considering these statements, obviously I must interpret them in the light of the type specimens in the National Museum (not seen by Townsend at the time of writing), as well as other specimens which have been accumulated here. In the first place, I have in my former article discussed the ocellars. Second, the proboscis in the two alleged genera is of substantially the same size and form, no differences appearing which seem to me to suggest a specific distinction, much less a generic one. In the type of *incarum* the proboscis is fully extended, in that of *calida* it is retracted, but it is extended in the paratype. Measuring the latter with a micrometer, it is found that the lateral sclerite of the joint beyond the elbow is 15 units long, while the same sclerite in the type of *incarum* is 18 units. In both specimens the head height is the same, 37 units. As to the stoutness of the segment, it is not practicable to get an exact

figure, as the organ in *incarum* has become a trifle compressed in drying; there is, however, no material difference in the two specimens. Third, as to the darkening of the costa in Neotrafoia, it does not occur in the type as Townsend now states. His original description says, "Wings clear," which is correct. Two other females from Peru have the wing clear, while a third has the costal darkening which Townsend now attributes to the species. If this is specific, which I greatly doubt, it pertains to a new species, not to *incarum*. The type *calida* has the veins bordered with brown, not forming a costal border; but the paratype has the wings clear as in the *incarum* type. These variations in infuscation do not seem important.

Since my first comment on this case, two additional specimens, male and female, have been discovered in the collection. They were both taken on the campus of the University of Colorado by Professor Cockerell. The male matches one of Townsend's species and genera, the female the other, which evidently strengthens the evidence that the two species are identical. Our series of twenty specimens, ranging from Peru to Colorado, seems to me entirely conclusive.

In the description of Neotrafoia, Townsend mentions on the scutellum of the type a median erect bristle just above the apex of the scutellum, a character he had never seen before. This occurs on every one of our series, in both sexes, and is certainly a very peculiar character. The unpaired median bristle which Townsend noted on the disk of the scutellum is usually paired in our series.

AN ANNOTATED LIST OF SOME PARASITIC INSECTS.

F. W. Poos, *Entomologist, Virginia Truck Experiment Station, Norfolk, Va.*

The parasitic insects listed below, with their respective hosts, were reared in eastern Virginia during the seasons of 1926 and 1927. The great importance of our beneficial forms of insects can not easily be gainsaid. The sixty-three species of parasites which are listed here, together with their different hosts, were collected and reared for the most part at odd times. Since these records in some instances show new distribution and new host associations for the parasitic species they are deemed worthy of publication. Except where otherwise indicated, the collecting and rearing were done by the writer. No attempt at completeness was made except in the case of the parasites of the potato tuber worm, *Phthorimaea operculella* Zell. Fourteen parasitic species were reared from this host in Virginia during 1926 and 1927, making a total of twenty-six that have now been reported in the North American literature.

The hymenopterous parasites which are reported here were all identified by S. A. Rohwer, A. B. Gahan and R. A. Cushman. All the dipterous parasites were identified by H. W. Allen, J. M. Aldrich and C. T. Greene. Many thanks are due these specialists of the U. S. Bureau of Entomology for their assistance. Mr. Gahan also kindly checked over the scientific names and otherwise criticized the manuscript.

The list which follows is arranged alphabetically according to hosts:

LIST OF PARASITIC INSECTS REARED IN EASTERN
VIRGINIA DURING 1926 AND 1927.

1. *Acrosternum hilaris* Say.
 - a. *Trissochus euschisti* Ashm. (Collected and reared by G. W. Underhill.)
 - b. *Anastatus reduvii* (How.). (Collected and reared by G. W. Underhill.)
2. *Alabama argillacea* Hubner.
 - a. *Itopectis conquistator* Say.
 - b. *Brachymeria ovata* (Say).
3. *Aphis pseudobrassicae* Davis.
 - a. *Diaeretus rapae* Curt.
4. *Autographa brassicae* Riley.
 - a. *Apanteles glomeratus* (Linn.).
 - b. *Apanteles marginiventris* (Cress.).
 - c. *Copidosoma truncatellum* (Dalm.).
5. *Bedellia somnulentella* Zell.
 - a. *Microbracon gelechiae* (Ashm.). (Collected and reared by H. S. Peters.)
 - b. *Apanteles bedelliae* Vier.
 - c. *Spilochalcis* sp. (Collected and reared by H. S. Peters.)
6. *Cirphis unipuncta* Haworth.
 - a. *Apanteles militaris* Walsh.
 - b. *Archytas analis* Fabr.
 - c. *Achaetoneura* (*Frontina*) *aletiae* Riley.
 - d. *Winthemia quadripustulata* Fabr.
7. *Diabrotica vittata* Fabr.
 - a. *Celatoria diabroticae* Sch.
8. *Hymenia fascialis* Cramer.
 - a. *Nemorilla maculosa* Meig. (Collected by C. O. Bare, Tampa, Fla.)
 - b. *Apanteles marginiventris* (Cress.).
 - c. *Eupteromalus viridescens* (Walsh).
 - d. *Sagaritis provancheri* (D. T.).
 - e. *Casimaria infesta* (Cress.).
9. *Illinoia solanifolii* Ashm.
 - a. *Aphidius rosae* Hal.
10. *Lema trilineata* Oliv.
 - a. *Emersonella lemae* Gir.
11. *Phlegethontius sexta* Johanssen.
 - a. *Apanteles congregatus* (Say).
 - b. *Eupteromalus viridescens* (Walsh).

