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CONTENTS

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NOTES ON THE SUBGENERA OF METOPIUS WITH A SYNOPSIS OF THE SPECIES OF CENTRAL AND SOUTHERN CHINA

(Hymenoptera, Ichneumonidæ)

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With the exception of a few relatively common forms, specimens of *Metopius* are rather rarely collected. Nevertheless, many species exist, distinguished by numerous and relatively constant characters, as demonstrated by Clémont (1929) in his revision of the Palearctic species. The European species of the genus whose habits are known are parasites of Lepidoptera.

I—Subgenera

The genus *Metopius* was described by Panzer (1806), who included two species, *M. vespoides* (Scopoli) [=*necator* (Fabricius)] and *dissectorius* (Panzer). Viereck (1912) designated *vespoides* (Scopoli) as the genotype. Clémont (1929) apparently believed that Panzer had included three species, *dissectorius* (Panzer), *micratorius* (Fabricius) and *necatorius* (Fabricius) [=*necator* (Fabricius)]. Although placing *necator* as a synonym of *vespoides* without comment on page 349, Clémont stated in his introduction that he regarded this synonymy as not fully established, and therefore redesignated the genotype as *Ichneumon micratorius* Fabricius, a species *not* included in the genus by Panzer at the time of his original description. Even though the identity of Panzer's *vespoides* with that of Scopoli is not definitely established (Clémont suggested that the former may be the same as *M. brevispina* Thomson), Clémont's genotype fixation is out of order, and the genotype of *Metopius* must remain *Sphex vespoides* Scopoli, as originally designated by Viereck.

Clémont, following his own genotype fixation, uses the subgeneric name *Metopius* for a group of species including *micratorius* (Fabricius), and describes a new subgenus, *Peltopius*, for *vespoides* (Scopoli) and its relatives. It is evident from the foregoing that *Peltopius* must fall as a synonym of *Metopius s. str.*,

being isogenotypic with it, and that a new name must be erected for the *Metopius s. str.* of Clémont. For this group, the name *Clémontia* is here proposed. The following is a bibliographical summary of the subgenera of *Metopius.*

1. *Metopius* Panzer, 1806, Krit. Rev. d. Ins. Deutschl., 2:78.
   Type species: *Sphex vespoides* Scopoli, designated by Viereck, 1912, Proc. Ent. Soc. Wash., 14:176.
   Peltastes Illiger, 1807, in: Rossi, Fauna Etrusca, 2nd Ed., p. 55.
   Type species: *Ichneumon necatorius* Fabricius [=*Sphex vespoides* Scopoli], designated by Curtis, 1824, Brit. Ent., 1:4.
   Peltopius Clémont, 1927, in: Schmiedeknecht, Opusc. Ichneum., fasc. 44:3461.
   Type species: *Sphex vespoides* Scopoli, designated by Clémont, 1929, Konowia, 8:347.
2. *Peltocarus* Thomson, 1887, Deutsche ent. Zeitschr., 1887:196.
   Type species: *Metopius croceicornis* Thomson, designated by Viereck, 1914, U. S. Nat. Mus., Bull. 83:112.
3. *Ceratopius* Clémont, 1927, in: Schmiedeknecht, Opusc. Ichneum., fasc. 44:3461.
   Type species: *Ichneumon dissectorius* Panzer, designated by Clémont, 1929, Konowia, 8:408.
4. **Clémontia** Michener, new subgenus.
   Metopius Clémont, 1927, in: Schmiedeknecht, Opusc. Ichneum., fasc., 44:3461.
   Metopius Clémont, 1929, Konowia, 8:365.
   Type species: *Ichneumon micratorius* Fabricius.

All of the American species which I have studied [*M. bellus* Cresson, *nevadensis* Cresson, *montanus* Cresson, *pollinctorius* (Say), and an apparently new species] belong to the subgenus *Clémontia.*

II—Species of central and southern China

Several authors have already described species of *Metopius* from various parts of the Orient, primarily from Japan, but with the exception of the widely distributed *M. rufus* Cameron, these forms are not represented in the Chinese material before me.

All of the species treated in the subsequent part of this paper belong to the subgenus *Ceratopius* Clémont, which is, at least in so far as the species known to me are concerned, divisible into two distinct groups, as shown in the first dichotomy of the following key. The possible propriety of a fifth subgeneric name is thus indicated.

KEY TO THE CENTRAL AND SOUTHERN CHINESE SPECIES OF METOPIUS

1. Dorsal carinæ of first abdominal tergite strongly elevated, so that the tergite, viewed from the side, has the upper surface strongly angulate at the summit of the subvertical anterior face; basal area of propodeum closed behind; posterior lateral angles of propodeum formed by an elevated angle on a carina; outer hind tibial spur about as long as apical width of hind tibia; first tergite with distinct longitudinal supraspiracular carina on each side.....2
—. Dorsal carinæ of first abdominal tergite not strongly elevated, so that the tergite, viewed from the side, has the upper surface rounded and the anterior face subhorizontal; basal area of propodeum open behind; posterior lateral angles of propodeum low and rounded; outer hind tibial spur longer than apical width of hind tibia; first tergite without supraspiracular carinæ.....5
2. Fourth abdominal tergite longer than broad; abdomen strongly blue, its pale markings much reduced.....*metallicus*
—. Fourth abdominal tergite broader than long; abdomen feebly metallic.....3
3. Areolet of fore wings small, with a long petiole; posterior lateral angles of abdominal tergites three to five yellow....*gressitti*
—. Areolet of fore wings not or hardly petiolate; tergites one to four with complete or nearly complete pale apical fasciæ.....4
4. Lateral ocellus separated from eye by nearly the ocellar diameter; propodeal areola broadest near middle, posterior end rather narrowly rounded.....*quadrifasciatus*
—. Lateral ocellus separated from eye by about one-half the ocellar diameter; propodeal areola broadest near posterior end, which is broadly rounded.....*vandykei*
5. Fifth and sixth abdominal tergites shorter than apical widths, each with a distinct posterior yellow band.....*rufus browni*
—. Fifth and sixth abdominal tergites about as long as apical widths, almost entirely black.....*uchidai*

Metopius (Ceratopius) quadrifasciatus Michener, new species

This is a species with feebly metallic abdomen, and complete yellow fasciæ on the first four abdominal terga.

Female: Length 11 mm. *Head* black; facial shield margined with yellow, more broadly so laterally than at the ends; sides of face yellow to a point well above antennal sockets; cheeks receding immediately behind the eyes; facial shield longer than broad, widest at upper end, upper margin feebly convex except laterally, lower margin separated from anterior margin of clypeus by distance equal to about two-thirds of basal width of mandible; facial shield coarsely punctate, especially medially, punctures separated by considerably less than their diameters; clypeus below shield

more finely but closely punctate; frons rather coarsely punctate, sparsely so near ocelli; lateral ocelli separated from eye margins by nearly ocellar diameter; antennæ dark brown above, paler brown beneath, under side of scape yellow, fourth segment about as long as broad; upper margin of swollen segment of maxillary palpi yellow. *Thorax* black, a small mesepisternal angle beneath tegula, anterior lateral ridges of scutellum, posterior margins of posterior lateral teeth of scutellum, and large transverse median spot on metanotum yellow; lower lateral regions of pronotum shining and impunctate, with about three longitudinal carinæ, uppermost longest, impunctate area continued above it; mesoscutum irregularly punctured, notalices elongate, very weakly impressed; mesepisterna coarsely and closely punctured, punctures separated by much less than their diameters, dorsal process of mesepisterna thin and inconspicuously differentiated from disc, sternauli deeper posteriorly than anteriorly, rather finely and sparsely punctate anteriorly; scutellum coarsely and irregularly punctured, slightly depressed along longitudinal median line, with sides diverging slightly posteriorly, depressed anterior portion with five longitudinal carinæ, posterior lateral angles rather elongate and acute; fore wings with costal margin dusky, the dusky band narrow and inconspicuous basad to the stigma, but broad enough distad to it to include the entire marginal cell, areolet narrowed to a point toward costal margin, but not petiolate, the distocostal side being conspicuously longer than any other side; stigma black; metapleura shining, rather coarsely and sparsely punctate, punctures separated by about their diameters; fore and middle legs dark brown, infuscated, apices of femora and outer sides of fore tibiæ pale yellow; hind legs black, tibiæ and apices of femora dark brown, apices of femora each with a small yellow spot on outer side; hind tibial spurs hardly longer than width of tibia at apex; first four hind tarsal segments about as long as tibia; propodeum with costulæ distinct, areola with a longitudinal, median, impunctate line, posterior end of areola rather narrowly rounded, closed, areola broadest medially, where it gives off a carina on each side which divides to form a small, distinct, triangular area on each side, immediately above the strongly angular posterior lateral angle of the propodeum; carinæ bounding petiolar area on the sides weak. *Abdomen* black with feeble bluish or purplish metallic reflection, posterior margins of first four tergites yellow, the band on fourth tergite broadest, occupying nearly one-third of the tergite; posterior margin of fifth tergite narrowly and irregularly yellowish; abdomen coarsely punctate, second tergite more sparsely so than third and with sublateral, basal, impunctate areas; punctures of third and following tergites close, finer on posterior tergites; tergites three to six each with a weak and inconspicuous longitudinal median ridge; first abdominal tergite, seen from directly above, slightly broader than long, seen from side, strongly angulate above, the dorsal carinæ being strongly elevated to form

the angle, at which point they approach one another rather closely, behind which point they diverge slightly before converging toward the posterior margin of the segment; longitudinal supraspiracular carinæ distinct and complete; tubercle below anterior end of spiracle slender; second to fourth tergites slightly broader than long (third hardly so), their posterior lateral angles not or hardly produced posteriorly; fifth tergite broader than long (proportions of length to breadth of abdominal segments as follows: II, 15/19; III, 18/20; IV, 20/22; V, 18/21); pubescence of fifth and sixth tergites fuscous.

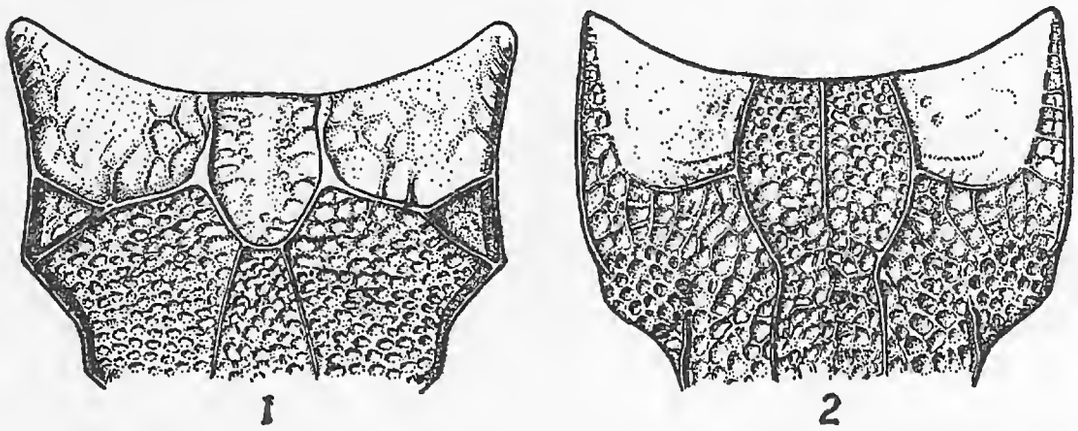

Figure 1. Dorsal and posterior surfaces of propodeum of *Metopius quadrifasciatus* Michener. Figure 2. Dorsal and posterior surfaces of propodeum of *Metopius uchidai* Michener. In these figures, no attempt has been made to show the lateral surfaces of the propodeum, which are visible to a certain extent from a posterior dorsal point of view.

Holotype, female: Tsin Leong San, east Kwantung, China, June 5, 1936 (J. L. Gressitt), on loan deposit in the California Academy of Sciences.

This species differs from *M. dissectorius* (Panzer) by the more elongate clypeal shield, which is more widely separated from the anterior margin of the clypeus, and the more elongate abdominal tergites. It differs from *M. fuscipennis* Wesmael by having only an inconspicuous keel on the abdominal tergites two to four, by the presence of a yellow band on the first tergite, and the absence of distinct bands on the fifth and sixth tergites. From *M. baibarensis* Uchida it differs in the shape of the first abdominal tergite, which is slightly broader than long, by the absence of a broad yellow band on the fifth tergite, and by the very feeble metallic reflection on the abdomen. This species differs from *M. purpureotinctus* (Cameron) and *areolatus* (Cameron) by the presence of strong, yellow, apical fasciæ on the first four, but not on the following abdominal tergites, as well as by other characteristics.

Metopius (Ceratopius) vandykei Michener, new species

This species is black, with feebly metallic abdomen and conspicuous fasciæ on the first four abdominal tergites.

Male: Length nearly 12 mm. *Head* black, facial shield completely margined with yellow, most broadly so laterally, sides of face yellow to point well above antennal sockets; sides of labrum and bases of mandibles with small yellow dots; palpi testaceous; cheeks receding immediately behind eyes; facial shield distinctly longer than broad, widest just above middle, upper margin feebly convex, lower margin separated from apex of clypeus by less than one-half basal width of mandible; facial shield coarsely punctate, especially medially, punctures separated by much less than their diameters; clypeus and frons more finely punctate, punctures of latter sparse near ocelli; lateral ocelli separated from eye margin by less than one-half their diameters; antennæ dark brown above, lighter beneath, scape and pedicel yellow beneath, fourth segment slightly broader than long. *Thorax* black, upper angles of mesepisterna, lateral basal ridges of scutellum, apical teeth of scutellum, transverse median area of metanotum, and posterior lateral angles of propodeum (feebly) yellow; lower lateral region of pronotum shining and impunctate, with a single complete longitudinal carina above which the impunctate area extends a short distance; mesoscutum coarsely and irregularly punctured, notalices complete, weakly impressed, closely punctate; mesepisterna coarsely and closely punctate, punctures separated by much less than their diameters, sternauli deeper posteriorly than anteriorly, dorsal mesepisternal process thin and scarcely separable from disc; mesoscutellum more coarsely punctate than scutum, depressed along longitudinal median line, lateral margins subparallel, although feebly convex, basal depression with three or four somewhat irregular longitudinal carinæ, posterior lateral angles robust, not strongly produced; wings nearly clear, feebly brownish along costal margin from stigma to apex of wings, areolet hardly petiolate, distocostal side hardly longer than basicaudal side, stigma black; metapleura coarsely punctate, punctures separated by less than their diameters; fore tibiæ and tarsi and apices of femora yellowish testaceous, outer sides of fore tibiæ yellow, remainder of fore legs dark brownish black; middle and hind legs black, tibiæ and tarsi dark brown, apices of femora with yellow spots, bases of middle tibiæ yellow; hind tibial spurs about as long as apical breadth of hind tibiæ, first four hind tarsal segments slightly shorter than hind tibiæ; propodeum with costulæ distinct, areola with longitudinal median, irregular, impunctate line, posterior end of areola broadly rounded, closed; areola broadest well behind middle, at which point it gives off a strong carina on each side, these carinæ dividing to enclose a small pit on each side just above the posterior lateral angles of the propodeum, which are elevated

and angular. *Abdomen* black, third and following segments feebly purplish, tergites one to four with apical pale yellow bands, those of first three narrowly broken medially, that of fourth broadest, and less than one-fourth as broad as length of segment, fifth tergite with narrow apical yellow band, wanting in median third; abdomen coarsely punctate, punctures of second tergite sparser than those of third, sublateral basal area of second nearly impunctate; punctures of third and following tergites quite close, feebly separated on sixth and seventh, and finer on these posterior tergites; tergites three to six with rather distinct, longitudinal, median ridge; fourth tergite broadest part of abdomen; first tergite distinctly broader than long, seen from above, seen from side angulate on dorsal surface, dorsal carinæ being strongly elevated to form the angle, and subparallel for a short distance behind angle; longitudinal supraspiracular carinæ distinct; posterior lateral angles of second and third tergites slightly produced posteriorly; second and third tergites slightly broader than long, fourth tergite more distinctly broader than long, and fifth conspicuously so (proportions of length to breadth of abdominal tergites: II, 16/19; III, 17/20; IV, 18/22; V, 15/21); pubescence of abdomen partly fuscous posteriorly.

Holotype, male, No. 5060, Calif. Acad. Sci., Ent.: Likiochai Forest Station, Honan, China, September 25, 1923, collected by Dr. E. C. Van Dyke, after whom it gives me great pleasure to name this species.

This species differs from *M. dissectorius* (Panzer) by the clearer wings, the more extensive abdominal maculations, and the shape of the propodeal areola, which is unusually broad and rounded posteriorly. It differs from *M. iyoensis* Uchida and *M. takabayashii* Uchida by the unwrinkled scutellum, from *M. arakawai* Uchida by the black basal part of the first tergite and other features of the abdominal markings, and by the sublateral, basal, nearly impunctate areas of the second tergite. *M. vandykei* may be distinguished from *M. hakiensis* Matsumura and *M. sapporensis* Uchida by the yellow scutellar teeth and the almost entirely black hind femora, from the former also by the absence of a yellow mesepisternal area, and from the latter by the longitudinal, median, impunctate band on the areola.

Metopius (Ceratopius) metallicus Michener, new species

This large and elongate species is characterized by the strongly metallic blue abdomen and the much reduced pale maculations.

Male: Length nearly 15 mm. *Head* black, facial shield broadly margined with yellow, sides of face narrowly yellow to a point well above antennal bases; labrum with yellowish dots laterally; mandibles each with a small, sub-basal yellow spot; palpi yellowish; cheeks receding immediately behind eyes; facial shield about one and one-half times as long as broad, widest in upper one-half which is parallel sided, upper margin feebly convex, lower margin separated from apex of clypeus by a little over one-third basal width of mandible; facial shield coarsely punctate, especially medially, punctures separated by much less than their widths, closest laterally; clypeus more finely punctate than labrum or facial shield; frons slightly more finely punctate than facial shield, impunctate adjacent to ocelli; lateral ocelli separated from eye margin by about one-third ocellar diameter; antennæ blackish above, dark brown beneath, under side of scape yellow, fourth antennal segment broader than long. *Thorax* black, tegulæ a little brownish; lower lateral parts of pronotum shining and impunctate with three longitudinal carinæ, the uppermost longest, impunctate area continued above it anteriorly; mesoscutum rather coarsely and irregularly punctured, notalices feebly indicated by slightly depressed and more coarsely and closely punctate lines; mesepisterna coarsely and closely punctate, punctures separated by considerably less than their diameters, finer in sternauli than elsewhere, sternauli narrower and deeper posteriorly than anteriorly; dorsal process of mesepisterna thin and inconspicuously differentiated from disc; mesoscutellum distinctly more finely punctate than mesoscutum, feebly depressed along midline posteriorly, sides parallel posteriorly, slightly diverging toward the rear in the region immediately behind the basal depression, lateral apical angles robust, weakly produced, basal depression with four longitudinal carinæ; wings brownish, particularly dark along costal margin from basal vein to apex, including the entire marginal cell, areolet not petiolate, but with a very short side on the marginal cell, distocostal side longer than any other, stigma black; metapleura irregularly rather finely punctate, shining, punctures not close; fore legs dark brown, tarsi, anterior sides of tibiæ, and apices of femora pale yellow; middle legs black, tibiæ and tarsi dark brown, apices of femora pale yellow; hind legs black, with minute transverse yellowish line at apices of femora; hind tibial spurs but little longer than apical width of tibiæ; first four hind tarsal segments slightly shorter than hind tibiæ; propodeum with costulæ distinct, areola without distinct longitudinal median line, posterior end rather narrowly rounded, closed; areola broadest behind the middle, but nearly parallel sided in front of this broadest point, giving off, behind the middle on each side, a carina which divides to enclose a triangular space just above the strongly angular posterior lateral protuberances of the propodeum. *Abdomen* strongly metallic purplish blue beyond the first tergite, which is black; tergites two to four with posterior lateral

angles yellow, and with inconspicuous, narrow, brown, apical bands between these yellow areas; abdomen coarsely punctate, more finely so posteriorly, punctures close on first tergite, fairly close on others; tergites two to seven with a longitudinal median dorsal carina; first tergite about as broad as long seen from directly above, seen from side angulate on upper side as a result of elevation of dorsal carinæ to form angles, carinæ converging rather strongly and evenly from these angles to the posterior margin of the tergite, longitudinal supraspiracular carinæ distinct and complete; second and third tergites feebly produced posteriorly at the sides, second about as long as broad, third and fourth slightly longer than broad, fifth broader than long, sixth and seventh distinctly broader than long (Proportions of length to breadth of abdominal tergites: II, 19/20; III, 22/21; IV, 22/21; V, 19/23. These segments appear to the eye considerably more elongate than these measurements indicate.); pubescence of tergites four to seven partly fuscous.

Holotype, male: Yin Na San, east Kwantung, south China, June 15, 1936 (J. L. Gressitt), on loan deposit in the California Academy of Sciences.

This form differs from other species of the subgenus by the elongated abdominal segments. It differs further from *M. dissectorius* (Panzer) by the much longer facial shield, and from *M. maruyamensis* Uchida by the reduced maculations of the abdominal segments.

Metopius (Ceratopius) gressitti Michener, new species

This is a dark species, with the posterior lateral angles of the first five abdominal tergites yellow.

Male: Length about 11 mm. *Head* black, facial shield yellow with a large, longitudinally elongate, median brownish black area; sides of face, to point well above antennal sockets, yellow; labrum and lower part of clypeus brownish; mandibles with yellow area sub-basally; palpi yellowish; cheeks receding immediately behind eyes; facial shield longer than broad, widest a little above middle, upper margin feebly convex, lower margin separated from anterior margin of clypeus by distance equal to about two-thirds of basal mandibular width; facial shield rather coarsely punctate medially, punctures separated by less than their diameters; lower clypeus and frons a little more finely punctate than facial shield, frons sparsely punctate in region of ocelli; lateral ocelli separated from eye margins by a little less than ocellar diameter; antennæ dark above, lighter below, under side of scape and pedicel yellow; fourth antennal segment a little broader than long. *Thorax* black, brownish laterally, upper angle of mesepisterna beneath tegulæ and an-

terior lateral ridges of scutellum with small yellow areas; lower lateral region of pronotum shining and impunctate with about three longitudinal carinæ, uppermost longest, impunctate area continued above it; mesoscutum rather coarsely, irregularly punctured, notalices hardly evident; mesepisterna coarsely and closely punctured, punctures separated by much less than their diameters, dorsal process thin and inconspicuously differentiated from disc, sternauli as deep posteriorly as anteriorly; scutellum more coarsely and irregularly punctured than scutum, slightly depressed along longitudinal median line, lateral margins about parallel, posterior lateral angles robust and but slightly produced, basal depression with seven longitudinal carinæ; wings nearly clear except for a small, somewhat dusky area on costal margin of apex of wing, occupying apical half of marginal cell and adjacent portions of wings; areolet small and long petiolate, distocostal side longer than any other; stigma black; metapleura coarsely punctate, punctures separated by somewhat less than their diameters; fore legs dark brown, apices of femora and outer sides of tibiæ yellow, rest of tibiæ and tarsi testaceous; middle and hind legs dark brown, coxæ infuscated, middle trochanters partly yellow, and apices of middle femora and bases of middle tibiæ yellow; hind tibial spurs but little longer than apical width of hind tibiæ; first four hind tarsal segments slightly shorter than hind tibiæ; propodeum with costulæ distinct, areola broadest in anterior half, which is about parallel sided, giving off a strong carina on each side behind midlle, these carinæ not dividing to enclose triangular spaces because of the reduction of their posterior rami; posterior lateral angles of propodeum elevated and angular, lateral carinæ of petiolar area weak. *Abdomen* black, almost without metallic reflection, tergites one to four with posterior lateral angles yellow, a brownish apical area uniting yellow areas on first tergite, fifth tergite with posterior margin, at the sides, narrowly yellow; abdomen coarsely punctate, second tergite more sparsely so than third, third and following tergites with punctures approximate and finer on posterior tergites; tergites two to six, especially four, with inconspicuous longitudinal median ridge; tergites all a little broader than long, fourth broadest (proportions of length to breadth of abdominal tergites: II, 15/19; III, 17/21; IV, 18/21; V, 16/21); first tergite, seen from side, angulate on upper surface, dorsal carinæ being strongly elevated to form angle, and subparallel for a short distance behind angle; longitudinal supraspiracular carinæ distinct and complete; posterior lateral angles of second and third tergites weakly produced posteriorly; pubescence of posterior tergites fuscous.

Holotype, male: Wong Sa Shui, south Kiangsi, south China, July 9, 1936, collected by my friend, Mr. J. Linsley Gressitt, in

honor of whom this species is named. It is now on loan deposit in the California Academy of Sciences.

This species differs from *M. dissectorius* (Panzer) and *M. baibarensis* Uchida by the absence of a strong blue reflection on the abdomen, which is broadest at the fourth instead of the fifth segment. It differs from the former also by the more elongate facial shield, and from the latter, as well as from *M. fuscipennis* Wesmael in the absence of complete abdominal fasciæ, and from *fuscipennis* at least in the shape of the first abdominal tergite, which is broader than long, and in the closely punctured mesepisterna.

METOPIUS (CERATOPIUS) RUFUS BROWNI (Ashmead)

Metopius browni Ashmead, 1905, Proc. U. S. Nat. Mus., 29:117.
Metopius kakogawanus Matsumura, 1912, Thous. Ins. Japan, suppl., 4:100, pl. 47, f.18.
Metopius rufus Sonan, 1925, Taiwan Nojiho, 219, p. 13.
Metopius (Ceratopius) formosanus Clémont, 1929, Konowia, 8:410.
Metopius (Ceratopius) rufus Uchida, 1930, Jour. Fac. Agr. Hokkaido Imp. Univ., 25:248.
Metopius rufus f. *kakogawanus* Uchida, 1932, Jour. Fac. Agr. Hokkaido Imp. Univ., 33:208, 222.

Metopius rufus Cameron, with its subspecies *browni*, has an extensive distribution, from India to the Philippine Islands, and far north into China and Japan. Certain specimens included in the following list of localities are from regions outside of the distributional scope of this paper.

One female, Mei-hsien, east Kwantung, south China, July 19, 1936 (J. L. Gressitt); one female, Nanking, China, June 3, 1923 (E. C. Van Dyke); one female and two males, Tokyo, Japan, April 15, 1930, and June 2 and 3, 1931 (J. L. Gressitt). Previously reported from Hongkong.

The males here recorded from Tokyo agree well with Ashmead's description of *browni*, as well as with Uchida's notes on the male of *rufus*. The similarity of the descriptions of *browni* and *pulchripes* Cameron suggests that the male of the typical Indian *rufus* may be *pulchripes*.

Metopius (Ceratopius) uchidai Michener, new species

This is a strongly maculated, non-metallic form, with conspicuous yellow bands on the first four abdominal tergites, in

contrast to the almost entirely black apical portion of the abdomen.

Male: Length 13 mm. *Head* with face yellow, except for a small infuscated area on each side below facial shield, the yellow extending up on sides of face nearly to level of ocelli; labrum, large area on mandibles, palpi, and scape and pedicel except dorsal side yellow; cheeks feebly bulging behind eyes; facial shield longer than broad, widest above middle, upper margin convex because of a median angle, on each side of which the margin is nearly straight, lower margin separated from anterior margin of clypeus by distance equal to over two-thirds of basal width of mandible; facial shield rather finely punctate, punctures separated by a little more than their diameters except on the closely punctate median area; clypeus below shield fully as coarsely punctate as shield; frons very finely punctate, with fine transverse striæ; lateral ocelli separated from eye margin by a little more than ocellar diameter; antennæ black above, flagellum brown beneath, fourth segment of antennæ broader than long. *Thorax* black, with broad, elongate areas on posterior margin of pronotum adjacent to mesoscutum, anterior lateral areas and posterior half of scutellum, large median area of metanotum, longitudinal area beneath tegulæ and larger vertical area beneath it, and small spots on posterior lateral angles of propodeum bright yellow; lower lateral portions of pronotum shining and impunctate with four or five longitudinal carinæ, the upper ones reduced posteriorly, impunctate area not extending above uppermost carina; mesoscutum irregularly punctured; mesepisterna coarsely punctured, intervals between punctures less than their diameters, punctures of sternauli, which are shallower posteriorly than anteriorly, fine; dorsal mesepisternal process thickened and rounded; mesoscutellum closely punctured, more finely so than some parts of mesoscutum, lateral margins diverging posteriorly, lateral apical angles strongly produced into long points, basal depression with four longitudinal carinæ; wings brownish, with darker area occupying apical part of marginal cell and most of last (open) submarginal, areolet elongate, large, not or very briefly petiolate, distocostal margin but little longer than basocaudal margin, stigma light brown; metapleura coarsely and rather closely punctate; fore and middle legs yellow except for large brown areas on inner side of femora; hind coxæ black, trochanters yellow maculated with brown, femora black with yellow spot on either side at base and apex, tibiæ and tarsi dark brown, hind tibial spurs considerably longer than greatest width of tibia, first four hind tarsal segments about as long as hind tibiæ; propodeum with areola large, with longitudinal median carina, posterior end open; areola broadest in front of the middle, sides arcuate, giving off near middle, on each side, a carina which

soon disappears; regions laterad to areola with large, smooth, and polished area basally; posterior lateral angles of propodeum rounded. *Abdomen* black, not metallic, tergites one to four with broad apical yellow bands, those of tergites one to three broadest laterally, that of second tergite narrowest, middorsally occupying about one-fourth of the tergite, that of fourth broadest, occupying more than one-half of the tergite; posterior margins of tergites five, six, and seven very narrowly yellowish at sides; punctures of abdomen coarse, becoming finer posteriorly, close except on sixth and seventh tergites, where they are somewhat separated; tergites three and four with feeble longitudinal, middorsal ridge; first tergite longer than broad, upper surface rounded as seen in profile, dorsal carinæ weakened posteriorly, subparallel in posterior median region, elsewhere converging toward the rear; supraspiracular carinæ absent; second tergite slightly broader than long, third to fifth about as broad as long, second and third produced slightly posteriorly at sides; sixth tergite somewhat broader than long, seventh broader than long (proportions of length to breadth of abdominal tergites: II, 17/20; III, 21/21; IV, 21/23; V, 20/21).

Holotype, male: Nodoa, Hainan Island, China, June 19, 1935 (J. L. Gressitt), on loan deposit in the California Academy of Sciences.

A female, no doubt of the same species, is from Yim Na San, east Kwantung, south China, June 13, 1936 (J. L. Gressitt). It differs from the male, in addition to the usual sexual characteristics, thus:

Clypeus below facial shield, labrum, and mandibles dark reddish brown, the clypeus infuscated; dorsal posterior mark on pronotum reddish; fore and middle legs with femora except apices, inner sides of tibiæ, and parts of tarsi light reddish brown; hind legs with femora reddish brown, outer sides with black median area, yellow apical area, and minute yellow basal area; wings with apical dusky spot more conspicuous; abdominal tergites five and six with very narrow posterior margins reddish brown, tergite seven mostly reddish brown.

This species is possibly related to *M. kakiensis* Matsumura, from which it differs in the broad apical yellow band on the scutellum, the complete yellow bands on the first three abdominal tergites, and the apically dusky wings.

I take pleasure in naming this striking species for Dr. Toichi Uchida, in recognition of his extensive work on Oriental Ichneumonidæ.

NEW SPECIES AND RECORDS OF STRATIOMYIDÆ FROM PALEARCTIC ASIA

(Diptera)

BY MAURICE T. JAMES

Colorado State College, Ft. Collins

The Stratiomyidæ of Palearctic Asia have been studied during recent years by Matsumura, Pleske, Lindner, and others, but it is to Lindner that we are indebted for the comprehensive treatment of this family in his contribution to *Die Fliegen der Palœarktischen Region.* However, it is evident that much is yet to be known of the Asiatic fauna. In this paper, I am describing several new species and giving some new records which will extend our knowledge of these flies. The specimens collected by Thompson, Van Dyke, and Wright are in the collection of the California Academy of Sciences unless otherwise noted.

Subfamily Beridinæ

Hoplacantha japonica James, new species

Female. *Head* black, dull on face, strongly bright-purplish metallic on front; antennæ brown; proboscis bright yellow; palpi brown. Ratio of first and second antennal segments and flagellum 10:4:14; of face in middle, front above antennæ, and vertex through paired ocelli 7:8:18 (same units as antennæ); front gradually widening posteriorly. Eyes with dense but short brownish-black pile; face, front, and vertex with dense brownish-black pile which is as long as the first antennal segment; pile of occiput concolorous, but shorter. *Thorax*, including pleura, scutellum, and bases of scutellar spines, bright emerald green; scutellar spines yellow at apex; pile mostly moderately long, whitish yellow, but the dorsum with some pile similar in color and length to that of face and front. Coxæ black, trochanters brown, legs otherwise yellow, except that the terminal segments of front and middle tarsi and knees and tibiæ of hind legs are somewhat darkened, and hind basitarsi are white (other segments of hind tarsi missing in type). Wings hyaline; veins yellow at base, otherwise brown; stigma brown. Halteres lemon-yellow. *Abdomen* brownish-black, semi-metallic, luster coppery except at apex, where it becomes purplish; genital lamellæ yellow. Pile short, black, dense; that of sides and venter pale yellow, long at base, becoming somewhat shorter apically. Length, 6.5 mm.

Holotype, female, No. 5121, Calif. Acad. Sci., Ent., Kagoshima, Japan, March, 1912 (J. C. Thompson).

Related to *compta* Enderlein (Sikkim, India) and *flavicornis* James (Formosa); the wholly dark coxæ, however, will readily distinguish it. The abundant bushy pile of the head will further distinguish it from *flavicornis* and the coloration of the legs from *compta.*

HOPLACANTHA SOLOX Enderlein

Female, Kagoshima, Japan, March, 1912 (J. C. Thompson). The types are from Sapporo.

ALLOGNOSTA SINENSIS Pleske

Female, Nikko, Japan (Koebele). The types are from Szechuan Province, China.

SUBFAMILY GEOSARGINÆ

GEOSARGUS JANKOWSKII Pleske

Two females, Weisohn, Manchuria, August 30, 1923 (E. C. (Van Dyke); one female, Soochow, China, May 27, 1923 (Van (Van Dyke).

GEOSARGUS SPLENDENS Meig.

One male, Kobe, Japan.

GEOSARGUS MANDARINUS Schin.

Two males, one female, Nanking, China, April 21-30, 1923 (Van Dyke); one female, Soochow, China, May 27, 1923 (Van Dyke).

GEOSARGUS METALLINUS Fabr.

Female, Yalhenya, Pin-Chang Prov., Manchuria, August 1-15, 1939 (M. I. Nikitin). This species is reported as very common in India and the East Indies, but has not previously been recorded from the Palearctic Region. My specimen seems to differ in no way from Indian specimens.

Geosargus vandykei James, new species

Female. Front narrow, at its narowest point, somewhat less than the width of the third antennal segment, metallic green; vertex becoming purplish; face sub-shining black; callus above antennæ yellow, undivided. Proboscis dirty yellow. Antennæ black on first two segments, otherwise brownish-yellow, the arista be-

coming darker apically. Pile black on front and basal antennal segments, otherwise yellowish, that on face rather dense. Occiput with a prominent fringe of yellowish pile. *Thorax*, including pleura and scutellum, purplish, the pleura in part with a reddish cast; metanotum emerald-green; pile fairly dense, especially behind and below, pale yellowish, almost whitish. Coxæ, trochanters and femora deep black; front and middle tibiæ and tarsi brownish-yellow, the middle tibiæ darker; hind tibiæ and tarsi brownish-black, the tibiæ with an indistinct median pale ring. Wings almost uniformly brown, somewhat paler on posterior margin. Halteres brownish-yellow. *Abdomen* metallic purplish at base, otherwise bronze or coppery, the purple being more extensive ventrally; pile abundant and conspicuous, especially when viewed from behind, mostly grayish-white, but black on areas in the form of cross-bands just behind middle of segments (more extensive ventrally than dorsally) and at apex. Genital lamellæ blackish. Length, 17 mm.

Holotype, female, No. 5122 Calif. Acad. Sci., Ent., Tung Ko Forest Sta., Kiangsu province, China, June 12, 1923 (E. C. Van Dyke).

Close to the European *iridatus* Scop., to which it runs in couplet 13 of Lindner's key (*Die Fliegen*, p. 38-9); *iridatus*, however, is smaller and has the callus over the antennæ divided into two white spots, the wings less strongly infumated, the legs more extensively black, etc.

Chloromyia melampogon Zeller

Male, Yalhenya, Pin-Chang Prov., Manchuria, August 1-15, 1939 (M. I. Nikitin).

Microchrysa laodunensis Pleske

Male, Shanghai, China, August 3, 1926 (Mrs. Dora E. Wright); female, Mokansan, Che Kiang Prov., China, August 28, 1927 (Mrs. Wright).

Ptecticus tenebrifer Walk.

Numerous records from Japan and China.

Ptecticus aurifer Walk.

Male, female, Nikko, Japan, July 30 and August 4, 1923 (Van Dyke); four females, Yen Ping, China, June 30 to August 13, 1917.

Subfamily Stratiomyinæ

Stratiomys anubis Wied.

Eight females, four males, Nanking, China, April 21 to June 11, 1923 (E. C. Van Dyke).

Stratiomys ruficornis pyrrhocera Lw.

Two males, two females, Mt. Ellurs, Nissa, Iran (Brandt).

Stratiomys lindneri James, new species

Female. *Head* black, except for the following yellow areas; posterior part of vertex and area behind it extending to the neck; a pair of spots above the antennæ, almost contiguous with each other and with eyes, and about half as high as front; and facial orbits extending almost from frontal spots to cheeks, and widening below. Pile of front and vertex variable, yellow to black, sparse; pile of head otherwise yellow, that on face and cheeks dense. Antennæ black; ratio of two basal segments and flagellum 50:10:65. Vertex flattened; front and vertex rugose; occipital orbits narrow, densely yellowish to whitish pollinose near eyes. *Thorax* black; scutellar spines and narrow apex between them yellow; pile dense, yellow, that on dorsum appressed or nearly so. Metanotal pile yellow. Legs black, knees, bases of tibiæ, and tarsi yellow, tarsi more or less darkened on apical segments. Wings brownish-yellow, paler apically and posteriorly. Halteres yellow. Abdomen black, marked with yellow; second segment with large lateral triangular markings which attain base of segment; third and fourth with linear rectangles, the pattern of which is variable, those on segment three sometimes being similar to those of two, and contiguous with them, those of four in the holotype expanded into a complete posterior band; fifth segment with a large median spot; lateral margins of dorsum and venter, and posterior margins of ventral segments, more or less expanded medially, yellow. Pile short, yellow, some black on black dorsal areas, short, somewhat longer at base and sides of dorsum and middle of venter. Length, 15-18 mm.