12. *Phthorimaea glochinella* Zell.
 - a. *Microbracon gelechia* (Ashm.).
 - b. *Hormius pallidipes* Ashm.
 - c. *Bassus gibbosus* Say.
 - d. *Chelonus phthorimaeae* Gahan.
 - e. *Orgilus mellipes* (Say).
 - f. *Perilampus fulvicornis* Ashm.
 - g. *Epiurus indagator* (Cress.)
13. *Phthorimaea operculella* Zell.
 - a. *Microbracon gelechia* (Ashm.).
 - b. *Campoplex ferrugineipes* Ashm.
 - c. *Hormius pallidipes* Ashm.
 - d. *Campoplex phthorimaeae* (Cush.)
 - e. *Bassus gibbosus* Say.
 - f. *Chelonus phthorimaeae* Gahan.
 - g. *Orgilus mellipes* (Say).
 - h. *Angitia* sp.
 - i. *Meteorus vulgaris* (Cress.). (Collected and reared by H. S. Peters.)
 - j. *Cardiochiles explorator* (Say)
 - k. *Sympiesis stigmatipennis* Gir.
 - l. *Perilampus fulvicornis* Ashm.
 - m. *Perilampus granulatus* Cwfd.
 - n. *Epiurus indagator* (Cress.).
14. *Phytomyza ilicis* Curtis.
 - a. *Opius striativentris* Gahan.
 - b. *Pleurotropis* sp.
 - c. *Pleurotropis lithocolletidis* Ashm.
 - d. *Closterocerus tricinctus* Ashm.
 - e. Spegegasterinae (genus and species unrecognized).
 - f. Miscogasteridae (? *Herbertia* sp.).
15. *Plutella maculipennis* Curtis.
 - a. *Angitia plutellae* Vier.
16. *Pontia rapae* Linn.
 - a. *Apanteles glomeratus* (Linn.).
 - b. *Pteromalus puparum* (Linn.).
 - c. *Phorocera claripennis* Mcq.
17. *Pyrausta ainsliei* Heinrich.
 - a. *Microgaster harnedi* Mues.
18. Syrphidae.
 - a. *Diplazon laetatorius* (Fab.).
19. *Thyridopteryx ephemeraeformis* Haw.
 - a. *Itopectis conquisitor* (Say).
 - b. *Pteromalus puparum* (Linn.).
 - c. *Brachymeria ovata* (Say).
 - d. *Habrocytus thyridopterigis* How.
 - e. *Horismenus* sp.

ADDITIONAL NOTES.

Reference to the previous species is made for the most part by the number and letter under which they stand in the foregoing list. 2. The cotton leaf worm, *Alabama argillacea* Hbn., became very abundant and defoliated the cotton in Princess Anne and Northampton Counties during the latter part of September, 1926. On October 22 one examination showed 75% of the pupae to be parasitized by the two species which are listed under 2, a and b.

4. The cabbage looper, *Autographa brassicae* Riley, was abundant enough to require control by arsenicals in the Norfolk trucking region during both 1926 and 1927. A polyembryonic parasite, *Copidosoma truncatellum* (Dalm.), was found to be parasitizing this host on collards, broccoli and potatoes in October of both seasons. The number of parasites which emerged from one individual host larva was counted in a few instances. The minimum was 736 and the maximum 1176.

5. The sweet potato leaf miner, *Bedellia somnulentella* Zell., was far more abundant in 1926 than 1927. During the latter part of August, 1926, some fields showed 50% of the individuals parasitized by *Apanteles bedelliae* Vier.

6. On May 30, 1927, 100 larvae of the armyworm, *Cirphis unipuncta* Haw., were examined. Fifty of these individuals each bore from one to seven eggs of tachinid flies.

7. On May 18, 1927, fifty adults of the striped cucumber beetle were collected in the field and confined in a cage to rear parasites. One parasite as listed under 7, a, was reared.

8. An extensive outbreak of the Hawaiian beet webworm, *Hymenia fascialis* Cramer, occurred in the Norfolk region during October and November of 1926. The parasites were not abundant enough to be of much benefit in the control of this pest. *Eupteromalus viridescens* (Walsh) was a secondary parasite attacking *Apanteles marginiventris* (Cress.).

9. The potato aphid, *Illinoia solanifolii* Ashm., was abundant enough on the potato crop in some fields during the spring of 1927 to require artificial control measures. *Aphidius rosae* Hal. was very abundant as were also some of the common predators.

10. The three lined potato beetle, *Lema trilineata* Oliver, was undoubtedly held in check largely by the egg parasite, *Emersonella lemae* Gir., which was collected abundantly from every section of tidewater Virginia visited during 1926 and 1927.

11. *Apanteles congregatus* (Say) was a common parasite of *Phlegthontius sexta* Johanssen. As many as 248 of these parasites were reared from one host larva. *Eupteromalus viridescens* (Walsh) was occasionally reared from *A. congregatus* (Say) as a secondary parasite.

12. The parasites of the eggplant leaf miner, *Phthorimaea glochinella* Zell., were of great benefit in keeping this insect in check both on eggplant and horse nettle (*Solanum carolinense* L.). All of the species of parasites which were reared from this insect were also reared from the closely related potato tuber worm, *Phthorimaea operculella* Zell. The writer is not certain, but is reasonably sure, that the species of *Perilampus* which were reared were secondary parasites and that they developed upon *Bassus gibbosus* Say.