Male. Similar; head entirely black; pile of frontal triangle and of narrow strip between eyes black; eyes with scattered but fairly long black pile. Pile of thorax and abdomen much longer, that of middle of ventral segments especially long and dense.

Holotype, female, No. 25444, Mus. Comp. Zool., Takayama, Japan, August 22, 1931 (Gressitt). Allotype, male No. 25444, Mus. Comp. Zool., same data. Paratypes, female, Takayama, Japan, August 12, 1931 (Gressitt); male, Takayama, Japan, August, 1932; male, female, Kobe, Japan; female, Sumiyushi, June, 1909; two females, Kyoto, Japan, July 16, 1923 (E. C. Van Dyke).

Close to the European *S. furcata*; but in that species the yellow facial orbits are lacking, the spots above the antennæ are much smaller, the scutellum is extensively yellow, the mesonotum has considerable erect pile, the body pile is whitish, and the average size is apparently smaller. Dr. Lindner had seen one female which he considered a distinct subspecies of *furcata* (*Die Fliegen*, Stratiomyidæ, p. 61) but did not name. I believe this form is worthy of specific rank.

Stratiomys hispanica planes James, new subspecies

Male. *Eyes* bare. Antennæ black; apex of second segment brownish-yellow; ratio of two basal segments and flagellum 20: 6:28. Face, except median line, angle of oral margin, and a spot below lower angle of each eye, yellow; lower occipital orbits broadened, yellow; head otherwise black. Pile of face dense, silvery. *Thorax* black, pile dense, mostly appressed, silvery. Metanotal pile silvery. Scutellum and spines yellow; a large black triangular spot at base. Coxæ, trochanters, and femora, except apices, black; tibiæ yellow, each with a median black ring, most noticeable on hind pair; tarsi yellow. Wings very lightly infumated, veins yellow. Halteres pale yellow. Abdomen black, with prominent paired yellow spots on segments two to four, and a median unpaired one on segment five; those on segment two border broadly on the lateral margin, and reach the base of the segment, where they continue laterally half-way to base of first segment; those on segment three touch lateral margin only posteriorly, but are large, almost semicircular, and reach the basal fourth or fifth of the segment; those on four are similar, reach the basal third of the segment, and sometimes broadly join each other to form a continuous transverse band; that on five reaches the basal third of the segment. Venter yellow; first segment with a basal black marking on each side or a transverse basal band; third, fourth, and fifth each with a transverse black or brown basal band. Length, 8-10 mm.

Holotype, male, No. 5123, Calif. Acad Sci., Ent., Curum, 100 km. Bouchir, Iran. (Brandt). Paratopotypes, six males, same data.

Distinguished from typical *hispanica* chiefly by the smaller size and the abdominal markings, and from *h. cypria* Pleske by the abdominal markings and the bare eyes.

Stratiomys annectens James, new species

Female. *Head* in large part yellow; occiput, except orbits, vertex, upper three-fifths of front, an area at base of antennæ and extending over median third of face to oral margin, oral margin, and an area between lower corner of each eye and oral margin,

black. Pile of face and front scattered; yellow. Occipital orbits of approximately equal width throughout. Antennæ black; ratio of basal two segments and flagellum 18:6:35. Eyes bare. *Thorax* black; pile rather dense, appressed, yellow; metapleural pile yellow. Scutellum yellow, black on basal fourth; spines yellow. Coxæ, trochanters, and femora, except apically, black; tibiæ yellow, the hind pair with an indistinct brownish ring; tarsi apparently yellow, front and middle ones, however, damaged in type. Wings hyaline; veins yellow. Halteres yellow. Abdomen black, marked with yellow; second segment with a pair of lateral triangles which extend about three-fifths distance to base; third and fourth segments with almost linear markings at posterior angles; fifth segment with posterior margin and a small median triangle yellow. Venter black, posterior margins of segments yellow, that of second broadest and reaching base of segment medially. Length, 10 mm.

Holotype, female. Yalhenya, Pin-Chang Prov., Manchuria, August 1-15, 1939 (M. I. Nikitin); author's collection.

Related to the Asiatic *prezwalskii* Pleske; also to the Nearctic *currani* James and *laticeps* Lw., particularly the former. The black vertex and adjoining sclerite of the occiput will readily separate it from all three of these species. In Lindner's key it traces to *potamida* or *prezwalskii*, but does not fit either alternative.

Hoplodonta viridula Fabr.

Numerous males and females, Yalhenya, Pin-Chang Prov., Manchuria, August 1-15, 1939 (M. I. Nikitin).

Odontomyia staurophora Schiner.

Female, Hangchow, China, May 12, 1923 (E. C. Van Dyke); male, Nanking, China, June 20, 1923 (Van Dyke).

Male (apparently undescribed). *Head* black, except oral margin and a line extending from upper oral angle to antennal bases, which are yellow; antennæ yellow. Pile of face whitish, longer and denser than in female. *Thorax* black except following yellow regions: humeri; supra alar calli and small areas just anterior to them, extending about half-way to suture; scutellum, except very narrow base, and scutellar spines; a broad area on pleura, extending from propleura over upper part of mesopleura to ptero- and metapleura; and a somewhat isolated spot on upper part of sternopleura. Thorax rather thickly clothed with whitish pile and golden (on dorsum) to silvery (on pectus) tomentum. Femora and hind tibiæ blackish or brownish-black, except at narrow bases and apices; tarsi somewhat darkened apically; legs otherwise yellow. Abdomen as in female (cf. Lindner, *Die Fliegen*, Stratiomyidæ, Pl. IV, fig. 48).

The resemblance of the female to the Nearctic *O. cincta* is striking, but the male, if I have correctly interpreted it, dispels any doubt as to their distinctness. The female of *cincta* has different patterns on the third and fourth abdominal segments, and the thorax is more hairy.

Odontomyia atrodorsalis James, new species

Female. *Head* black except following yellow areas: two spots on front, along midfrontal suture, immediately anterior to unpaired ocellus; a considerable area, half width of face, below antennæ; and an area on each occipital orbit, below middle of eyes; limits of these areas not well defined. Antennæ, proboscis, and palpi black. First antennal segment somewhat longer than second; flagellum missing. Face rather broad, carinate. Head with rather dense white to yellow appressed pile; some erect pile on cheeks. *Thorax* black; scutellum narrowly yellow only at tip, the color extending some distance outside spines, however; spines yellow. Thorax densely yellow tomentose dorsally, pleura and pectus with abundant white pile, mostly appressed. Legs beyond trochanters yellow; femora more or less darkened on inner surface; last three or four tarsal segments blackish. Wings hyaline; strong veins brown; vein R_4 absent; M_1 long, but weak except at base; M_2 comparatively strong; M_3 developed only at base. Halteres yellow. *Abdomen* black above except narrow lateral and apical margin; venter yellow. Length, 7 mm.

Holotype, female, Yalhenya, Pin-Chang Prov., Manchuria, August 1-15, 1939 (M. I. Nikitin); author's collection. Paratype, female, same data but July 1-19, 1939.

O. tigrina is the only other palearctic species with a wholly black abdomen; but in that species, the face is rounded, R_4 is present, the coloration of the legs and venter is different, etc. The closest relatives are such species as *O. microleon* of Europe and *O. hoodiana*, *O. pubescens*, etc., of North America.

Subfamily Clitellariinæ

Nemotelus argentifer Lw.

Three females, one male, Curum, 100 km. Bouchir, Iran (Brandt).

Ephippium bergeri Pleske

Male, Yalhenya, Pin-Chang Prov., Manchuria, August 1-15, 1939. (M. I. Nikitin.)

Ephippium obtusum James, new species

Male. *Head*, including antennæ, entirely black; proboscis brownish-black. Eyes densely black-pilose. Occiptal orbits with silvery tomentum; proboscis white haired; head otherwise wholly black pilose, pile especially dense on face and cheeks. Ratio of first and second antennal segments, flagellum (excluding style) and style 8:5:16:8; style thick, blunt at apex, with short, black pile; segments of flagellum and style indistinctly separated. *Thorax*, including legs and scutellum, entirely deep black; yellow tomentose on dorsum, whitish on pectus; pile mostly black, rather short, moderately abundant; lateral spines short, somewhat longer than first antennal segment; scutellum slightly directed upward, spines on a level with scutellum, divergent, sharp, not club-like, about as long as first two antennal segments combined. Tarsi and apices of tibiæ, especially front and hind ones, densely yellow-pilose, so that in certain lights these members may appear yellow to the naked eye. Halteres yellow. Wings black, deepest along anterior margin; veins black; union of discal and fifth posterior cells almost punctiform. *Abdomen* black, broader than thorax, as broad as long; short black pilose on basal three and one-half dorsal and on first ventral segments, otherwise whitish-pilose, silvery at apex dorsally. Length, 12 mm.

Holotype, male, No. 5124, Calif. Acad. Sci., Ent., Kobe, Japan, May, 1909.

E. stylatum Brunetti, from Kangra Valley, India, is also a black species with a thick, blunt style; but it is smaller, the wings are gray, the knees yellow, etc. The other known species of *Ephippium* all have acute, slender, arista-like styles.

Subfamily Pachygastrinæ

Evaza japonica Lindner

Male (undescribed). Frontal triangle, except spot at apex, silvery pollinose. Thorax with longer pile than in female. Scutellum, except spines, almost wholly black, only a trace of yellow at apex. Halteres yellow. Abdomen with considerable black, as well as pale, pile above. Otherwise agrees with Lindner's description of female.

One specimen, Mt. Ishizuchi, Shikoku Al., Japan, July 14, 1933.

Discussion

The eastern Asiatic materal treated in this paper shows an interesting blending of European, American, and Oriental ele-

ments. The Oriental elements include *Hoplacantha japonica*, *Hoplacantha solox*, *Geosargus metallinus*, *Ptecticus tenebrifer*, *Ptecticus aurifer*, *Ephippium bergeri*, *Ephippium obtusum*, and *Evaza japonica*. All these either occur or have close relatives in the Oriental region. As to the genera, *Hoplacantha* is neither European nor Nearctic (Neotropical, however); *Ptecticus* is not European and the two species listed here are subgenerically distinct from the American species; *Ephippium* has one European and no American representatives.

The European elements, that is, species either occurring in Europe or having close relatives there, include *Geosargus splendens*, *Geosargus vandykei*, *Chloromyia melampogon*, *Stratiomys anubis*, *Stratiomys lindneri*, and *Odontomyia viridula*. To the great Holarctic fauna, with close relatives both in Europe and Nearctic America, belong *Allognosta sinensis*, *Geosargus mandarinus*, *Microchrysa laodunensis*, *Odontomyia atrodorsalis*, *Odontomyia staurophora*, and *Stratiomys annectens*. The last two species are of special interest because they form connecting links between European and even more closely related Nearctic species.

Additional Records of the Cockroach, Supella supellectilium (Serv.), in California

The recent note by Rehn (Ent. News, 1940, 51:222) recording the presence of *Supella supellectilium* (Serv.) in California (San Bernardino) for the first time prompts the writer to offer this additional note. Recently (Nov. 4, 1940) specimens of this cockroach (one male, one nymph) were collected in Owens Valley by Dr. Harvey W. Crook, Inyo County Health Officer. Dr. Crook stated that the cockroaches were causing trouble in a house, where they were found in the kitchen, around the sink, in cupboards, in cracks, etc.; the oöthecæ were found on curtains, in corners and other convenient places.

Through Dr. B. C. McIvor, another record is available from Alameda, California; the specimens were obtained in the fall of 1937.

For additional information concerning this cockroach, the reader is referred to the papers of Back (Proc. Ent. Soc. Wash., 1937, 39:205) and Gould & Deay (Purdue Univ. Agric. Exp. Sta. Bul. No. 451, 1940).—Thomas H. G. Aitken.

A LIST OF THE ANTS OF WASHINGTON STATE

(Hymenoptera, Formicidæ)

BY FALCONER SMITH

Cambridge, Massachusetts

Seventy-nine species, subspecies, and varieties of ants are included in the following list. Of these, two, *Formica moki* subsp. *xerophila* M. R. Smith and *Leptothorax diversipilosis* M. R. Smith, are new and recently described species. Those thirteen forms indicated by an asterisk are reported for the first time from Washington.

The geographic range of the ants has been indicated by letters in brackets after each specific name. Thus [E] refers to eastern Washington; [W] to western Washington; and [EW] to both regions. Initials have been substituted for most of the collectors' names, and these have been placed after the name of the locality as follows: (TK), Professor Trevor Kincaid; (Wheel), Professor W. M. Wheeler; (Mann), W. M. Mann; (FS), Falconer Smith.

Free use has been made of several important papers on the Washington formicifauna* and reference to these is necessary for information on the biology of the ants.

The writer acknowledges his appreciation to M. R. Smith for his determination and verification of many of the forms; and to Professor Trevor Kincaid for his valuable guidance and kind permission to use his extensive ant collection.

Subfamily Ponerinæ

1. *Stigmatomma pallipes* subsp. *oregonense* Wheeler. [W] Seattle (FS); Bothell, Olympia (TK).

Subfamily Myrmicinæ

2. *Monomorium pharaonis* L. [W] Seattle (TK).
3. *Solenopsis geminata* Fabr. "California to British Columbia" (Barret).
4. *Solenopsis molesta* Say. [EW] Pullman, Wawawai (Mann); Olympia, Tenino [TK]; Tacoma, Dry Falls, Vantage, Soap Lake (FS).

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*Mann, W. M. 1911. On some Western Ants and their Guests. Psyche, 8:493-514.

Wheeler, W. M. 1910. North American Ants of the Genus *Camponotus*. Ann. Acad. Sci., N. Y., 20:295-354. — 1913. Ants of the Genus *Formica*. Bull. Mus. Comp. Zool., Harvard, 53:390-565.

5. *Solenopsis molesta* var. *validiuscula* Emery. [E] Wawawai (Mann).
6. *Pheidole californica* subsp. *oregonica* Emery. [E] Almota, Pullman, Wawawai (Mann); Corfu, Vantage, Grand Coulee, White Bluffs, Dry Falls (FS).
7. *Stenamma brevicorne* subsp. [W] Bay Center (TK); San Juan Is. (FS).
8. *Stenamma brevicorne* subsp. *diecki* Emery.* [W] Bay Center (TK).
9. *Stenamma nearcticum* Mayr. [W] San Juan Is. (FS).
10. *Aphœnogaster subterranea* subsp. *occidentalis* Emery. [EW] Almota (A. L. Melander); Pullman, Wawawai (Mann); Olympia (TK); Fort Lewis, San Juan Is., Cle Elum (FS).
11. *Aphœnogaster subterranea* subsp. *valida* var. *manni* Wheeler. [E] Pullman (Mann).
12. *Aphœnogaster subterranea* subsp. *borealis* Wheeler.* [W] Olympia (TK); San Juan Is. (FS).
13. *Pogonomyrmex occidentalis* Cress. [E] Wawawai (Mann); Spokane (TK); Dead Man's Lake (Adams County), Moses Lake, Stratford, Toppenish, Vantage (FS).
14. *Myrmica mutica* Emery. [EW] Ellensburg, Pullman (Mann); Olympia, Nisqually River (TK); Stuck River (FS).
15. *Myrmica rubra* subsp. *brevinodis* Emery.* [W] Chase Lake (King County) (FS); Chinook, Bay Center, Naselle River (TK).
16. *Myrmica rubra* subsp. *brevinodis* var. *sulcinodoides* Emery.* [W] Naselle River, Bay Center (TK); Nisqually River, San Juan Is., Stuck River (FS).
17. *Myrmica rubra* subsp. *brevinodis* var. *subalpina* Wheeler. [W] Orcas Island (Mann).
18. *Myrmica scabrinodis* var. *sabuleti* Meinert. [W] San Juan Is. (Mann).
19. *Leptothorax acervorum* subsp. *canadensis* Prov.* [W] Bay Center, Olympia (TK); Seattle, Garland Hot Springs (FS).
20. *Leptothorax acervorum* subsp. *canadensis* var. *yankee* Emery. [W] Seattle, San Juan Is. (FS).
21. *Leptothorax curvispinosus* subsp. *rugatulus* Emery.* [EW] Seattle (TK); Fort Lewis, Leavenworth, Cle Elum, San Juan Is., Dryden (FS).
22. *Leptothorax nitens* subsp. *occidentalis* Wheeler. [W] Friday Harbor (TK), (FS).

23. *Leptothorax melanderi* Wheeler. [E] Pullman (Mann).
24. *Leptothorax eldoradensis* Wheeler.* [EW] Cle Elum (FS); Rosario (TK).
25. *Leptothorax diversipilosis* M. R. Smith.* [W] Fort Lewis (FS).

Subfamily Dolichoderinæ

26. *Tapinoma sessile* Say. [EW] Pullman, Ellensburg, Orcas Island (Mann); Almota (A. L. Melander); Rock Lake (Wheeler); Cle Elum, San Juan Is., Seattle, Olympia, Mt. Angeles, Sequim, Grand Coulee (FS).
27. *Iridomyrmex analis* Andre. [E] Wawawai (Mann).

Subfamily Formicinæ

28. *Brachymyrmex heeri* subsp. *depilis* Emery.* [E] Grand Coulee (FS).
29. *Lasius niger* var. *neoniger* Emery. [EW] Union City (J.C. Bradley); Pullman (Mann); Bay Center, Chinook, Nellicota (TK); San Juan Is., Seaview, Skating Lake (FS).
30. *Lasius niger* var. *americanus* Emery. [EW] Orcas Island (Mann); San Juan Is., Seattle, Soap Lake (FS).
31. *Lasius niger* var. *sitkaensis* Perg. [EW] Pullman (Mann); Olympia, Bay Center (TK); Seattle, Bluitt Pass, Bothell, Fort Lewis, Mt. Rainier, Mt. Pilchuck, Neah Bay, San Juan Is., Seabeck, Stillaquamish River, Puyallup (FS).
32. *Lasius brevicornis* Emery. [E] Pullman (Mann); Cle Elum (FS).
33. *Lasius interjectus* Mayr. [E] Pullman (Mann).
34. *Lasius latipes* Walsh. [E] Pullman, Wawawai (Mann); Almota (A. L. Melander); Rock Lake (Wheeler).
35. *Lasius claviger* Roger.* [E] Grand Coulee (FS).
36. *Formica manni* Wheeler. [E] Kiona, Pullman, Wapato, Wawawai (Mann); Grand Coulee (FS).
37. *Formica sanguinea* subsp. *subintegra* Emery. [EW] Pullman (Mann); Olympia (TK).
38. *Formica sanguinea* subsp. *subnuda* Emery. [W] Seattle (Wheel.); San Juan Is., Mt. Pilchuck, Olympia, Garland Hot Springs (FS).
39. *Formica sanguinea* subsp. *puberula* Emery. [EW] Pullman (Mann); Olympia (TK).

40. *Formica oreas* var. *comptula* Wheeler. [EW] Pullman (Mann); San Juan Is. (FS).
41. *Formica truncicola* subsp. *integra* Nyl.* [EW] Cle Elum, Alder Creek (Chelan County), San Juan Is. (FS).
42. *Formica truncicola* subsp. *integroides* Emery.* [EW] Cle Elum, Yakima, Leavenworth, San Juan Is. (FS).
43. *Formica truncicola* subsp. *integroides* var. *subclaviceps* Wheeler. [W] San Juan Is. (Mann); Seattle (FS).
44. *Formica truncicola* subsp. *integroides* var. *hæmorrhoidalis* Emery. [E] Ellensburg (S. Henshaw).
45. *Formica rufa* subsp. *obscuripes* Forel. [EW] Pullman (Mann); Loon Lake (S. Henshaw); Rock Lake (A. L. Melander); San Juan Is., Grand Coulee (FS).
46. *Formica rufa* subsp. *obscuripes* var. *melanotica* Emery. [EW] Pullman (Mann); Olympia (TK); Tacoma, Fort Lewis, San Juan Is., Shelton, Seattle (FS).
47. *Formica microgyna* subsp. *rasilis* Wheeler. [W] Olympia (TK).
48. *Formica fusca* L. [EW] Pullman (Mann); Mt. Rainier (J. C. Bradley); San Juan Is. (Mann), (FS); Shaw Island, Bothell, Seattle, Paradise, Sequim, Tacoma, Olympic (FS), Labam (TK).
49. *Formica fusca* var. *subsericea* Say. [EW] Olympia (TK); Dry Falls, Tacoma (FS).
50. *Formica fusca* var. *argentea* Wheeler. [EW] Pullman, Wawawai (Mann); Yakima (S. Henshaw); Mt. Rainier, Seattle (Wheel.).
51. *Formica fusca* var. *marcida* Wheeler. [EW] Ellensburg, Kiona (Mann); Brinnon (J. C. Bradley); Soap Lake (FS).
52. *Formica fusca* var. *subœnescens* Emery. [EW] San Juan Is. (Mann); Brinnon (J. C. Bradley); John Island, Cle Elum (FS).
53. *Formica fusca* var. *gelida* Wheeler. [EW] Olympic Mts. (J. C. Bradley); Toppenish, Leavenworth, Stratford, San Juan Is., Mt. Rainier, Orcas Is., Chase Lake (King County), Soap Lake (FS).
54. *Formica fusca* var. *neorufibarbis* Emery. [W] San Juan Is. (Mann); Union City, Mt. Rainier (J. C. Bradley); Olympia, Naselle River (TK); Bothell, Snoqualmie Falls, Granite Falls (FS).

55. *Formica fusca* var. *neoclara* Emery. [EW] Wawawai (Mann); Moses Lake, Goose Lake (FS); Olympia, Bay Center, North Bend, Nemah River (TK).
56. *Formica fusca* var. *blanda* Wheeler. [W] Olympia, Seattle (TK); Fort Lewis, Paradise (FS).
57. *Formica fusca* subsp. *pruinosa* Wheeler. [E] Wawawai (Mann).
58. *Formica fusca* var. *lutescens* Wheeler. [E] Ellensburg, Kiona, Wawawai (Mann).
59. *Formica rufibarbis* var. *occidua* Wheeler. [EW] Wawawai (Mann); Seattle (FS).
60. *Formica subpolita* Mayr. [EW] Orcas Is. (Mann); Vantage, Grand Coulee, San Juan Is., Tacoma (FS).
61. *Formica subpolita* var. *camponoticeps* Wheeler. [E] Rock Lake, Wawawai (Mann); Govan (J. A. Hyslop); Almota (A. L. Melander).
62. *Formica subpolita* var. *picea* Emery. [EW] Pullman (Mann); Grand Coulee, Seattle (FS).
63. *Formica cinerea* var. *lepida* Wheeler. [W] Seattle (TK) (FS); Sand River, Bay Center (TK); Garland Hot Springs, Stuck River (FS).
64. *Formica neogagates* Emery. [EW] Almota (A. L. Melander); Pullman, Wawawai (Mann); Soap Lake, San Juan Is. (FS).
65. *Formica neogagates* subsp. *lasioides* var. *vetula* Wheeler. [EW] Pullman (Mann); Olympia, Bay Center, San Juan Is. (TK).
66. *Formica moki* subsp. *xerophila* M. R. Smith.* [E] Leavenworth (FS).
67. *Formica pallide-fulva* subsp. *schaufussi* Mayr. [W] Seattle (TK) (FS).
68. *Polyergus rufescens* subsp. *breviceps* Emery. [E] Pullman (Mann).
69. *Camponotus lævigatus* Fred. Smith. [EW] Union City (J. C. Bradley); Seattle (TK); Bothell (FS).
70. *Camponotus maculatus* subsp. *vicinus* Mayr. [EW] Almota (A. L. Melander); Pullman, Grand Coulee (Mann); San Juan Is., Orcas Is., Shelton, Seattle (FS).
71. *Camponotus maculatus* subsp. *vicinus* var. *nitidiventris* Emery.* [EW] Nisqually River (TK); Cle Elum, Tacoma, San Juan Is., Soap Lake, Cashmere (FS).

72. *Camponotus maculatus* subsp. *vicinus* var. *luteangulis* Wheeler. [EW] Yakima River (S. Henshaw); Wawawai (Mann); Cle Elum, San Juan Is., Shelton (FS).
73. *Camponotus maculatus* subsp. *vicinus* var. *plorabilis* Wheeler. [EW] Almota (A. L. Melander); Ellensburg, Kiona, Pullman, San Juan Is. (Mann); Seattle (Wheel.).
74. *Camponotus maculatus* subsp. *maccooki* Forel. Washington (Osten Sacken).
75. *Camponotus herculeanus* subsp. *pennsylvanicus* De Geer. [W] San Juan Is (Mann).
76. *Camponotus herculeanus* subsp. *pennsylvanicus* var. *whymperi* Forel. [EW] Wenass, Spokane, Brinnon (Wheel.); Neppel (FS); Mt. Rainier (J. C. Bradley).
77. *Camponotus herculeanus* var. *modoc* Wheeler. [EW] Klikitat Valley (S. Henshaw); Pullman (C. V. Piper); Union City (J. C. Bradley); Olympia, Bay Center (TK); San Juan Is. (Mann) (FS); Park Forest Camp (Kittitas County), Maple Creek (Chelan County), Flowing Lake, Steven's Pass, Seattle (FS).
78. *Camponotus herculeanus* subsp. *ligniperdus* var. *novæboracensis* Fitch. [EW] Union City (J. C. Bradley); Nisqually River, Olympia (TK); San Juan Is., Seattle, Cle Elum (FS).
79. *Camponotus caryæ* (Fitch). [W] Washington (Wheel.); Olympia (TK).

The Mosquito Genus Mansonia Blanchard in California

While studying material in the mosquito collection of the University of California the writer encountered four female specimens of *Mansonia perturbans* (Walker), a mosquito new to California. This is the first record of the genus *Mansonia* from California and greatly extends the known distribution of the species. Previously the species has been collected as far west as British Columbia, Montana, and the Mississippi Valley. The California specimens are from widely separated localities and were collected by Professor W. B. Herms, University of California, during the course of malaria mosquito surveys. The records are: Landers, Placer County, July 9, 1917; Galt, San Joaquin County, July 15, 1917; Holt, San Joaquin County, July 17, 1919; and Bakersfield, Kern County, July 28, 1919. The writer is indebted to Dr. Thomas H. G. Aitken for verification of his determination.—William C. Reeves.

A NEW SPECIES OF XYLOTRECHUS

(Coleoptera, Cerambycidæ)

BY RALPH HOPPING

Vernon, British Columbia

Xylotrechus robustus Hopping, new species

Holotype, male, length 17 mm., width 5 mm. Color dark brown to black with grey hairs on the fasciae. Front of head with coarse grey hairs on each side and below frontal umbone. Base of each antenna with a small pubescent spot situated in eye emargination. Pronotum with a narrow anterior marginal band. Scutellum clothed with grey vestiture. Elytra with three transverse bands and tips of elytra grey and truncate. First or subbasal band interrupted each side of elytral suture, the second band interrupted at suture, third band attaining suture. Abdomen with four pubescent bands on posterior margins of segments and a short broken one just in front of hind legs. Bicarination on front of head opaque and roughened and not polished as in most species of *Xylotrechus*. Tarsi of fore legs rather strongly dilated, probably more so than in any other species of the genus.

Allotype, female, length 18 mm., width 6 mm. Differs from the male only in the more slender femora, shorter antennæ, lack of finely granulated areas on occiput and distinctly yellow fasciæ rather than grey as in the male.

The male holotype bears the labels "Ed. B. Andrews, Estes Park, Colo.", "Estes Park, Colo., Griffith Mill, 4-IX-35-7800." The female allotype bears the labels "Ed. B. Andrews, Estes Park, Colo.", "Estes Park, Colo., Griffith Mill, 10-IX-35-7800." Five male and three female paratyes were all taken at Griffith Mill between September 4 and 14, 1935.

Types are in the collection of the author. Paratypes are in the collection of Mr. Ed. B. Andrews (6) and the author (2). I am indebted to Mr. Andrews for the very fine series of ten specimens from which this species was described.

The species belongs to the *undulatus* group as defined in the revision, "The Clytini of Boreal America, Pt. 1," by George R. Hopping (Ann. Ent. Soc. Amer., 25:529-570, 4 plates, 1932). On page 540 of the above, last paragraph under *X. mormonus*, "*insignis*" should read "*undulatus*." *X. robustus* is probably nearer *mormonus* than any other species, but averages much larger and lacks the sparse grey hairs on the elytra and abdomen of *mormonus*. From *undulatus* it differs conspicuously in its

absence of longitudinal markings, all markings being transverse, resembling more the *Neoclytus* in this respect than the typical *Xylotrechus*.

In the series, the males run from 14 to 17 mm., and the females 14 to 18 mm.

Charles William Woodworth

Charles William Woodworth, who recently died on November 19, 1940, was born at Champaign, Illinois, April 28, 1865. He was one of America's first trained entomologists, having studied with S. A. Forbes and graduated from the University of Illinois in 1885 and with H. A. Hagen at Harvard University 1886-8 and 1900-1. He served as entomologist and botanist at Arkansas Agricultural Experiment Station from 1888 to 1891 and in the latter year moved to California where, at the University of California, he became a leader in the development of entomology on the Pacific Coast. He became professor of entomology in 1913 and emeritus in 1930. His interests were many, for he encouraged and promoted systematic, economic, and medical entomology, and was also a mathematician, physicist, chemist, and inventor. He organized the University of California Entomological Society in 1895 and published "The Entomologists' Daily Post Card," the organ of this society, to the extent of 118 issues in 1895. He also founded the Pacific Slope Association of Economic Entomologists in 1909 and was its first president.

He published extensively in the field of entomology and wrote: "A List of the Insects of California," in 1903; "Wing Veins of Insects," in 1906; "Guide to California Insects," in 1913; "Classification of Orders of Insects," in 1915; "Microscope Theory," in 1924; and many other important papers. He was a member and at one time president of the Cambridge Entomological Club, an honorary fellow of the Entomological Society of America, a member of the Pacific Coast Entomological Society (1901) and later (1912) an honorary member, a charter member of the American Association of Economic Entomologists, a fellow of the American Association for the Advancement of Science, and a member of other scientific societies. More extended biographies have been prepared and will appear in early issues of *Science* and the *Journal of Economic Entomology*. —E. O. Essig.

THE LIFE HISTORY OF PHLŒOTHRIPS (HOPLANDROTHRIPS) SYCAMORENSIS (MASON)

(Thysanoptera, Phlœothripidæ)

BY N. STAHLER

University of California, Berkeley

The abundance of *Phlœothrips* (*Hoplandrothrips*) *sycamorensis* (Mason) on the London plane tree, *Platanus acerifolia*, on the University of California campus in Berkeley suggested an investigation of the life history of this species. This study was carried on during the past winter from November to April, inclusive. The thrips were kept in small Stender dishes and fed on fresh green bark. Some difficulty was experienced in maintaining the first instar larvæ alive, but the later stages were rather easily reared.

According to Bailey (1938, Pan-Pac. Ent., 14:19-23) the taxonomy of this species is in doubt, although it plainly belongs in the genus *Phlœothrips* Haliday. Mason (1926, Pan-Pac. Ent., 2:155-7) described the species from sycamore trees at Springville, California, and stated that the larvæ are "light yellow to colorless" and that the winter is passed in the egg stage. The present observations indicate that he may have confused the life history with that of another species, possibly *Karnyothrips flavipes* (Jones), as suggested by Bailey (*in litt.*). The writer takes pleasure in acknowledging the assistance rendered by Dr. S. F. Bailey.

The metamorphosis of this species of thrips follows the pattern outlined for phlœothripid Thysanoptera by Priesner (1927, *Thysanopteren Europas*, Lf. III:484). The eggs are white, faintly reticulate and subellipsoidal (0.27 mm. x 0.17 mm.) with tapering micropylar end. Several days prior to eclosion the embryo may be seen within the egg with the red eye spots near the micropyle. Eggs are found in masses under loose bark, particularly around growth or leaf scars. Females deposit their eggs singly over a period of several weeks, and although the generations overlap, the period of maximum egg abundance during these observations was in early February. Under laboratory conditions the egg stage required about twelve days, but during the cool winter months under natural conditions, it lasted as long as three weeks.

When freshly hatched, the first instar larvæ are about 0.6 mm. in length with the terminal setæ of the abdominal tube

nearly as long as the body. The antennæ, dorsal thickenings of the thorax and tube are grey, while the rest of the body, except for the scarlet-red eyes, is transparent. In about a day a contrasting scarlet coloration appears in the form of a wide pleural band extending from the prothorax to the ninth abdominal segment and in irregular patches on the dorsal area of the thorax. The dorsum of the abdomen and the entire venter of the body are pale yellow. Before molting, the primary larvæ reach a length of about 1.2 mm. Under laboratory conditions, where the length of the stages was determined, the first instar requires about eleven days and is the most active stadium of the thrips.

The first and second instar larvæ may be conveniently separated by the shape of the third antennal segment which is about 1.4 times as long as its greatest width in the former and about 2.3 in the latter. The second larval stadium lasts four to five weeks, depending in part on the abundance of food and the humidity. The larvæ vary in length from 1.4 to 2.0 mm. The antennæ and tube are fuscous, the legs pale fuscous and the head flavotestaceous. Each thoracic tergum bears a broad crimson patch. No other changes from that described for the first instar appear during this active feeding stage.

The prepupal stage of *P. sycamorensis* (averaging 1.5 mm. in length and lasting for two to three days) is readily distinguished by its short horn-like antennæ. The scarlet markings are broader than in the preceding stage, tending to form complete rings around the prothorax and posterior abdominal segments. The antennæ, legs and tube are nearly transparent, while the rest of the body appears as in earlier stages. The prepupæ are sluggish and do not feed.

The first pupa, which is about the same size as the preceding instar, is characterized by the reflexed antennæ about as long as the head and by the wing pads which reach to the anterior margin of the second abdominal segment. The red pigmentation is reduced to discontinuous lateral maculations. The first pupa molts in two or three days. The second pupal stage differs from the first by the longer antennæ which extend to the middle of the prothorax and by the wing pads which reach to the third abdominal segment. It is somewhat larger (about 1.9 mm. long) and the more pronounced scarlet pigmentation is in the form of discontinuous bands on the dorsal and lateral areas of the body. The compound eyes are noticeably larger than in the first pupa. The second pupal period lasts from five to

seven days. The pupæ of both stages secrete themselves in crevices under the bark and do not feed.

In the freshly emerged adult the antennæ, head and legs are nearly transparent and the rest of the body ferrugineous. The development of the black cuticular color takes place during the first day and as readily in darkness as in sunlight. In the laboratory eggs were deposited one week after the adults had emerged. The total life cycle of this species of *Phlœothrips*, from egg to egg, lasts approximately eleven weeks, seven of which are spent in feeding stages.

The larvæ and adults are negatively phototropic and when crawling or feeding on the outside of the trunk gather on the shady side of the tree. They are more active in warmer weather and very few specimens were found moving about until the leaves appeared. Some are to be seen on the larger branches but the writer could discover only a few adults and larvæ on the leaves.

Among the natural enemies may be listed a species of *Cephalothrips*, predaceous upon the eggs and larvæ and an anthocorid bug (identified by Dr. R. L. Usinger as *Xylocoris* sp.) preying on all stages. Several common species of ladybird beetles, *Chilocorus bivulnerus* Muls., *Adalia bipunctata* (Linn.) and *Lindorus lophanthæ* (Blaisdell) were present in thrips colonies and fed on the larvæ in the laboratory. Mites were observed feeding on the yolk within partly ruptured egg shells, but none was seen to actually pierce the eggs.

The Henry Clinton Fall Memorial Publication Fund

The Pacific Coast Entomological Society has recently received, through Mrs. Carl A. Richmond, a gift of securities valued at one thousand dollars from the estate of the late Henry Clinton Fall. This fund is to be known as the Henry Clinton Fall Memorial Publication Fund and is to be administered by the Board of Directors of the Society through its Publication Committee. The terms of the bequest generously provide for considerable freedom of action both in the administration of the fund and in the subject matter covered by the publications to which it is applied.

Dr. Fall was a charter member of the Society and served as its first vice-president. The establishment of this fund is a fitting memorial to his long association with the Society and with entomology in California.—E. G. Linsley.

A NEW SPECIES OF ANTHOPHORA FROM CALIFORNIA

(Hymenoptera, Apoidea)

BY P. H. TIMBERLAKE

University of California Citrus Experiment Station, Riverside, California.

The following species of *Anthophora* is published at this time to provide a name for use in other papers. The type is deposited in the collection of the Citrus Experiment Station, Riverside, California.

Anthophora linsleyi Timberlake, new species

This belongs to a small southwestern group having the hind tibia of the male dilated and produced at apex on inner side, the process bearing the inner tibial spur a short distance before the apex, and having the hind basitarsus much dilated, flattened, and with a sharp tooth on inner margin near base. *A. vallorum* (Ckll.) appears to be the only other described species belonging to this group, and it differs from *linsleyi* in having the face marks yellow; the hind tibia much less expanded at apex, with the process comparatively small, tapering and acute, and the spur inserted just before its apex; the tooth on the hind basitarsus much smaller and placed half way between the base and middle; the pubescence more or less tinged with fulvous; and the fifth tergite of the female with much black hair.

Male. Moderately robust, black. Small spot at base of mandibles, labrum except usual pair of spots, clypeus except extreme anterior margin and a spot on suture on each side above, transverse supraclypeal mark, lateral face marks roundly emarginate above, with a short orbital extension to level of antennæ, and scape beneath, creamy white. Claws rufous on basal half. Spurs rufotestaceous. Tegulæ piceous. Wing almost clear hyaline. Tergites one to six broadly whitish hyaline at apex. Tergite seven with two small teeth at apex, widely separated by a rounded sinus. Front and middle legs quite ordinary. Hind legs as described above, with the following particulars: Hind femora and tibiæ subincrassate. Spinous tip of tibial process a little blunt at apex and bent straight backward parallel with axis of tibiæ, this process also with a small acute tooth on inner margin opposite the insertion of the spur. Hind basitarsus broadest across basal half, then tapering to moderately wide apex, with the outer margin arcuate, more strongly rounded out on basal half. Inner margin straight except for the rather large triangular tooth placed ditinctly basad of the middle. Inner margin also produced in a very small sharp tooth at apex. Mandibles short, tapering, acute at apex and almost

edentate on inner margin. Third antennal joint equal to the fourth plus one-half the fifth joint. Clypeus dullish, very obscurely punctured. Frons, vertex and thorax moderately shining, with very fine shallow punctures, most distinct on the mesonotum. Vertex between lateral ocellus and eye very minutely sculptured, but shining, impunctate. Abdomen a little dullish, finely granular-punctate. Pubescence long and rather dense, dull ochreous or grayish, and sparsely intermixed with black on mesonotum. Hair of face below antennæ sparse. On frons a transverse line of black hairs just below anterior ocellus, and another group on each side at a slightly higher level. Vertex with much black hair on each side close to occipital margin, but hair in middle light. First tergite with long dense light hair. Following segments with shorter, thinner, erect hair, which is more or less black at base of tergites three and four, and sometimes tergites two to six. Venter with fine, short, appressed, light hair, except that on the first segment which is much longer and erect. Near the middle of the venter is a large circular patch of black pubescence situated mostly on segments four and five. Hair of legs light, but becoming chocolate brown on inner side of tarsi. Length, 10-12 mm.; anterior wing, 7.6-8.7 mm.; width of abdomen, 3.8-4.5 mm.

Female. Similar to male. Face entirely black. Clypeus convex, more or less shining, closely and shallowly punctured, sometimes with a more or less distinct median impunctate line. Mandibles often yellow-testaceous apically, the inner tooth very small and placed considerably before the apex. Joint three of antenna about equaling joints four to six combined. Apices of tergites less broadly and less conspicuously whitish hyaline. Wings considerably more dusky. Tibial spurs dark brown or blackish. Pubescence generally more ochreous, rarely pale fulvous, with black hairs inconspicuously intermixed on mesonotum. Black hairs on frons and vertex as in male. First tergite with long, light, erect hair. Following segments appearing comparatively nude, clothed with shorter, subappressed, mostly light hair, but with some black pubescence at base of tergites two to four. Hair of tergite five light, but hair on each side of the pygidial plate of tergite six chocolate brown. Hair of legs light, but more or less fuscous or black on coxæ and trochanters, and hair on inner side of tarsi chocolate brown, that on hind basitarsi margined on each side with blackish. Apical tuft of hind basitarsus dark brown or fuscous. Scopal hairs of hind tibia and basitarsus glistening ochreous white. Length, 10-13 mm.; anterior wing, 8.5-8.8 mm.; width of abdomen, 4.5-4.8 mm.

Holotype, male, allotype, female, and eight paratypes, males, collected at nests in roadway, near mouth of Deep Creek, Mohave Desert, April 26, 1936 (E. G. Linsley). Also the following paratypes: thirty-five females collected under the same circumstances

as the type, May 5, 1936 (Linsley and Timberlake); four females, Westwood Hills, Los Angeles County, June 3 and 26, 1935 (Linsley); two females, Panoche Creek, Fresno County, April 30, 1922 (A. J. Basinger); three males reared from larvæ collected eight miles south of Little Lake, Inyo County, April, 1940 (G. E. Bohart); one female, west side of Mohave River, one mile from mouth of Deep Creek, on *Salvia carduacea*, May 5, 1936; one female, four miles east of Adelanto, on *Lupinus odoratus*, May 22, 1932; two females, three miles southwest of Victorville, on *Dalea saundersii*, May 6 and 12, 1939; two males, ten females, Lovejoy Buttes, seven miles north of Llano, on *Salvia carduacea*, May 2, 1937; one male, same locality and day, on *Phacelia distans;* two males, eighteen females, four miles west of Coalinga, Fresno County, on *Salvia carduacea*, May 11, 1938; and eight females, same locality and day, on *Lupinus* (Timberlake).

Book Notices

The Spider Book. By John Henry Comstock, revised and edited by W. J. Gertsch. Doubleday, Doran and Company, Inc. pp. xi+729, 770 text figures. 1940. Price $6.00.

Perhaps the greatest tribute to this well-known book is the present "revision" by a leading authority on spiders who found it necessary to add but little and revise almost nothing. To quote from the editor's introduction, "Inasmuch as the Spider Book was intended as a popular introduction, it has seemed inexpedient to incorporate into the book controversial arrangement, debatable nomenclature, or radical departure from the present standard." We might expect that the more significant of the recent advances in arachnology would be useful, even in an introductory book, but entomologists should be grateful to learn that this standard work is once more available.

An Introduction to Entomology. By John Henry Comstock. Ninth edition, revised. Comstock Publishing Company, Ithaca, New York. pp. xxi+1064, 1228 figures, portrait of J. H. Comstock. 1940. Price $5.00.

The constant demand for this standard text book of entomology has necessitated frequent reprintings. The present edition provides a fuller treatment of the parasitic Hymenoptera by Dr. H. K. Townes. It is to be regretted, however, that the bibliography contains no reference to the standard entomological works of the past decade. To treat insect morphology without reference to the works of Imms, Weber, and Snodgrass, physiology without reference to Wigglesworth and the various orders of insects without mention of the leading works in these fields is to misguide a generation of beginning students.—R. L. Usinger.

A NEW SPECIES OF ELEODES FROM NORTH-EASTERN ARIZONA

(Coleoptera, Tenebrionidæ)

BY FRANK E. BLAISDELL, SR.

Stanford Medical School and Associate in Research, California Academy of Sciences, San Francisco, California

In 1933 the Ansel Hall Expedition into north-eastern Arizona and south-eastern Utah, collected the interesting species of *Eleodes* which is described below.

Eleodes (Melaneleodes) halli Blaisdell, new species

Form ovate, widest across middle of elytra, in the female slightly more than twice as long as wide. Color black and dull in luster, under surface of body somewhat shining and polished. Punctation quite strong and moderately dense; elytra densely punctato-muricate, punctures with short blackish or brownish inconspicuous hairs.

Head moderate in size, not quite as wide as pronotal apex, widest across eyes and there twice as wide as long before postocular line; sides not prominent, margins moderately arcuate over antennal insertions, thence straight and convergent, continuously so with sides of epistoma, the latter broadly and feebly emarginate at apex, angles rounded. Frons nearly plane, slightly convex laterally and feebly declivous against eyes, sutures obliterated; densely punctate, punctures moderately small, slightly coarser apically on epistoma; labrum slightly convex, side arcuate, angles well rounded, apex not widely emarginate at middle. Eyes transverse, short, upper lobe slightly larger; broadly and feebly emarginate anteriorly. Antennæ long, extending about three segments beyond pronotal base, last three segments slightly wider than the preceding, second segment short and annular as usual, one-fourth as long as third; the latter elongate and subcylindrical, four times as long as wide at apex; segments four to seven inclusive subequal in length and width, feebly obconical and about two and one-half times as long as wide; eighth obconical and a little longer than wide; ninth and tenth irregularly subspherical, about as long as wide; eleventh slightly narrowed apically and not quite twice as long as wide.

Pronotum subquadrate, about one-sixth wider than long; apex truncate, very finely beaded, bead interrupted at middle, angles obtuse-angular and slightly blunt; sides moderately arcuate, widest just before middle, thence straighter and convergent to base, very slightly sinuate; base in width equal to pronotal length and about one-sixth wider than apex, moderately and broadly arcuate, marginal bead rather fine, angles obtuse and scarcely rounded. Disk feebly convex centrally, gently and arcuately declivous in about lateral sixth, marginal beads not visible from above, quite obsolete on basal sinuation; densely punctate, punctures slightly larger than on head, denser laterally and well separated centrally.

Pronotal sides and sternum densely punctato-rugose.

Elytra oval, obtusely pointed apically, about one-half longer than wide and two and one-half times as long as pronotum; base scarcely wider than pronotal base, feebly emarginate and adapted to that of pronotum, humeri obtuse-angulate, their surfaces slightly concave to receive the pronotal basal angles, scutellum transverse, small and arcuate at apex. Sides broadly, evenly arcuate, most convergent in apical fourth, apex narrowly rounded. Disk rather strongly convex, arcuately declivous laterally and somewhat abruptly inflexed; apical declivity arcuately oblique, almost vertical; surface very densely muricato-punctate somewhat as in *Eleodes tricostata* Say, but with murices smaller and similar throughout and more or less confluent, each bearing a short, blackish setiform hair from its puncture, striæ of punctures more or less distinct and feebly impressed, intervals narrow and very feebly convex, becoming most so laterally and on apical declivity.

Sterna and parapleuræ more or less rugoso-punctate.

Abdomen moderately convex, glabrous and shining, sparsely punctate, punctures small, surface more or less irregularly rugulose. First segment on median line equal to combined lengths of fourth and fifth; second segment equal to third and fourth together, fifth as long as fourth and a little shorter than second. *Legs* moderate in length and stoutness. Metatibiæ about as long as their femora; metatarsi two-thirds as long as their tibiæ, moderately slender, first segment of each equal to combined lengths of second and third, also equal to length of fourth; second and third segments equal to each other, each quite twice as long as wide at apex.

Male. Narrower. Antennæ relatively long. *Abdomen* impressed on middle third of first three segments.

Female. Wider, elytra more oval and more or less slightly inflated. Antennæ shorter and the abdomen more evenly convex.

Measurements of types. Male: length: 14 mm.; width, 5.5 mm. Female: length, 13.5 mm.; width, 6.5 mm.

Holotype, female, No. 5172, and allotype, male, No. 5173, in the collection of the Museum of the California Academy of Sciences. The female was collected at Kayenta, Navajo County, Arizona, 20 miles WNW, on June 27, 1933, at an altitude of 8200 feet, by H. N. Hultgren. The males were secured at Kayenta, 15 miles WNW on June 24, at an elevation of 7200 feet. Three specimens studied: two males and one female; one male a paratype.

Halli is a member of the Quadricollis Section of the subgenus *Melaneleodes*, to which it belongs by reason of the enlarged inner protibial spurs; it is particularly related to the species of the Humeralis Group, by its dull luster and more or less asperate elytral sculpturing; the sculpturing is somewhat similar to that of *tricostata* Say. The elytral setiform hairs arise from the punctures near the tips of the prickles or murices.

In *humeralis* Lec. the elytra are less convex on the disk and the sculpturing is very densely and rather finely, muricately punctate or almost granulate. In *halli* the asperities are distinct murices and not granules.

In *concinna* Blais. the elytra are less asperate and the sculpturing consists of less densely placed muricate granules that are shining at their summits. This species is the form *granulatomuricata* of the author's Monograph.*

In *coloradensis* Blais. (see *humeralis* Lec. forma *tuberculomuricata*, Monograph,*) the form is robust with the elytra subtuberculately muricate mainly laterally and apically.

Halli is most closely related to *fuscipilosa* Blais. from Utah. It differs, however, in its more convex and fusiform-ovate form, striate elytra with the intervals more or less convex, especially on the sides and apical declivity. In both species the sculpturing is similar, the setiform hairs arising from the muricate punctures are longer, coarser and fulvous in color in *fuscipilosa* and the elytra are less convex dorsally, more broadly oval and rather more abruptly inflexed laterally, the strial punctures not impressed as in *halli*.

*Blaisdell, F. E. A monographic revision of the Coleoptera belonging to the Tenebrionide Tribe Eleodiini inhabiting the United States, Lower California, and adjacent islands. U. S. National Museum Bull. 63, pp. xii+524, 13 plates, 1909.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

H. M. ARMITAGE, *Vice-President* — E. O. ESSIG, *President* — E. G. LINSLEY, *Secretary*

PROCEEDINGS

One Hundred and Sixtieth Meeting, March 16, 1940

The one hundred and sixtieth meeting was held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco. President E. G. Linsley in the chair. The following members were present: E. G. Linsley, G. F. Ferris, R. L. Usinger, E. S. Ross, C. D. Michener, J. O. Martin, E. R. Leach, K. S. Hagen, W. E. Simonds, O. B. Cope, L. B. Boyer, R. C. Miller, E. O. Essig, W. H. Lange, H. M. Armitage, P. C. Ting, R. G. Dahl, P. A. Harvey, H. H. Keifer, A. E. Michelbacher. Visitors present were: E. J. Campan, W. F. Barr, Mrs. E. P. Van Duzee, R. Smith, M. Huebler.

The minutes of the previous meeting were read and approved.

Dr. Linsley called for a report of the membership committee. Mr. L. D. Christenson's name was suggested and he was unanimously elected to membership. Mr. E. R. Leach was called upon for the treasurer's report. He called attention to the fact that there were 229 paid subscribers to volume fifteen of the Pan-Pacific Entomologist and 270 paid subscribers all together.

Dr. Michelbacher and Dr. Duncan were appointed to a committee to decide on the time and place for the annual field trip.

Dr. Linsley reported the recommendation of the reorganization committee that the society become incorporated. It was then moved, seconded and carried that the society become incorporated as a non-profit organization. Professor Ferris read the revised by-laws for approval and they were adopted in principle.

Professor Essig suggested that the membership fee for students be reduced to one dollar and that they be given a voice and vote in the society. This suggestion was moved, seconded, and passed.

Dr. Miller reviewed the affiliations of various North American Academies of Science.

Continuing the symposium on "Special Methods of Mounting for Temporary and Permanent Preservation of Insects," Dr. Linsley called on Mr. Ting whose subject was "The Dissection and Preserving of Coleopterous Genitalia." Mr. Ting stated that genitalic characters are now commonly used by coleopterists, but that good judgment should be used in determining their importance just as with the more obvious external characters. He mentioned a recent paper by Dr. P. J. Darlington in which the latter states that a long or short median lobe may exist in individuals of the same species of Carabidæ. Mr. Ting stated that the best genitalia mounts and dissections are made when the genitalia with all

associated parts and the terminal and often invaginated abdominal segments are cleared in caustic potash. A display of different types of genitalia mounts was passed around including dissections kept in minute vials of glycerin held on the pin impaling the exact specimen from which they were dissected, permanent slide counts correlated by number with the pinned specimens, and small celluloid slides attached to the pinned specimens.—PETER C. TING, Secretary.

One Hundred and Sixty-first Meeting, April 28, 1940

Annual field meeting held at Phoenix Lake, Marin County, California. Members present were: R. G. Dahl, J. W. Tilden, N. Stahler, B. Brookman, N. E. Good, T. Aitken, W. C. Reeves, P. D. Gerhardt, J. H. Freitag, E. Lindsay, R. L. Usinger, E. S. Ross, A. E. Michelbacher, C. D. Michener, W. E. Simonds, E. O. Essig, C. D. Duncan, P. C. Ting. Visitors present were: E. G. Meyers, S. Kennedy, E. W. Drews, G. F. Smith, Mrs. Newell Good, Martha Putnam Usinger, Martha Michelbacher, Elinor Freitag, Ethel L. Essig, Mary Isabel Essig, Christine Putnam, T. H. Tudor, Louise Brandt Tudor, Helen Brandt Simonds.

The group assembled at 10 p. m. and collected in the vicinity of Phoenix Lake. After a picnic luncheon most of the members hiked to nearby hills and collected at higher altitudes. Due to adverse weather conditions general collecting was not very good.—PETER C. TING, Secretary.

One Hundred and Sixty-second Meeting, September 21, 1940

The one hundred and sixty-second meeting was held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco. President E. G. Linsley in the chair. The following members were present: E. G. Linsley, E. S. Ross, E. C. Van Dyke, N. E. Good, E. O. Essig, G. F. Ferris, J. O. Martin, B. Brookman, O. B. Cope, A. Smith, J. W. Tilden, C. D. Duncan, R. L. Usinger, C. D. Michener, W. F. Barr, K. Hagen, P. A. Harvey, Alice Eastwood, W. E. Simonds. Visitors present were: W. A. Evans, M. B. Irvine, M. M. Barnes, A. W. Brereton, L. H. King, H. I. Magy, G. S. Monsfield, D. R. Murphy, H. T. Reynolds, D. J. Raski, E. Mittler, G. Adachi, M. F. Hastings, W. Y. Chong, A. Bartel, P. S. Crane, E. Lindsay.

The minutes of previous meetings were approved as corrected.

Old business. President Linsley announced that the society had become incorporated and called for financial contributions from those members wishing to assist in defraying the cost involved. He then read the names of the Board of Directors for 1940 as well as the Standing Committees as follows: Board of Directors: E. G. Linsley, President; H. M. Armitage, Vice-President; P. C. Ting, Secretary; E. R. Leach, Treasurer; E. O. Essig (Publication); R. L. Usinger (Editorial); E. S. Ross (Historical); C. D. Duncan (Membership). Standing Committees:

Membership: C. D. Duncan (chairman), A. E. Michelbacher, C. D. Michener; *Program:* G. F. Ferris (chairman), R. L. Usinger, E. S. Ross. *Publication:* E. O. Essig (chairman), E. G. Linsley, C. D. Duncan, H. H. Keifer, G. F. Ferris, F. E. Blaisdell; *Editorial:* R. L. Usinger (editor), E. C. Van Dyke (associate editor), E. S. Ross (assistant editor), G. F. Ferris, E. G. Linsley; *Historical:* E. S. Ross (chairman), E. O. Essig, E. C. Van Dyke, R. L. Usinger, E. G. Linsley.

President Linsley announced receipt of securites valued at $1,000 from the H. C. Fall estate to be identified as the Fall Memorial Publication Fund. This gift was gratefully acknowledged by the secretary in a letter to Mrs. C. A. Richmond dated September 17, 1940.

The membership committee proposed the names of M. M. Barnes, W. F. Barr and F. W. Furry. They were unanimously elected to membership.

The secretary reported for the Board of Directors the recommendation that the society's meetings be increased to eight per year to be held from September through April as a means of adding interest and increasing the continuity of the meetings. It was moved and seconded and carried that this recommendation be adopted.

Dr. Usinger reported that the publication committee had decided to increase the subscription price of the Pan-Pacific Entomologist to $2.50 per year for non-members and explained that this move was prompted by the need for more funds to pay off the deficit coupled with decreased income from the foreign subscribers.

New business. President Linsley appointed a nominating committee consisting of A. E. Michelbacher (chairman), C. D. Duncan and R. L. Usinger to report its recommendations for new officers at the next meeting.

The death of Mr. E. P. Van Duzee was announced by President Linsley and it was decided that the entire October issue of the Pan-Pacific Entomologist be dedicated as a memoriam to him. Professor Essig read an account of the life and works of Mr. Van Duzee written for the issue by himself and Dr. Usinger. Apropos of facts mentioned in this account, Miss Alice Eastwood explained in detail how she saved the entomological types of the California Academy of Sciences from destruction in the earthquake and fire of 1906. The secretary was instructed to write a letter to Mrs. Van Duzee expressing the society's sympathy and feeling of loss with the death of Mr. Van Duzee.

Exhibits and observations. Dr. Ferris briefly discussed his most recent research on the Diaspidæ and exhibited some of his drawings of these scale insects. He also called attention to a display of Mr. Cope's drawings on the morphology of the Psocoptera which will appear in Microentomology.

Dr. Duncan passed around three attractive canes made from branches that had been engraved by scolytid beetles, stating that such branches were found on the ground in shaded situations.

Mr. W. Y. Chong of Davis exhibited a peculiar apterous tipulid (*Chionea*) collected on a snow bank in the Sierra Nevada Mountains.

Mr. G. E. Bohart placed on exhibit a conopid fly with its host bee, pointing out that the fly was remarkably large for so small a host.

Mr. Tilden passed around a collection of moths and beetles which he collected during a recent trip into Arizona.

As the main feature of the program Dr. Van Dyke gave an account of his field work since his last attendance. Leaving Berkeley on August 15, 1939, and traveling by automobile accompanied by Mrs. Van Dyke, he drove by way of the Grand Canyon to Carlsbad Caverns. Here he made a special point to collect in the bat caves as only blind camel crickets could be found in other parts of the caverns. On the bat manure he was able to collect carabid beetles of the genus *Rhadine* which were almost colorless and had reduced eyes. They were collected as they walked about on the surface of the manure and were not found elsewhere in the caves. Also found on the bat manure were numerous bat fleas, two species of moths, and tenebrionid beetles of the genus *Embaphion*. Dr. and Mrs. Van Dyke then drove across the "Pan handle" of Texas and through Oklahoma to Ft. Smith, Arkansas, whence they went into the Quachita Mountains of Arkansas, a southern extension of the Ozark uplift, and on into the Ozarks of Missouri collecting with the hope of securing relict carabid beetles (*Nemoratus*, etc) in this, one of the most ancient ranges in the United States. As the season was unusually dry, collecting was not so good as might otherwise be expected. Leaving this region they drove to Mobile, Alabama, where they remained two months and visited H. P. Loding. The Mobile region was found to be quite diverse with swampy lowlands and pine-covered highlands. The sand dunes of Mobile Bay and of the Gulf of Mexico were found to have a very poor fauna as compared to that of the Pacific Coast dunes. Dr. Van Dyke reported that his most interesting collecting was had in the turpentine cups attached to pine trees in which many beetles become trapped. Beetles thus collected seem to be immune from future attack by museum pests. From Mobile they drove into Florida and collected in the cedar swamps and everglades. Insects were not abundant, probably due to the unusually cold winter. Driving north to Clemson, South Carolina, they visited Mr. O. L. Cartwright and Wm. Upholt. After visiting Henry Good at Auburn, Alabama, in the latter part of April they drove to Cheaha State Park. About the first of May they visited de Soto State Park where, on May 7, Mrs. Van Dyke suffered a paralytic stroke and was taken to Gadsden, Alabama, and placed in a hospital where

she died on the evening of May 18, 1940. Following this very unfortunate happening Dr. Van Dyke returned to Berkeley as soon as possible.—E. S. Ross, Secretary, pro tem.

One Hundred and Sixty-third Meeting, December 7, 1940

The one hundred and sixty-third meeting was held at 2 p. m. in the entomological laboratories of the California Academy of Sciences, San Francisco. President Linsley in the chair. The following members were present: E. G. Linsley, E. S. Ross, R. L, Usinger, E. C. Van Dyke, J. W. Johnson, N. Stahler, N. E. Good, B. Brookman, T. H. G. Aitken, A. E. Michelbacher, G. F. Ferris, W. E. Simonds, W. F. Barr, R. G. Dahl, K. S. Hagen, O. B. Cope, A. C. Smith, E. A. Smith, C. D. Michener, R. J. Bartges, F. E. Blaisdell, Sr., W. H. Lange, H. H. Keifer, C. D. Duncan, H. M. Armitage, E. O. Essig, R. C. Miller. Visitors present were: T. Aarons, D. Murphy, E. Lindsay, F. Driver, C. Peek, A. W. Brereton.

The minutes of the previous meeting were read and approved.

Committee reports. The treasurer's report was given by E. S. Ross due to Mr. Leach's absence. The report was approved.

Dr. Usinger reported for the publication committee and announced that a list of the members of the society will be published in the next issue of the Pan-Pacific Entomologist.

Mr. Ross reported on the work of the historical committee.

Reporting for the program committee, Dr. Usinger reviewed the new meeting schedule and set tentative dates for the spring meetings, as follows: January 25th, February 15th, March 8th and April 13th. The plan for the program in each of these meetings was also announced with Mr. Cope and Mr. Michener to speak during the January meeting concerning their work on the morphology of Psocoptera and bees respectively, Mr. Ross to discuss his research on the Embioptera during the February meeting, the March meeting to be devoted to a symposium on insect ectoparasites lead by Dr. Ferris and the April meeting consisting of the usual field trip. Dr. Usinger urged members wishing to take part in a program to notify the program committee.

The membership committee, with Dr. Duncan reporting, submitted the names of Dr. G. F. MacLeod, Marvin Kolber, Thomas F. Kelley, N. W. Frazier, J. W. MacSwain and A. W. Brereton for membership in the society. All were elected by unanimous vote.

Dr. Michelbacher, reporting for the nominating committee, proposed the names of E. O. Essig for president, H. M. Armitage for vice-president, and Dr. E. G. Linsley for secretary. It was moved and seconded and carried that this report be accepted and that the secretary be instructed to cast a unanimous ballot in favor of these nominees.

Dr. Linsley then expressed sincerest thanks in behalf of the officers and himself for the loyal support given by the members to the society's activities during his term of office. The meeting

was then turned over to the new president, Prof. E. O, Essig, who continued the meeting with a call for exhibits and observations from the members.

Mr. Ross passed around a photograph of a *Polistes* collected by Dr. Van Dyke at Antioch, California, which was remarkable in that it had fifteen female Strepsiptera projecting from the abdomen.

Mr. Armitage described a case of rapid infestation of an orchard by eriophyid mites from a neighboring orchard. A discussion of the mechanism of such dispersal of mites followed. It was generally agreed by Mr. Keifer and others that wind dispersal probably was most important and that birds probably also carried mites from place to place on their legs as is the case with the crawlers of scale insects.

President Essig then called upon Dr. Linsley to present his retiring presidential address entitled "The Biology of the Meloidæ with Special Emphasis on the Genus *Hornia*."

Dr. Linsley first called attention to the paucity of biological studies of North American Meloidæ stating that of the thirty-one North American genera, twenty-nine are practically unknown biologically. In his discussion of hyper-metamorphosis he first mentioned the common practice of referring to the first instar larvæ of meloids as triungulins and suggested the adoption of primary larvæ as a substitute term. He devoted considerable attention to the methods by which the primary larvæ become attached to a host. In reviewing the host relations of the various genera of Meloidæ it was discovered that the Meloinæ are dominantly locust parasites while nearly all the Nemognathinæ are associated with bees. His studies of the possible origin of parasitism of meloids indicate that such habits are developed from predatism and that the change to pollen feeding really was not a great step.

His detailed discussion of the biology of *Hornia* was largely based on a study of two western species; one a subspecies of *minutipennis*, the other a new species from the east side of the Sierra Nevada Mountains. Both of these species are parasitic on bees of the genus *Anthophora*, as are other species of *Hornia*. One of the most peculiar features of the biology of *Hornia* is the fact that mating and oviposition take place in the bee cell occupied by the female, neither sex normally coming to the surface of the ground. The primary larvæ crawl out of a hole in the cell made by the female and wait on the surface of the ground at the nesting site for a host. This larva, upon reaching a cell of the host, first feeds on the host's egg thus reserving for itself the pollen supply intended for the bee larva. It was found that hibernation takes place in the exuviæ of the fourth and fifth instar larvæ, a device which protects the *Hornia* larvæ from the mold which accounts for the death of many bee larvæ.

Following Dr. Linsley's address the meeting was adjourned.—E. S. Ross, Secretary, pro tem.

List of Members*

'37 Aitken, Thomas, 112 Agric. Hall, Univ. of Calif., Berkeley.
'38 Armitage, H. M., State Agric. Bldg., Embarcadero St., San Francisco, Calif.
'36 Atkins, Mr. and Mrs. C. H., 321 So. 8th St., San Jose, Calif.
'35 Bailey, Stanley F., Univ. Farm, Davis, Calif.
'40 Barnes, Martin M., 552 Padilla St., San Gabriel, Calif.
'40 Barr, W. F., 1606 53rd Ave., Oakland, Calif.
'39 Bartges, Rex, 966 Florence Lane, Menlo Park, Calif.
'37 Bartlett, B. R., Univ. of Calif. Citrus Exp. Station, Riverside.
'20 Basinger, A. J., Univ. of Calif. Citrus Exp. Station, Riverside.
'29 Blackwelder, R. E., U. S. Nat. Mus., Washington, D. C.
Ch. Blaisdell, F. E., Ent. Dept., Calif. Acad. of Sci., San Francisco, Calif. (HM '38).
'35 Bohart, George, 1945 Yosemite Road, Berkeley, Calif.
'35 Bohart, Richard M., Dept. of Ent., Univ. of Calif. at Los Angeles, 405 Hilgard Ave., Los Angeles, Calif.
'36 Boyer, L. B., 1490 22nd Ave., San Francisco, Calif.
'07 Bradley, J. C., Ent. Dept., Cornell Univ., Ithaca, N. Y.
'40 Brereton, A. W., 112 Agric. Hall, Univ. of Calif., Berkeley.
'39 Brookman, Bernard, 112 Agric. Hall, Univ. of Calif., Berkeley.
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'21 Campbell, R. E., P. O. Box 297, Alhambra, Calif.
'35 Cazier, Mont A., 779 Peralta, Berkeley, Calif.
'20 Chamberlin, J. C., Box 278, Forest Grove, Ore.
'40 Christenson, L. D., 1583 D St., San Bernardino, Calif.
'19 Cole, Frank E., 925 W. Highland Ave., Redlands, Calif.
'23 Comstock, John A., Los Angeles Mus., Exposition Park, Los Angeles, Calif.
'39 Cope, Oliver B., Nat. Hist. Mus., Stanford Univ., Calif.
Ch. Cottle, James E., 513 B St., Hayward, Calif.
'39 Dahl, Richard G., 5061 Congress Ave., Oakland, Calif.
'24 Davis, A. C., Bur. of Ent., Beltsville Res. Center, Beltsville, Md.
'36 De Bach, Paul, Citrus Exp. Station, Riverside, Calif.
'35 De Leon, Donald, 210 Forestry Bldg., Ft. Collins, Colorado.
'36 Dickson, R. C., 4474 Elmwood Court, Riverside, Calif.
'19 Dietrich, Henry, Comstock Hall, Ithaca, N. Y.
'37 Downes, Anthony, 120 Pepys Road, Wimbledon, London S. W. 20, England.
'37 Du Bois, J. J., 205 Wayside Drive, Turlock, Calif.
'20 Duncan, Carl D., Box 4, Stanford Univ., Calif.
'02 Eastwood, Alice, Botany Dept., Calif. Acad. Sci., San Francisco, Calif. (HonM '12).
Ch. Ehrhorn, Edw. M., c/o Bishop Museum, Honolulu, T. H.
'36 Embury, M. A., Univ. Farm, Davis, Calif.

*Ch—Charter member (1901).
LM—Life member.
HM—Honored member.
HonM—Honorary member.

'14 Essig, E. O., 201 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'36 Ferguson, George, Ohio State Univ., Columbus, Ohio.
'19 Ferris, G. F., Nat. Hist. Mus., Stanford Univ., Calif.
'40 Frazier, Norman, 112 Agric. Hall, Univ. of Calif., Berkeley.
'25 Freeborn, S. B., Giannini Hall, Univ. of Calif., Berkeley, Calif.
'32 Furniss, R. L., 445 U. S. Court House, Portland, Ore.
'40 Furry, F. W., 947 Nordica Drive, Los Angeles, Calif.
'38 Good, N. E., U. S. Public Health Service, 14th Ave. and Lake St., San Francisco, Calif.
'32 Gressitt, J. Linsley, Lingnan Univ., Canton, China.
'03 Grinnell, Fordyce, 179 Upper Crescent, Sausalito, Calif.
'24 Hadden, F. C., Midway Island, Pacific Ocean (LM '30).
'39 Hagen, Kenneth S., 1313 54th Ave., Oakland, Calif.
'35 Harvey, Paul, S. F. State Teachers College, 124 Buchanan St., San Francisco, Calif.
'27 Heid, Graham, 1927 Talmadge St., Los Angeles, Calif.
'10 Herms, W. B., 2032 Del Norte St., Berkeley, Calif.
'01 Hopping, Ralph, Box 308, Vernon, B. C.
Ch. HOWARD, L. O., Bur. Ent., Washington, D. C. (HonM '12).
'36 Jensen, D. D., 1583 D St., San Bernardino, Calif.
'39 Johnson, John W., 112 Agric. Hall, Univ. of Calif., Berkeley.
'27 Keen, F. P., 445 U. S. Court House, Portland, Ore.
'25 Keifer, H. H., 1112 Swanton Drive, Sacramento, Calif.
'40 Kelly, T. F., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'36 Kessel, Dr. and Mrs. E. L., 2326 Russell St., Berkeley, Calif.
'20 Kincaid, Trevor, Zool. Dept., Univ. Wash., Seattle, Wash.
'40 Kolber, M., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'32 Lange, W. Harry, Jr., 2205 Derby St., Berkeley, Calif.
'16 Leach, E. R., 217 Hillside Ave., Piedmont, Calif.
'36 Lester, Will, Box 225, Saratoga Ave., Santa Clara, Calif.
'34 Lindahl, J. C., Nat'l Park Service, Belmont, Montana.
'27 Linsley, E. Gorton, 112 Agric. Hall, Univ. of Calif., Berkeley.
'40 MacSwain, J. W., 112 Agric. Hall, Univ. of Calif., Berkeley.
'37 Maehler, K. L., No. 18 Morrill Apts., 2437 Shattuck Ave., Berkeley, Calif.
'35 Mallis, Arnold, Ent. Dept., Univ. of Calif. at Los Angeles, 405 Hilgard Ave., Los Angeles, Calif.
'10 Mann, Wm. M., National Zoological Pk., Washington, D. C.
'19 Martin, J. O., 2617 Derby St., Berkeley, Calif.
'29 McClay, A. T., 1062 47th St., Sacramento, Calif.
'20 McCracken, Isabel, P. O. Box 1545, Stanford Univ., Calif.
'40 MacLeod G. F., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'31 Mead, Albert R., Dept. of Zoology, Univ. Farm, Davis, Calif.
'20 Melander, A. L., Biol. Dept., City College, New York, N. Y.
'33 Michelbacher, A. E., 112 Agric. Hall, Univ. of Calif., Berkeley, Calif.
'36 Michener, C. D., 112 Agric. Hall, Univ. of Calif., Berkeley.
'38 Miller, Robert C., Calif. Acad. of Sci., Golden Gate Park, San Francisco, Calif.

'04 Moulton, Dudley, 35 Elwood St., Redwood City, Calif.
'23 Nast, Ernest H., 4112 24th St., San Francisco, Calif.
'20 Newcomer, E. J., Box 1291, Yakima, Washington.
Ch. Nunenmacher, F. W., 11 Arbor Drive, Piedmont, Calif.
'34 Parker, Frank H., Rt. 2, Box 195, Phoenix, Ariz.
'21 Pierce, W. D., Ent. Dept., L. A. County Mus., Los Angeles, Calif.
'34 Platt, F. R., 524 N. Spring St., Los Angeles, Calif.
'39 Poff, Marjorie, 145 San Carlos, San Jose, Calif.
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CONTENTS

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NOTES AND DESCRIPTIONS OF NEOTROPICAL TRIATOMINÆ

(Hemiptera, Reduviidæ)

BY ROBERT L. USINGER

University of California, Davis

Since the appearance of a preliminary paper (Usinger, 1939) on blood sucking bugs of the subfamily Triatominæ, many additional notes and specimens have come to hand. Most of this material has been received through the generous cooperation of Messrs. H. G. Barber, E. Brumpt, S. C. Bruner, Luis Mazzotti, and S. F. Wood. To all of these, I wish to express my appreciation and thanks.

Bolbodera scabrosa Valdés

Bolbadea leabrusa Valdés Ragués, Anal. Acad. Cien. Med., Fís. Nat. Habana, 46:435, 1910. *Error of transcription.*

Bolbodera scabrosa Valdés Ragués, Cat. Mus. Cub. "Gundlach," p. 101, 1914.

Bolbodera scabrosa Uhler, MS., Bruner and Fracker, Ann. Ent. Soc. Am., 19:247-249, fig. 1, 1926.

Callotriatoma cubana Usinger, Univ. Calif. Publ. Ent., 7:33-56, 1 plate, 1939.

Mr. H. G. Barber has kindly called my attention to the description of *Bolbodera scabrosa.* This name was unfortunately omitted from the list of Neiva and Lent (1936) and all other accounts of this subfamily and was listed in the Zoological Record without comment as to its systematic position. Although I have not compared the type of *Bolbodera scabrosa* with *Callotriatoma cubana,* it seems certain that the two are identical. Hence the name *Bolbodera* should be substituted in my key to genera (1939).

The situation is even more complicated as indicated by Mr. S. C. Bruner who writes, "The description and figures were made from an old faded specimen (evidently a female) in a sealed glass-topped box in the Gundlach collection, Havana . . . I have learned since our article appeared that one Dr. Pedro Valdés

Ragués in the year 1910 published a paper entitled 'Clasificación Gundlach de Hemípteros Cubanos, Conforme a los Ejemplares que existen en el Museo del Instituto de 2ª Enseñanza de la Habana' (pp. 425 to 446, Anales, Academia Ciencias Med., Físicas y Naturales de la Habana, Tomo XLVI, Febrero, 1910). It is one of the most remarkable contributions I know of; scarcely a name is written as originally intended. Nevertheless, this so-called 'Gundlach Classification' exists, although Gundlach really wrote the labels correctly in German style script, following determinations made by Uhler in most cases . . . In describing *Bolbodera scabrosa* we unfortunately adopted Uhler's manuscript name. Now this appears in the Valdés paper (page 435) as follows (exact): '*Bolbadea leabrusa* 8 mm. algo ancho rojizo . . . 385.' The number is printed, so this is right." Metcalf (1936) treats the names of Valdés in the Fulgoroidea as *nomina nuda* but Bruner and Barber (1937) follow a strict interpretation of the rules for it is perfectly obvious that the remarks of Valdés, however brief, still constitute a description. The present case is further complicated because of the "error of transcription" of Gundlach's German script. However, we know the correct orthography of Uhler's manuscript name from several sources and Valdés himself spells the name correctly in a subsequent publication (1914) as indicated in synonymy above. I am further indebted to Mr. Bruner for copying portions of this 1914 paper for me.

Dimidiata Group

For many years the status of *Conorhinus maculipennis* Stål (1859) has remained in doubt because of Champion's misidentification of *dimidiata* (1899). Basing his conclusions entirely upon the extent of the corial markings, Champion considered Mexican specimens with only a small discal spot on the corium as typical *dimidiata.* Specimens from the same locality (Temax, Yucatan) with more extensive corial markings were designated as variety *a* with *maculipennis* as a synonym, while a single female from the same locality with the corium dark except on the "outer margin at the base and a space along the middle of the apical margin" was called variety *b.* Actually this variation approaches a continuum in the fine series before me collected, for the most part, by Dr. Luis Mazzotti. Moreover, this

entire series of Mexican specimens is smaller in size, 24½ to 28½ mm., than "typical" *dimidiata* from farther south. *Dimidiata* Latreille (1827) was described from Peru and specimens before me from Costa Rica and Panama agree with Latreille's description and figure. The length varies from 29 to 33 mm. and the head is often proportionately longer than in *maculipennis*. Stål called attention to these differences in 1859 and the extensive material which has come to light since that time indicates clearly that we are dealing at least with a geographically distinct subspecies.

Two other species of the *dimidiata* group have recently been discovered, both with ranges of distribution continuous with the widespread Central American and northern South American *dimidiata*. One of these, *hegneri*, was recently described by Mazzotti (1940) while the other is described below. The following key will aid in identifying members of the *dimidiata* group.

Key to the Species of the Dimidiata Group

1. Corium and connexivum in great part black, the corium infuscated basally as well as at middle and at apex and the connexivum pale only narrowly laterally in the region of posterior angles. Clavus at least obscurely infuscated even on apical half. Mexico.....*hegneri* Mazzotti
–. Corium and connexivum at least one-half yellow or orange-yellow, the base of the corium and apical half of the clavus always pale and immaculate. Connexivum yellow with more or less extensive black spots on antero-lateral portion of each segment 2
2. Head over twice as long[1] as wide across the eyes, 113::50; the eyes small, one-half to two-thirds as wide as interocular space; humeri distinctly angulately produced, subrounded at apices. Length 31 to 33 mm. Colombia.....*capitata* n. sp.
–. Head length subequal to, or shorter than, twice the width across eyes; eyes wider, four-fifths the width of interocular space or nearly equal to width of interocular space; humeri scarcely produced, distinctly rounded. Length 24½ to 33 mm. 3
3. Head subequal in length to twice the width across eyes. Length 29 to 33 mm. Costa Rica, Panama, and southward.....*dimidiata* (Latr.)
–. Head usually shorter than twice the width across eyes. Size smaller, 24½ to 28 mm. Mexico.....*maculipennis* (Stål)

[1] The length of the head is measured from extreme apex to, *but not including*, constricted neck region.