13. *Campoplex ferrugineipes* Ashm. was the most abundant parasite of *P. operculella* in the fall of each year, while *Microbracon gelechia* (Ashm.) was apparently the most important parasite during the early part of each year although it was found in the field on this host from May to October, inclusive. When parasitizing *P. operculella* in tobacco in the field it had a dark brown cocoon somewhat resembling the size and color of the "flaxseed" of the Hessian fly. This was in distinct contrast to the white cocoons which were formed when deloping on the same insect host under cage conditions.

Some notes were made regarding the biology of *M. gelechia* during 1926 and are summarized as follows: Unfertilized females produced males only. It was reared on larvae of *Diatraea zeacolella* Dyar during a shortage of larvae of *P. operculella*, as many as twenty individuals being reared from one larva. The period from deposition of eggs to emergence of adults, ranged from 10 to 12 days and averaged 11 days. Eggs hatched in 28 hours. One female deposited 62 eggs. The pupal period of three females ranged from 3 to 5 days and the pupal period of 39 males ranged from 3 to 7 days with an average of 4.1 days. Under favorable conditions in small vials, 19 males lived from 2 to 10 days, averaging 6.6 days, while five females under similar conditions lived from 8 to 41 days, averaging 16.8 days.

14. In a few instances the holly leaf miner, *Phytomyza ilicis* Curtis, was sufficiently abundant to require artificial control measures in Norfolk. Several collections in the spring before the leaves fell showed an average of 10% parasitism during 1927.

16. Adults of the imported cabbage butterfly, *Pontia rapae* Linn., were seen on the wing during warm days every month in the year at Norfolk. During the late fall of 1927 one field was observed from which large numbers of larvae were crawling to find suitable quarters for pupation. Examination of 100 individuals showed 47% were parasitized by *Apanteles glomeratus* (Linn.).

17. *Pyrausta ainsliei* Heinrich was not found abundantly. *Microgaster harnedi* Mues. was reared from *P. ainsliei* which was collected at Deep Creek in 1926. Parasitized larvae were

collected at Bowling Green in 1927 but the attempts to rear these parasites to maturity were unsuccessful.

18. Two species of Syrphidae were quite abundantly attacking the pea aphid, *Illinoia pisi* Kalt., and the potato aphid, *Illinoia solanifolii* Ashm., during the spring of 1927. *Diplazon laetatorius* (Fab.) emerged from the pupae of both *Syrphus americana* Wied. and *Allograpta obliqua* O. S.

19. Local outbreaks of the bagworm, *Thyridopteryx ephemeraeformis* Haw., occurred but the parasites listed from this host were not abundant enough to hold this pest in check without the additional aid of arsenicals.

A TWO-WORD CODE OF NOMENCLATURE.

By W. L. McATEE.

Not to keep the reader in suspense, we announce at the beginning that the two words are "Respect priority."

Immediately we make profound apologies to pre-Linnaean zoologists because of our arbitrary dating of nomenclature from the *Systema Naturae* and ignoring their, in some cases, almost equally acceptable contributions.

With the further reservation that the present article applies only to names of generic or lower rank, we present our argument.

The one thing in codes of nomenclature that not only has logic, justice, and right on its side, but in addition embodies downright human interest, is priority. Being the first to discover, the first to make known a truth of nature are among the greatest rewards of the taxonomist, and having that priority recognized is not only a satisfaction but a natural right. So long as priority is observed we need have little fear of doing injustice to the men who have built up the fabric of taxonomy.

There are those, however, mostly not taxonomists, who would give short shrift to priority, and exercise arbitrary choice as to names. How short-sighted are their efforts! Why defend use of a name in preference to a prior competitor because it has been used for 50 or for that matter for 150 years? If our civilization has luck, it will continue for a period ten times that long and we fondly hope it will merge into an ever enduring cultural stability. In that case the hitherto elapsed periods that have made certain names familiar will shrink into insignificance, and changes, which will be forced sooner or later anyway by inexorable right and justice, presumably will reign for a length of time that will make the period of usage that any name may have at present attained seem of little conse-

quence. A broad view of the subject, therefore, means a long-time view, and once taken reveals the feebleness of arguments for the retention of names on the period-of-usage basis. The conservation of names for any more arbitrary reasons is nomenclatorial quackery.

We repeat that the essence of a fair and logical system of nomenclature is priority; all of the other words used in filling out a lengthy code of nomenclature are subordinate to this key word, and for the most part also are superfluous.

In golf, if we play the ball as it lies, we conserve the basic principle of the game, and following that rule alone can not go far wrong. The other rules are explanatory or supplementary and serve mainly to point out the application of the basic rule to special cases. So in systematic nomenclature, if we observe priority, first, foremost, and as well as may be, all the time, we shall be playing the game according to its highest standards. In other words, we shall be just to our predecessors, fair to our colleagues, and loyal to science.

As ye hope for priority, so abide ye by priority.

The Code: Respect priority.

STABILITY IN NOMENCLATURE.

BY W. L. McATEE.

Stability is the slogan of most advocates of nomenclatorial remedies. Whatever exception to orderly nomenclatorial progress is proposed, the chief reason urged in most cases is promised enhancement of stability. Some would have stability even by overriding every right of discovery in research, or of pioneering in nomenclature. The proponents of *nomina conservanda* in particular would destroy the most fundamental and just principle in nomenclature, namely, recognition of priority.