Triatoma capitata Usinger, new species

A large, relatively pale form with longer, more slender head, smaller eyes, and sharper humeral angles.

Head over twice as long (excluding constricted neck region) as broad across the eyes, 113::50; tylus narrowed anteriorly, broad and bulbous on basal half, with a broad depression at extreme base; juga scarcely attaining level of apices of antenniferous tubercles; lora not quite reaching apex of tylus; upper surface transversely rugose along the middle and punctate throughout, moderately elevated posteriorly; eyes one-third longer than postocular length of head to posterior constriction, 24::19, about half as wide as interocular space, 12::25; ocellar yoke located at extreme base of head just in front of constricted neck region; anteocular portion of head three and one-half times as long as postocular portion, 70::19. *Antennæ* inserted near middle of anteocular area, the ratio of distance from eyes to apex of antenniferous tubercles :: distance from antenniferous tubercles to apex of head as 33::37; first antennal segment reaching three-fourths of the distance to apex of head; proportion of segments one to three as 28:92:75, the fourth segment missing. *Rostrum* two-thirds as wide at apex of first segment as thickness of front femora at middle; proportion of segments one to three as 45:71:21; long hairs confined to apical segments. *Pronotum* about four-fifths as long on median line as total head length including neck region, 105::130; nearly half again as broad across humeral angles as long, 152::105; disk with anterior spines much as in *dimidiata*; humeral angles rather strongly produced and a little elevated or reflexed, apices rounded. *Scutellum* as in *dimidiata* but with anterior discal elevations more prominent, rounded. *Hemelytra* scarcely reaching tip of abdomen, two-sevenths broader at level of apices of coria than across base of coria, leaving an expanse of connexivum exposed on either side about one-sixth the greatest width across hemelytra; hemelytral surface nearly naked, with only a few very small and inconspicuous subappressed hairs. *Connexivum* likewise nearly glabrous but with a scattering of short, black, appressed hairs along lateral margins. *Under surface* much as in *dimidiata* but with the thorax less highly polished and the abdomen with sparser and slightly shorter hairs and less strongly flattened venter.

Color yellow and black, the hemelytra with black on basal third of clavus, a very small spot at middle of corium, and narrowly on apex of corium. Membrane dark fuscous. Connexivum black across basal third of each segment above and beneath, these black areas posteriorly widened medially. Edges of ventral abdominal plates yellowish to the spiracles and beyond them in front and behind. Elsewhere black except for paler third antennal segment, joints of legs, tarsi, and apical rostral segment which are lighter.

Size, male, length 31 mm., width (pronotum) 7½ mm., (connexivum) 10½ mm.; female, length 33 mm., width (pronotum) 7½ mm., (connexivum) 12 mm.

Collected at Miraflores (Boyaca), altitude 1450 m. (type locality); Malaga (Santander) altitude 2250 m.; Soata (Boyaca) altitude 2050 m.; and Toledo (Santander) altitude 1650 m., all in Colombia, S. A., and sent to me by Dr. E. Brumpt who is rearing the species at the Laboratoire de Parasitologie de la Faculté de Médecine de Paris. The female holotype is deposited as No. 5117, in the California Academy of Sciences. The male allotype is in my own collection.

Phyllosoma Group

The group of Triatominæ included in the genus *Meccus* Stål (type *phyllosoma* Burm.) proves to be less isolated than originally supposed and hence has correctly been relegated to synonymy. In the future the still more restricted group of species, excluding the recently rediscovered *mexicanus* H. S. (Mazzotti, 1940c), may best be referred to as the "phyllosoma group." This typically Mexican group has remained in the utmost confusion until recently because of the difficulty in identifying Burmeister's species and because of the tendency to lump everything under the single name, *phyllosoma.* Thanks to the assiduous field work and careful laboratory breeding done by Dr. Mazzotti a more rational picture has gradually emerged. It now appears that my *Triatoma picturata,* recently confused by various persons with *longipennis*, *phyllosoma*, and *pallidipennis*, is an extremely variable species as regards color pattern, some specimens having an entirely black pronotum instead of the typical pale posterior lobe while the orange markings of the connexivum vary greatly in extent. Members of the phyllosoma group may be distinguished from the other large (over 24 mm. in length) North and Central American Triatomas by their longer first antennal segment which reaches or surpasses level of apex of tylus and by the distinct curved black hairs which are either appressed or erect on the corium and which may be short and scale-like and scarcely as long as the interspaces between hairs or may be long and erect, reaching ½ mm. in length. The various species may be separated upon a sound morphological basis as follows.

Key to the Species of the Phyllosoma Group

1. Upper surface clothed with relatively short hairs, those of the corium less than one-third mm. in length, curved and appressed and shorter or about as long as the interspaces between hairs.....2
–. Upper surface clothed with long, erect or suberect, slightly curved black hairs, those of the corium about one-half mm. long, much longer than the interspaces between hairs.....4
2. Abdominal venter and metasternum clothed with short, subappressed brown hairs; with long, black, backwardly directed hairs confined to the mesosternum. Venedio, Mazatlan..... .....*longipennis* Usinger
–. Abdominal venter and meso- and metasternum clothed with backwardly directed, slightly curved hairs, many of which are over one-half mm. in length.....3
3. Membranous apical half of clavus and most of corium white, the base of the corium tinged with orange and the base of clavus and narrow apex of corium black. Guerrero, Colima, Jalisco, Michoacan, Morelos, Mexico (Distrito Federal)..... .....*pallidipennis* (Stål)
–. Membranous apical half of clavus black. Corium black with very broad orange areas basally and subapically. Nayarit, Jalisco, Colima.....*picturata* Usinger
4. Hemelytra short, not exceeding fifth visible abdominal tergite. Orange connexival markings confined to posterior third or fourth of each segment and reaching lateral margins only at postero-lateral angles. Juchitan and Tehuantepec, Oaxaca .....*phyllosoma* (Burm.)
–. Hemelytra longer, reaching at least to middle of sixth abdominal tergite and sometimes exceeding tip of abdomen. Orange connexival markings occupying one-third to one-half of the posterior portion of each segment, including lateral margins. Pinotepa Nacional, Collantes, Tututepec and Alacranes, all in Oaxaca.....*mazzottii* n. sp.

Triatoma mazzottii Usinger, new species

A large orange and black species with strongly dilated connexivum, with much of the body covered by fine erect or backwardly directed black hairs which are much longer than interspaces between the hairs (½ mm. in some cases), and with the hemelytra nearly reaching or even surpassing the tip of abdomen.

Head nearly two and one-half times as long (excluding constricted neck region) as broad across eyes, 120::51; tylus tapering apically but only slightly enlarged near base, the head broadly, transversely depressed at the base of tylus; juga short, scarcely reaching level of apices of antenniferous tubercles; lora reaching

almost to tip of tylus; upper surface with a longitudinal row of transverse wrinkles and with moderately long, subappressed, curved, black hairs in front of eyes and much longer, suberect hairs posteriorly; the surface gradually elevated posteriorly and then depressed behind the eyes to ocelli; eyes only slightly longer than postocular length of head to posterior constriction, 24::22, and less than two-thirds as wide as interocular space, 14::22; ocellar yoke at posterior constriction of head but the ocelli extending well forward to the middle of postocular portion of head; anteocular portion of head three and one-half times as long as postocular portion, 75::21. *Antennæ* inserted exactly midway between the eyes and apex of head, the apices of antenniferous tubercles reaching just halfway from front margin of eyes to apex of head; first segment reaching beyond tip of tylus to extreme apex of head, second segment three times as long as first, 114::37, remaining segments broken off; first two antennal segments clothed with stiff black, moderately long, apically directed, subappressed hairs, without long erect hairs. *Rostrum* about two-thirds as wide at apex of first segment as front femur at middle, 11::18; proportion of segments one to three as 45:74:21. *Pronotum* (on median line) about one-seventh shorter than total length of head, 112::132; less than half again as broad across humeral angles as long, 162::112; constricted at middle to one-half the width across humeral angles, 82::162, then swollen on anterior lobe, the greatest width across lateral tubercles one-eighth greater than across constriction, 90::82; anterior collar strongly depressed and flattened, constricted behind to about one-half the greatest width of anterior lobe, 47::90, and then strongly anterolaterally produced as blunt spines, the total width across which is one-fourth greater than at the constriction of the collar; disk with very large, smooth wrinkles, with two stout, subacute spines in front of the middle of anterior lobe; sparsely clothed with exceedingly long, erect black hairs. *Scutellum* one-fourth longer than broad at base, 83::65; three-fourths as long as pronotum on median line, 83::112; apical spine scarcely elevated posteriorly and bluntly rounded at tip. *Hemelytra* long, reaching to apical third of last dorsal abdominal segment; only moderately widened posteriorly when at rest, one-fifth broader across widest point, a little before level of apices of coria, than at narrowest point just behind bases of coria, 170::143; clavus on basal half and corium throughout sparsely clothed with erect, slightly curved, black hairs which are well over one-half millimeter in length. *Connexivum* very broadly dilated, the abdomen appearing suboval in outline; broadly exposed, almost two-thirds broader than greatest width across folded hemelytra, 276::170; naked above and beneath except for very short, appressed, black hairs along lateral margins. *Under surface* highly polished and clothed with fine long backwardly directed hairs; mesosternum with a transverse, arcuate

elevation with its concave side directed posteriorly and sharply depressed; abdominal venter smoothly rounded or roundly flattened. *Legs* with shorter hairs than on most of the body, the femora with a pair of blunt spines subapically.

Color uniformly black with orange-yellow basally and subapically on the coria and on the basal half of each connexival segment extending slightly onto abdominal tergites and ventrites. Constricted neck region, apex of rostrum, tarsi, joints of legs, and probably last two antennal segments fulvous or paler.

Size, male, length 34 mm., width (pronotum) 8 mm. (connexivum) 14 mm.; female, length 35 mm., width (pronotum) 7½ mm. (connexivum) 14 mm.

Holotype, male, No. 5118, C. A. S., Ent., allotype, female, No. 5119, C. A. S., Ent., and three male paratypes, Tututepec, Oaxaca, Mexico, Luis Mazzotti collector. Other specimens from the type locality and Pinotepa Nacional, Collantes, and Alacranes, Oaxaca, are in the collection of Dr. Mazzotti, to whom this species is gratefully dedicated in appreciation of his outstanding work on the Triatominæ of Mexico.

One of the male paratypes is somewhat smaller (length 31 mm., width of pronotum 6¾ mm., of connexivum 12 mm.) with the membrane exceeding tip of abdomen by about one-fourth the length of last abdominal segment.

Mazzottii is closest to the true *phyllosoma* (Burm.) of which Burmeister (1835) said "Flugeldecken viel schmaler und kurzer der fast kreisrunde, zeimlichdicke Hinterleib." *Phyllosoma* differs in having a smaller pronotum, shorter hemelytra, and less extensive orange markings. Moreover, it is geographically isolated for Dr. Mazzotti writes, "I have collected it only in Juchitan, and Tehuantepec, Oax., localities of the Pacific coast of the Tehuantepec Isthmus. At the West of the Isthmus the coast advances into the ocean, and all that coast until the limits of the State of Guerrero is denominated 'Costa Chica de Oaxaca.' In that coast and very distant from the Isthmus, at Pinotepa Nacional, Oax., Collantes, Oax., Tututepec, Oax., Olacranes, Oax., etc., I have collected exclusively the long wing variety; I have never found this species at the Isthmus (Juchitan and Tehuantepec)." Since writing the above Dr. Mazzotti has received three more specimens of the true *phyllosoma,* this time from Totocapan "in the middle of the state to the South East from the city of Oaxaca." A map showing the distribution of these species is given by Mazzotti (1940a). His symbol indicating the *phyllos-*

oma with (*alas cortas*) is the true *phyllosoma*. It is possible that *mazzottii* may prove to be only a subspecies of *phyllosoma* but any further conclusions regarding its status must await breeding work in progress in the laboratory of Dr. Mazzotti.

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YELLOWJACKETS VERSUS CAMPERS

BY R. M. BOHART

University of California at Los Angeles

Vespula pennsylvanica (Saussure), a common western yellowjacket, was encountered in unusually large numbers this summer in the California Sierra and in other mountainous regions as far south as San Diego County. Reports from Lake Tahoe, Mammoth Lakes, Tuolumne Meadows, Kennedy Meadows (near Sonora Pass), Huntington Lake, Giant Forest, Mineral King, resorts on Mt. San Bernardino, and several points in the mountains of San Diego County indicate that this insect was the source of great annoyance to campers in July and August, far exceeding that of mosquitoes or other flies. According to quarantine officers stationed at Lake Tahoe, people moved from public camps at the north end of the lake "en masse" because of numerous stings and the necessity of having to compete with wasps for every mouthful of food eaten. Yellowjackets continuously feed their young with raw meat in the form of caterpillars, bits of dead fish washed up on lake and stream margins, or steaks from the dinner table. In hot weather thirst drives the adults to any place where water has been spilled and to the wet sand of bathing beaches. It was here that their presence resulted in annoyance to bathers and fishermen.

The number of persons stung was mostly limited to cases where the wasps were hit or squashed. Stings often resulted in painful swellings several inches across and inflamed at the center. The pain usually subsided after an hour or less and was followed by itching.

Fly spray guns were in great demand among campers, and local stores were early sold out. However, permanent relief was achieved only by destruction of the nests which were to be found under root arches, decomposing logs, and boulders. At Lake Tahoe this was safely accomplished by approaching the nest at night, dousing it with kerosene, and covering the area quickly and liberally with dirt.

The explanation for the unprecedented abundance of yellowjackets is purely a matter for conjecture, but the relatively mild winter and early spring may have been partially responsible. It is a good guess that with a normal winter this year the yellowjacket plague will become merely a matter of history and the mosquitoes will again come into their own.

APHIDIDÆ OF NEVADA WITH A NEW GENUS AND SPECIES

BY E. A. DREWS

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This paper is the second dealing with aphids occurring in Nevada. Unless otherwise indicated the species were collected by the author. The writer is indebted to Professors E. O. Essig and M. A. Palmer for aid in determinations. Mr. W. W. Sampson gave considerable aid in description of the first instar of the new genus.

Aphis cerasifoliæ Fitch. On *Prunus demissa* (Nutt.) at Reno, Nevada, October 20, 1939.

Aphis lutescens Monell. On *Asclepias* at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis helianti Monell. On *Asclepias* at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis medicaginis Koch. On *Vicia* at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis rumicis Linnæus. On nettle at Idlewild Park, Reno, Nevada, October 21, 1939.

Aphis varians Patch. On *Ribes* leaves at Idlewild Park, Reno, Nevada, October 21, 1939.

Capitophorus potentillæ (Walker). On rose at Overton, Nevada, June, 1935. (Knowlton & Smith, p. 151, 1937).

Capitophorus rosarum (Walker). On wild rose at Wellington, Nevada, October 19, 1939.

Capitophorus xanthii (Oest). On *Xanthium canadensis* at Overton, Nevada, June, 1935. (Knowlton & Smith, p. 151, 1937).

Cinara engelmenniensis (Gillette & Palmer). On *Abies* at Genoa, Nevada, July 20, 1939.

Epameibaphis utahensis Knowlton & Smith. On *Artemisia tridentata* at Centerville, Nevada, September, 1939.

Mucrotrichaphis toti Knowlton & Allen. On *Artemisia* at Elko, Nevada, July 1, 1939. (Knowlton & Allen, p. 33, 1940).

Periphyllus utahensis (Knowlton). On *Salix* at Wellington, Nevada, October 19, 1939.

Phorodon menthæ (Buckton). On mint at Idlewild Park, Reno, Nevada, October 21, 1939.

Schizolachnus pini-radiata (Davidson). On pine at Centerville, Nevada, July 20, 1939.

Nevadaphis Drews, new genus

Apterous viviparous female. Front rounded; antennæ six-segmented, shorter than body, spur of VI about as long as base, or longer. Eye with reduced number of facets and with ocular tubercle large. Rostrum shorter than body. Cornicles very short, cylindrical, rims absent. Cauda apparently ovate and with long hairs, longer than length of cornicle.

First instar nymph. Antennæ four-segmented, shorter than body, a few prominent hairs, spur slightly longer than base, distal segment narrowly elongate, conical with sensoria forming a rosette with one large and five or six smaller ones. Eyes with reduced number of facets and with ocular tubercle large. Rostrum acute, nearly as long as body, apical segment very slender and long, remaining segments with a few prominent hairs. Cornicles very short, rimless, bases slightly narrower than tip. Cauda broadly rounded, wider than long, with two to four long hairs. Distal tarsal segment with four or five bristles longer than width of segment bearing them; proximal segment with two setæ on the top of the segment nearly as long as length of inner side. This first instar approaches none of those that are known from the Pacific Coast.

Genotype: *Nevadaphis sampsoni* Drews, new species.

In Nevsky's (1928, p. 4) key to the genera, *Nevadaphis* keys out to *Xerobion* and *Xerophilaphis* but fits neither genus. It differs from *Xerobion* in that no flocculent wool was evident, the cuticle is not markedly sculptured with hexagonal reticulations, the cornicles are cylindrical, not truncate, the cauda is longer, not shorter than cornicles, and ovate not bluntly-conical. It differs from *Xerophilaphis* in that no fine pruinose matter was evident, the cornicles are rimless, the cuticle is not plainly hexagonally reticulated, and the unguis of VI is about as long as base or longer.

Nevadaphis sampsoni Drews, new species

Apterous viviparous female. Body ovate but with head and thorax smaller than abdomen; color a dirty yellow to reddish-brown, often mottled; all hairs inconspicuous. Front of head rounded, without frontal tubercles; antennæ reaching just beyond third coxæ, secondary sensoria not present, a few simple hairs present, III generally shorter than IV or V, VI duskier than other segments. Eyes with reduced number of facets, ocular tubercle taking up about one-third of entire area of eye. Rostrum acute, reaching beyond third coxæ, with numerous long hairs arranged in two rows along its length. Lateral thoracic and abdominal tubercles present. Cornicles cylindrical, base usually

narrower than tip but at times slightly wider, about half as long as cauda, at times with one or two long hairs arising from basal area of cornicle. Cauda broadly ovate and with some hairs, usually about one-fourth the length of cauda. The following measurements are given in mm. Body: width 1.32, length 1.88. Appendages: antennal segments, I .067, II .063, III .180, IV .230, V .220, VI base .153, spur .167, rostrum .705, hind tarsi .118 (less claws), tibia .564.

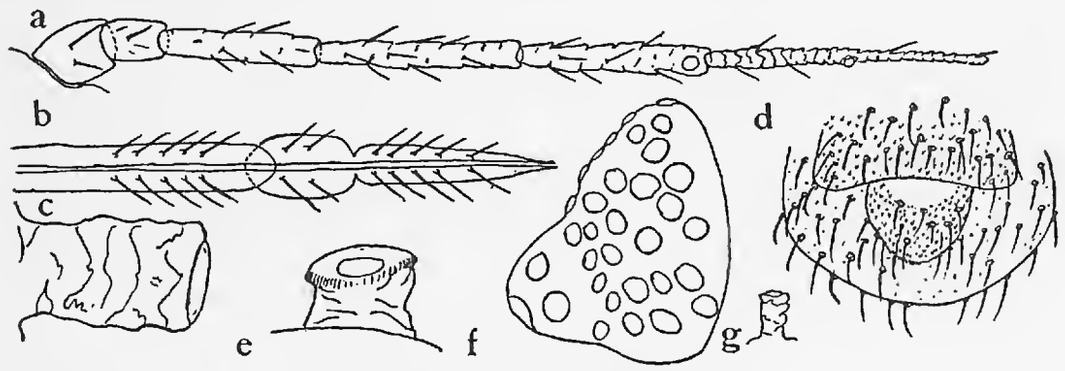

Figure 1. *Nevadaphis sampsoni* Drews, new species. a. antenna, b. rostrum, c. and g. cornicle, d. cauda, e. cornicle of first instar nymph, f. eye.

Segment III varies from shorter than IV to one-fifth longer than IV. V also ranges from shorter to one-tenth longer than IV. In the illustrations the two groups of figures a-d and e-g are drawn to different scales. All illustrations except f are of the apterous viviparous female.

Type, No. 4678, C.A.S., Ent. and paratypes in the collections of E. O. Essig, W. W. Sampson and the author, collected during September, 1939, and again on October 20, 1939, at Topaz Lake, Douglas County, Nevada, at an elevation of 5000 feet.

Collected rarely on the roots of *Artemisia tridentata* but abundant when present, feeding from the surface of the ground down to a depth of ten inches or more; sometimes attended by small ants. Although observed over a month previous to the date of collection, there was no evidence of sexual or alate forms.

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DISTRIBUTIONAL NOTES AND NEW RECORDS OF ACMÆODERA

(Coleoptera, Buprestidæ)

BY WILLIAM F. BARR
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During a recent collecting trip to southern California and southwestern Arizona made by R. G. Dahl, K. S. Hagen and the writer, a number of uncommon *Acmæodera* were taken in previously unrecorded localities. Along with these distributional records, host data, which should prove valuable for future collectors, were recorded. The writer would like to express his appreciation to Mr. Mont A. Cazier for his assistance and criticism. Thanks are also due to those who are mentioned as collectors of the specimens for allowing the writer to compile these data.

ACMÆODERA SABINÆ Knull

Acmæodera sabinæ Knull, 1937. Ent. News, 48:15-16.

This desirable little species was previously recorded by Cazier[1] from Holtville, California. Since the Holtville specimen was taken from an irrigation ditch, it seems desirable to record additional captures and host plants for this species. Five specimens were collected at San Luis, Yuma County, Arizona, June 15, 1940 (K. S. Hagen, R. G. Dahl and W. F. Barr), on *Pluchea sericea* (Nutt.); one specimen from Gordon's Well, Imperial County, California, June 17, 1940 (W. F. Barr), swept from *Larrea tridentata* var. *glutinosa* Jep.; and one specimen from Yermo, San Bernardino County, California, June 9, 1940 (W. F. Barr) on *Larrea tridentata* var. *glutinosa* Jep. The Yermo locality extends the known distribution of the species northward by about eighty miles and the California distribution (Holtville) by about one hundred and sixty miles.

ACMÆODERA JAGUARINA Knull

Acmæodera jaguarina Knull, 1938, Ann. Ent. Soc. Amer., 31(2): 135-136.

This species was described from a number of specimens, collected at Yuma, Yuma County, Arizona, in June and August. Two specimens were collected by the writer at San Luis, Yuma County, Arizona, June 15, 1940, on dead *Pluchea sericea* (Nutt.). About thirty specimens were collected at Thermal, Riverside County, California, June 17, 1940 (K. S. Hagen, R. G. Dahl and W. F.

[1] Cazier, M. A., 1940. Wasmann Collector, 4(1):28.

Barr), in the evening as they were flying to dead *Prosopis* branches. This is the first record of the occurrence of this recently described species in California.

ACMÆODERA HULLI Knull

Acmæodera hulli Knull, 1928, Ent. News, 39:315.

Specimens of this species were collected for the first time in California at Cedar Canyon, Providence Mountains, San Bernardino County, California, June 10, 1940 (K. S. Hagen, R. G. Dahl and W. F. Barr), on *Prosopis*. One specimen was collected by the writer at Thermal, Riverside County, California, June 17, 1940, on dead *Prosopis*. This species was described from New Mexico and has also been collected in Arizona and Sonora, Mexico. The California specimens show unusual variation in the number and arrangement of the elytral maculations. Some specimens have six isolated spots on each elytron, some seven, and others eight. One specimen has the two subapical spots united longitudinally and the two middle spots united transversely, forming elongate spots.

ACMÆODERA PINALORUM Knull

Acmæodera pinalorum Knull, 1930, Ent. News, 41:15-16.

This widely distributed Arizona species was collected for the first time in California at Cedar Canyon, Providence Mountains, San Bernardino County, California (K. S. Hagen, R. G. Dahl and W. F. Barr). Seven specimens were taken on *Prosopis*.

ACMÆODERA VULTUREI Knull

Acmæodera vulturei Knull, 1938, Ent. News, 49:228.

This species was recorded by Knull from Elizabeth Lake, Los Angeles County, California. Additional California records include: Pinon Flat, San Jacinto Mountains, Riverside County, California, May 24-26, 1939, and May 21, 1940 (B. Brookman, E. G. Linsley, E. S. Ross and C. D. Michener), taken on *Eriogonum fasciculatum* Benth. and Kernville, Kern County, California, June 7, 1940 (K. S. Hagen and W. F. Barr). Three specimens were taken on *Quercus*.

ACMÆODERA BIVULNERA Horn

Acmæodera bivulnera Horn, 1894, Proc. Cal. Acad. Sci., (2) 4:371.

Ten specimens of this uncommon species were collected at Ehrenberg, Yuma County, Arizona, June 14, 1940 (K. S. Hagen,

R. G. Dahl and W. F. Barr). One specimen was taken on *Larrea tridentata* var. *glutinosa* Jep. and the others on dead *Prosopis.*

ACMÆODERA YUMÆ Knull

Acmæodera yumæ Knull, 1937, Ohio Jour. Sci., 37(5):301.

Additional localities and hosts for this desirable species include three specimens from San Luis, Yuma County, Arizona, June 16, 1940 (W. F. Barr) taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra;* and five specimens from Gordon's Well, Imperial County, California, June 17, 1940 (R. G. Dahl and K. S. Hagen), taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra.*

ACMÆODERA FISHERI Cazier

Acmæodera fisheri Cazier, 1940, Wasmann Collector, 4(1):19-20.

Since this species was described from a single specimen it seems worth while to record its capture at Thermal, Riverside County, California, June 17, 1940 (R. G. Dahl). One specimen was taken on *Pluchea sericea* (Nutt.). This locality is about one hundred and forty-five miles south of the type locality (Mojave). On this specimen, the scales on the pronotum are confined to the extreme lateral margins as compared to the type specimen which has the scales extended on to the disk. The scaling of the under surface is less dense than in the type specimen, but is nevertheless a dense felt-like tomentum. Also the punctuation of the pronotal disk is more evident and the elytral maculations are more extensive and more irregular in the Thermal specimen.

ACMÆODERA PURSHIÆ Fisher

Acmæodera purshiæ Fisher, 1926, Ent. News, 37:114-115.

The range of this already wide-spread Great Basin species was further extended when it was collected at Pinon Flat, San Jacinto Mountains, Riverside County, California, May 21, 1940 (E. V. Stahl). A single specimen was collected on *Juniperus.* Previously the only southern locality was Bishop, Inyo Couty, California (Fenyes collection). The Pinon Flat locality extends the range southward by about two hundred and seventy miles.

ACMÆODERA INYOENSIS Cazier

Acmæodera inyoensis Cazier, 1940, Wasmann Collector, 4(1):18-19.

Two collecting trips into Nevada have extended the distribution of this species into that state. Eleven specimens were taken

in Kyle Canyon, Mount Charleston, Clark County, Nevada, May 23, 1940 (P. C. Ting, W. Reeves and M. A. Cazier), on desert mallow; two specimens were collected at Charleston Mountain Park, Clark County, Nevada, 9,000 feet, June 21, 1940 (R. M. Bohart).

ACMÆODERA ROSSI Cazier

Acmæodera rossi Cazier, 1937, Pan-Pac. Ent., 13(3):115.

Numerous specimens of this unusual *Acmæodera* were collected at the following localities: two specimens from twenty-three miles south of Vidal, Riverside County, California (K. S. Hagen and W. F. Barr) on palo verde; about ten specimens from Ehrenberg, Yuma County, Arizona, June 14, 1940 (R. G. Dahl, K. S. Hagen and W. F. Barr), collected on *Larrea tridentata* var. *glutinosa* Jep., dead *Prosopis* and dead *Acacia greggii* Gray; about thirty specimens from San Luis, Yuma County, Arizona, June 15-16, 1940 (K. S. Hagen, R. G. Dahl and W. F. Barr), taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra* and also found in an irrigation ditch; and seven specimens from Gordon's Well, Imperial County, California, June 17, 1940 (R. G. Dahl and W. F. Barr), taken on *Larrea tridentata* var. *glutinosa* Jep. and *Ephedra.*

As *Acmæodera* is a rather popular group and since there has not been any recent distributional paper written on it, the following state-by-state list seems desirable. The *Acmæodera* occur primarily in the southwest and adjoining states and as a result, only these few states are given for distributional purposes. The eastern and northern states have only one or two rather cosmopolitan species, i. e., *A. pulchella, A. ornata,* and *A. tubulus,* and therefore are not itemized individually. A summarization of the state lists shows the following:

	Total number of species	Endemics	Original type locality
California	64	28	46
Arizona	56	14	36
Texas	28	10	16
New Mexico	15	0	4
Nevada	15	0	1
Lower California	13	7	10
Utah	13	0	3
Northern Mexico	13	0	0
Colorado	6	0	1
Oregon	5	0	0
Florida	5	1	0

The exact type localities of *A. ornata* Fabr., *A. scalaris* Mann., *A. pulchella* Hbst., *A. flavomarginata* Gray, *A. rubronotata* Lap. & Gory, and *A. tubulus* (Fabr.) are unknown to the writer and the original literature is unavailable.

Only authentically determined specimens were used in this paper, therefore, it does not contain any of the doubtful localities which have appeared in earlier papers due to incorrect determinations.

California[2]

1. *acuta* Lec.
2. *adenostomæ* Cazier
3. **alacris* Horn
4. *aliciæ* Fall
5. *angelica* Fall
6. **angelica nexa* Fall
7. **aurora* Fall
8. **barri* Cazier
9. biedermani Skinner
10. **bishopiana* Fall
11. *comata* Lec.
12. *connexa* Lec.
13. **coquilletti* Fall
14. cribricollis Horn
15. **dohrni* Horn
16. *dolorosa* Fall
17. **fenyesi* Fall
18. **fisheri* Cazier
19. flavosticta Horn
20. *gemina* Horn
21. gibbula Lec.
22. **guttifera* Lec.
23. *hepburni* Lec.
24. **holsteni* White
25. hulli Knull
26. **humeralis* Cazier
27. insignis Horn
28. *inyoensis* Cazier
29. jaguarina Knull
30. **jocosa* Fall
31. junki Thery
32. *labyrinthica* Fall
33. lanata Horn
34. *latiflava* Fall
35. *liberta* Fall
36. lucia Fall
37. **mariposa* Horn
38. **mariposa bernardino* Van D.
39. **morbosa* Fall
40. **nigrovittata* Van D.
41. **palmarum* Timberlake
42. **perlanosa* Timberlake
43. pinalorum Knull
44. *plagiaticauda* Horn
45. **postica* Fall
46. **prorsa* Fall
47. **pubiventris* Horn
48. pulchella Hbst.
49. **pullata* Cazier
50. purshiæ Fisher
51. **quadriseriata* Fall
52. quadrivittata Horn
53. *robusta* Horn
54. *robusta rubrosuffusa* Fall
55. *rossi* Cazier
56. sabinæ Knull
57. **simulata* Van D.
58. **sinuata* Van D.
59. *sinuata sexnotata* Van D.
60. **tenebricosa* Fall
61. tuta Horn
62. *vandykei* Fall
63. vulturei Knull
64. yumæ Knull

[2] Species marked with an asterisk are known only from the state under which they are listed. Names in italics indicate species originally described from the state. Species listed in Roman type occur in more than one state.

Arizona

1. acuta Lec.
2. aliciæ Fall
3. *amplicollis* Lec.
4. angelica Fall
5. *biedermani* Skinner
6. *bivulnera* Horn
7. *bowditchi* Fall
8. **carlota* Fall
9. comata Lec.
10. **conoidea* Fall
11. **constricticollis* Knull
12. **convicta* Fall
13. cribricollis Horn
14. *cuneata* Fall
15. *daggetti* Fall
16. *decipiens* Lec.
17. **delumbus* Horn
18. *discalis* Cazier
19. *disjuncta* Fall
20. *falli* Kerr
21. flavomarginata Gray
22. gemina Horn
23. gibbula Lec.
24. **gibbula gila* Knull
25. **griffithi* Fall
26. **horni* Fall
27. hulli Knull
28. insignis Horn
29. *jaguarina* Knull
30. *junki* Thery
31. liberta Fall
32. *ligulata* Cazier
33. **lineipicta* Fall
34. *lucia* Fall
35. **mimicata* Knull
36. opacula Lec.
37. ornata Fab.
38. **papagonis* Duncan
39. *parkeri* Cazier
40. *pinalorum* Knull
41. pulchella Hbst.
42. quadrivittata Horn
43. recticollis Fall
44. **resplendens* Van D.
45. rossi Cazier
46. *Sabinæ* Knull
47. scalaris Mann.
48. **serena* Fall
49. sparsa Horn
50. stigmata Horn
51. *subbalteata* Lec.
52. *varipilis* Van D.
53. *vulturei* Knull
54. **wheeleri* Van D.
55. *wickenburgana* Knull
56. *yumæ* Knull

Texas

1. *auritincta* Fall
2. bowditchi Fall
3. **consors* Horn
4. *cribricollis* Horn
5. discalis Cazier
6. disjuncta Fall
7. falli Kerr
8. **flavinigrapunctata* Knull
9. flavomarginata Gray
10. *gibbula* Lec.
11. **hæmorrhoa* Lec.
12. junki Thery
13. **macra* Horn
14. *maculifera* Horn
15. *miliaris* Horn
16. **neglecta* Fall
17. **obtusa* Horn
18. ornata Fabr.
19. *paradisjuncta* Knull
20. **perforata* Cazier
21. pulchella Hbst.
22. quadrivittata Horn
23. rubronotata Lap. & Gory
24. scalaris Mann.
25. **texana* Lec.
26. tubulus (Fabr.)
27. **uvaldensis* Knull
28. **wenzeli* Van D.

New Mexico

1. amplicollis Lec.
2. auritincta Fall
3. decipiens Lec.
4. gibbula Lec.
5. *hulli* Knull
6. lucia Fall
7. maculifera Horn
8. *opacula* Lec.
9. pulchella Hbst.
10. quadrivittata Horn
11. *recticollis* Fall
12. scalaris Mann.
13. sparsa Horn
14. subbalteata Lec.
15. *variegata* Lec.

Nevada

1. connexa Lec.
2. cribricollis Horn
3. gemina Horn
4. hepburni Lec.
5. inyoensis Cazier
6. labyrinthica Fall
7. lanata Horn
8. latiflava Fall
9. ornata Fabr.
10. *purshiæ* Fisher
11. robusta Horn
12. robusta rubrosuffusa Fall
13. tuta Horn
14. vandykei Fall
15. variegata Lec.

Lower California

1. **clausa* Horn
2. **faceta* Fall
3. flavomarginata Gray
4. *flavosticta* Horn
5. gibbula Lec.
6. *insignis* Horn
7. **lucana* Van D.
8. **opinabilis* Fall
9. **rubescens* Schaeffer
10. **scapularis* Horn
11. *stigmata* Horn
12. **vanduzeei* Van D.
13. *varipilis* Van D.

Utah

1. acuta Lec.
2. bowditchi Fall
3. cuneata Fall
4. dolorosa Fall
5. labyrinthica Fall
6. *lanata* Horn
7. lucia Fall
8. purshiæ Fisher
9. *quadrivittata* Horn
10. sparsa Horn
11. *tuta* Horn
12. vandykei Fall
13. varigata Lec.

Northern Mexico

1. bivulnera Horn
2. daggetti Fall
3. gibbula Lec.
4. hulli Knull
5. miliaris Horn
6. paradisjuncta Knull
7. parkeri Cazier
8. quadrivittata Horn
9. rubronotata Lap. & Gory
10. scalaris Mann
11. sparsa Horn
12. subbalteata Lec.
13. wickenburgana Knull

COLORADO

1. ligulata Cazier
2. lucia Fall
3. pulchella Hbst.
4. quadrivittata Horn
5. *sparsa* Horn
6. variegata Lec.

OREGON

1. angelica Fall
2. connexa Lec.
3. plagiaticauda Horn
4. sinuata sexnotata Van D.
5. variegata Lec.

FLORIDA

1. confusa Fisher
2. *marginotata Chev.
3. ornata Fabr.
4. pulchella Hbst.
5. tubulus (Fabr.)

THE GENUS ORTHOPODOMYIA THEOBALD IN CALIFORNIA

(Diptera, Culicidæ)

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While making observations and collections of *Aëdes varipalpus* (Coq.), "the Pacific Coast tree-hole mosquito," in southern California during February, 1940, larvæ and adults of the genus *Orthopodomyia* were encountered. The larvæ were in tree holes of cottonwood, *Populus fremontii* Wats., which had been filled by rains. Previous to this time *A. varipalpus* had been the only culicid known to inhabit tree holes in California.

Orthopodomyia is a small genus of mosquitoes whose members breed exclusively in tree holes. Only two species are known to occur in the United States, *Orthopodomyia signifera* (Coq.) and *Orthopodomyia alba* Baker. The former was described by Coquillett (1896) from the District of Columbia. Its present distribution includes most of the eastern and southern states from Massachusetts to Texas. A previous but unrecognized record of this species in California was made by Clara Ludlow (1906), who reported "*Culex*(?) *signifer*" from Benicia Barracks, Solano County. Howard, Dyar, and Knab (1917) stated, however, "We quote the California locality cited by Dr. Ludlow

with doubt, as no other specimens have been received or reported from west of the Plains." As a result subsequent workers have chosen to ignore the record. The writer on March 21, 1940, visited Benicia Barracks and vicinity in an attempt to recover *O. signifera*, but the only tree-hole mosquito found breeding in this area was *A. varipalpus*. *Orthopodomyia alba* was described by Baker (1936) from Ithaca, New York. Since then it has also been recorded from Alabama, Shields and Miles (1937).

The immature stages of *Orthopodomyia* were first collected in California at Riverside, Riverside County, on February 17, 1940, a large cottonwood tree with two rot holes was found which contained larvæ of *Orthopodomyia* and *A. varipalpus;* those of the former were obtained in all four instars, and 150 adults were reared from this collection. A second collection was made on the same day three miles to the south of Riverside, from a cottonwood tree which also contained larvæ of both mosquitoes. Subsequent collections of *Orthopodomyia* were made on June 30 and July 12 from the same tree holes. At the latter date larvæ of all four instars, pupæ, and adults were found.[1] Another locality was discovered on July 2 when larvæ of *Orthopodomyia*, *A. varipalpus*, and *Culex quinquefasciatus* Say were collected in cottonwood and willow tree holes two miles to the west of Redlands, San Bernardino County. From this material 621 fourth instar larvæ and 145 adults have been examined.

Study of the larvæ has shown the Californian species to be *O. signifera*, although certain variations from characters given for the eastern *O. signifera* (see Baker, 1936) have appeared. According to King, Bradley and McNeel (1939) the principal character separating the larvæ of *O. signifera* from *O. alba* is the presence of dorsal plates on segments six, seven, and eight (occasionally seven and eight) as contrasted with no plates in *O. alba*. In the Californian specimens dorsal plates are not always present on abdominal segments six, seven, and eight. Of the fourth stage larvæ examined only 60 had plates on these segments, 368 had plates on segments seven and eight, and 243 had a plate on only the eighth segment. Of the latter group 59 later added a plate on the seventh segment, and three added plates on segments six and seven. Addition of plates takes place without

[1] Breeding apparently occurs continuously in the tree where the original collection was made as on August 27 larvæ were still abundant, and adults were observed resting on the inner surface of the hole.

moulting and is apparently a hypodermal deposition the physiological nature of which is unknown. The number of teeth in the anterior row of the comb of the eighth abdominal segment varies from 13-22, as contrasted with previous descriptions of 17±2 (*signifera*) and 11±2 (*alba*). This variation and that recorded by Shields and Miles (1937) for *O. alba* of an increase to 18 would indicate that the character is of little value in differentiating *O. signifera* from *O. alba.*

The character of hypodermal pigmentation given as pink or purple for *O. signifera* and lacking for *O. alba* has been found in California to depend entirely upon larval diet. In sunny tree holes an abundant growth of *Thiocapsa,* a rose pink pigmented bacterium occurs. Larvæ from holes containing this pigmented organism have a purple or pink hypodermal coloration. Removal from such a hole and changing to a yeast diet results in loss of this pigmentation, and they become yellow to brown. These larvæ when placed in a container with the pigmented organisms become pink again within a week.

In other characters larvæ agree with those of typical *O. signifera.* General hairy appearance inconspicuous. Head capsule rounded, dark brown; antennal tuft inconspicuous, of three to five hairs; sub-basal tuft inconspicuous; transutural tuft single. Abdomen with lateral tufts of the first two abdominal segments short and multiple. Ventral tuft of sixth abdominal segment composed of seven to thirteen hairs. Siphon about three and one-half times as long as wide, slightly tapered; siphonal tuft with five to eight hairs. Anal segment completely ringed by its plate. Anal gills long and tapering.

Pupæ of the Californian *O. signifera* are brown with darker intersegmental bands. Those from larvæ with considerable pink pigmentation are especially dark. The respiratory trumpet is not so angular in outline as typical *O. signifera* because the sides are gently curved. However, in some cases the corners are sharp in outline.

Considerable difficulty has generally been experienced in separating the adults of *O. signifera* from *O. alba* (see Baker, 1936). The former has been described as having the cuticula of the first abdominal tergite purplish brown, a continuous apical black band on the second abdominal tergite, and abdominal

tergites from the third segment posteriorly with white basal triangular patches laterally. *O. alba* differs by having the cuticula of the first abdominal tergite yellow, triangular black apical areas laterally on the second abdominal tergite, and abdominal tergites from the third segment posteriorly with continuous white basal bands. The Californian specimens exhibit a marked trend towards *O. alba.* The cuticula of the first abdominal tergite is yellowish brown. In many specimens the second abdominal tergite is completely white scaled, but in the majority of cases there are dark, apical triangular areas laterally; the second abdominal tergite has a continuous apical black band in less than 20 per cent of the specimens. Abdominal tergites from the third segment posteriorly possess continuous white basal bands in 90 per cent of the specimens, and in only the remaining 10 per cent are basal triangular white patches found laterally.

Male terminalia agree with descriptions of *O. signifera,* except that the basal lobe has three to five large stout spines instead of only three; the majority have four as found in *O. alba.*

Adult specimens have been placed in the collections of the United States National Museum, the California Academy of Sciences, and the University of California. The writer is indebted to Dr. T. H. G. Aitken for verification of his determination and to both him and Prof. W. B. Herms for reading the manuscript.

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THE UNIVERSITY OF CALIFORNIA ENTOMOLOGICAL SOCIETY
and
THE ENTOMOLOGIST'S DAILY POST CARD

BY E. O. ESSIG

University of California, Berkeley

The University of California Entomological Society, which appears to have been the second[1] entomological organization formed in California, held its first business meeting and adopted by-laws at the University of California, Berkeley, January 3, 1895. Officers elected were: President, E. J. Wickson; Vice-President, J. J. Rivers; Secretary and Editor, C. W. Woodworth. New members elected were: B. M. Lelong, Alexander Craw, Dr. H. H. Behr, Dr. E. C. Van Dyke, Prof. A. J. Cook, C. H. Shinn, and W. G. W. Harford.

According to Article 1 of the by-laws, "the object of this Society shall be to advance the science of Entomology in all its branches."

The official organ of the Society was "The Entomologist's Daily Post Card," which is referred to as "A California Journal of Entomology"—the first entomological publication in the state. It was published on cards, each daily issue (published daily at first and subsequently issued weekly, beginning April 1, 1895) consisting of printing on both sides of a substantial card 3¾x5½ inches. The issues were intended "to form a card index to the insects of California and adjoining states." Many early records of insects appearing in this journal have been overlooked by entomologists. The contents included timely information and announcements and usually a synoptical key to a genus, family, or order of insects or a title of some recently published outstanding paper in entomology. In the first number appeared this interesting statement: "The two things most needed for the study of Entomology in California are a series of synopses of our species and a bibliography of our literature." Among other notes are, "A new insect box" (No. 3, Jan. 4, 1895); "Hints for Teachers" (Nos. 5-6, Jan. 7-8, 1895); "Microscopical mounts of insects"—refers to the possibilities of "mount-

[1] The California Entomological Society was founded at San Francisco on March 13, 1891, and The Pacific Coast Entomological Society was first organized as The California Entomological Club in the same city on August 7, 1901.

ing insects of considerable size for microscopical study" (No. 8, Jan. 10, 1895); "An entomological game" (No. 28, Feb. 2, 1895); "Lamp chimney for breeding cages" (No. 30, Feb. 5, 1895); "Reference Collections—refers to the Ricksecker collection of Coleoptera and the Rivers collection of Lepidoptera at the University of California (Nos. 35-36, Feb. 11-12, 1895); "The orders of insects" (Nos. 71-76, March 27-April 2; Nos. 111-112, May 16-17, 1895); "The Smyrna fig insect" (Nos. 94-95, April 24-25, 1895); "Experiment Station entomologists" (Nos. 106-107, May 9-10, 1895); "Arsenites in Bordeaux Mixture"—in which attention is called to the fact that Prof. C. P. Gillette "first called attention to the possibility of applying an arsenite as Paris green in Bordeaux mixture with even greater safety to the plant than when applied alone, and thus save the cost of one application" (No. 26, Jan. 31, 1895). A vacation notice in No. 118, May 23, 1895, closed the series.

There is nearly a complete set of this journal in the archives of the University of California Library and the author has a set with but a single card missing. The cards have greatly deteriorated and are browned with age. The writer is able to furnish almost complete sets to libraries.

TRIGONOPTERUS IN THE CAROLINE ISLANDS

(Coleoptera, Curculionidæ)

BY ELWOOD C. ZIMMERMAN

Bernice P. Bishop Museum, Honolulu

The cryptorhynchine genus *Trigonopterus* (=*Idotasia*) contains more than 80 species which are distributed from Sumatra to Samoa with the greatest development in Papua. None have heretofore been recorded from Micronesia. Bishop Museum's Micronesian Expedition of 1935-1936 procured the following striking new species of the genus from the Caroline Islands.

Trigonopterus carolineæ Zimmerman, new species

Figure 1

Color: head, rostrum, club of the antennal scape, prothorax, coxæ, trochanters, bases of and usually the edges and apices of the femora, mesosternum, sides of the metasternum, basal margin and apices of the elytra black, elsewhere mostly brownish-red, the

elytra conspicuously shiny brownish-red and contrasting sharply with the shiny black pronotum, the elytra transluscent; setæ yellowish to golden.

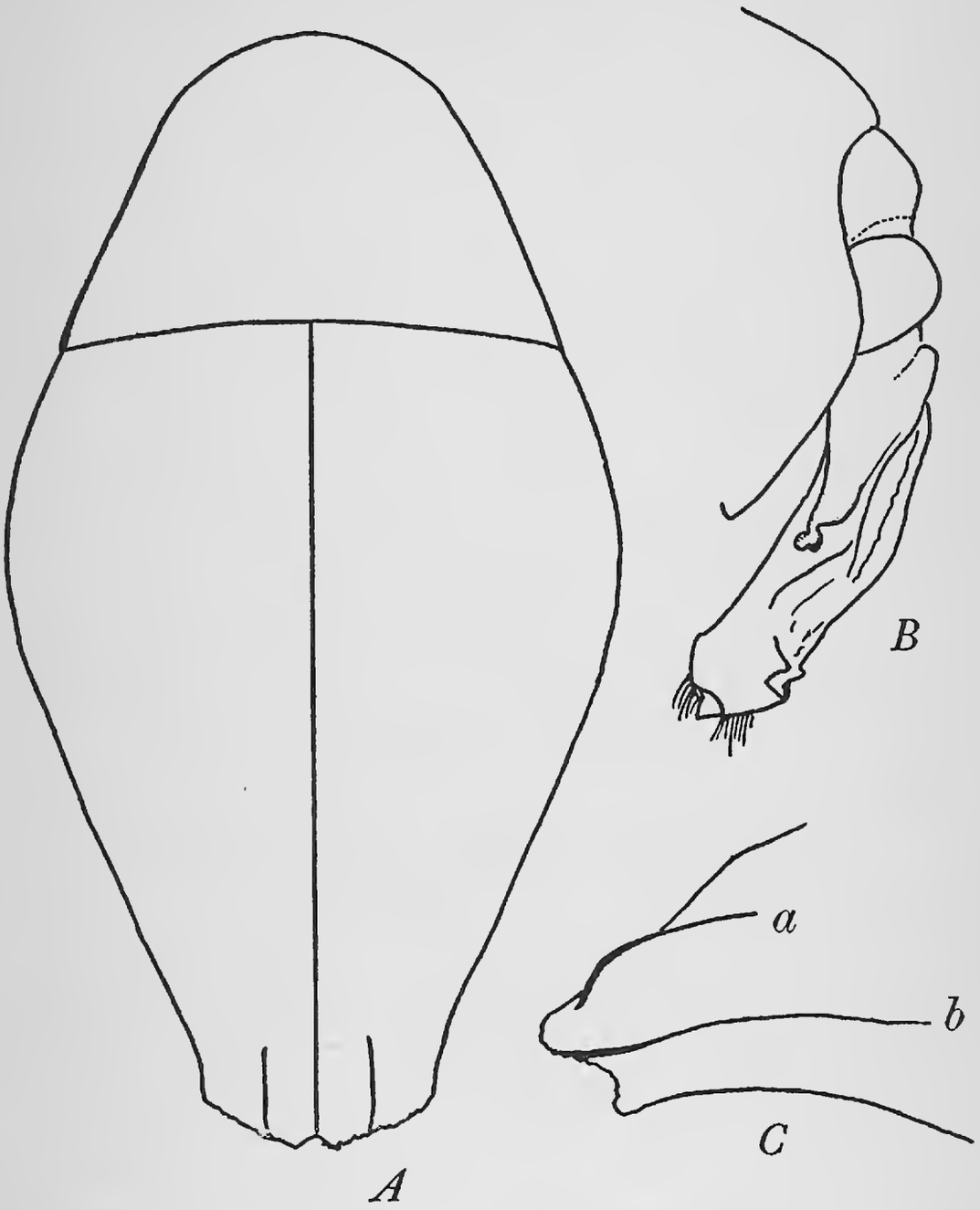

Figure 1. *Trigonopterus carolineæ* Zimmerman, new species. A, lateral outline; B, outline of head and rostrum; C, outline of side of apex of elytron, *a*, elevated second interval, *b*, elevated and coalesced intervals 7, 8 and 9.

Head reticulate, rather dull, the crown coarsely and densely punctate except near the pronotum; interocular area broadly, shallowly and conspicuously concave, with a very deep, coarse groove around each eye, the eyes therefore appearing protuberant, the middle of the area impunctate, the punctures on the sides and

below the middle longitudinally confluent. *Rostrum* in the male coarsely reticulate and dull throughout, with three strongly developed, coarse carinæ, exclusive of the carina above each scrobe, running from near the base to beyond the antennal insertion, the intercarinal striæ coarse, punctate, each bearing a row of erect setæ; at about one-fourth from the apex there are three conspicuous, dorsal, tubercle-like prominences on an arc of an apparent transverse ridge which are remnants of the three dorsal carinæ which have become obsolete or almost obsolete just behind the tubercles where the rostrum is depressed (see fig. 1, B); rostrum of the female more slender, the dorsal carinæ not continued beyond the antennal insertion, and from there distad rather shiny and with lines of moderately large punctures being continuations of the striæ behind the antennæ, without subapical tubercles. *Antennæ* with the scape sinuous, strongly clavate, as long as the first four funicular segments, its broadest part two and one-half times as broad as the narrowest part of the stalk; first funicular segment as long as 2, 2 about as long as 3 plus 4 plus 5, 3 to 7 each successively slightly broader; club broadly rounded at the apex, one-fourth longer than broad, about as long as the preceding five funicular segments. *Thorax* five-eighths as broad as long, base slightly sinuous, the sides evenly converging in an almost straight line to the convex apex; dorsum with a variable, rather inconspicuous impunctate median line, elsewhere closely and evenly set with medium sized oval punctures whose interstices are mostly narrower than the punctures, each puncture containing a fine, decumbent, anteriorly directed seta that hardly projects beyond the anterior margin of the puncture; dorsum evenly convex transversely and longitudinally, without a subapical constriction. *Elytra* shaped as illustrated, one and one-half times as long as broad, not quite three times as long as the prothorax, measured from the side (14:5), dorsal and lateral outlines continuous or almost continuous with those of the pronotum; none of the striæ excepting the eighth obviously impressed in the basal two-thirds, marked by series of small punctures, the punctures and the flat, broad intervals bearing miscroscopical setæ; stria 8 impressed and coarsely punctate from the base nearly to the second ventrite, the outer side of the stria appearing as a shelf-like ridge, the outer stria obsolete from the base about to the hind margin of the first ventrite, then becoming deeply impressed from the third ventrite to the apex; interval 2 elevated at the apex for about the length of the fifth ventrite, intervals 7, 8 and 9 forming a coalesced elevation from above the fourth ventrite to the apex, a continuation of this elevation runs from the latero-apical corner to the suture, the true margin is therefore below and anterior to the apparent margin, the area between the elevation and the margin concave; the elytral apices forming a common, variable, emargination at the suture; some of the setæ

in the hollow between the distal elevations of the coalesced intervals 7, 8 and 9 and interval 2 usually squamiform and elongate oval in shape. *Legs* with the femora not expanded distally, the punctures bearing conspicuous, prostrate setæ lying parallel to the long axis, with a stria along the lower outer margin in which the setæ are more numerous, the lower sides flattened and only shallowly concave, the outer edge not elevated into a conspicuous flange; tibiæ, excepting for the basal angulation, almost straight, each with the uncus developed and appearing to arise somewhat nearer the inner than the outer corner, none with a distinct tooth at the inner apical angle, although that angle may be acute, the fore pair with some irregular, sinuous, longitudinal carinæ between the well developed dorsal and ventral marginal carinæ on the outer side and without a very conspicuous longitudinal patch of golden setæ as found on the mid and hind tibiæ, mid and hind tibiæ without distinct carinæ on the outer side between the marginal carinæ, with more than the apical fourth of the outer side occupied by a large, conspicuous patch of stiff golden setæ that conceal an oblique carina; tarsi with the first segment slightly longer than the third, twice as long as the second, the third fully one-third broader than long and fully as long as the preceding two segments, dorsa of all segments with long, stiff setæ. *Sternum* coarsely reticulate, with the posterior surface of the mesosternal receptacle with conspicuous plumose squamæ in the male, but with simple hair-like setæ in the female; metasternum broadly concave in both sexes and with a few scattered setiferous punctures, the anterior edge broadly arcuate, about two-thirds as long along the median line as the first ventrite; mesocoxæ separated by a distance about one-fifth greater than the transverse chord of a mesocoxa. *Venter* reticulate like sternum; with the first two ventrites broadly and shallowly concave in the female, the second ventrite almost flat, both ventrites more deeply concave in the male; first ventrite with the intercoxal margin broadly arcuate, with small, scattered setiferous punctures, about as long along the median line as ventrite 2 plus one-half of 3; second ventrite as long as 3 plus 4, ventrites 2, 3 and 4 with small scattered setiferous punctures; ventrite 5 broadly concave, clothed with a dense mass of erect, thin, broad, plumose squamæ which almost completely covers the ventrite in the male but is wanting from the basal median area in the female. Length: 4.0-4.5 mm.; breadth: 2.0-2.25 mm.

Caroline Islands: Ponape Island, holotype male, allotype female and one male paratype in Bishop Museum, collected by Z. Ono at Wone, February 17, 1936.

This is a very distinct and striking species. The shiny reddish elytra make a strong contrast with the black pronotum. I know of no other species to which it is closely allied or which it resembles.

A NEW CALIFORNIAN STENOPOGON

(Diptera, Asilidæ)

BY BERNARD BROOKMAN
University of California, Berkeley

The asilid herein described as new was first brought to the writer's attention by Mr. Mont Cazier who had collected a few specimens about ten miles southeast of Livermore, California. A subsequent trip to the locality revealed that this species was quite abundant, flying rather sluggishly through the tall, dry grass stems, upon which it rested and awaited its prey. The prey, noted in several instances, included leafhoppers, buprestids of the genus *Acmæodera*, and several kinds of small Diptera and Hymenoptera.

The writer is indebted to Mr. Cazier who loaned material for this study, who has been of assistance in drawing up this description, and for whom the new species is gratefully named, to Professor W. B. Herms, Dr. E. G. Linsley, Dr. T. H. G. Aitken and Mr. C. D. Michener who read the manuscript and who offered valuable suggestions for its improvement, and to Dr. S. W. Bromley for verifying the status of this species.

Stenopogon (Stenopogon) cazieri Brookman, new species

This is a medium sized, slender, dark colored species, having a black mystax and a bare postnotum. It is related to *Stenopogon jubatus* Coquillett[1] and *Stenopogon jubatoides* Bromley[2].

Male. *Head* black; face with golden, sericeous pubescence on gibbosity, yellow pollinose from above gibbosity to antennæ; mystax entirely black; antennæ black, thinly pruinose, bristles on first two segments black, third segment one and one-half times as long as first two together, style three-eighths as long as third segment, tapering distally and bearing short, terminal spine; front yellow pollinose with black bristles; ocellar tubercle with tuft of black bristles; palpi and proboscis shining black, palpi with black hairs, proboscis bearing long, slender black and silvery hairs; occipital arch silvery pollinose, dorsally with long, black bristles, ventrally with both black and silver hairs; beard largely of black hairs interspersed with silvery hairs. *Thorax* black, brownish pollinose; prothorax with black bristles and black and silver hairs interspersed; mesonotum bearing black macrochætæ and microchætæ; humeri with slender black bristles and few silvery hairs; postalar calli with strong, black bristles, some silvery hairs dorsally; sternopleuron with a tuft of long, slender, pale hairs; scutellum

[1] Coquillett, D. W., 1904, Invertebrata Pacifica, 1:38.
[2] Bromley, S. W., 1937, Jour. N. Y. Ent. Soc., 45:297.

with stout black marginal bristles; postnotum entirely bare. *Legs*: coxæ black, brownish pollinose, with long black bristles and hairs projecting anteriorly, posterior edge with silvery hairs; femora black, distal tips rufous, bearing black bristles and slender silvery hairs; tibiæ black, proximal three-eighths rufous, all setæ black; tarsomeres rufous with black tips, setæ black. *Wings* fumose; basal area including proximal three-fourths of first basal, all of second basal, anal, and axillary cells, and alula frosted in appearance; costal margin clothed with short black, scale-like hairs. *Abdomen* shining black, tergites edged with dark gray pollen, thickly covered with rather long, slender, silvery-white hairs; lateral eminences of first tergite densely pilose, bearing many slender black, few pale bristles dorsally and strong pale bristles and silvery hairs laterally; sternites gray pollinose on anterior edges and on central, subcircular area at posterior edges; terminalia black; lateral lobes of ninth tergite about as long as greatest height of terminalia, rounded apically, bearing slender black bristles; ninth sternite five-sixths as long as tergite, posterior margin deeply and widely incised, producing U-shaped notch, postero-lateral lobes thus formed slender, projecting laterally, curving dorsally, basal portion with few black bristles tipped with silver, lobes with pale hairs. Total length, 20.5 mm.; abdomen, 14 mm.; wings, 14 mm.

Female. Similar to male but in general with more pale hairs and bristles; wings with less extensive frosted area at base; pile of abdominal tergites shorter, less dense; no pale bristles on lateral edges of first tergite; posterior edge of sixth tergite, all of seventh and eighth tergites with short black hairs; ovipositor with black spines. Total length, 23 mm.; abdomen, 17 mm.; wings, 15 mm.

Holotype, male, No. 5115, and allotype, female, No. 5116, Mus. Calif. Acad. Sci., Ent., collected 10 miles southeast of Livermore, Alameda County, California, May 10, 1940 (M. A. Cazier and A. E. Michelbacher). Paratopotypes: one male, five females, May 2, 1936 (M. A. Cazier); fifteen females, sixteen males, May 10, 1940 (M. A. Cazier and A. E. Michelbacher); thirty-nine females, twenty-seven males, May 12, 1940 (M. A. Cazier, C. D. Michener and B. Brookman). Paratypes: two males, two females, summit Mount Hamilton, Santa Clara County, California, May 19, 1940 (W. C. Reeves and M. A. Cazier). Paratypes have been deposited in the following collections: University of California, Berkeley; California Academy of Sciences; United States National Museum; American Museum of Natural History; S. W. Bromley; M. T. James; M. A. Cazier; T. H. G. Aitken and B. Brookman.

Stenopogon cazieri may be readily separated from *Stenopogon jubatus* Coq. by the predominance of black hairs and

bristles on the occipital arch, the beard and the legs, and by the brown pollinose mesonotum. Males may be separated by the shape of the lateral lobes of the ninth tergite, those of *cazieri* appearing (from lateral view) stout, broadly rounded apically, and not curving ventrad to any extent, while those of *jubatus* are more slender, taper acutely toward the apex and have the apical half curved ventrally. In addition to other characters, the females of *cazieri* retain the basal frosted area of the wing; this area is completely absent in the female specimens of *jubatus* at my disposal.

This species is distinguished from *Stenopogon jubatoides* Brom. by the following characters: the hairs and bristles of the occipital arch, beard and legs are predominantly black, while those of *jubatoides* are white; the third segment of the antennæ is relatively short (from one to one and one-third times the length of the first two segments together) and bears a ventral excision along the apical half, while that of *jubatoides* is relatively long (from one and one-half to two times the length of the first two segments together) and bears a ventral excision along the apical two-thirds or more; the antennal style is relatively long (from one-third to one-half as long as the third segment), while that of *jubatoides* is relatively short (from one-fifth to one-sixth as long as the third segment). In addition the males may be separated by the shape of the posterior notch of the ninth sternite, that of *cazieri* being deeply and widely incised and U-shaped with the inner edges of the postero-lateral lobes subparallel, that of *jubatoides* being shallowly notched and more V-shaped with the inner edges of the postero-lateral lobes widely divergent apically.

In the long series at hand there is a surprisingly small amount of variation in color and structure. This is particularly true of the males. In length the males vary from about 17 mm. to 21 mm. The females, in general, are larger than the males, varying from 18 mm. to 25 mm. in length. The latter have more light colored pile on the head and thorax than the males, a few specimens approaching *Stenopogon jubatoides* in the amount of white pile present. There is a certain amount of variation in the relative proportions of the antennal segments, but in no instance did these proportions approach those found in *Stenopogon jubatoides.* There are at hand four specimens from Sunset Valley, Santa Barbara County, California, which have the wing membrane infuscated only along the veins, but which, in all other respects, appear identical to the Livermore specimens.

A NEW AMERICAN SUBGENUS AND SPECIES OF AËDES

(Diptera, Culicidæ)

BY THOMAS H. G. AITKEN

University of California, Berkeley

The writer wishes to take this opportunity of expressing his appreciation to Mr. W. H. W. Komp for his help and criticism in the preparation of the manuscript; helpful criticism by Mr. M. A. Cazier and Mr. B. Brookman is also acknowledged. Thanks are especially due Dr. and Mrs. A. E. Michelbacher and Mr. E. S. Ross, the collectors from whom the specimens were obtained for study.

The description of the subgenus is so arranged that the diagnostic portion includes the main characters used by Edwards (Gen. Insct., Fasc. 194:130, 1932) in his key to the females of the subgenera of *Aëdes*; thus the reader will be able to refer directly to the most closely allied subgenera.

Kompia Aitken, new subgenus

Wings without a tuft of very long scales at extreme base; tarsal claws toothed on front and middle legs; cerci short; eighth abdominal segment large and not completely retractile, eighth sternite large and prominent; entire body highly ornamented; head mainly clothed with broad, flat scales, but with a median dorsal stripe of narrow scales; post-spiracular setæ absent.

Head without setæ on occiput except for ocular row; eyes narrowly separated above antennæ, space between eyes occupied by narrow scales; antennæ slender in female, verticels moderately long, flagellar segments about equal in length; proboscis slender, slightly longer than fore femora; palpi about one-sixth as long as proboscis. *Thorax* with anterior pronotal lobes widely separated; dorsocentral setæ (including pre-scutellars) present; spiracular and post-spiracular areas devoid of setæ, the latter area adorned with patch of broad, flat scales; sternopleural setæ sparse; lower mesepimeral setæ absent; meron with upper margin above level of base of hind coxæ; scutellum trilobed, scales broad on median lobe, extremely narrow on lateral lobes (each bearing setæ); postnotum bare; wing scales predominantly narrow, upper surface of stem vein without hairs, squama completely fringed, anal vein reaching well beyond base of cubital fork; pulvilli absent. *Legs* with toothed claws on fore and mid tarsi. *Abdomen* pointed.

Type: *Aëdes* (*Kompia*) *purpureipes* Aitken, new species.

Although lacking postspiracular bristles, this subgenus belongs in the genus *Aëdes*, on the basis of the characters outlined above. Unfortunately the absence of males and larvæ prevents determining its true relationship. *Kompia* appears to be most closely related to the subgenera *Finlaya* and *Howardina*, particularly the former, from which it may be separated by the absence of postspiracular bristles; it also differs from *Howardina* in this character, as well as by having toothed tarsal claws on the front and middle legs of the female. The writer takes great pleasure in naming this subgenus in honor of Mr. W. H. W. Komp, Senior Medical Entomologist, U. S. Public Health Service, who has done much to further our knowledge of neotropical mosquitoes, and who confirmed the writer's opinion concerning the status of this mosquito.

Aëdes (Kompia) purpureipes Aitken, new species

Female. *Head* with proboscis and palpi clothed with appressed black scales having dark, metallic blue shade in certain lights; clypeus bare, shiny black; antennæ black, tori shiny black with patch of broad silvery scales mesially; occiput with dark integument, heavily clothed with scales arranged in the following pattern: a dark, metallic clump on lateral ocular margins surrounded by pale band (the scales in front silvery and those in back golden), a submedian dark, metallic purple clump and a median patch of narrow, golden scales which become silvery between the eyes, a clump of erect, forked, black scales posteriorly, ocular margins bordered by few black setæ. *Thorax* with integument ochraceous orange; mesonotum golden-yellow, with two dark submedian longitudinal stripes from anterior margin to scutellum, and with two dark lateral stripes extending from scutellum half way to anterior margin, the two submedian dark stripes separated anteriorly by a median line of golden scales half the width of each stripe, posteriorly by the bare ante-scutellar space which is lined laterally with silvery scales, submedian dark stripes with few dark dorsocentral setæ, stouter, longer and more numerous posteriorly, margins of mesonotum lined with pale setæ, more numerous above wing-base; scutellum with median lobe bearing clump of broad silvery scales and six long, pale setæ, lateral lobes with small patch of narrowly-linear, elongate, black scales and five or six very long pale setæ; anterior pronotal lobes capped with broad silvery scales and clump of variably colored setæ (about 15), posterior pronotum with patch of broad silvery scales followed by five variably colored setæ; pleuræ (inclusive of pronotum and coxæ) marked by three longitudinal silvery white stripes, formed of broad scales on proepisternum, mesanepisternum, sternopleuron and mesepimeron, setæ

(pale) arranged as follows: proepisternum (about six), mesanepisternum *without* setæ, sternopleuron with two groups, upper and lower (about three each), prealar area (about seven), upper mesepimeron (about 15); coxæ yellow, clothed with broad silvery scales, darker ventrally, also each with a row of pale and dark setæ; trochanters yellow, with a few silvery scales; femora yellow on basal third, the pale color tending to run out to the apex on inner side of first two pairs of legs, remainder of femora adorned with dark, metallic purple scales, apex of femora with a patch of white scales; tibiæ and tarsi clothed with dark metallic scales varying from purple to spectrum blue (depending on light), pale bands absent; few pale setæ occurring along length of leg; tarsal claws of first two pairs of legs with tooth, those of hind legs simple, formula 1.1-1.1-0; wings clothed with narrow, dark scales, which in certain lights take on the bluish-purple color of the legs (this color also visible on wing membrane); halteres yellow, with few pale silvery and dark scales on knob. *Abdomen* with ochraceous yellow integument, adorned with broad, brown scales which in certain lights are metallic purple and in others yellowish; tergites with slight indications of narrow, pale basal bands which expand laterally into triangular areas of silvery scales, pale setæ present on first tergite and apices of following tergites; sternites with brown scales similar to those on dorsum, pale setæ present on disc as well as apices of sternites.

Holotype, female, No. 5155, Calif. Acad. Sci., Ent., collected at Triunfo, Distrito del Sur, Baja California, México, July 7, 1938, by A. E. Michelbacher and E. S. Ross. Paratypes, three females from five miles west of San Bartolo, Distrito del Sur, July 13, 1938, and one female from Miraflores, Distrito del Sur, July 8, 1938, by A. E. Michelbacher and E. S. Ross. Paratypes (unfortunately rather badly rubbed) deposited in the California Academy of Sciences, United States National Museum, University of California and the Escuela Nacional de Ciencias Biologicas, México, D.F. All collections were made at night.

An additional female specimen has recently come to hand, collected by Mr. E. S. Ross at Patagonia, Santa Cruz County, in southern Arizona, August 8, 1940. Although rather badly rubbed, the specimen appears identical with those from Lower California. The postspiracular setæ are absent, the pleural bands formed by the silvery scale patches are in evidence, the thorax is distinctly yellow and retains a few of the yellow mesonotal scales, and the legs are clothed with dark scales, but they are

not so markedly metallic purple. The specimen, caught in the daytime, was in the act of biting.

Dr. Alan Stone, U. S. National Museum, has kindly compared the specimens from Lower California and Arizona with Dyar's types of *Aëdes muelleri* (Ins. Insc. Mens., 8:81, 1920), from the vicinity of México City, México, and *A. iridipennis* (Ins. Insc. Mens., 10:92, 1922), from the Chiricahua Mountains, Arizona, and finds them to be very different; the absence of postspiracular bristles is alone sufficient to distinguish the former.

Obituary

During the past year entomology has lost several of its most distinguished workers. Of the younger entomologists, Grace Adelbert Sandhouse, aculeate Hymenopterist in the Bureau of Insect Identification of the U. S. D. A., died on Nov. 9, 1940, at the age of 44 and F. W. Edwards, Dipterist and Deputy Keeper of Entomology at the British Museum (Natural History), died on Nov. 15, 1940, at the age of 46.

Older scientists whose names have been intimately associated with American entomology for the last half century include: W. S. Blatchley, naturalist and author of several indispensible insect manuals, who died on May 28, 1941, at the age of 81; Samuel Henshaw, Coleopterist, bibliographer, and director emeritus of the Museum of Comparative Zoology, who died on Feb. 5, 1941, at the age of 89; Ch. Wardell Stiles, Parasitologist and for many years secretary of the International Commission on Zoological Nomenclature, who died on Jan. 24, 1941, at the age of 73; Charles William Leng, Coleopterist, cataloguer, and director of the Public Museum, Staten Island, N. Y., who died on Jan. 25, 1941, at the age of 81; and Clarence P. Gillette, authority on the Aphididæ and director emeritus of the Colorado Agricultural Experiment Station, who died on Jan. 4, 1941, at the age of 81.

Contributors to early California entomology include: Gustavus A. Eisen, early collector in Lower California and one of the persons responsible for the introduction of the Blastophaga into California, who died on Oct. 29, 1941, at the age of 93, and Edward M. Ehrhorn, charter member of the Pacific Coast Entomological Society and one of the pioneers in Plant Quarantine work in San Francisco, who died on Feb. 11, 1941, at the age of 79.—Robert L. Usinger.

NOTES ON THE DISTRIBUTION AND HABITS OF REDUVIID VECTORS OF CHAGAS' DISEASE IN THE SOUTHWESTERN UNITED STATES

(Hemiptera, Reduviidæ)

BY SHERWIN F. WOOD

Los Angeles City College

INTRODUCTION

For the past eight years, the writer has been collecting cone-nosed bugs of the genus *Triatoma* for examination as vectors of Chagas' disease. The observations concerning American human trypanosomiasis have appeared in various journals but most of the data relating to the insects has not been published. Preliminary reports of the early work were published by C. A. Kofoid and Fae Donat (1933), and the final report of the important results of all this early work was published by Fae Donat Wood (1934). Due to the widespread occurrence of naturally infected bugs (Wood, 1941a), it seems advisable to record this information on the occurrence and life history of the insect vectors, including unpublished notes of F. D. Wood.

The writer wishes to acknowledge the very able and generous assistance of Dr. Robert L. Usinger of the University of California at Davis in checking the identity of the various species of insects. Recent observations have been made possible by research grants from the American Medical Association (Fae D. Wood) and the American Association for the Advancement of Science (Sherwin F. Wood). The writer gratefully acknowledges the aid of the American Association which has stimulated the continuance of his research. The writer is deeply appreciative of field notes generously supplied by Dr. Fae D. Wood and of her critical review of the manuscript.

MATERIALS AND METHODS

The following cone-nosed bugs have been collected during field work in the Southwest: *Triatoma protracta* (Uhler), *T. protracta woodi* Usinger, *T. rubida* (Uhler), *T. longipes* Barber, *T. gerstæckeri* Stål, *T. heidemanni* Neiva, *T. sanguisuga* Lec., *T. indictiva* Neiva and *Paratriatoma hirsuta* Barber. All of these bugs, except *longipes*, have been taken from the nests of various species of wood rats (*Neotoma* spp.). They have become known colloquially to the writer by such common names as "bellows bugs, blood-sucking bugs, blood-suckers, suckers, Walapai Tigers (Wali's), cactus bugs, bedbugs, big bedbugs, and Chinese bedbugs."

The materials found necessary for collecting in all kinds of wood rat nests consisted of a long-handled geologist's pick, a shovel, a machete and heavy gloves. The rat nests were partly or completely torn down until all inner grass nests and surrounding twigs had been carefully examined for bugs. Although the bugs were at first collected with forceps, this method proved too clumsy compared with handling with fingers. In order to avoid possible contamination of the hands by feces of infected bugs, they were usually picked up by grasping them sidewise between thumb and finger.

Much field work has been carried out during the hottest parts of the year. At first, many bugs died during transit through the desert. Later, live insects were brought back to the laboratory successfully by protecting them from exposure to sunlight and by keeping them at lower temperatures with improvised water-evaporating coolers. Although this method has not been 100% efficient, it has saved the lives of many bugs carried long distances through the arid Southwest.

In the laboratory, the blood of white rats, *Rattus norvegicus* (Erxleben), has been used as the principal food for the insects. The rats are confined to hardware cloth cylinders of various sizes, depending upon the age of the rat, and then placed in one-half of a 10″ glass moist chamber or a 10″ x 3″ white enameled pan. One must be sure that the rat is blocked properly or it may escape and eat all the bugs. This is accomplished by inserting several wooden sticks behind the animal and binding them to the cylinder with rubber bands. A piece of cheese cloth is stretched over the top of the pan and held securely by one or two large rubber bands while the bugs feed. One can observe the bugs through the cheese cloth or the walls of the moist chamber. Unless it is desired to collect the feces of the bugs, a double strip of paper toweling about 2″ wide is placed underneath the cylinder to absorb the urine of the rat. Otherwise, a close watch must be kept of the bugs, especially small nymphs, or they may drown in the rat's urine. The insects are left with the rat for a few minutes to many hours depending upon their age, nearness of last feeding, and atmospheric temperature.

The insects are stored in straight-sided, pint, one-half pint or smaller glass jars with metal screw tops perforated with many holes small enough to prevent first instar nymphs from escaping. The bottom of each jar has at least two circular pieces of paper

toweling to absorb the feces of the bugs. Inside the jar there is a double thickness of paper toweling folded into pleats one-half to one inch across depending on the size of the jar. The paper extends to within one inch of the top of the jar, which prevents most bugs from reaching the metal top.

When not being fed, the bugs are kept on shelves away from any possible exposure to sunlight. Each jar has one serial number in two places, on the lid and on the pleated paper inside. A record is kept under this number of all data pertaining to these bugs for as long as they exist in the laboratory. Due to the fact that many of these cultures of bugs continue to live for several years, most of the data is from cultures which have died out in the laboratory.

Many types of containers have been used for field work but the most satisfactory one is that described by Wood (1941b).

Insect Vectors of Chagas' Disease

Triatoma protracta (Uhler)

Infected localities: Murray Canyon, near San Diego, San Diego County, Calif.; Eaton Canyon, near Pasadena, Los Angeles County, Calif.; Old Copper Mill Site (6 miles east of Tyrone), and 5 miles east of Tyrone, Grant County, New Mexico.

Uninfected localities: In California: Carroll Canyon, near La Jolla, San Diego County; near Del Mar, San Diego County; Verdugo Woodlands, near Glendale, Los Angeles County; Monrovia Canyon, Los Angeles County; 23 miles west of Victorville, Los Angeles County; Liebre Mountains near Sandbergs, Los Angeles County; Lower Shake Canyon, Los Angeles County; Sepulveda Canyon, Los Angeles County; and Piñon Flats, Riverside County. In Arizona: Six miles southwest of Sedona, Yavapai County; Pinery Canyon, Coronado National Forest, Cochise County; 12 miles southeast of Dos Cabezas, Cochise County; and the Alvarado Mine, near Congress Junction, Yavapai County. In New Mexico: One and five miles south of Silver City, Grant County; Tyrone, Grant County; 9 and 10 miles east of Tyrone, Grant County; and 30 miles southwest of Silver City, Grant County. In Utah: Seven miles north of Kanab, Kane County, and 10, 15, and 16 miles west of St. George, Washington County.