It is not surprising that taxonomists have not especially welcomed bearers of such gifts as these. Moreover, it is a simple truism that approval of taxonomists is necessary for the permanent success of any nomenclatorial regulation. Advocates of propositions deviating from the fundamentals of the subject should take warning that their proposals must be cast in forms more acceptable to systematists. They are further warned that their favorite cry of stability assures no certainly favorable reaction from the taxonomist. In fact, stability of names is a matter of little moment to the systematist. He must deal with *all* of the names that have ever been proposed in his group, and, so far as convenience is concerned, it matters

little which is at the top of the list. He is properly concerned, however, in having the oldest identifiable name at the head of the synonymy, not only for the sake of according credit where credit is due but also of building up by observance of the equitable, just, and honorable principle of priority, some guarantee of similar recognition of his own work. He is not likely, therefore, to yield to propaganda involving sacrifice of ethical considerations, and threatening individual achievement in taxonomy for the sake of such a fetish as artificial and temporary stability. He knows that the road to real stability, or as near an approximation to it as codes will ever yield, is through as thorough adherence as possible to the principle of priority.

MINUTES OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Through the courtesy of the Washington Academy of Sciences, an abstract of the minutes of the meetings of the Entomological Society of Washington is printed in the Proceedings of the Academy. This practice has continued for several years.

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OF WASHINGTON

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EUGENE AMANDUS SCHWARZ.

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

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In Memoriam.

The following resolution was adopted by The Entomological Society of Washington on November 1, 1928:

The Entomological Society of Washington appreciates to the fullest degree that in the passing of Dr. Eugene Amandus Schwarz it has lost its most learned member, its most loyal and generous supporter and the kindest and most helpful of friends. The Society points with pride to the fact that Doctor Schwarz was one of its founders, that he held in the course of the years every office in which he could serve, and that the title Honorary President was created especially for him.

The Society feels that American entomologists should be grateful that this great soul has lived among them for more than fifty years, constantly in his quiet way influencing their trend of thought towards the very best methods and towards sound scholarship.

Signed: L. O. HOWARD,
Chairman,
H. S. BARBER,
AUGUST BUSCK.

DR. E. A. SCHWARZ.

BY L. O. HOWARD, HERBERT S. BARBER AND AUGUST BUSCK.

Eugene Amandus Schwarz was born in Liegnitz, Silesia, April 21, 1844, and died in Washington October 15, 1928, at the age of eighty-four years and six months. Of that long life, fifty-five years were spent in this country, and more than fifty of those years in the service of the United States.

Doctor Schwarz was always very reticent about his early life in Germany. In fact, he never liked to talk about himself. He shunned the publicity of *Who's Who in America* and of *American Men of Science*. Indeed we should know little of that part of his life which was not spent among us were it not that during later years he has from time to time, in perhaps unguarded moments, talked a bit to one of us (Barber) owing to a long-time close intimacy. From these data (noted soon after they were told) we have been able to see a short way into his life in the pre-Washington days.

Then, too, and most fortunately, Walther Horn of Berlin never forgot the impression made on him by Schwarz's personality and learning when as a young man he (Horn) visited Washington in 1902. For the twenty-six years since then he has kept Schwarz constantly in mind. Just before he started for America last summer to attend the Fourth International Congress of Entomology he wrote one of his delightful sketches entitled "Et Meminisse et Vaticinari liceat," in which he told some of the facts he had gathered in Germany. This is the substance of this sketch, published in *Entomologische Mitteilungen* for September 20, 1928 (XVII, No. 5), and done into English for us by Carlo Zeimet.

"My thoughts for months have been dwelling on Liegnitz. Fourteen months ago I was sitting there with Theodor Becker, 87 years old, in his house half empty and deprived of all his treasures. His collection had just been transferred to the Museum in Berlin, and the boxes in which his library was packed were ready to be shipped to my institution. We were talking of 'tempi passati' far back.

"The news reached me to-day that Theodor Becker passed away on June 29th.

"Strange thoughts are crossing in my brain. With Theodor Becker a great German entomo-taxonomist has passed away in Liegnitz. He may be considered the oldest of his type. Denmark gave him years ago to Germany. Another great German entomologist born in Liegnitz, the oldest one now living, is Eugen Amandus Schwarz whom Germany gave to the United States more than fifty years ago and who is now 85 years old.

"The careers of these two veterans from Liegnitz appear

to be entirely different at the first glance, since they seem to have had nothing to do with one another; they never met together. When Becker came to Liegnitz, Eugen Amandus Schwarz was considered by his friends, and also by his relatives, to have disappeared and to have died long ago. Nevertheless these two curves of life crossed twice. The first time they crossed by means of the younger brother, Karl Schwarz, three years younger than Eugen, who had taken over the collection of Coleoptera of his elder brother. The curves crossed the second time when both were over eighty years of age and had come indirectly into contact through the medium of a younger friend of E. A. Schwarz (R. C. Shannon).

"I am not in the habit of depicting as a chronicler the curricula of the entomological world: I wish rather to make a sketch with a few brush-strokes of the past and the present time.

"When in 1864, Germany went to war with Denmark, young Becker was a student at the Polytechnicum in Zurich with a few other Danish-German fellow students. The Danish order to answer the call for military service had been sent to him by his father, who wrote him that if he did not respond the penalty was death. The young Theodor replied that he would take a chance of being shot later on, as he was entirely in sympathy with Germany, as were his fellow students.

"Many years later, Becker, who had become an architect, came to Liegnitz as City Architect. Up to that time insects had not interested him. Chance brought him together with Karl Schwarz who, with J. Gerhardt, collected insects. Becker made many trips to the south with Schwarz. One day it happened that Becker went to St. Moritz for a few weeks, and Karl Schwarz asked him to collect some beetles for him. Becker complied with this request as well as he could, but when he got back with bottles filled with insects Schwarz found that a large part of them were not beetles at all, and sent them back to Becker with the statement that they were flies and that he did not want them. Becker had caught these insects with his hand because they were more conspicuous.

"Immediately Becker's interest in Diptera was aroused, and his next step was to buy Meigen and try to identify the funny insects. The second book bought was Schiner. In a rapidly ascending curve he rose to be the celebrated author of the Palearctic Diptera, and in a very short time was in the most friendly relations with the great leading dipterologists of Europe, namely, Villeneuve, Schnabl, Szerny, Kertesz, Bezzi, Lichtwardt, Dziezicki. They went together collecting all over Europe, and many pictures have been taken of them showing a splendid record of this international fly club. There has never again been in Europe a similar circle of friends interested

in entomology since Kraatz passed away. Becker spent the rest of his life in retirement in comfortable circumstances.

"And the other veteran, Eugen Amandus Schwarz? His interest in entomology was deeply seated from his earliest days. It was this interest that made him give up his studies in philology and which took him from his family and from his homeland. He resigned in 1872 from a teachership. Subsequently we find him in Leipzig together with Ed. Bugnion, the brother-in-law of Forel, as a student of Leuckart. Then he disappeared. No one knew about him, with the possible exception of Kraatz, who was an intimate friend of his teacher in entomology, K. Letzner.

"Then he emerged from obscurity in the United States, first in Cambridge, where the great German immigrant, Hagen, delivered lectures. But his restless nature did not permit him to stay long in that place. Soon we find him with a new friend and patron, H. G. Hubbard, with whom he collected Coleoptera in Michigan, Florida and other States, and for whom he acted as curator. Later he made a collecting trip into the western States for John L. Leconte, and in 1878 he placed himself in the service of Charles V. Riley as an associate of L. O. Howard and his German colleague, Pergande, who came from Stettin. His friendship with H. G. Hubbard was only dissolved by the latter's death, which unfortunately occurred (to the loss of science) in 1899 when, comparatively young, he passed away with tuberculosis. This was the severest shock to Schwarz in his new country.

"Held in high esteem and honored as rarely has been an entomological immigrant to the United States, Schwarz initiated friendships and found friends in his new country who have been faithful to him like gold.

"I shall mention Henry Ulke, who belonged to the circle of friends of Karl Hauptmann and who painted the portraits of a number of the Presidents of the United States. I would also mention L. O. Howard, who became his chief, colleague, friend and protector at the same time. Of the younger generation, I would cite Herbert S. Barber and R. C. Shannon, who to-day faithfully attend and protect their old friend who has been a father to them and who is now rendered a physical wreck by old age. There are few entomological names in the United States which during the last twenty years have stood higher in the estimation of others than that of this veteran of Liegnitz. Some years ago the Entomological Society of Washington made him Honorary President. Later he received the degree of *Doctor honoris causa* from the University of Maryland. But that which has made Eugen Amandus Schwarz famous is that he has always willingly placed his unlimited knowledge and experience at the disposal of the younger generations.

"And the old fatherland? There are very few in Germany to-day who know his name; but these few connect with his name the same conception which has become inseparable with him in the New World, i. e., the conception of a stupendous knowledge, a knowledge in all fields of entomology, especially in the one most difficult of all, namely, bibliography.

"Few will imagine and few are aware that there has rarely been a German entomologist who, in spite of the fact of never having seen his native land again, has adhered so faithfully in his thoughts to his own country as has Schwarz. Up to his very last days he has always nourished in his soul a love for his native home which he never forgot. I shall never forget the evenings which I spent with him thirty years ago in company with his old Silesian friend, Henry Ulke, the senior of the entomologists in Washington.

"I am now about to see E. A. Schwarz in a few weeks and to transmit to him greetings from his old colleague from Liegnitz—Theodor Becker.

"A memorial of some sort has been erected to many entomologists, but very few have ever been given a greater testimonial than was given to E. A. Schwarz in the words of L. O. Howard: 'What has made the Entomological Society of Washington valuable to us beyond all other organizations has been the constant presence and participation in all its discussions of Eugene A. Schwarz.'"

Most fortunately, Horn's hope of seeing Schwarz was realized, and, when he visited Washington during the last days of last August, he had the pleasure of reading this sketch (in German) to our dear old friend.

Mr. Barber's notes follow:

As a boy, in his home town, Schwarz became acquainted with Gerhardt, the elder, who advised the purchase of Redtenbacher's *Fauna Austriaca*. Gerhardt went into the service of a famous mycologist, and was thereby detracted from entomology. He, however, taught Schwarz the fundamentals of entomology and of natural sciences. Schwarz then invented an entomological sieve, a greatly improved form of the older cumbersome sieve of Kiesenwetter and others. Later, as a student at the University of Breslau, he made the acquaintance of Prof. Karl Letzner, who was much surprised by Schwarz's results in collecting with the sieve.

He was in Breslau during the war between Prussia and Austria in 1866. In that year the name "E. Schwarz, student in Liegnitz, Coleoptera," appears in the *Berlin Ent. Zeitschr.*, vol. X, p. 430. In the same year he served in Austria as Fiber Specialist in sorting surgical dressing material in the Austrian

war, because his defective eye-sight prevented his service in the army.