Throughout the southwestern United States, 1211 specimens of *Triatoma protracta* have been collected. Nine hundred and

fifty-seven have been examined of which 196 (20.48%) were found infected with *Trypanosoma cruzi* Chagas. Twelve hundred and five specimens of *protracta* were collected in wood rat (*Neotoma* spp.) nests, five in human dwellings and one in the field at night.

In the areas where only *Triatoma protracta* has been collected, the writer has taken 506 bugs from 158 rat nests, an average of 3.20 bugs per nest. The largest number of bugs from one nest was 85 in a nest at Murray Canyon. From trips in 1932, 1933, 1937, and 1939, a total of 453 *protracta* has been collected from Murray Canyon. One hundred and forty-three (31.56%) of these bugs were infected. In 1937 and 1939, only one out of nine nests from Murray Canyon failed to yield any bugs. Of the eight infested nests, four harbored infected bugs. In 1937, one hundred fifty-two bugs were collected from Eaton Canyon, of which 57 (37.50%) were infected. Rat nest records for the Eaton Canyon *protracta* show that of eleven nests examined, three did not yield any bugs. Of the eight infested nests, only three harbored infected bugs. In 1939, from five and six miles east of Tyrone, 49 bugs were collected of which two or 4.08% were infected with *Trypanosoma cruzi* Chagas. Rat nest records for the infected localities near Tyrone show that of 15 nests examined, six did not harbor any *Triatoma*. Of the nine infested nests, two harbored infected bugs.

Field records of 443 specimens of *Triatoma protracta* examined show that 92 adults, and 83 large, 162 medium, and 106 small nymphs were collected.

Life history: The data here presented are from mixed cultures of adults and nymphs of *Triatoma protracta*. Since the cultures were self-perpetuating, the age of the culture represents a longer period than the actual life cycle of the species. As can be noted above from field records, the cultures usually were started with nymphs.

In twelve cultures of *T. protracta*, maintained in the laboratory for isolation of strains of *Trypanosoma cruzi*, the age of the cultures in days varied from 320 to 1068, the average being 805 days. The number of feedings of the bugs in these cultures varied from five to 27, the average being 14. The average interval between feedings for the 12 cultures was 58 days, the extremes being 37 to 69. The longest interval between feeding which the *Triatoma* survived was 213 days, the average of the longest intervals for the 12 cultures being 155 days. These bugs

were probably large nymphs which fed to capacity at the previous feeding. One isolated adult male from another group of cultures lived 205 days on three feedings.

In another culture, four females produced 83 eggs.

The host mammals collected in nests where *Triatoma protracta* only occurred are *Neotoma fuscipes annectens* Elliot and *N. f. macrotis* Thomas in California, and *Neotoma albigula albigula* Hartley and *N. lepida lepida* Thomas from Utah.

Triatoma protracta woodi Usinger

Infected localities: Near the Chisos Mountains, Brewster County, Texas; 13 miles east of Marathon, Brewster County, Texas; and near Quemado, in the Quemado Valley, Maverick County, Texas.

Uninfected localities: (See Usinger, 1939). In Arizona: Near "Pankeyville," three miles north of the junction of State Highways 14 and 81, on 81, Cochise County; near Congress Junction, Yavapai County; and the Alvarado Mine, near Congress Junction, Yavapai County. In New Mexico: Eleven and 17 miles west of Las Cruces, Dona Ana County; 37 and 51 miles northeast of Carlsbad, Lea County; and two miles north of Socorro, Socorro County. In Texas: Four and 10 miles northwest of Bosque Bonito, Hudspeth County; 32 miles northwest of Pecos, Reeves County; 68 miles south of Marathon, Brewster County; four and 19½ miles east of Eagle Pass, Maverick County; 24 miles south of Laredo, Webb County; and 23 miles south of Catarina, Webb County.

This cone-nosed bug was referred to in a previous publication as a pale castaneous form of *T. protracta* (See Wood and Wood, 1938, p. 210). Throughout the southwestern United States, 489 *Triatoma protracta woodi* have been collected, of which 415 have been examined and 20 (4.81%) found infected with *Trypanosoma cruzi* Chagas. All of the bugs were collected in the nests of wood rats (*Neotoma* spp.).

In the areas where *Triatoma proctracta woodi* only was collected, the writer has taken 433 bugs from 59 rat nests, an average of 7.33 bugs per nest. The largest number of bugs from one nest was 76, from 13 miles east of Marathon. Near the Chisos Mountains, of 23 bugs collected one (4.34%) was infected. This involved the examination of four rat nests, one of which had no *Triatoma.* Thirteen miles east of Marathon, 142 *protracta woodi* were collected of which 18 (12.60%) were

infected. Here, nine rat nests were examined of which one had no *Triatoma.* Of the eight infested nests, five harbored infected bugs. Examination of nine bugs from the Quemado Valley revealed one infected with *Trypanosoma cruzi.*

Field records of 415 *Triatoma protracta woodi* examined show that 56 adults, and 82 large, 160 medium and 117 small nymphs were collected.

Life history: The total number of days for six mixed cultures (adults and nymphs) of *Triatoma protracta woodi* varied from 883 to 1369, the average being 1074. This involved from 10 to 17 feedings, the average being 13.5 feedings. The range of intervals in days between feedings for the six cultures was 58 to 108, the average being 80.5 days. The longest interval that any of the bugs survived was 217 days. The average of the longest intervals of the six cultures was 199 days. In another culture, one of three nymphs was raised from the egg through adulthood in 593 days on 15 feedings. The longest feeding interval this male *T. p. woodi* survived as a nymph was 129 days.

One isolated female produced 21 fertile eggs. This same female lived 202 days on five feedings. One male in another culture lived 94 days on two feedings. Another male lived 205 days on two feedings.

The host mammal collected in New Mexico from nests in which only *T. p. woodi* was found is *Neotoma albigula albigula* Hartley.

Triatoma rubida (Uhler)

Infected localities: Alvarado Mine, near Congress Junction, Yavapai County, Arizona, and Sanderson, Terrell County, Texas.

Uninfected localities: In California: Along Palms to Pines Highway, near Cathedral City, Riverside County. In Arizona: Broadway and Craycroft Avenue, Tucson, Pima County; near "Pankeyville," three miles north of the junction of State Highways 14 and 81, on 81, Cochise County; six miles southwest of Sedona, Yavapai County; Sullivan Mine, near Congress, Yavapai County; Congress Junction and vicinity, Yavapai County; and five miles west of Wickenberg, Maricopa County. In New Mexico: Eleven and 17 miles west of Las Cruces, Dona Ana County, and 30 miles southwest of Silver City, Grant County.

This cone-nosed bug was previously referred to by us (Wood and Wood, 1938, p. 210) as *Eutriatoma* (*Triatoma*) *uhleri*

(Neiva). Throughout the southwestern United States, 771 specimens of *Triatoma rubida* have been collected or sent to the writer, of which 230 have been examined and three (1.30%) found infected with *Trypanosoma cruzi* Chagas. One hundred seventy-six were collected in wood rat (*Neotoma* spp.) nests and 595 were collected in or on houses and tents.

In the areas where only *Triatoma rubida* was found, the writer has taken 19 bugs from 24 rat nests. The largest number taken from one nest was 16 near Congress Junction. Of the 135 *rubida* examined during 1939 and 1940 from the Alvarado Mine, 78 came from rat nests and 57 from the inside or outside of houses or tents. The only infected specimen was one of 78 bugs collected from 32 rat nests of which 14 did not yield any bugs. Of five female *rubida* received from a house in Sanderson, Texas, two females were infected with *Trypanosoma cruzi.*

Field records of 230 *Triatoma rubida* examined show that 87 adults, and 32 large, 86 medium, and 25 small nymphs were collected.

Life history: One laboratory culture started from a group of eggs laid by bugs collected six miles southwest of Sedona, Yavapai County, Arizona, was maintained for 1014 days. The total number of feedings was 26. The average interval between feedings was 38 days while the longest interval that one large nymph survived was 154 days. At the tenth feeding, there were 22 nymphs. At the twenty-sixth and last feeding, there was one large nymph. One nymph was fatally injured with forceps and five were eaten by the rats. Four nymphs were found dead at 685 days, one was found dead at 777 days, one at 958 days and one large nymph survived 1014 days but was too weak to feed. Nine nymphs completed metamorphosis. The life span of these adults (five males, four females) from first instar nymphs to death varied from 691 to 833 days on 20 and 21 feedings.

An isolated female *T. rubida* lived 58 days on two feedings and deposited 61 fertile eggs. In another culture, three females deposited 129 eggs. In a different culture, two females collected as adults lived 63 days on four feedings and deposited 87 eggs. Another isolated female lived 59 days on two feedings and deposited 38 eggs. In another culture, one female lived 49 days on three feedings while a second female lived 63 days on three feedings.

During the early evening of May 30, 1940, the writer observed *Triatoma rubida* and *T. longipes* in flight at the Alvarado

Mine in Arizona. As soon as it became dark, close watch was kept of our tent walls, and the window screens of one miner's house. Usually, the noise of the insect as it flew by or hit the screen or tent wall attracted our attention. They seemed to come down canyon with the warm wind. The writer projected a flashlight beam into the air at about a 45° angle and *Triatoma* could be spotted as they flew across this light beam. Sixteen adults (12 *rubida*, 4 *longipes*) were collected on this night. The following night, 29 adults (26 *rubida*, 3 *longipes*) were collected. On both occasions, bugs were prevalent in the early evening. About 9:30 p. m. the wind became cool and the *Triatoma* no longer could be found, although the next morning several were collected inside the tent.

The host mammal taken in nests in Arizona where only *Triatoma rubida* were collected was *Neotoma albigula albigula* Hartley.

Triatoma longipes Barber

The only locality where the writer has collected this bug is the Alvarado Mine, near Congress Junction, Yavapai County, Arizona. From this area, the writer has collected or received for examination during 1939 and 1940, 152 *Triatoma longipes* of which 62 were examined and 10 (16.12%) found infected with *Trypanosoma cruzi* Chagas. One hundred forty-eight were collected in or on houses or tents, two were taken on sleeping bags, one was found in a mine shaft near the entrance and one was collected under a large rock slab of a big boulder.

Field records of 62 *Triatoma longipes* examined show that 59 adults and three large nymphs were collected.

Life history: One culture of 12 adult *Triatoma longipes* (four females, 8 males) was maintained for 85 days at which time four adults (three males, one female) were still alive. This was during summer weather in a reinforced concrete building. The number of feedings was seven and the feeding interval averaged 11 days with 19 days as the longest interval between feedings. One of the males in this culture lived 23 days, another male and three females lived 34 days whereas three males and one female lived longer than 85 days.

In another culture, one male lived 111 days on five feedings. One female of a different culture lived 75 days on four feedings. This same female, the only one in the culture, deposited 157 eggs.

Triatoma gerstæckeri (Stål)

Infected localities: Quemado Valley, near Quemado, Maverick County, Texas, and 25 miles northwest of Hondo, Medina County, Texas.

Uninfected localities: Five and one-half miles north of Salineno, Starr County; two and six-tenths miles south of Faysville, Cameron County; two miles south of Faysville, Hidalgo County; five and five-tenths miles east of Benavides, Duval County; one mile west of Realitos, Duval County; four miles east and nine miles west of Aguilares, Webb County; two miles west of Webb, Webb County; 23 miles south of Catarina, Webb County; two miles south of Asherton, Dimmit County; and Sanderson, Terrell County, all in Texas.

Fifty-five *Triatoma gerstæckeri* were received or collected of which 54 were examined and three (5.55%) found infected with *Trypanosoma cruzi* Chagas. Fifty-two of these bugs came from wood rat (*Neotoma* spp.) nests and three came from houses.

In areas where only *gerstæckeri* was found, the writer collected 14 bugs from 18 wood rat nests. The largest number collected from any one nest was 13 in a nest 5.5 miles east of Benavides. Two large nymphs from the Quemado Valley and one female received from a house 25 miles northwest of Hondo were found infected with *Trypanosoma cruzi.* Of 12 wood rat nests examined in the Quemado Valley, only two harbored bugs and one of these contained the infected nymphs.

Field records of 54 *Triatoma gerstæckeri* examined show that three adults, and 22 large, 15 medium and 14 small nymphs were collected.

Life history: One laboratory-raised female lived 119 days on five feedings. In another culture, a male lived 53 days on two feedings, while another male lived 119 days on five feedings. In a different culture, one female collected in the field lived 40 days in the laboratory on one feeding.

Triatoma heidemanni Neiva

Uninfected localities: Twenty-three miles south of Catarina, Webb County, Texas, and two miles south of Asherton, Dimmit County, Texas.

Thirteen *Triatoma heidemanni* were collected in wood rat nests. All were examined and found to be negative for *Trypanosoma cruzi.* There were two adults (one male, one female), and eight medium and three small nymphs.

Life history: In a laboratory culture, one male lived 71 days on four feedings at intervals of 14, 7 and 18 days while another male lived 228 days on nine feedings at intervals of 7, 18, 29, 40, 14, 46, 21 and 14 days.

Triatoma sanguisuga Leconte

Uninfected localities: Five and five-tenths miles east of Benavides, Duval County, Texas; one mile west of Realitos, Duval County, Texas; and four miles east of Aguilares, Webb County, Texas.

Ten *Triatoma sanguisuga* were collected in wood rat nests. All were found negative upon examination. There was one adult female, and seven medium and two small nymphs.

Life history: In one laboratory culture, a female lived 155 days on four feedings at intervals of 64, 20 and 13 days.

Triatoma indictiva Neiva

Uninfected localities: 5.5 miles east of Benavides, Duval County, Texas, and "The Pines," Tyrone, Grant County, New Mexico.

Four medium-sized nymphs of *Triatoma indictiva* were collected in wood rat (*Neotoma* spp.) nests.

Life history: One female *Triatoma indictiva* from near Benavides lived 257 days on 9 feedings. The longest interval between feedings was 46 days, the average being 25 days. Two females from Tyrone lived 15 days after completing metamorphosis during the summer. Another male from Tyrone lived 47 days after feeding on a large nymph of *Triatoma protracta* which had recently fed. This is the first instance of cannibalism ever seen in the cultures. The large nymph of *protracta* seemed annoyed by the contact but the *indictiva* followed it wherever it went, keeping its proboscis tip in contact with the underside of the abdomen and evidently continued feeding. In a few minutes, the bugs were separated and the wing tips of the *indictiva* were well elevated above the end of its abdomen which was partly distended. The *T. protracta* nymph was not noticeably deflated even after the feeding of the *indictiva*, but there was less tension on the skin of its abdomen. On the abdomen, at the point of contact with the proboscis, there was a small droplet of clear fluid after the *indictiva* had moved away.

(To be continued in next number)

THE OVIPOSITION OF CONOPID FLIES UPON SMALLER ANDRENID BEES

BY G. E. BOHART

University of California, Davis

The following observations were made at Berkeley, California, in February, 1937 and 1938. A species of conopid fly, *Myopa rubida* Bigot, was seen to oviposit in several species of andrenid bees. In one instance an *Andrena complexa* Viereck was crowded from a blossom of *Ranunculus californicus* Benth. by one of these parasites which then followed directly behind the bee and seized it in flight at a distance of two or three yards from the flower. The fly grasped the bee's thorax and carried the bee in a straight line for about twenty feet, then released hold and flew away. At this point the fly was captured and ascertained to be a female. Since the bee escaped, the exact placement of the egg was not determined. The same procedure was observed nearby on a *Brassica campestris* Linn. blossom with an undescribed black *Andrena.*

The following year several conopids were found pursuing *Andrena* of different species around the branches of blooming *Salix* trees. In all cases the conopid followed the intricate flight path of its quarry before capturing it. An *Andrena pallidiscopa* Viereck was captured together with its parasite but examination revealed that oviposition had not yet been accomplished.

Published observations on the oviposition of conopids have generally been confined to that upon larger insects, such as *Bremus* and *Vespula*,[1] or *Bembix*.[2] The remarkable feature of the attack upon *Andrena* is the usual size discrepancy in favor of the parasite. The *Andrena complexa* observed was not more than half the size of its aggressor and a smaller but still noticeable size difference occurred between *Andrena pallidiscopa* Viereck and its parasite. The larvæ of these flies must find enough food in the abdomens of their adult hosts to complete development. Such a ratio of size of parasite to size of prey is exactly the opposite of the condition usually found in insects.

Three possible explanations of this condition are discussed below. First, there must be a very complete utilization of the abdominal contents of the bee. A dead *Andrena* containing a

[1] Meijere, V. C. 1903. Beitrag zur Kenntniss der Biologie und der Systematischen verwandtschaft der Conopiden. Tijdsch. voor Ent. 46:144-225.

[2] Bohart, G. E. and J. W. MacSwain. 1939. The life history of the sand wasp, *Bembix occidentalis beutenmuelleri* Fox and its parasites. Bull. South. Calif. Acad. Sci. 38:84-98.

conopid puparium has its greatly distended abdomen completely filled by the parasite. In addition, nectar taken by the bee is probably absorbed by the larva. This might even cause an increase in the appetite of the bee. Second, a conopid undergoes considerable expansion after emergence. This can be demonstrated by comparing the small, shriveled appearing pupa of *Myopa* taken from its puparium with a fully developed and expanded adult. Hence it seems logical to suppose that the parasite has a lower specific gravity than its host. Third, there is a great variation in the size of adult conopids of the same species. This may amount to a doubling in size of the largest example over that of the smallest. Inasmuch as these flies are not host specific, we may postulate that large specimens developed in large *Andrena* while small conopids developed in small host species, regardless of the size of their parents.

Winter Insect Collecting in Mexico

The results of two weeks' collecting by H. Welsh, Thurman Crawford and the authors in Mexico, starting December 23, 1940 indicated that at this season general insect collecting is very profitable in the more humid areas. Along the route covered from Laredo, Texas, to Mexico City and east to Vera Cruz, good collecting was encountered almost anywhere in the territory south of Valles and east of the Sierra Madre Orientale. On the mountain slopes and in the canyons, especially west of Tamuzunchale where the Pan-American highway ascends to the Mexican Plateau and in the Orizaba Valley near Cordoba, many plants were in bloom and conditions were ideal for all sorts of flying insects. In the lowland forests, night beating for leaf-feeding insects, sweeping for shade-dwelling Diptera, and pulling apart rotten wood for fungous feeders was usually successful.

In the semi-arid region north of Valles, which enjoys a wet season in the summer and early fall, conditions were too dry for most orders of insects. However, in spite of the lack of flowers and fresh vegetation, butterflies were very abundant in this area. Similarly, the high arid country of the Mexican Plateau and the upland coniferous forests bordering it were too dried out even though the weather was sufficiently warm for flying insects.

Since nights were cool everywhere, collecting by lantern was limited mainly to insects feeding or resting nearby.—G. E. Bohart and N. Stahler.

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CONTENTS

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THOMAS DE GREY, D.L., F.R.S., F.E.S., etc., Sixth Baron Walsingham (1843-1919), a lepidopterist of note and one of the greatest figures in the history of shooting in the British Empire. (From his book "Hit or Miss" by Phillip Allan.)

The Pan-Pacific Entomologist

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ITINERARY OF LORD WALSINGHAM IN CALIFORNIA AND OREGON, 1871—1872

BY E. O. ESSIG

University of California, Berkeley

Lord Walsingham is a name familiar to entomologists throughout much of the world. It is a very honored one in England where his Lordship lived. How it became important to entomology in North America and particularly to the Pacific coast is the purpose of this sketch. But before beginning our narrative, it might be well to briefly sketch his interesting career before he came to travel in this country in the years 1871 and 1872. He was educated at Eaton and Trinity College, Cambridge University, and had just finished a five-year term as Conservative M. P. for West Norfolk. He was at the time a member of the Entomological Society of London and a Trustee of the great British Museum. He had traveled extensively in the Old World and already had gained a reputation as an authority on the Microlepidoptera or smaller moths. He was but little known in eastern United States and was wholly a stranger to the Pacific coast. Here he had come for the express purpose of collecting moths to add to his collections. He was very successful in his quest and returned home with a large number of specimens most of which he later described as new species from California and Oregon. Unfamiliar as he was in a relatively wild country, he was unable to give very accurate and detailed locality records for many of these western moths, and American entomologists who have studied his species have at times wished for more exact information concerning the localities from which they may have been taken.

Knowing that he had presented his magnificent collection of 50,000 specimens of Microlepidoptera to the British Museum of Natural History in 1910, I sought some information regarding his activities in western North America while I was engaged in research work at the Museum during the winter and spring of 1937. Fortunately, it was possible to consult with Mr. H. Stringer,

formerly associated with Lord Walsingham and then one of the keepers of the Walsingham collections. Among other things he showed me the diaries kept by Lord Walsingham and his esquarry, Amos Carrier. These diaries seemed to be of so much interest and importance to American zoölogists and especially to microlepidopterists that I asked permission to copy them. This was granted and longhand copies were made which are reproduced in this article.

These extracts are published by permission of the Trustees of the British Museum with the consent of the present Lord Walsingham.

In the late summer of 1871 the sixth Baron Walsingham arrived in San Francisco from England with an entourage for the purpose of exploring certain parts of northern California and Oregon for the collection of entomological and other zoölogical specimens to add to his large collections in Norfolk, England. He and his party had crossed the Atlantic by boat and traversed the United States via the newly constructed continental railway. They planned to continue by horseback and horse-drawn vehicles. In addition to his Lordship the party included Thomas Eedle, Amos Carrier, groom and author of the Carrier diary, Cater, Hiram Monts, Thomas Morton, trapper from Portuguese Flats, California, and Charley Morton, his son. The equipage consisted of saddle horses for riding and mules and wagon to haul provisions and equipment through the sparsely settled and wilderness areas through which the party was to pass. It appears that Lord Walsingham, probably accompanied by Thos. Eedle, left San Francisco on Friday, May 17, 1871, by train to Petaluma where they joined Amos Carrier and the equipage which were transported by boat. There are some discrepancies in the two diaries, but I am giving them just as they were written by Walsingham and Carrier. The accompanying maps, traced from the originals, give the locations of the camps by number as indicated in the text. Interpolations and additions by me are in brackets.

Unfortunately so far I have been unable to secure any information concerning the equipage of this expedition and very little other information has been available. The arrival of Lord Walsingham in San Francisco created little comment in the local press. However, the following items from San Francisco papers are worthy of note.

DAILY EVENING BULLETIN, vol. 32, Wednesday Evening, May 17, 1871[1].

"*Earl de Grey's Invitation*—The invitation to the recent reception of Earl de Grey, at Washington, consisted of a small card, with merely the words written upon it, 'Earl de Grey, at Home, Saturday, April 22, 9 P. M.' These a fellow carried around on horseback in a basket and we are having a violent discussion in town as to whether this originated in Earl de Grey's contempt for America socially, or whether it really is the nobby way, to be initiated by all hereafter. We have heard of cards at weddings before, but we never heard of no envelopes to the huge size pasteboard, and the gorgeous envelope this aristocratic Earl has dispensed with. I think it a good thing myself and could be further innovated on if the fellow on horseback would just take a list of the guests, and then ride up to the door of each, and give a yell like the charcoal man and milk fellow: it would be very simple, straightforward and democratic, and then it would have the further advantage of letting all your neighbors know that you have been invited out.—Donn Piatt."

SAN FRANCISCO NEWS LETTER AND ADVERTISER—May 13, 1871, p. 13.

"*Entomological.* Lord Walsingham and his associate savants will be received on their arrival in San Francisco by the California Lepidoptera Society, of which Dr. Behr, Dr. Behrens, Harry Edwards, and Julius Quinchard are the most distinguished members. Dr. Behr has a very large and valuable collection of the lepidoptera, embracing rare specimens from every part of the globe. Harry Edwards is also the owner of an extensive collection, both of which will, no doubt, be inspected by the British entomologist."

SAN FRANCISCO NEWS LETTER AND ADVERTISER—May 13, 1871, p. 8.

"When the Party of British entomologists shall arrive on their scientific mission for the inspection and classification of our California 'bugs,' it is to be hoped that they will take an early opportunity to move one of our San Francisco Jenkinses of the 'Society Gossip' variety under the microscope."

SAN FRANCISCO NEWS LETTER AND CALIFORNIA ADVERTISER—May 27, 1871, p. 9.

The Town Crier

"Lord Walsingham, an accomplished bug sharp, is in California making a collection of insects and reptiles. He has already found a great number of nice little toadies."

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[1] This is the day Earl de Grey left San Francisco on his tour through Northern California and Oregon. Apparently the Bulletin Staff did not know he was in town since I found no mention of him in that paper.

DAILY ALTA CALIFORNIA, Vol. XXIII, Saturday Morning, May 13, 1871.

Arrivals from England

"Lord Walsingham, a savant, whose careful studies in natural history have made him distinguished among scientific men of England, Lord Walter Campbell, the Hon. Mr. Laird, the Hon. M. Chaplin, and Mr. A. De Laski arrived overland last evening [Friday, May 12, 1871] and are stopping at the Grand Hotel."

WALSINGHAM DIARY	CARRIER DIARY
13. V. 1871. San Francisco—collected a few species at Rock Cliff House near San Francisco among growth of lupin and other shrubby plants on sand.	
17. V. 1871. San Francisco—off at 1 via Petaluma (American Hotel).	17. V. 71 (Th.). [Thursday, May 17, 1871].[2] Left San Francisco and sailed to Petaluma [taking wagon, animals, supplies, and equipment].
18. V. 1871. Collected near Petaluma 6 a. m. *Gelechia* very abundant. 3 specimens set. Plume allied to *teucrii*—1 specimen. On way to Santa Rosa—*Bucculatrix* . . . cocoons abundant on wide-leaved evergreen oak [*Quercus agrifolia* Nee]. *Halias* (?) on same oak. *Lithocolletis, Tinea* (black sp.), *Laverna* ?? (a small sp.), *Phyllocnistis?* one pupa.	
Camp 1. 18. V. 1871. Four miles south of Santa Rosa (13 miles from Petaluma). Shot 1 yellow lark, 1 woodspeck, 1 nuthatch, 2 doves, 1 thrush (brown breast). Killed small snake.	
Camp 2. 19. V. 1871. Russian River. Up early — shot 2 woods-pecks. Saw California quail. Start to pass Santa Rosa and get on as far as may be to good camp. Got a few things on road to Camp 2. Took *Bucculatrix* sp. common among plant pressed (labelled Camp 2. Bucc.).	19. V. 71 (F.). Camped near Santa Rosa.

[2] Explanatory notes in brackets by E. O. Essig.

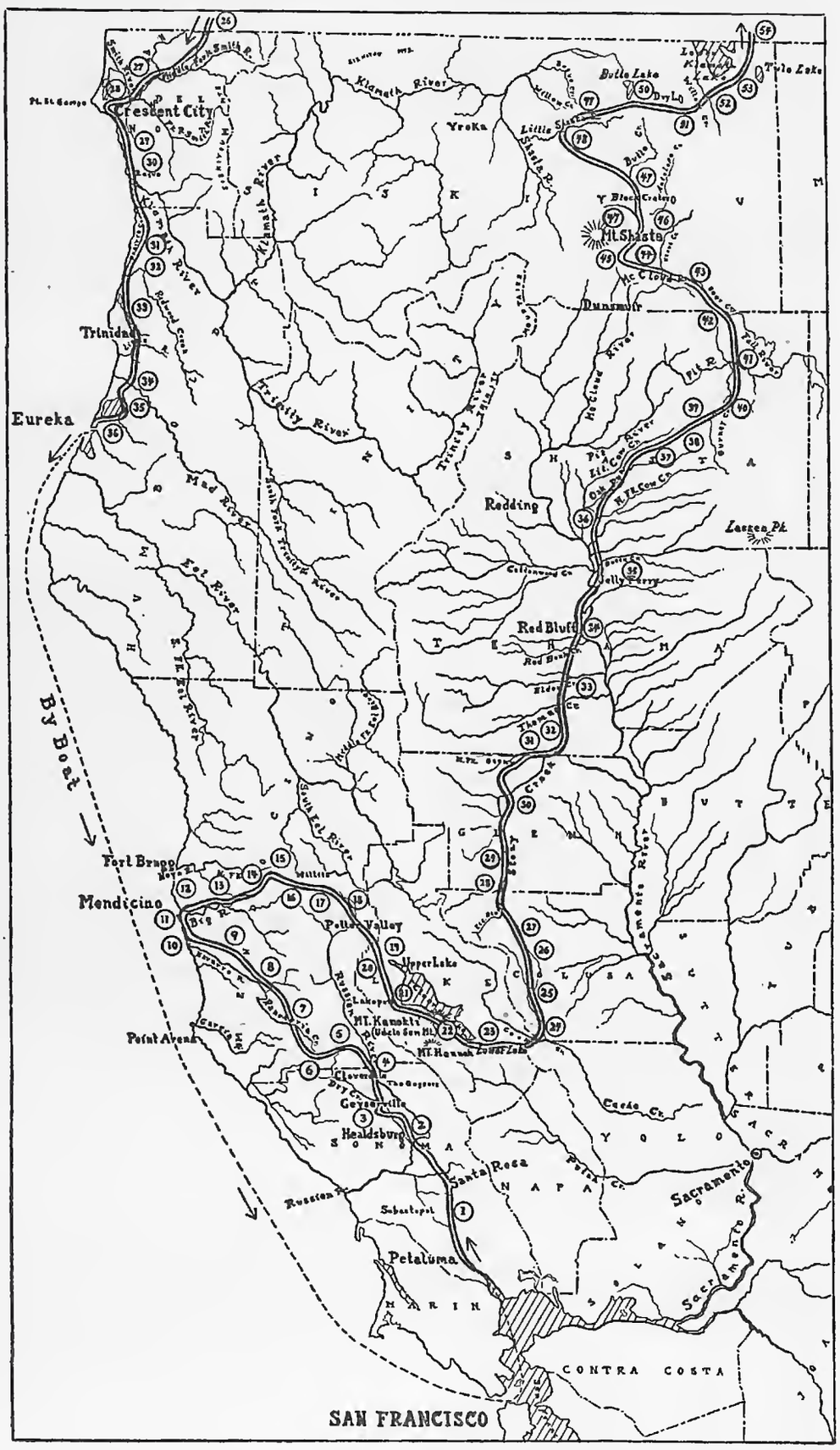

Figure 1. Itinerary of the Walsingham party through California, 1871-1872.

Coleophora cases on leaves of bush (labelled Camp No. 2. Col.). Took a number of insects and some birds—killed but lost a humming bird. Killed dotterel, hawks, woodpeckers, etc., etc.

Camp 3. Dry Creek. 20-21. V. 1871. Shot several birds by road. Mis-directed to Geyser Springs and made a turn left instead of right. Found good camp and collecting ground. Stayed over Sunday. Shot a humming bird. They are easy to see—hard to shoot—hard to pick up—easy to miss.
21. V. 1871. Sunday. Windy, no collecting.
20-21, 1871. (S.-S.). Camped over Sunday.
22-23. V. 1871. Sonoma County, Cal. Off towards Cloverdale, but wishing to see the Geyser Springs on the way, sent the waggon on with Eedle and Carrier to camp past Cloverdale, while Cater and I, with net, pill-boxes and pistols only, rode over 15 or 20 miles by the old road from Geyserville to the springs—the most beautiful scenery I ever saw, but a road which would have been simply destructive to the waggon. Many moths flying, boxed a few including a good *Hyponomeuta*. Arrived at hotel and saw geyser — regular tourist haunt puffed by a penny peep-show—sort of a German landlord. Guide talked a good deal about the devil!

Camp 4. Near Pluton Creek [Pluto Creek].
22-3. V. 1871. Walsingham & Eedle.
23. V. 1871. Off at 5:30 by trail toward Cloverdale—trail mighty weak—lost it very often and wandered up and down enormous hills—in one place found a X for a sign-post marked with a "To the Geysers. Excuse twist—new road." It was a *twist* with a vengeance and as hard a bit of riding as I ever

22. V. 71. (M.). Left Healdsburg early on Monday morning. Travelled through Cloverdale—wanted bread, could not get any nor potatoes—travelled a long way before we could find a place to camp. Found a place at last with beautiful water—but no grass for the mules—one of the mules fell into the brook in the night—great trouble to get out. Carrier and Eedle camped alone. Lord Walsingham and Cater gone back to Geysers—are to pick us up today if possible. 23. V. 71 (Tu.).

did. If the pony slipped, no chance. I walked and drove my pony before me the greater part of the way. A good evening's work at collecting.

Camp 5. Head of Dry Creek. 24. V. 1871. Mendocino Co., California. Went on today to Camp No. 5 on the same Dry Creek as No. 3—near the head of it on the road from Cloverdale to Mendocino. *Adela* . . . took 2 or 3 on way and at camp.

24. V. 71. (W.). Caught large snake.

Camp 6. Small river (west of Divide—? running into Navarro River). South Mendocino Co. Cal. 25. V. 1871. On again, a short march after a long morning's setting. Reached a camp (Camp 6) on a small river running towards the Pacific showing that we crossed the divide. Under the edge of the big trees (*Taxodium sempervirens* [*Sequoia*]—a bad collecting camp. Saw a skunk—heeled a stone at him—didn't he stink! Saw a very large red and black woodpecker.

25. V. 71. (Th.). Camped beside river—Creek (dry).

Camp 7. Rancheria Creek (Navarro River). Mendocino Co. 26. V. 1871. On again to Camp 7 on Navarro River—15 miles march—rough road. Lots of quail, hares, and tracks of deer. Several humming birds, shot three. Saw black and white kingfisher. Beautiful collecting ground, but wet weather, and only took 2 Arctiæ, one or two Plumes and some few odds and ends.

Camp 8. In redwoods near Navarro River. Mendocino Co., Cal. 27-28. V. 1871. Marched on right into the big redwoods (*Taxodium sempervirens*) enormous trees about 180 feet high I guess, miles and miles of this. Camp in middle of redwoods where we are about 13 miles from the forest end and from the coast.

27-28. V. 71. (S.-S.). Camped in the middle of large forest—14 miles to go before we get out tomorrow—no moths to be caught—frogs very noisy.

28. V. 1871. Whit Sunday! Stopped in camp—a most uncomfortable camp on side of hill. No birds except humming birds and no insects to speak of.

28. V. 71. Whit Sunday. Could not travel—very heavy rain. Very large trees. Guide rode his horse into one tree which was hollow and turned around —thought we had lost him! Expect to reach the Pacific Ocean at Mendocino.

Camp 9. Clearing in redwoods near Navarro River. Mendocino Co., Cal. 29. V. 1871. Shot three humming birds. On towards Mendocino. Went out for deer early—saw a hind and calf—no shot. Road fearfully bad and hilly, slow progress, reached within three miles of coast and camped at a log clearing. Saw a big tree cut. Caught a small ————?? *Cerostoma* sp. white—smaller than the last species ghost moth—6 spms.

29. V. 71. (M.). Started for Mendocino—got stuck fast with waggon and mules—had to wait till Lord Walsingham and Cater came to help out. Still in forest—large tree on fire.

Camp 10. Mouth of Albion River. Mendocino Co., Cal. 30-31. V. 1871.
30 V. 1871. Marched to Albion River and camped at mouth. Cold, most disappointing country, very few insects and chiefly European species. Lots of different flowers on side hill.

30. V. 71. (Tu.). Mouth of Albion River. Very large tree falling.

31. V. 1871. Camp again same place.

31. V. 71. (W.). Camp close to Pacific Ocean—7 miles from Mendocino City—stayed two nights—large number of Indians on roadside.

Camp 11. One mile south of Mendocino City. Mendocino Co., Cal. 1-2. VI. 1871. 1. VI. 1871. Moved towards Mendocino—camped a mile south of it. 2. VI. 1871. Shot a sea-lion on outlying rocks; had to swim over with a rope to tug him ashore—boiling down oil for lamps and skinning sea-lion made us camp here again. Cirisium? (=761 larvæ notes No. 20). (=761 S) bred a *Cirisium Bucculatrix*. (=7660 S) bred some *Bucculatrix* from evergreen oak near Petaluma. D. Evergreen oak nr. Santa Rosa. 18. V. 71. excl. 2. VI. 1871.

1-2. VI. 71. (Th.-F.). One mile south of Mendocino City. Lord Walsingham shot large sea-lion. Carrier swam out to rock some distance off to get him. Made a great deal of oil for lamp from sea-lion.

Camp 12. North of Mendocino City (close to town). Mendocino Co., Cal. 3-5. VI. 1871.

3. VI. 1871. Moved to camp 12 on the north side of Mendocino, close to town. Boiling down bones of sea-lion for skeleton.

4. VI. 1871. Same camp (12) —saw three bears—no rifle!
5. VI. 1871. Same camp (12) —went after bears—found them but got no shot.

Camp 13. South of Noyo River (near deserted hut in woods) 10 mi. from Mendocino City —in forest. Mendocino Co.
6. VI. 1871. On to Camp 13 near deserted hut in woods. Woods on fire—much smoke —trees falling at distance.

Camp 14. North Fork of Big River = Rio Grande. Mendocino Co.
7. VI. 1871. On to Camp 14, on head of Big River. Shot a water ousel.

Camp 15. Head of Noyo River (5 miles south of Little Lake [near Willits]. Mendocino Co., Cal. 8-11. VI. 1871. On to Camp 15 on ridge of hill 5 miles south of Little Lake. Saw two deer—good collecting ground, several new species.

9. VI. 1871. Same camp (15) —hunt.

10. VI. 1871. Same camp (15)—hunt with Frost and Spanish George. Lots of good moths.

11. VI. 1871. Same camp (15)—shot two deer. Collected some mines taking up the whole plant on which they were . . ., bred . . . (genus?) on June 17th. Collected and set at this camp 400 specimens many new.

Camp 16. Little Lake road—past Little Lake.
12. VI. 1871. Took several moths. (*Coleophora* sp.) two

3-5. VI. 1871. (S.-S.). North of Mendocino City (close to town).

3. VI. 1871 (S.). Finished making oil (3 gallons) from sea-lion—packed up and travelled through Mendocino City. Found nice camp and stayed over Sunday.

4-5. VI. 71. (S.-M.). Sunday very nice day. Monday same place—very warm.

6. VI. 71. (Tu.). 10 miles from Mendocino—in forest.

7. VI. 71. (W.)—head Big River.

8. VI. 71. (Th.). 5 miles from Little Lake on top of mountain. Saw deer—had long way to go for water—one spring dried up—Lord Walsingham caught a great many moths.

9. VI. 71. (F.). Very hot day. Camp same place.

10. VI. 71. (S). Still very hot. Same place.

11. VI. 71. (S.). Lord Walsingham shot two small deer—dogs and men had good chase.

12. VI. 71. (M.). Four miles from Little Lake — found pretty snake and a nice camp —not much water.

sorts on dandelion and sunflower plants. Cocoons (long white) of *Tortrix* on some plants. Cocoon of *Cerostoma* on blue flower. Mines of larvæ on dandelion.