His first entomological paper appeared in 1869 (*Jahresbericht der Schlesischen Gesellschaft für Natürliche Kultur*, vol. 47, pp. 180-199). It was a short account of his excursion of September 29 to October 3, 1869, to the "Glatzer Schneesberge," and including, with notes on many of the beetles taken there, a technical treatment of the *Hydroporus* fauna of Silesia.

In 1870 he was before Paris in the distributing hospital of the Medical Corps, and became acquainted with many good men, including a number of French surgeons who were continuing their work after their capture by the Germans.

In 1871 the name "E. Schwarz, candidate in Breslau, Coleoptera," appears in the list of members of the *Berliner Entomologischen Verein* (*Berl. Ent. Zeitschr.*, xv, p. 13).

In 1872, under the authorship of Dr. E. Schwarz, in Breslau, was published (*Berl. Ent. Zeitschr.*, xvi, p. 153) his letter to Kraatz discussing collecting news and mentioning the collection of insects brought back from France by his younger brother who had served in the Königs Grenadier Regiment No. 7.

[In 1872 he was a student at the University of Leipzig, as we learn from Horn's account, and there he was associated with Ed Bugnion, later Professor of Comparative Anatomy in the University of Lausanne. Bugnion, now retired and living at Aix-en-Provence, France, told one of us (Howard) in 1923 of those days with Schwarz, and as he talked his fine old face glowed with enthusiasm.]

In December, 1872, he came to the United States, finding employment with Hagen at Cambridge, Mass., on the recommendation of Kraatz. His first work was arranging the Hagen collection of alcoholics under an unfortunate plan which he said probably caused the ruin of the collection. His first salary was six hundred dollars a year and quarters.

He introduced the entomological sieve into America, and greatly surprised Hagen with the material thus collected at Cambridge in winter time.

In 1874 his name again appears in the *Berliner Ent. Zeitschr.*, vol. 18, p. 17, as "E. Schwarz, of Breslau, temporarily in Cambridge."

After the death of Agassiz he found himself without a position, and (May 1, 1874) accompanied his friend and pupil, H. G. Hubbard, to Detroit where they founded the Detroit Scientific Association and commenced the building up of a collection of insects. They began to collect insects in Florida, spending several months there, and returned in time to prepare their material before the meeting of the American Association for the Advancement of Science in Detroit in August of 1875. At this meeting he made the acquaintance of Lintner, Riley,

Grote, Osten Sacken, William Saunders, and especially of Leconte (President of the American Association that year) whose astonishment at the species of beetles they had taken in Florida grew into a life-long admiration and cooperation. At this time Schwarz was so afflicted with ague from the Florida trip that he had difficulty in answering questions.

The next year (1876) Schwarz went alone to Florida, spending the spring months, and afterwards made a summer trip by schooner all around Lake Superior in company with Hubbard. The winter was spent at Detroit, working over the collection of George D. Smith of Boston.

In the summer of 1877 Hubbard and Schwarz made their big expedition to Lake Superior. It required several months to work up their captures upon which they and Leconte published "The Coleoptera of Michigan" two years later. At Doctor Leconte's instigation, Schwarz went to Colorado early in 1878, Leconte employing him to collect beetles there. But the season had hardly started when he received a telegram from Riley offering him a position in the Department of Agriculture. This he accepted, and spent the following winter investigating the cotton worm from Texas through the Southern States to the Bahamas. Riley's bulletin (No. 3, U. S. Entomological Commission) utilized this work.

Here end Barber's notes.

When Howard arrived in Washington, November 13, 1878, he found only Riley and Pergande at work in the entomological offices of the Department of Agriculture. They were in the two west-end rooms of the second floor of the old building and in the adjoining hall room. Schwarz, who had taken the oath of office the previous July, had been sent South, as indicated above, to study the cotton caterpillar; and in the following spring he visited the Bahamas. He returned to Washington about the time that Riley resigned in March or April, 1879, and went with him to the offices of the U. S. Entomological Commission which Riley opened in his new house at 1701 13th Street. Pergande and Howard remained with the Department, under J. H. Comstock, who succeeded Riley as chief of the service and who remained until March, 1881. Schwarz and W. H. Patton worked with Riley on R Street, and, as there was a certain amount of bickering between the heads of the two offices, the assistants rarely met during these two years.

When Riley returned to the Department in March, 1881, he brought Schwarz with him, added B. P. Mann, W. S. Barnard and George Marx to the staff, and promptly sent Howard into the field for five months. When the latter returned to Washington he began really to know Schwarz and to appreciate him.

The two worked at adjoining desks. Howard did not realize fully at the time (nor for several years—it grew upon him and influenced him unconsciously) what this daily association meant, and his experience duplicates the experience of others as they came along in the ensuing years. Looking back from this distance, let us take a perspective: Riley, genius though he was, had had no higher education (he came to America and went on a farm in Illinois at the age of seventeen); Pergande, a mechanic of no schooling; Howard, fresh from Cornell and only 23 years old; and Schwarz, a classical scholar of standing, trained with some of the best entomologists of Germany, recently from Hagen's laboratory and still more recently from the Detroit meeting of the American Association for the Advancement of Science, where Leconte praised his knowledge and his work in almost extravagant terms! What wonder that the rest of them profited greatly by this association! Howard states, "As I look back to-day, I am filled with admiration and amazement at Schwarz's bearing. He allowed us to feel no attitude of superior learning on his part. Was that not almost superhuman? It was Schwarz and his learning that kept the rest of us from rawness. Our respect for his knowledge was great, but we never, so far as I know, attempted to put ourselves into his place and consider how very crude we must have seemed to him in many ways. He was always the kindly, considerate, thorough gentleman, apparently absolutely devoid of scholastic assumption."

His knowledge of the literature of entomology was no less than stupendous. He early began a card catalog of the literature on the habits of insects, which from the start was of the greatest use to all the men in the service. He was not only the most indispensable man at headquarters, but was one of the best field workers in America or elsewhere and was used by Riley in all sorts of ways. Not only did he write a number of papers published without his signature, but he influenced to a large degree the character of many others. The monographic paper on the *Psyllidae*, for example, was in the main the work of Schwarz.

He played a large part for many years in many of the most important entomological investigations of the Department from the days of the cotton caterpillar work through the time of the early work on the cotton boll weevil down to the days of the investigation of the *Thurberia* weevil in recent years.

But aside from all these big official things there were very many other ways in which Schwarz's presence in the organization and his work did the greatest good. His very presence among us had a great educative value. Take our own Society for example. From the very start he was its most valuable member. His papers set us a very high standard. His part in the free

discussions was sound and illuminative. He was always present at the meetings and always took a most important part. The quotation from Howard which closes Horn's sketch was not exaggerated. There is probably not one of the many scores of workers who have attended our meetings in the past who has not been influenced for the better by association with this wise and kindly man.

As in the Society, in which for many years he was the greatest single personal influence, so it was in the Department of Agriculture and in the National Museum. Younger men went to him for counsel and for help in their scientific problems and even in their personal problems, sure of his kindly interest and resourcefulness.

Is it any wonder that such a man had many friends? And is it any wonder that into his life there came one of those rare and wonderfully beautiful friendships which in its quiet way equaled the great friendships of history—David and Jonathan, Damon and Pythias? Schwarz and Henry G. Hubbard left Cambridge together in 1874, and, on Hubbard's wealthy father's estate in what was then a suburb of Detroit, they built an entomological museum. From this center they made their remarkable expeditions. Later Hubbard located at Crescent City, Florida, where he was often visited by Schwarz, and together they made Crescent City entomologically famous. There it was that Hubbard wrote his admirable "Insects of the Orange" and conducted his early kerosene-emulsion work. Through Schwarz's influence he had been made an agent of the Department of Agriculture, and he was in Washington when Riley resigned in June, 1894.

During the ensuing years and until Hubbard's death, they were either always together or in constant correspondence. Some of Hubbard's remarkable letters were read by Schwarz before this Society and were published in our Proceedings. But Hubbard contracted tuberculosis of the lungs and gradually failed. Shortly before his death he and Schwarz went together into the dry climate of Arizona, and Hubbard's life was prolonged by this stay. There they constantly carried on their entomological observations, and we like to think of the two together on their short excursions, preparing their own meals in the lower mountains; Hubbard so weak that he could only sit and study the things around him while Schwarz did the camp work. It was on such an excursion that Hubbard found the first queen of *Termes* in this country. He was that sort of man, and Schwarz was that sort of man. Put either of them anywhere, under the most unfavorable circumstances, and they would see things that no one else ever saw, and their knowledge was such as to appreciate the importance or nonimportance of what they saw. Had Hubbard stayed with Schwarz down

there, his life might have been prolonged, but he unwisely went to Detroit for a Christmas with his family and the end came soon.

Hubbard had married in the meantime and had become the father of children. After his death Schwarz's friendship extended to the family and has always lasted. He introduced one of Hubbard's sons with great pride some years ago at the Cosmos Club and elsewhere in Washington.

During the last forty years Schwarz's fame as a man of great learning slowly spread among the entomologists of this country until it became generally recognized. After the founding of the great Entomological Society of America in 1907 he was made one of the first group of Honorary Fellows. For a long time he was the only honorary member of the Entomological Society of New York. In 1923 the University of Maryland made him Doctor of Science (*honoris causa*), and in 1916 he was made Honorary President for life of our own Entomological Society of Washington after an amendment to the constitution had been adopted creating this honorary office. In August, last, the Fourth International Congress of Entomology, meeting at Ithaca, sent him a special telegram of greeting and respect. Thus, in spite of his self-effacement, his true merits as a man of science became widely recognized.

With his appointment as Custodian of Coleoptera in the National Museum in 1898 he introduced better standards of care and arrangement and his personality secured the deposit of numerous collections besides the very extensive one made by Hubbard and himself. These he incorporated as far as possible into a single general collection. His interest and encouragement of attempt by younger men to introduce improvement was always keen. From the older method of using, as pin-labels, scraps of colored paper indicating regions, he, more than any one else, forced the current use of small printed labels recording exact locality, date and collector. Although he recognized the reference collections of the museum and of individual field workers as essential to identification, his emphasis was always laid upon the correlation of host-plants, larvae and habits in the consideration of the status of any species. Through his own collecting and the encouragement of younger men he started and actively promoted the formation of the collection of Coleoptera larvae which has since grown to be probably the largest in the world. His interest was always greater in neglected groups and families than in those fashionable among amateur collectors. Therefore his collections are remarkable for minute or obscure forms. Rarely did he assume any credit for such series of specimens, but usually mentioned the friend in whose company he had found the species.