Camp 17. 13. VI. 1871. Camp No. 17. Short of Potter's Valley (above Potter's Valley) [Potter Valley].

13. VI. 71. (Tu.). Cold Creek Canyon — three miles from Potter's Valley.

Camp 18. 14. VI. 1871. Camp No. 18. Cold Creek Cañon—Potter's Valley.

14. VI. 71. (W.). Potter's Vale [Potter Valley]—caught small trout—had them for breakfast on Thursday. Travelled through beautiful valley to Blue Lake.

Camp 19. Blue Lake. 15-16. VI. 1871. Bred *Lithocolletes*. Bred *Depressaria* . . . (lost).

15-17. VI. 71. (Th.-S.). Same place.

Camp 20. 17. VI. 1871. On to Camp 20, Scott's Valley—5 miles north of Clear Lake—fair collecting camp—some wet ground and much dry. One small rattlesnake. Ants innumerable—many hares.

18. VI. 71. (S.). Scott's Valley.

19. VI. 1871. Camp No. 20. Found bird, skins all, or nearly all, spoilt by maggots —fat on arsenical soap! Moral—use alum and thoroughly dry skins before. This has been a very good collecting camp.

19. VI. 71. (M.). Same place. Carrier caught beautiful snake, brown and white. Very hot. Lord Walsingham caught a great many moths. A pleasant Sunday was spent by all.

Camp 21. Lakeport. 20. VI. 1871. on to camp 21. Lakeport. No moths. Several nice birds—one nest of shrike—9 eggs of tortoise.

20. VI. 71. (Tu.). Clear Lake.

Camp 22. Uncle Sam Mountain [Mount Konocti]. 21. VI. 1871. On to Camp 22—half way to Lower Lake—Uncle Sam Mt. No moths.

21. VI. 71 (W.). Travelled through Lake Port—got provisions to last till arrive at next place, which probably will be Fort Crook. Weather very hot. Uncle Sam Mountain. Carrier very ill.

Camp 23. Lower Lake (Cash Creek) [Cache Creek]. 22. VI. 1871. Fish in Cash Creek. 23. VI. 1871. Camp 23—caught 4 nice fish (largest about 4 lbs.) probably allied to Barbel—*grandis*? [Sucker]

22-23. VI. 71. (Th.-F.). Cash Creek.

Camp 24. South-west Colusa Co. North Fork Cache Creek. 24-25-VI. 1871.	24. VI. 71. (S.). North Fork Cash Creek. No moths on wing.
	25. VI. 71. (S.). Same place—close to Indian's grave, where one was burned and buried. Carrier picked up some beads which were burned with the Indian.
Camp 25. Phip's Place. 26. VI. 1871.	26. VI. 71. (M.). Camp not known.
Camp 26. Bear Valley [Southwestern Colusa County]. 27. VI. 1871.	27. VI. 71. (Tu.). Bare [Bear] Valley.
Camp 27. Three miles from Indian Valley.	28. VI. 71. (W.). Three miles from Indian Valley.
Camp 28. Deserted Ranch (S. of South Fork of Stony Creek). 29. VI. 1871.	29. VI. 71. Indian Valley [Indian Valley crosses the boundary between Lake and Colusa counties near the middle].
Camp 29. South Fork of Stony Creek. 30. VI.-3. VII. 1871.	30. VI. 71. (F.). Stony Creek. 1. VII. 71. (S) Same place. Some very nice fish caught. 2. VII. 71. (S.) Same place. 3. VII. 71. (M.). Same place. Carrier very ill—burnt very much by sun.
Camp 30. Near South Fork of Stony Creek. 4. VII. 1871.	4. VII. 71. (Tu.) North Fork of Stony Creek.
Camp 31. Newville. 5. VII. 1871. [Newville was located on the boundary between Colusa—now Glenn and Tehama counties.]	5. VII. 71. (W.). Newwall [Newville]—found camp late at night.
Camp 32. North Fork of Stony Creek. 6-7. VII. 1871.	6. VII. 71. (Th.). Main and North Fork of Stony Creek.
Camp 33. Thomas Creek.	7. VII. 71. (F.) Thomas' Creek [Thomas Creek].
Camp 34. Red Bluff. 8. VII. 1871.	8. VII. 71. (S.). Red Bluff. Lord Walsingham bought Carrier a new hat for 4½ dollars.
Camp 35. Jelly Ferry.	9. VII. 71. (S.). Jelley's Ferry [Jelly Ferry, across the Sacramento River].
Camp 36. Millville. 5. VII. 1871.	10. VII. 71. (M.). Millville.
Camp 37. Cow Springs (=Hummingbird Springs).	11-12. VII. 71. (Tu.-W.). Camp not known.

Camp 38. Cedar Creek. 13. VII. 1871. [Near Silver City].

13. VII. 71. (Th.). Cedar Creek.

Camp 39. Hatchet Creek [Fork of Pit River]. 14-17. VII. 1871.

14. VII. 71. (F.). Hatchet Creek. Carrier caught some fine trout. Numbers of moth on wing.

15-16. VII. 71 (S.-S.). Same place. Carrier stung by mosquito in the night—woke up in morning with one eye quite blind—a large rattlesnake killed.

17. VII. 71. (M.). Same place.

Camp 40. Burney Falls. 18-20. VII. 1871.

18. VII. 71. (Tu.). Burney Creek.

19. VII. 71. (W.). Same place. Lord Walsingham caught large salmon. Carrier caught some trout. Baked some bread in frying pan which was rather heavy—all of us were well filled out after dinner.

20. VII. 71. (Th.).

Camp 41. Pitt [Pit] River (=Upper Sacramento River). 21-26. VII. 1871.

21. VII. 71. (F.). Pit River—numbers of Indians fishing with spears.

22. VII. 71. (S.). Same place. Some beautiful trout caught by Lord Walsingham.

23. VII. 71. (S.). Same place.

24. VII. 71. (M.). Same place. Cater shot new woodpecker.

25. VII. 71. (Tu.). Same place. Lord Walsingham caught six salmon trout weight about 20 lbs.

26. VII. 71. (W.) Same place.

Camp 42. Bear Creek. 27-28. VII. 1871.

27. VII. 71. (Th.). Bear Creek. Carrier's birthday.

28. VII. 71. (F.). Same place.

Camp 43. McCloud's Creek [McCloud River]. 29-30. VII. 1871.

29. VII. 71. (S.). McCloud Creek.

30. VII. 71. (S.). Same place. A man shot in Pit River for stealing horse (day after we left).

Camp 44. Winchester. 31. VII. 1871; 1. VIII. 1871.

31. VII. 71. (M.). Camp not known—by creek near Chasta [Mt. Shasta].

1. VIII. 71. (Tu). Same place.

Camp 45. Mt. Shasta (continued here with various out camps for hunting). 2. VIII-1. IX. 1871. [almost a month].

2. VIII. 71 (W.) Square's Creek [Squaw Creek?]. Close to Chasta Mountain. Mountain covered with snow, 14,-440 ft. high.

3. VIII. 71. (Th.). Lord Walsingham and Cater going to hunt today.

4. VIII. 71. (F.). Camp same place. Lord Walsingham shot two deer on Mount Chasta.

5. VIII. 71. (S.). Same place.

6. VIII. 71. (S.). Same place. A very quiet Sunday.

7. VIII. 71. (M.). Same place. Lord Walsingham and Cater gone up Mount Chasta to hunt bear.

8. VIII. 71. (Tu.). Same place —his Lordship still hunting.

9. VIII. 71. (W.). Same place.

10. VIII. 71. (Th.). Same place.

11. VIII. 71. (F.). Same place. Carrier had dinner with shepherd and mountaineer. Good sport shooting quail.

12. VIII. 71. (S.). Same place.

13. VIII. 71. (S.). Same place. His Lordship and Cater came down from mountain and brought in two deer.

14-15. VIII. 71. (M.-Tu.). Same place (i.e. Square's [Squaw Creek—close to Mt. Shasta.]

16. VIII. 71. (W.) Cater gone to Beauville for stores. [Berryville?]

17. VIII. 71. (Th.). Lord Walsingham and Eedle gone up Mountain. Carrier left in camp alone one night.

18-20. VIII. 71. (F.-S.). Same place.

21. VIII. 71. (M.). Same place. His Lordship and Cater gone to McCleod Creek [McCloud River], to hunt bear.

22. VIII. 71. (Tu.). Same place.

23. VIII. 71. (W.). Same place. Carrier shot hawk.

24. VIII. 71. (Th.). Same place.

25. VIII. 71. (F.). Same place. Lord Walsingham and Cater came in from hunting—his Lordship killed one black bear and one deer.

26. VIII. 71. (S.). Same place.

27. VIII. 71. (S.). Three hunters and two Indians came to supper. Cater very ill.

28. VIII. 71. (M.). His Lordship and Eedle gone up Mount Chasta with three hunters to hunt bears.

29. VIII. 71. (Tu.). Carrier very ill.

30. VIII. 71. (W.). Same place. Lord Walsingham returned from mountain with two large Bucks.

31. VIII. 71. (Th.). Same place.

1. IX. 71. (F.). Same place. His Lordship and Eedle packed up birds for England.

2. IX. 71. (S.). Left Chasta.

Camp 46. Ash Creek. 2. IX. 1871. (East slope of Mt. Shasta.)

2. IX. 71. (S.). Ash Creek. Forest on fire. Trees falling in all directions.

Camp. 47. Sheep Rock [5000 ft.] 3. IX. 1871.

3. IX. 71. (S.). Sheep Rocks. Had to travel some distance before we could get water. Beautiful scenery.

Camp 48. Little Shasta Creek. [Little Shasta River]. 4-5. IX. 1871.

4. IX. 71. (M.). Little Chasta Creek.

5. IX. 71. (Tu.). Cater came home with stores.

Camp 49. Bull's Meadows [Balls' Meadows]. 6-7. IX. 1871.

6. IX. 71. (W.). Bull's Meadow. Pretty camp with plenty of grass for the cattle. A gray fox killed.

7. IX. 71. (Th.). Same place.

Camp 50. Muddy Lake. 8. IX. 1871.

8. IX. 1871. (F.). Butte Lake Valley. [Butte Creek Valley].

Camp 51. Alkali Lake. 9. IX. 1871.

9. IX. 1871. (S.). Hot Creek. Great many ducks shot and one goose.

Camp 52. Willow Creek. 10-11. IX. 1871.

10. IX. 1871. (S.). Willow Creek —plenty of wild ducks shot.

11. IX. 1871. (M.). Willow Creek.

Camp 53. Lower Klamath Lake —broke down. 12-15. IX. 1871.

12. IX. 1871. (Tu.). Same place. [Willow Creek]. Carrier caught 22 trout.

Camp 54.

13. IX. 1871. (W.). Little Clamworth Lake [Little or Lower Klamath Lake]. Saw bull fight in the morning. Our waggon broke down. Saw hot springs.

14. IX. 1871. (Th.). Same place. Lord Walsingham killed Pea and other wild fowls on Lake.

15. IX. 1871. (F.). Same place. Cater came back with axletree for waggon.

Trip Through Oregon

Lord Walsingham extended his explorations northward into Oregon where he was occupied chiefly in hunting during the period of September 16, 1871, to June 17, 1872.

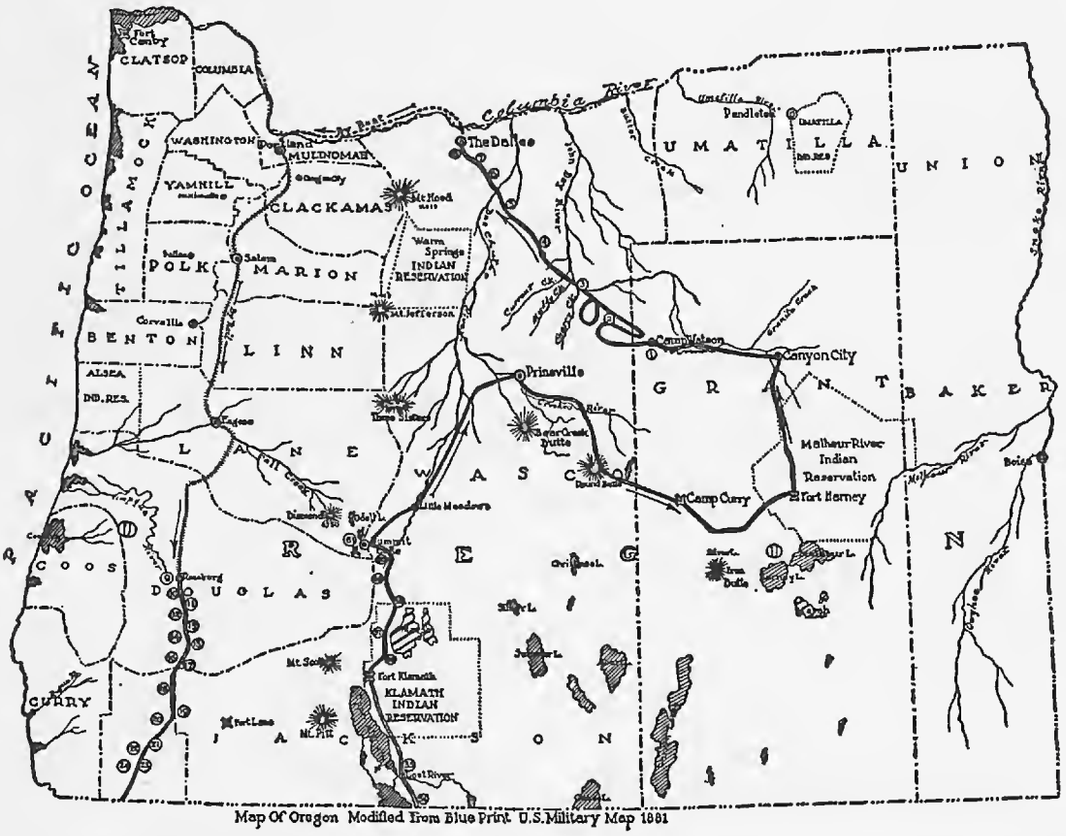

Figure 2. Itinerary of the Walsingham party in Oregon, 1871-1872.

Excepting for the map and the few remarks by Carrier, information concerning the trip through Oregon is not available at this time. I suspect that more data was prepared, but it was apparently not brought to my attention. It is hoped that such information as may be procurable will be presented at a later date. On examining the map it will be seen that the series of camp numbers terminates with 61 just north of Summit Lake in southeastern Lane County or the extreme northwestern part of Klamath County. Here the old road turned abruptly east for a short distance and joined the road which may now be U. S. Highway 97 through Little Meadows and then turns off east to Princeville and up the Crooked River soon taking a southeasterly route by Round Butte and through Camp Curry, Harney Lake Valley, and on to Fort Harney. From here the route lay north to Canyon

City and thence northwest through Fort Watson [Camp Watson], Bridge Creek, Cherry Creek, Currant Creek, Antelope Creek, across the Deschutes River [Deschutes Bridge] to The Dalles. The camps from Summit Lake to Camp Watson are not numbered and only a few are indicated but beginning with Camp Watson as Camp 1, eight camps are indicated on the journey down to the Dalles. From here the trip to Portland was made by boat. The journey south from Portland was by rail to what appears on the map to be Eugene or a point slightly south. Camp 9 may have been set up at Roseburg or vicinity and from there the route followed U. S. Highway 99 to Grants Pass and from there it was over the old mountain road to Crescent City, California.

CARRIER'S DIARY

Camp 55. 16. IX. 1871 (S.). Lost River. His Lordship caught fish for supper. Seven Indians came into camp on horses—stayed in camp sometime—one with ring in his nose.

17. IX. 1871. (S.). Same place. Indian Chief called "Captain Jack" came into camp with other Indians—stayed sometime. His Lordship talked with Chief. Many ducks killed.

Camp 56. 18. IX. 1871. (M.). Link River—hot springs. A duck was cooked in hot springs. Carrier washed up dinner things with water from springs.

Camp 57. 19. IX. 1871. (Tu.). Upper Clamworth Lake [Upper Klamath Lake]. Forest on fire close by.

Camp 58. 20. IX. 1871. (W.). Clamworth Lake [Klamath Lake]—great many Indians.

Camp 59. 21. IX. 1871 (Th.). Crooked Creek.
22. IX. 1871. (F.). Same place. His Lordship caught fine trout.
23. IX. 1871. (F.). Same place. Beaver killed.
24. IX. 1871. (S.). Same place. Carrier caught 18 large trout.

Camp 60. 25. IX. 1871 (M.). Had to empty wagon to get up sand hill—travelled by moonlight in forest. Carrier got fixed on tree with wagon. 12 o'clock at night when we struck camp. His Lordship and hunters had lighted fire and gone to sheep camp.

The Return Trip Through California

The return trip to California was made by way of the wagon route[3] from Grants Pass, Oregon, to Crescent City and Eureka, California. On this return trip the camps were renumbered beginning with Camp 9 at what appears on the map to be either Eugene or a point south of that city in Oregon.

[3]The author traversed this route by automobile in July, 1909, and found it extremely rough going and in some places almost impassable.

CARRIER'S DIARY

Camp 26. 17. VI. 1872 (M.). Taylors—on top of the Siskiyou Mountains. Lost one mule. [Near the Oregon-California boundary.]

Camp 27. 18. VI. 1872. (Tu.). Haltville. Still in mountains.

Camp 28. 19-21. VI. 1872. (W.-F.). Crescent City.

Camp 29. 22. VI. 1872. (S.). Six miles from Clamworth [Klamath] River.

Camp 30. 23. VI. 1872. (S.). Mouth of Clamworth [Klamath] River.

24. VI. 1872. (M.). Horses had to swim river. Lord Walsingham killed black bear.

Camp 31. 25. VI. 1872. (Tu.) Gold Bluff in sea.

Camp 32. 26. VI. 1872. (W.). On high hill—lost our trail.

Camp 33. 27. VI. 1872. (Th.). Eight miles from Trinidad.

Camp 34. 28. VI. 1872. (F.). Mad River.

Camp 35. 29. VI. 1872. (S.). Acada [Arcata].

Camp 36. 30. VI. 1872. (S.). Eureka

1. VII. 1872. (M.). Came in town. Camp broken up. Humboldt Bay. Lord Walsingham gone to hunt Grizzly. Carrier left in Town Eureka.

2-10. VII. 1872. (Tu.-W.). ————.

11. VII. 1872. (Th.). Left Eureka by Ship Pelican.

12. VII. 1872. (F.). Arrived at Grand Hotel, San Francisco. Homeward bound to England.

[End of Carrier's Diary]

DAILY ALTA CALIFORNIA, San Francisco, vol. XXIV, Friday morning, July 13, 1872.

"Str. Pelican—arrived from Eureka, July 12—26 hours."

Passenger list included Lord Walsingham, Geo. Cator, and A. Carrier.

SOME OBSERVATIONS AND CAPTURES OF CALIFORNIA LEPIDOPTERA

BY J. W. TILDEN AND G. S. MANSFIELD

San Jose State College, California

Several interesting species of Lepidoptera were taken by the writers in eastern San Luis Obispo County, about ten miles west of Simmler, on March 20-22, 1940.

California juniper (*Juniperus californicus* Carr.) is the principal tree in the region. The juniper hairstreak (*Mitoura siva juniperaria* Comst.) was fairly common on these trees, and about twenty specimens were taken. Since juniper is known to occur north along the inner Coast Range, it seems possible that the range of this butterfly may eventually be found to coincide with that of its food plant.

Two specimens of *Euproserpinus phæton* G. and R. were taken. One was found about noon, feeding from the blossoms of a small white composite. The other was taken under unusual circumstances. It was found at night while we were searching for night insects with a Coleman lantern. It was resting on the sand in a dry wash, near a white composite of the same species as that from which the other specimen had been taken. It was entirely inactive, with its wings folded over its abdomen. V. L. Clemence of Atascadero has taken this species in considerable numbers near that town.

Two specimens of *Xanthrothrix neumogoeni* Hy. Edw. were taken, flying in the heat of the day around the flowers of a bright yellow composite. On the basis of available specimens, this species would appear to be rather scarce. There is a specimen in the collection of the California Academy of Sciences at San Francisco, which was taken in Southern California, much farther south than San Luis Obispo County.

Philotes sonorensis F. and F. has been taken on several occasions in Alum Rock Park, Santa Clara County, California. Arthur and Edgar Smith first noticed the occurrence, and called it to our attention in 1939. A single female was taken there in March, 1939, by Tilden. In 1940, two males and one female were taken by Tilden and Mansfield, and two others were seen. The presence of both sexes suggests that the species is established and breeding in that locality. The northernmost record previously known to us is Fremont Peak in San Benito County (Strohbeen and Dodge, 1931). It has been taken near the Pinnacles National Monument. Its locality of greatest abundance is in the southern part of the State.

Pieris sisymbrii Bdv. breeds in small numbers in the foothills of the Mt. Hamilton Range, and has been taken in Alum Rock Park by Arthur and Edgar Smith and by the writers.

This is another insect of the more arid parts of the State that pushes north and west along the Mt. Hamilton Range.

(To be continued in next number)

NOTES ON THE DISTRIBUTION AND HABITS OF REDUVIID VECTORS OF CHAGAS' DISEASE IN THE SOUTHWEST UNITED STATES

(Hemiptera, Reduviidæ)

BY SHERWIN F. WOOD

Los Angeles City College

(Continued from page 94)

Paratriatoma hirsuta Barber

Uninfected localities: Alvarado Mine, near Congress Junction, Yavapai County, Arizona; Palms to Pines Highway, 1000 feet elevation, near Cathedral City, Riverside County, California; and Tahquitz Canyon, near Palm Springs, Riverside County.

Eleven *Paratriatoma hirsuta* were collected from nests of wood rats (*Neotoma* spp.). All were negative. There were 5 males, 3 females, 1 large and 1 medium nymph collected in California with Dr. R. L. Usinger and one male was collected in Arizona by the writer. This male lived four days in captivity.

Habitat of Cone-nosed Bugs

The nests of *Neotoma fuscipes macrotis* Thomas in California where bugs infected with *Trypanosoma cruzi* Chagas have been collected were in chaparral near, at, or around the base of bushes and trees. They were large cone-shaped or dome-shaped heaps of dead sticks and twigs intermixed frequently with green cuttings and leaves of buckthorn, holly-leaf cherry, poison oak, sumac, holly, or wild buckwheat. There were several exits or entrances and a number of runways in each nest. There was at least one nest site well within the structure where finely shredded plant material was placed to form a protective cup in which the rat slept. The small and medium-sized nymphs of *Triatoma protracta* (Uhler) were usually found in this inner nest material or near it. The large nymphs were usually found on twigs or sticks near the grass nest. The adults were among the sticks and twigs anywhere in the dark parts of the nest and not usually in the grass inner nest material.

In the Quemado Valley, Texas, infected *Triatoma gerstæckeri* Stål were found in a wood rat nest under a mesquite stump. The grass nest material was about two feet below the ground level directly beneath the main mass of the stump and well protected by the branching roots. Some twigs, dried cactus pads, and

cow chips were piled around the base of the stump covering the runways. The runways were dug up, the stump uprooted and the bugs taken from its undersurface where they were clinging to exposed roots. Other nests were mostly in pricklypear cactus (*Opuntia* spp.). They consisted of a few twigs, cow chips, horse dung or dried *Opuntia* pads with or without rocks and dirt, piled up around, over, or among the branches of these large, flat-stemmed cacti. They were very inconspicuous until one was close to the cactus. There were runways through the nest and into the ground and when rats were found during summer collecting they were usually in these underground burrows. One infected nymph of *Triatoma protracta woodi* Usinger was found in a cactus nest in the Quemado Valley.

Near the Chisos Mountains and 13 miles east of Marathon, Texas, infected *Triatoma protracta woodi* Usinger were collected from nests built in cactus and small-leafed sumac, *Rhus microphylla* Engelm.* The structures above ground were piles of twigs and cow chips built around the base of the sumac. The rat's runways extended from these surface structures to underground tunnels. There were grass inner nests in the structures above ground as well as in the tunnels beneath the ground. Bugs were found crawling along the walls of these tunnels and in some localities where the ground was very dry, the bugs escaped by retreating into large cracks along the walls of these tunnels.

Naturally infected *Triatoma protracta* (Uhler) were found in rat nests near Tyrone, New Mexico. Here, the above ground structures consisted of piles of dead cane cactus stems or cow chips or both, sometimes mixed with a few twigs, built at or around the base of a cane cactus. Due to the open type of growth of this cactus, these nests were very conspicuous and easy to search for bugs. In most cases, there were underground runways connected with these nests and bugs were collected not only from nest material above ground but also from the walls of the runways.

At the Alvarado Mine in Arizona, one infected nymph of *Triatoma rubida* (Uhler) was collected in a nest of *Neotoma albigula albigula* Hartley built in a pricklypear (*Opuntia* sp.) cactus. This nest consisted of sticks, twigs, and dried *Opuntia* pads piled around the base of the cactus. There were underground tunnels connected to runways through the nest structure on the surface of the ground.

*Identification by Dr. Omer E. Sperry, Sul Ross State Teachers' College, Alpine, Texas.

New Locality and Vector Records

The writer has reported here for the first time two new localities for the recovery of *Trypanosoma cruzi* Chagas in Texas. Naturally infected bugs were obtained from houses 25 miles northwest of Hondo, Medina County (Bandera Strain in *Triatoma gerstæckeri*), and in Sanderson, Terrell County (Sanderson Strain in *T. rubida*). Both *Peromyscus californicus insignis* Rhoads and albino *Mus musculus* Linnaeus have been infected with the Bandera Strain and the Sanderson Strain. In Experiment 75 (*Peromyscus*, Bandera Strain), leishmaniform *T. cruzi* was found in tissue impression smears of heart muscle and leg muscle made on the 20th day after intramuscular (gastrocnemius) inoculation. Typical blood forms of *T. cruzi* have been demonstrated in experimental infections with the Sanderson Strain. Both strains have been transferred through mice and back into laboratory-raised, trypanosome-free *Triatoma* nymphs.

A new vector for *Trypanosoma cruzi* is here reported from Arizona and California. Three negative female *Paratriatoma hirsuta* were fed on Experiment 75 (Bandera Strain). All three were found infected 10 days after feeding, showing numerous crithidias in their fecal deposits. When examined 21 days after feeding, numerous trypanoform and crithidial stages were demonstrable. A white mouse (Exp. 87) inoculated with feces of the experimentally infected *Paratriatoma* showed typical *T. cruzi* in its blood 14 days after inoculation.

Discussion

The total number of cone-nosed bugs collected or received from southwestern United States was 2,716. Of these, 1,754 were examined for *Trypanosoma cruzi* Chagas and 232 or 13.22% were found infected. The heaviest infection in any locality examined by the writer was 37.50% for 152 specimens of *Triatoma protracta* from Eaton Canyon, California, as compared with 92% for 100 specimens of *Triatoma gerstæckeri* reported by Packchanian (1939) from near Three Rivers, Texas. Of 1,402 cone-nosed bugs examined by Mazzotti (1940) from Mexico, 392 or 27.96% were infected. The heaviest infection detected by him was in 70 specimens of *Rhodnius prolixus* when 81.42% were found infected. Records for 451 wood rat nests examined by the writer in the southwest show that 1,303 cone-nosed bugs were collected, an average of 2.88 bugs per nest.

The collections of *Triatoma* from houses and wood rat nests at the Alvarado Mine, Arizona, would seem to indicate a yearly

cycle for the species found there, namely, *rubida*, *protracta*, *protracta woodi*, and *longipes*. As reported previously (Wood, 1941a), the adults were found in houses from about May 15 to September 15 and then not seen again until the next year. Evidently the nymphs winter over in the rat nests and complete metamorphosis the following summer. In 1939, 15 rat nests examined August 12 and 13 yielded 102 *Triatoma* of which there were 6 adults, and 21 large, 66 medium, and 9 small nymphs. In 1940, 17 rat nests were examined May 30, 31. Of the 17 *Triatoma* collected, there were 12 adults, and 3 large and 2 small nymphs. Therefore, the best time of year for collecting nymphs at the Alvarado Mine would seem to be the fall.

Summary

1. Five different *Triatoma* (*protracta*, *protracta woodi*, *rubida*, *longipes*, *gerstæckeri*) have been found naturally infected with *Trypanosoma cruzi* in the United States.
2. A new vector from Arizona and California, *Paratriatoma hirsuta*, has been experimentally infected with *cruzi*.
3. Two new Texas localities are reported for *Trypanosoma cruzi*.
4. Notes on the longevity, habits, and occurrence in wood rat nests of the various cone-nosed bugs are recorded.

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A SYNOPSIS OF THE GENUS TRACHUSA WITH NOTES ON THE NESTING HABITS OF T. PERDITA

(Hymenoptera, Megachilidæ)

BY CHARLES D. MICHENER

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The genus *Trachusa* Panzer[1] is represented by but three properly authenticated species, one from Eurasia, one from California, and one from Arizona. The additional names (all of Old World species) included in *Trachusa* have been long unrecognized, and are probably either synonyms of the well-known *T. byssina* or representatives of other genera, as indicated in part by Friese (1911).

Considering their widely discontinuous distribution, the three species of *Trachusa* are remarkably similar, as indicated in the following generic description.

Moderate sized, robust bees. Females almost entirely black, males with clypeus and sides of face cream-color or yellow, the lateral face marks truncate below level of antennæ; pubescence pale, rather abundant, often forming feeble bands on abdominal tergites; outer faces of the rather broad tibiæ clothed, especially apically, with characteristic, regularly placed, short, robust hairs; punctation of head and thorax, except clypeus and supraclypeal area, fine and dense; head narrower than thorax, short anterioposteriorly; antennal bases considerably nearer to anterior ocellus than to anterior margin of clypeus; inner margins of eyes feebly converging below or subparallel; buccal fossa deep, margined by hypostomal carinæ; labrum longer than broad, subrectangular; cheeks about as broad as eye; mandibles stout, especially in females, those of male tridentate, of female with an apical tooth, followed by a notch, followed by a feeble rounded tooth which grades into a long, nearly straight edge which terminates in the strong inner apical angle; trophi rather short; labial palpi considerably shorter than glossa, first segment slightly shorter than second; maxillary palpi five segmented, second and third segments longest; thorax high; notalices linear; angle between anterior and lateral faces of mesepisternum strong; metanotum vertical, enclosure of propodeum nearly so and large; arolium present; claws of male cleft, of female with large, median, internal tooth; wings, brownish; abdomen rather short and strongly convex above, first tergite bearing a broad basal concavity; sternites two to five of female with a scopa; abdomen of male with seven exposed tergites and

[1] The name *Trachusa* Panzer is here used on the assumption that the "Erlangen list" will be disregarded. As pointed out by Morice and Durrant (Trans. Ent. Soc. London, 1914: 426, 427), *Stelis* becomes a synonym of *Trachusa* Jurine, and *Diphysis* Lepeletier must be used in place of *Trachusa* Panzer, if the "Erlangen list" is accepted.

six exposed sternites, seventh and eighth sternites concealed above sixth; male genitalia with cardo broadest ventrally, reduced to a narrow ribbon dorsally; coxopodites broadest basally, bearing ventrally, near bases, the volsellæ; parameres slightly exceeding coxopodites, not united by a sclerotic bridge.

Key to the Species of Trachusa

Males

1. Mandibles largely yellow; sixth and seventh tergites simple, without subapical folds or ridges.....*byssina*
–. Mandibles black; sixth tergite with transverse subapical keel or carina, seventh with a variously modified subapical fold.....2
2. Sixth tergite with posterior margin evenly rounded; mandible with distance from end of apical tooth to end of second tooth greater than distance between apices of second and third teeth .....*perdita*
–. Sixth tergite with posterior margin produced and subtruncate medially; mandible with distance from end of apical tooth to end of second tooth less than distance between ends of second and third teeth.....*manni*

Females

1. Sixth tergite simple.....*byssina*
–. Sixth tergite with strong basal elevation, separated by vertical or overhanging fold from produced, flange-like margin....*perdita*

Trachusa byssina (Panzer)

Apis byssina Panzer, 1798, Faun. Ins. German., 5:56.
Trachusa serratulæ Panzer, 1805, Faun. Ins. German., 8:86.
Megachile resinana Schilling, 1829, Ubers. Arbeit. schles. Ges. f. vaterl. Cultur, i. J, p. 75.
?*Diphysis Pyrenaica* Lepeletier, 1841, Hist. Nat. Ins., Hymen., 2:308, female and male.
Megachile rotundiventris Perris, 1852, Ann. Soc. Linn. Lyon, 1:196, male and female.
Trachusa serratulæ var. *seitzi* Cockerell, 1925, Entom., 58:158, ♂.

Male: Mandibles largely yellow, apex of median tooth equidistant between apices of other two teeth; facial markings yellow; face not elevated along line of upper margin of clypeus; stigma longer than broad; second recurrent vein meeting or basad to second transverse cubital; posterior basitarsi broadest medially; enclosure of propodeum impunctate or only narrowly punctate above; posterior margins of tergites feebly depressed; sixth tergite with posterior margin furnished with a broad, rounded, apical flange medially; seventh tergite feebly and broadly emarginate apically, not carinate; third sternite with posterior margin concave medially and margined by long hairs; fourth and fifth sternites also

emarginate medially on posterior margins; sixth sternite with two, broad, apical, lateral lobes, separated by a broad, truncated emargination, each of the lobes furnished with a shining, impunctuate, longitudinal ridge which extends nearly to the base of the exposed portion of the sternite; genital coxopodites greatly broadened basally, slender and simple apically; parameres not meeting basally, converging apically. Length 10 to 11 mm.

Female: Similar to male except for the usual sexual characters; clypeus with two or three denticles on each side of middle; fifth and sixth tergites simple. Length about 11 mm.

Among specimens before me from Germany and Austria, several different combinations of the slight venational characters upon which the variety *seitzi* is based are presented. This species has an extensive range from the Pyrenees eastward through central Europe and far into Asia.

Several of the works referred to in the preceding synonymy have not been available to me.

TRACHUSA MANNI Crawford

Trachusa manni Crawford, 1917, Proc. Ent. Soc. Wash., 19:167 ♂.

Male: Mandibles black, apical tooth slender and curved, its tip closer to tip of median tooth than latter is to tip of third tooth; facial marks lemon yellow; clypeus without transverse ridge at upper margin and without longitudinal median, impunctate ridge; second recurrent vein interstitial with second transverse cubital; enclosure of propodeum with broad, punctate band above; posterior margin of sixth tergite with median, produced, subtruncate, apical flange as broad as the median interruption in the subapical, strongly raised carina, which curves anteriorly at the sides, this carina not provided with a median, apically directed, projection; seventh tergite with longitudinal median carina basally, and a strong subapical fold, which is greatly produced laterally near the apex as a broad lobe on each side, forming a wide, deep, median emargination in what appears to be the posterior margin of the tergite; true posterior margin of tergite slightly beneath this fold, and with a shallow median emargination as broad as the emargination in the subapical fold; apical portions of third, fourth, and fifth sternites densely pubescent, apical margin of sixth with a subtriangular, median projection. Length 14 mm.

The type specimen is in the United States National Museum. This species is known only from the two original specimens from Ramsey Canyon, Huachuca Mountains, Arizona. Since I have not seen this species, the preceding descriptive comments have been taken from Crawford's paper and from notes on the type sent by Miss Grace A. Sandhouse.

TRACHUSA PERDITA Cockerell

Trachusa perdita Ckll., 1904 Bull. So. Calif. Acad. Sci., 3:159 ♂.

Male: Mandibles black, apical tooth rather broad, its tip farther from tip of second tooth than the latter is from third; facial markings cream color; face elevated along line of upper margin of clypeus, and clypeus with a longitudinal, median, impunctate ridge; stigma of fore wings broader than long; second recurrent vein distad to second transverse cubitus; enclosure of propodeum with broad, punctate band above; posterior basitarsi slender and parallel sided; posterior margins of abdominal tergites strongly and abruptly depressed; sixth tergite with posterior margin broadly rounded, the entire margin (instead of median part only as in other species) produced as a flange which is delimited basally by the subapical, transverse, feebly nodulose keel, which curves anteriorly at the sides and gives off medially a short, subtriangular projection or keel toward the posterior margin of the segment; seventh tergite with longitudinal median ridge basally, and a subapical transverse fold which is not greatly produced and which might appear to be the apical margin of the segment only laterally, because the median and most strongly elevated portion of the fold is strongly arched anteriorly so that it is, at the midpoint, nearer to the base of the exposed portion of the tergite than to the apex; area distad to and enclosed in the arch of the fold smooth, depressed, and brown; posterior margin of seventh tergite narrowly and rather feebly emarginate medially; third and fourth sternites with margins slightly produced posteriorly in the middle, not provided with long hairs; fifth sternite similar but with weak, median emargination in produced portion; sixth sternite broad, feebly three lobed at apex, lateral lobes low and subtruncate, at extreme sides of sternite; median lobe more elevated, exceeding lateral lobes, truncate, and furnished with a pair of large, strongly anteriorly directed teeth at its apex which form a U-shaped emargination; seventh and eighth sternites heavily sclerotized, seventh with posterior margin furnished with a broad, V-shaped median emargination, eighth rather elongate, broadened posteriorly to the trilobate apex, median lobe longer and broader than lateral lobes, its apex slightly emarginate; genital coxopodites not much broadened basally as seen from above, apically with small, blunt, external tooth and transverse subapical ridge; parameres contiguous (but not fused) in basal halves, slender and widely separated apically. Length 11 to nearly 13 mm.

Female: Black, with whitish pubescence, forming bands on posterior margins of abdominal tergites one to five. Head, except for clypeus and supraclypeal area, finely and closely punctate; clypeus and supraclypeal area rather coarsely punctate, the region of the suture separating these sclerites, and the median longitudinal line of the clypeus somewhat elevated and not punctate, although dull; anterior margin of clypeus with about eight or nine

small denticulations; hypostomal carinæ more strongly elevated than in *byssina;* enclosure of propodeum punctured above, impunctate but minutely tessellate below (punctate band broader than in *byssina*); abdominal tergites rather similar to those of male in punctation, with posterior margins conspicuously and rather abruptly depressed and more closely punctate than rest of tergites, these depressed margins broader than in the male; fifth tergite with posterior margin feebly and broadly emarginate medially; sixth tergite with large, median, basal, strongly and abruptly elevated area, produced medially and apically to a small, overhanging point; posterior margin of sixth tergite produced medially as a broad, rounded, horizontal shelf or flange; ventral scopa long and dense. Length nearly 13 mm.

Neallotype, female, No. 4845, Calif. Acad. Sci., Ent., Hastings Natural History Reservation, near Jamesburg, Santa Lucia Mountains, Monterey County, California, 1800 feet elevation, June 14, 1938, on *Brodiæa ixiodes* (C. D. Michener). The type specimen is from Tehachapi, California, and is in the American Museum of Natural History, New York City.