Anything he knew which bore upon an entomological problem

in hand was always available to any enquirer, but when asked about his collecting trips and adventures as personal narratives, he was reticent. Only an incomplete record of his travels and collecting in America can be offered, but his field observations extended throughout all sections of the United States and to Cuba, Guatemala and Panama. After the founding of the Washington Biologists' Field Club at Plummer's Island, he became its most active collector. One of his last extended collecting vacations was spent there in 1923, when he was already in feeble condition.

He was always collecting. Whether traveling for the office, or on a planned vacation to investigate a region or a fauna new to him, he used all possible time looking for little-known forms. His chief expeditions are briefly listed below.

Towards the close of his active life he seemed almost completely immersed in his museum work, and among his many public-spirited acts he presented his entomological library to the Museum.

In 1926, while living in the home of his protege, R. C. Shannon, Schwarz awoke one morning slightly dazed and unable to express himself coherently in speech or writing. Although he remained apparently unimpaired in intellect, his decline dated from that time. The friends closest to him were able to converse with him by formulating their questions in such a manner as to require only a nod or a shake of the head in reply, and he continued to come to his office, to read the newspaper and to take interest in the entomological and personal problems of his associates. He enjoyed music as much as he always had and especially classic German music. Wagner, played on the victrola, was sure to bring happy smiles. To the last he retained his sweet graciousness and kindness to others.

On the evening of October 8, 1928, he fell on the floor in Mr. Barber's home, where he had spent the last few years of his life, and sustained the serious bone-fracture which, with pneumonia following, caused his death a week afterwards, October 15th, at 5:00 P. M.

Looking at this story from one point of view, we know much of this fine life, far more than half of which was lived with us, and all that we know is admirable. Looking at it from another point, it seems something of a mystery after all (possibly only from his reticence about personal affairs). There he was in Germany, in his late twenties, a man of the schools, a trained philologist. Horn hints that he had a teaching position. Possibly an honored and successful career in his home-land lay before him. Then he broke all ties and came across the sea to America, where he led a quiet life with no rewards save

the love and admiration of the few who knew him. He never married, and he told no one his inner thoughts or of his youth except as he may have told Hubbard and except for the fragments preserved by Barber.

Was it his great love for entomology and the compelling desire to get into a new world and to study strange forms that brought that break? Perhaps. Perhaps he was happy. Perhaps he was one of those rare souls who find their greatest happiness in helping others. Surely he did help others all these years.

APPENDED NOTE.

After this paper was presented at the meeting of the Society on November 1, 1928, letters were received from Mr. Nathan Banks of Cambridge, Mr. R. C. Shannon, and Dr. Walther Horn of Berlin. Mr. Banks, now Curator of Insects in the Museum of Comparative Zoology, was for many years connected with the Bureau of Entomology at Washington. During a part of that time he occupied a room with Doctor Schwarz, and they talked a great deal on many subjects. As Mr. Banks remembers them, the facts told him by Schwarz add little to the statements we have already made. Mr. Shannon, who was closely associated with Doctor Schwarz during his later years, mentions in his letter particularly Doctor Schwarz's friendship with H. G. Hubbard.

Doctor Horn, after his return to Europe in September, succeeded in finding out more about Schwarz's early history in Germany and succeeded in learning the facts concerning his relatives still living over there. Horn will publish all of these things in Germany, and we need not anticipate his publication beyond stating that he has apparently explained all that there was of mystery in the departure of our friend from Germany and his reticence in regard to the causes. As he explains it, Schwarz wished to become a zoologist and to specialize in entomology, but his parents did not like the plan. They compelled him to study philology, with the idea of the career of a high-school master. Schwarz followed his parents' directions for a few years only; then, without their knowledge, he devoted himself to zoology. The time came when he could go no further without his parents' knowledge, and, rather than to explain to them that he had neglected their plans and disappointed them in their ideas, he left for the United States. Horn thinks that, had Schwarz mustered up his courage and explained the situation fully to his father, the elder Schwarz would have swallowed his disappointment and consented to the change of career. What a loss it would have been to American entomology had our friend faced the situation in that way!



COLLECTING EXPEDITIONS PARTICIPATED IN BY
DR. E. A. SCHWARZ.

1875. Florida: Indian and St. John rivers and Cedar Key, in company with Hubbard.
1876. Florida (March-June): Tampa to Enterprise.
Lake Superior: A schooner trip all around the lake, with Hubbard, during summer.
1877. Lake Superior: Summer at Marquette and Isle Royale, with Hubbard.
1878. Colorado (early summer): Garland, Veta Pass, etc.
- 1878-9. Southern States, from San Antonio, Texas, to Nassau and Long Island, Bahamas (December-May).
1880. Texas and Alabama.
1887. Florida: First visit to subtropical region, Key West, Biscayne Bay.
1891. Utah: Wasatch Mts. (with Hubbard).
1892. Colorado, Oregon, Washington, British Columbia and Alberta (with Hubbard).
1893. North Carolina: Mountains (with Hubbard).
1894. Florida: Punta Gorda (with Hubbard).

1894. Texas and Alabama.
 1895. Texas: Brownsville, San Diego, etc.
 1898. Arizona, southern (with Hubbard).
 1900. California: Fresno (fig insects).
 1901. Arizona and New Mexico (with Barber).
 1902. Cuba.
 1903-4. Cuba.
 1906. Guatemala (with Cook, etc.).
 1909. Mexico (with Bishopp).
 1911. Panama.
 1912. Florida: Key West.
 1913-14. Arizona, southern (with Barber).
 1918. Florida: Everglades and Keys (with Barber).

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