Although apparently rare, this bee proves to be rather widely distributed in southern and central California, as indicated by the following additional localities: The Gavilan, Riverside County, May 31, 1937, on *Pentstemon antirrhinoides* (P. H. Timberlake); Santa Barbara, May 7, 1936, on morning glory (I. McCracken).

The female of this species, previously known only from the unique male type, is here described for the first time.

On June 14, 1938, at the Hastings Natural History Reservation, I had the opportunity to observe briefly the habits of *Trachusa perdita.* About a dozen nests were found, all in the ground on one hillside (the only place on the Reservation where any individuals of this species were seen). There was a tendency toward grouping of the holes, all those seen being disposed in groups of two to four, the individual holes of a group being from eight inches to two feet apart. They were in loose, somewhat sandy soil, the surface of which sloped in a southerly or westerly direction at an angle of 20° or 30° from horizontal. No turrets or piles of earth marked the entrances, which were left open and unguarded when the females left to visit flowers. The holes were about ten mm. in horizontal diameter, slightly less in vertical diameter, and slanted downward throughout their courses at angles of 20° to 30° from the horizontal. In the five nests which

were opened, the tunnels, which were five or six inches long, bent strongly to one side in a broad curve, which, in one case placed the bottom of the tunnel almost directly beneath its entrance.

The cells were placed end to end in the lower part of the tunnel, and were rather firmly glued together, so that an entire series of them could be removed unbroken. The intercellular partitions were thin, there being no thick resinous plugs, such as those shown by Hachfeld (1926) for *T. byssina*, between cells. Outside dimensions of the cells averaged 16 mm. in length by 10 mm. in diameter. Cells were made from irregular pieces, commonly two or three times as long as broad, cut from the serrate margins of the thick leaves of the shrub, *Rhamnus crocea*, which grew nearby. These pieces were arranged with their long axes at right angles to the long axes of the cells, and cemented together to form firm walls by means of a gum which was sticky at the time of excavation but became very hard after a few months in a vial. Although this gum burned vigorously, seemingly with the odor of pine pitch, there were no conifers within two miles of the nesting site. It caused adherence of numerous small pebbles and particles of sand to the outside of the cells. Although possibly carried in by the insects, these objects were in all probability *in situ* in the soil.

One nest excavated contained a single incomplete cell, half full of a stiff, sticky, brown substance, the pollen of *Brodiæa ixiodes*, which was the flower visited chiefly by these bees at this locality. Other nests were more nearly complete, the one with the largest number of cells having, however, but four. The uppermost cell of this nest was incomplete and unprovisioned, in the process of being built, but the others contained fully grown larvæ, which had consumed all of their food. This suggests that the process of nest building and provisioning is slow, although that of larval development may be rapid.

A number of cells were placed in vials, and opened from time to time during the next year. The fully grown larvæ eventually enclosed themselves in tough, brown, parchment-like cocoons, and remained thus, as prepupæ, throughout most of the winter. In early June, 1939, one passed through a brief pupal state and emerged as an adult, cutting an opening through the side of its cell, but the few others still alive remained as prepupæ within their cocoons, and would have emerged the following summer, perhaps, had they not been killed.

The cocoons were similar to those of *Osmia*, with a large, solid, well formed nipple in the middle of a deep concavity or chamber at the anterior end. This cavity was formed by a thin sheet extending anteriorly from the side walls of the cocoon along the inner surface of the cell. Hachfeld shows this chamber closed in *T. byssina*, but states that the sheet which forms it is easily broken. Such may be the case in the cocoons before me, in all of which the chamber is broadly open anteriorly. Laterally, the sheet which forms the anterior cavity is supported by several, thin, rather irregular lamellæ connecting it with the anterior end of the cocoon proper. This is quite a different structure from the three, regularly placed, concentric rows of supporting strands, not confined to the lateral parts of the chamber, described and figured for *T. byssina* by Hachfeld.

As may be seen from the preceding notes on *Trachusa perdita*, its habits differ considerably from those of *T. byssina*, which have been described in some detail by several European authors. The latter species, according to Friese (1911, 1923), nests in groups of as many as forty or fifty females, and the tunnels do not have the unusual shape described for those of our species, but may be branched. However, as in *T. perdita*, the cells are made of pieces of leaves, stuck together by gum (in the case of *T. byssina* at least, pitch from pine).

Acknowledgments

I wish to express my appreciation to the late Mr. E. P. Van Duzee for the use of specimens in the collection of the California Academy of Sciences, to Mr. P. H. Timberlake for specimens from his collection, to Miss Grace A. Sandhouse for important notes on the type of *Trachusa manni*, and particularly to Dr. J. M. Linsdale for the opportunity to take advantage of the facilities of the Frances Simes Hastings Natural History Reservation of the University of California.

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NOTES ON CANTHARIS
(Coleoptera, Cantharidæ)

BY DOROTHY FENDER

McMinnville, Oregon

In the early stages of a revisional study of the genus *Cantharis* in which the author is now engaged, a new species very near *Cantharis carolinus* Fabr. was discovered mixed with the older species. It is very likely that this species has been confused with *carolinus* for many years, as was the case with *C. neglectus* Fall.

Neglectus in spite of its close resemblance to *carolinus*, is not closely related to it. The new species herein described and *carolinus* form a group by themselves, which, in the opinion of the author, must properly be considered as representing a distinct genus. This opinion is based on the enormous development of the basal portions of the male genital armature, these being so strongly developed as to envelope most of the remainder of the structure, a condition not paralleled elsewhere in the family. It is the present intention only to describe the new species and leave the problem of the generic status of this group for treatment in the larger paper in preparation. A redescription of *C. carolinus* is herein also presented as an aid in recognizing the new species.

Cantharis carolinus Fabr.

Black, pubescence golden. Head black, sides of clypeus and a narrow frontal stripe testaceous (this maculation might also be described as two piceous stripes between the antennæ); rather finely, distantly punctate, the surface rather polished; occiput smooth and convex. Eyes small, about one-fourth the length of head in the male, less than one-fourth the length of head and widely separated in the female. Antennæ stout, laterally compressed, subserrate, those of the female relatively more slender and shorter. Thorax subquadrate, moderately transverse, more so in female; front angles rounded, hind angles sub-acute; front margin evenly, shallowly arcuate, hind margin subsinuate; testaceous, with a discal black area which is wider at base than apex, the margins of this area smooth, not interrupted by the testaceous as in *bilobatus* and *neglectus*; smooth, shining, with fine scattered punctures bearing the fine, rather long, golden pubescence. Tarsi stout, all segments broad and lobed. Claws with a long basal tooth making them appear cleft (fig. 1). Ventral segments black, sides and median area of apex of each segment often narrowly testaceous. Male genital armature with the dorsal plate shallowly emarginate, ventral hooks simple (fig. 3). Length: Male: overall 11.5 mm.;

elytra 8.2 mm.; antennæ 8 mm. Female overall 13 mm.; elytra 9 mm.; antennæ 7 mm. Width: Male elytra 3.5 mm.; thorax 2.75 mm. Female elytra 4 mm.; thorax 3.5 mm.

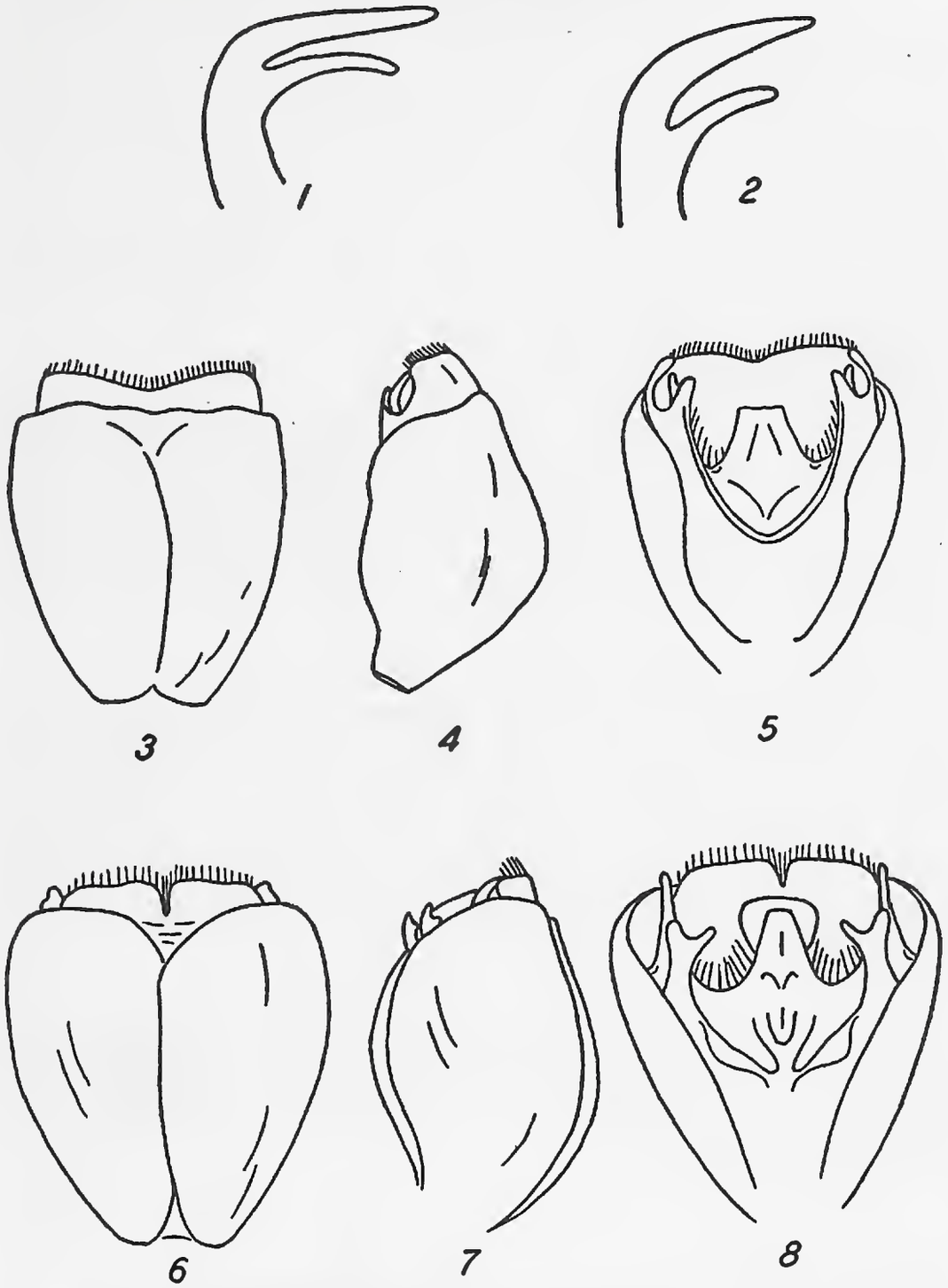


Figure 1, ungual formation of *Cantharis carolinus* Fabr.; 2, same of *lobatus*, n. sp.; 3, 4, and 5, dorsal, lateral, and ventral views, respectively, of male genital armature of *carolinus;* 6, 7, and 8, dorsal, lateral, and ventral views, respectively, of *lobatus*, n. sp.

The color phase *C. jactatus* Say differs only in paler pigmentation.

Two hundred specimens examined. Distributional extremes are represented by Maine, Ontario and Minnesota on the north and Key West, Florida to Texas on the south.

Cantharis bilobatus Fender, new species

Piceous, or brunneo-piceous, pubescence cinereous. Head piceous except for a pale area at base of antennæ extending forward to side margins of clypeus, leaving frons dark, this a solid dark area in most specimens. In some specimens there is a paler area directly between the antennæ, and in the pale forms this dark frontal area is split into two stripes. Punctation rather close, moderately deep, confused, rather coarse, surface rather dull; occiput impressed, not convex. Eyes large, nearly one-half the length of head in the male, about one-fourth the length of head in the female. Antennæ slender, sub-cylindrical, segments a little shorter in the female. Thorax subquadrate, slightly narrowed anteriorly; relatively longer and less transverse, that of female more transverse but less so than in *carolinus;* pale with piceous maculation, this as in *carolinus* except that the yellow part intrudes into the external portion of the base, thus forming two piceous basal lobes on each side. Tarsi slender, nearly cylindrical (at least in dried specimens). Claws as in *carolinus* except that the tips of the two parts are more distant (fig. 2). Ventral segments of male piceous, margined with dark testaceous at sides and except for sixth at apex, this testaceous portion broadest on the median line. Female uniformly piceous beneath. Male genital armature: dorsal plate deeply cleft on the median line, ventral hooks bilobed (fig. 6). Measurements: Length: Male overall 10 mm.; elytra 8 mm.; antennæ 5.5 mm. Female overall 10.5 mm.; elytra 8.5 mm.; antennæ 5.5 mm. Width: Male elytra 3 mm.; thorax 2 mm. Female elytra 3.75 mm.; thorax 2.5 mm. The two specimens from Ontario are smaller; male and female measuring 8 and 9.5 mm. in length respectively.

In some specimens the normally piceous areas are dark testaceous or brunneous and the frontal stripe is divided as in *carolinus.* This represents a color phase corersponding to *C. carolinus jactatus* Say.

Holotype, male, Hennepin County, Minn., collected by C. W. Oestlund. Allotype, female, Douglas County, Minn., June 14, 1937, collected by F. C. Fisk. Specimens examined, 8 males and 10 females. Iowa: Sioux City, June 23, 1925 (C. N. Ainslie). Minnesota: Crookston, July 12, 1935, and July 3, 1939; Houston County, May 24, 1937 (P. M. Schroeder), and June 16, 1910; Itaska Park, July 3, 1939; two specimens, Shakopee, June 10, 1922 (C. E. Mickel); La Crescent, June 16, 1925 (C. B. Philip); two specimens, Ottertl County, Otto Lugger collection. North Carolina: Lake Waccaman, April 14, 1904 (F. S. Sherman); Wallace, April 6, 1904 (F. S. Sherman). New Mexico: Otto Lugger collection. (This record seems anomalous). Ontario:

Prince Edward County, July 14, 1929; Rainy River District, July 22, 1924 (J. F. Brimley).

Perhaps the easiest character for differentiating this species when mixed with *carolinus* material is the lobular form of the basal portion of the piceous pronotal maculation. *Neglectus*, which also has the basal portion of the pronotal maculation interrupted, differs in the pale part entering only on the median line whereas this species, while some of the testaceous may interrupt the base at the center, always has the lateral portion interrupted. Rarely, paler *carolinus* specimens may show a breaking up of the basal portion of the pronotal maculation, but there is not the definite lobe which we find in this species. This pronotal character, if supported by the more slender form, slender antennæ and tarsi, more divaricate ungual teeth, and large eyes, makes identification simple, even without the aid of genitalic dissections.

DESCRIPTIONS OF TWO NEW SPECIES OF WATER BEETLES OF THE GENUS HYDROPORUS FROM CALIFORNIA[1]

(Coleoptera, Dytiscidæ)

BY HUGH B. LEECH

Vernon, British Columbia

Hydroporus rossi Leech, new species

A dark species belonging to the *vilis* group of Fall's "A Revision of the North American species of *Hydroporus* and *Agaporus*" (1923); last abdominal sternite of female produced at apex.

Female. Length 3.66 mm., width 2.01 mm. Form rather broadly ovate, only slightly convex; dorsal surface finely alutaceous, ventral more shining. Head piceous; pronotum piceous, narrowly paler along lateral margins; elytra dark reddish-brown, narrowly piceous along suture and lateral margins; metasternum and metacoxal plates piceous, abdominal sternites dark reddish-brown; first four antennal segments, legs, and tip of last sternite reddish-brown, outer antennal segments tinged with piceous.

Head two-thirds as wide as pronotum, surface finely alutaceous, finely sparsely punctate. *Pronotum* widest at base, basal margin bisinuate; surface finely reticulate, finely sparsely punctate, punctures twice as large as those of head, an anterior transverse series

[1] Contribution No. 2050, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Ontario.

coarser and closer; lateral marginal bead two-thirds as wide as terminal antennal segment. *Elytra* finely reticulate, finely sparsely punctate, especially at sides; punctures a little coarser than those of pronotum, separated by several times their own widths. *Metacoxal* plates finely alutaceous, more finely sparsely punctate than pronotum; metasternal wings and first two abdominal sternites laterally slightly more coarsely punctate than elytra; last abdominal sternite a little produced at apex. First three protarsal segments two-thirds width of protibia, claws simple.

Male. Very similar to female. Last abdominal sternite not produced at apex; pro- and mesotarsi a little wider; anterior protarsal claws slightly thicker and more bent than their fellows. Male genitalia: see figures 1-3.

Holotype, female, No. 4976, and allotype, male, No. 4977, Calif. Acad. Sci., Ent., Pigmy Forest, Fort Bragg, Mendocino County, California, May 5, 1938, E. S. Ross, collector.

Paratypes, eleven females, four males, all same data as holotype. Distributed as follows: one pair, Canadian National Collection; one female each to the British Museum (Nat. Hist.), United States National Museum, Museum of Comparative Zoology, and Mr. J. B. Wallis; the remainder in my collection. The smallest paratype, a female, is 3.30 mm. in length; the series is remarkably uniform in punctation; several specimens are teneral, and hence their elytra and abdominal sternites are paler in color.

Hydroporus rossi is most closely allied to *pacificus* Fall, to which species the females run in his key. *H. pacificus* is smaller (2.6—3 mm.), more coarsely punctate, much less broadly ovate, paler in color, and occurs in Alaska and British Columbia.

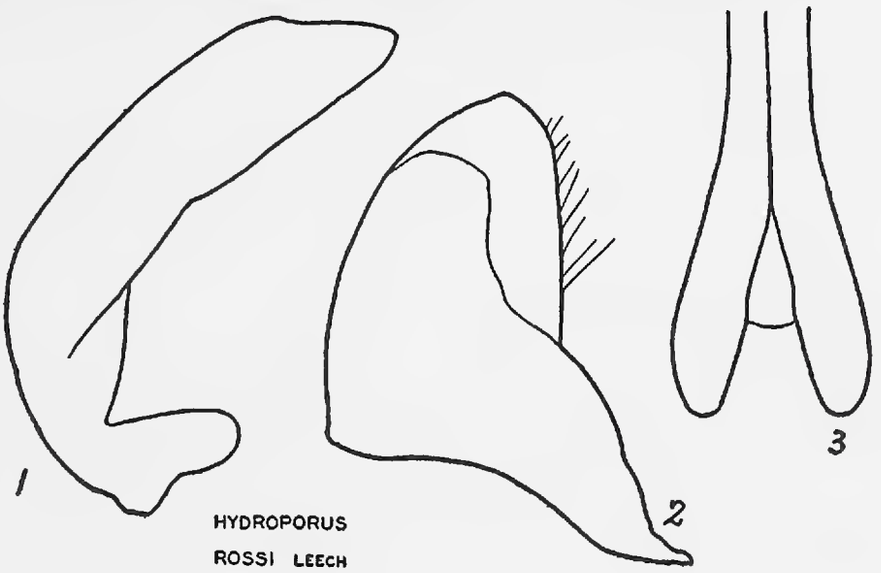
In describing the produced apex of the last abdominal sternite in *pacificus*, Fall remarked that he had not determined the sex of the three specimens before him, and that the character might possibly be sexual. I have at hand a series of *pacificus* from British Columbia, several examples of which were verified by the late Dr. Fall. It is quite easy to show, by dissection, that all specimens having the last ventral produced are females.

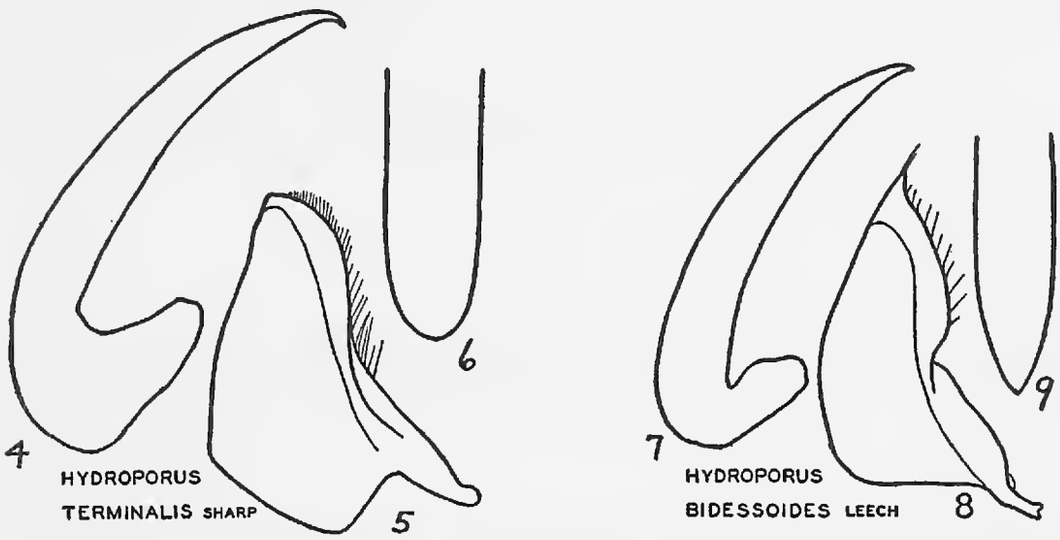
Hydroporus bidessoides Leech, new species

A small dark brown species, with coarsely punctate elytra; resembles a large *Bidessus*, at first glance.

Male. Length 2.22 mm., width 1.11 mm. Form rather evenly oval, narrower posteriorly than anteriorly; moderately convex, finely alutaceous dorsally, more shining ventrally. Head dark red-

dish-brown, anterior margin narrowly paler; pronotum reddish-brown, lateral marginal bead paler; elytra dark reddish-brown, vaguely paler laterally. Legs and first four antennal segments pale reddish-brown, outer seven antennal segments piceous. Body beneath black, epipleura and metacoxal processes reddish.





Figs. 1-3, male genitalia of *Hydroporus rossi* Leech: 1. Profile of ædeagus; 2. Paramere, lateral view; 3. Apex of ædeagus, dorsal view. Figs. 4-6, *Hydroporus terminalis* Sharp, same. Figs. 7-9, *Hydroporus bidessoides*, Leech, same.

Head slightly more than two-thirds width of pronotum, reticulate, finely sparsely punctate. *Pronotum* widest at base, one-third broader than long, surface reticulate, finely sparsely punctate, except for anterior and posterior transverse series of coarser punctures; lateral marginal beads broad, as wide as outer antennal segments; basal line of pronotum not sinuate between hind angles and median prolongation. *Elytra* more finely reticulate than head or pronotum, coarsely punctate, the punctures separated by from one to three times their own diameters; a few finer punctures inter-

mixed. *Metacoxal* plates reticulated, punctures about as coarse as those of elytra; abdominal sternites more shining, sparsely punctate; apical sternite slightly flattened medially. Male genitalia: see figures 7-9. First three segments of pro- and mesotarsi moderately dilated, tarsal claws simple.

Female. Very similar to male, but darker; pro- and mesotarsi narrower. Length 2.25 mm., width 1.14 mm.

Holotype, male, No. 4978, allotype, female, No. 4979, Calif. Acad. Sci., Ent., Caspar, Mendocino County, California, December 16, 1939, J. R. Helfer, collector.

Paratypes, twenty-two males, twenty-seven females, same data as holotype. One female, Caspar, Mendocino County, California, January 20, 1936 (J. R. Helfer). All specimens were taken in a small pool. The paratypes vary in length from 2.19 to 2.40 mm.; the elytral punctation is finer in some specimens, than in the type. Paratypes will be distributed as follows: four males, four females to Mr. J. R. Helfer of Caspar, California; one pair each to: the Canadian National Collection, the British Museum (Nat. Hist.), the United States National Museum, the Museum of Comparative Zoology, and Messrs. J. B. Wallis, F. N. Young and Ralph Hopping; the remainder in my collection.

In addition to the above types, four males and three females are before me; they are too damaged or too teneral to be designated as paratypes.

Hydroporus bidessoides is most closely allied to *H. terminalis* Sharp, to which it runs in Fall's key. I have a good series of Californian *terminalis* including two homeotypes compared by Mr. J. Balfour-Browne of the British Museum; as contrasted with *bidessoides,* Sharp's species is larger (2.55—2.88 mm.), more finely punctate, more attenuated posteriorly, flatter, and has slightly narrower lateral pronotal margins; in addition the median lobe of the male genitalia is differently shaped—compare figures 6 and 9.

The ædeagi of the species of Fall's *vilis* group of *Hydroporus* are very distinctive: all known to me are bifid apically, a character which I have not observed elsewhere in the genus, and which may well be definitive of the group. If this latter supposition is correct, then *terminalis* and *bidessoides* will have to be removed from this assemblage, for the ædeagus is simple in both species. However, I have not as yet observed an external character upon which to make this separation; the species *barbaræ* Fall and *browni* Wallis recently described as allied to *terminalis,* are unknown to me in nature.

THREE NEW ELATERIDÆ FROM THE PACIFIC NORTHWEST
(Coleoptera)

BY M. C. LANE

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Walla Walla, Washington

This paper contains descriptions of three new species of Elateridæ belonging to the genus *Limonius*.

Limonius rufihumeralis Lane, new species

Male. Length 8.8-12.0 mm., width 2.4-3.3 mm. Elongate parallel, convex; body, antennæ, and legs deep black, except humeral angles of elytra, which are reddish orange; surface moderately shiny, with very short, erect, gray vestiture, becoming somewhat longer, decumbent, and whitish on abdomen and legs.

Head quadrate, coarsely, umbilicately punctured; frons broadly triangularly concave; clypeal margin entire, arcuate or slightly emarginate when viewed from above; antennæ extending by one to two segments beyond posterior angles of pronotum, second and third segments small, only slightly longer than wide, similar in shape and size, the two together nearly as long as fourth, which is triangular, sixth segment slightly longer than wide, fourth to tenth slightly serrate.

Pronotum one-sixth longer than wide, widest across posterior angles, sides nearly straight, parallel in posterior third, thence narrowing very slightly to anterior angles, which are very slightly explanate; posterior angles produced, obtusely angulate on outside, with a short, fine carina not reaching margin; disc convex to side margins in middle, which are hidden from above, median line canaliculate at basal third; surface densely, deeply, and coarsely punctate on summit, punctures becoming larger and umbilicate toward margins, separated by much less than their own diameters. Scutellum prominent, flat, finely, densely punctate, more densely pubescent than rest of body.

Elytra one-tenth wider than pronotum, about two and one-half times as long as wide, the sides straight and parallel to apical third, evenly arcuate to apices, which are bluntly rounded; orange color covering entire humeral region and base of each elytron, the inner margin of color sharply defined, extending backward for a short distance along second or third interval, there gradually sloping outward to lateral margin near hind coxal plate, and extending faintly along lateral margin to apical third; striæ well defined, moderately coarsely, deeply punctate, the intervals very slightly convex, with three irregular rows of fine punctures.

Proplura densely umbilicately punctured; sternopleural plate excavated and flared in front, grooved one-third to one-half dis-

tance to procoxæ; posterior margin of propleura deeply notched, usually with a blunt tooth in notch; produced hind angles rectangular. Prosternum umbilicately punctured, the punctures more sparsely spaced than on propleura, mucro concave between procoxæ. Metasternum and abdomen moderately densely, finely punctate; last abdominal segment slightly emarginate and depressed on sides, with distinct pattern arrangement of vestiture around these depressions; also with brushes of longer hairs extending from margin between side marginations and apex. Ædeagus as figured.

Female. Length 10.5—13.4 mm. Width 2.9—3.8 mm. Differs from male in being on the average only slightly broader and more robust, with antennæ barely reaching to posterior angles of pronotum; last abdominal segment without marginal brushes of long hair, but with vestiture pattern, emargination, and depression as in male, though somewhat reduced.

Type locality—Slopes of Blue Mountains near Walla Walla, Washington.

Type, allotype, and paratype—Catalogue No. 54845, United States National Museum. Paratypes in the collection of the California Academy of Sciences, in the Canadian National Collection, in the Museum of Comparative Zoology, and in the collections of the Academy of Natural Sciences of Philadelphia, Ohio State University, Montana State College, Utah State College, Idaho University, Washington State College, M. C. Lane, H. P. Lanchester, M. H. Hatch, K. E. Gibson, E. W. Jones, and J. H. Baker. Described from 126 males and 72 females, from the following localities: Washington—Walla Walla, April 21 to May 21, 2000 to 3000 feet (Lane, Lanchester, Jones, Gibson); Mount Spokane, June 22, 6000 feet (Lane, Gibson); Buckeye (Hopkins), Kamiak Butte, Palouse, May 20 (Lane, Gibson); Pullman, April 11 to June 6 (Piper, Melander, Bales, Westall, Eide, Eiffert, Burke, Hedberg); Godman Springs, Blue Mountains, June 25, 6000 feet (Lanchester, Jones). Idaho—Moscow, May 1 to June 30 (Clarke, Brindley, Rice, Wakeland, Shull, Aldrich, Yothers, Riddel); Viola, May 24 (Gibson); White Bird, May 23 (Lanchester); Cœur d'Alene, May 7 to 24 (Evenden, Rust). Oregon—Tollgate Road, Blue Mountains, May 27 to June 12, 3000 feet (Lanchester); Milton, June 10 (Jones); Meacham, May 9 to 22 (Lane, Lanchester); Wallowa Lake, May 27 to July 3, 4500 feet (Lane); Baker, Pine Creek, May 12 to 30, 4000 feet (Baker, Lane); Whitman National Forest, Blue Mountains, June 12, 5000 feet (Lane, Lanchester, Baker). Montana—Bozeman, May 18 to June 27; Gallatin County, May 23, 1900, 4800 feet (Cooley); Yellowstone Park,

June 26 to July 19 (Robinson, Melander); Lake County, May 13 (Eichmann); Menard, June 17 (Kohls); Jefferson County, June 23; Florence, June 3; Lolo, May 15. Utah—Logan, May 8 (Knowlton). Canada—Calgary, June 1 (Bryant).

The large series of paratypes is quite uniform in size and color, the humeral orange area showing only very slight variations in shape and extent.

This species has been confused for years with *crotchi* Horn but is distinct from it in distribution as well as in many other characters. The new *rufihumeralis* is easily distinguished from *crotchi* and other black *Limonius* with red humeral angles on the elytra by the genitalia and characters of the last abdominal segment. In *crotchi* the last abdominal segment has evenly rounded margins and regular vestiture.

Limonius rufihumeralis is not uncommon in the yellow pine-shrub association of the Blue Mountains of Washington and Oregon and the Bitter Root Mountains of Idaho, its range extending into Montana and Utah, and north to Alberta.

The first specimen under *Limonius crotchi* Horn in the LeConte collection at the Museum of Comparative Zoology at Cambridge, Mass., is a female of *rufihumeralis* from Utah. The second specimen in the LeConte collection is a true *L. crotchi* Horn from Oregon. There is also a female of *rufihumeralis* from Pullman, Wash. (W. B. Mann) in the Blanchard collection at Cambridge. There is a specimen of *rufihumeralis* labeled Seattle, Wash., in the Canadian National Collection at Ottawa, which is probably wrongly labeled, as this species has never been found west of the Cascade Mountains in Washington by the author or his correspondents after years of extensive collecting in that region.

Limonius lanchesteri Lane, new species

Male. Length 9.2 mm., width 2.5 mm. In form, color, and vestiture similar to *rufihumeralis*, but elytra entirely brownish orange, antennæ and femora piceous to brown, tibiæ and tarsi lighter, abdomen sometimes narrowly margined with orange, and scutellum dark brown.

Head quadrate, coarsely, umbilicately punctured; frons broadly concave above clypeal margin, the latter entire and broadly arcuate; antennæ extending at least by one segment beyond posterior angles of pronotum, second and third segments small, subequal, together as long as triangular fourth, the sixth segment slightly longer than wide, fourth to tenth slightly serrate.

Pronotum one-fifth longer than wide, sides nearly straight, parallel, slightly sinuate before posterior angles, narrowing very little to anterior angles, which are somewhat explanate; posterior angles produced, angulate, finely carinate; disc convex, margins hidden at middle from above, canaliculate at base; surface with coarse, umbilicate punctures set closely on disc, very closely on sides. Scutellum prominent, flat, densely punctate, and pubescent.

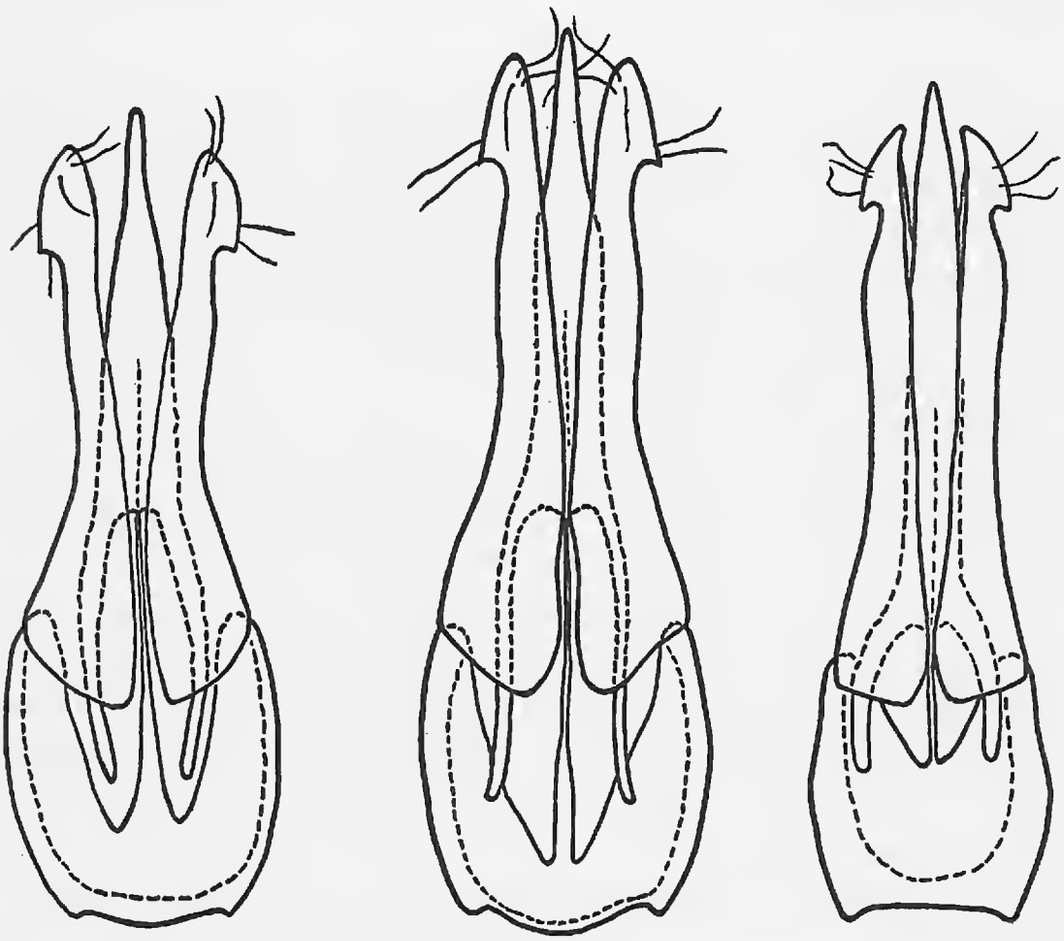

Fig. 1. Male ædeagi of three new species of *Limonius*.

Elytra slightly wider than pronotum, about two and one-half times as long as wide, sides nearly straight, slightly wider at apical third, gradually arcuate to apices, which are obtusely rounded; striæ well defined, coarsely punctate; intervals flat, with two irregular rows of fine punctures.

Propleura with very close, umbilicate punctures; sternopleural plate excavated, flared in front and grooved one-third to one-half distance to procoxæ; posterior margin of propleura deeply notched, produced hind angles rectangular. Prosternum with coarse umbilicate punctures, mucro slightly concave between procoxæ. Metasternum and abdomen densely, finely punctate; last abdominal segment with side emarginations and vestiture pattern as in *rufihumeralis*. Ædeagus as figured.

Female. Length 12 mm., width 3.3 mm. Differs from male in being longer, broader, and more robust, with antennæ slightly shorter; last abdominal segment with reduced emargination and hairs as in *rufihumeralis*.

Type locality—Rocky Bar, Idaho.

Type and allotype—Catalogue No. 54846, United States National Museum. Paratypes in collections of M. C. Lane and H. P. Lanchester. Described from four males and one female, all collected in the mountainous region of south central Idaho. The type was collected near Rocky Bar, Idaho, 6000 feet altitude, June 7, 1937, by H. P. Lanchester, for whom the species is named. The allotype was collected near Challis, Idaho, June 21, 1930, and a paratype near Atlanta, Idaho, 8600 feet, June 20, 1931, both by Lanchester. Other paratypes were collected near Smith's Ferry, Idaho, June 23, 1938, and Rocky Bar, Idaho, 6000 feet, June 16, 1939, by Lane.

This species is named for Horace P. Lanchester with appreciation of the many pleasant hours of association in the laboratory and the field studying the Elateridæ.

Very little variation is shown in this small series, except in the legs, which vary a little in color. This species is closely related to *rufihumeralis* by its form and abdominal and genital characters. It differs in having the elytra all orange, the scutellum, abdominal margins, and legs lighter, the pronotum longer with coarse umbilicate punctures on the disc, and the anterior angles more explanate. The lobes of the male genitalia are shorter in proportion to the base in *lanchesteri* and the lateral lobes are more arcuate on the outer angles. Extensive collecting over a period of years has failed to show variation of color or other characters which might suggest that these two species are the same. Their distribution apparently does not overlap, and they should be considered distinct from each other, as well as distinct from all other nearly related species in the genus.

Limonius humidus Lane, new species

Male. Length 8.8-10.4 mm., width 2.3-2.8 mm. Elongate parallel, convex; black, except humeral angles of elytra, which are orange; surface shiny with very short dark vestiture above, becoming longer and ashy colored beneath.

Head quadrate, coarsely, deeply punctured; frons only slightly concave; clypeal margin entire, but not strongly so in middle, and nearly truncate when viewed from above; antennæ extending by nearly three segments beyond posterior angles of pronotum; second

and third segments small, globular, similar in shape, subequal, the two together shorter than fourth, which is triangular, sixth segment slightly longer than wide, fourth to tenth serrate, eleventh elongate and slightly thicker than preceding segments.

Pronotum one-sixth longer than wide, widest across posterior angles, sides nearly straight, narrowing anteriorly, slightly sinuate near posterior and anterior angles, the latter definitely explanate; posterior angles produced, angulate, with short, fine carina parallel to margin; disc evenly convex to side margins, which are visible from above, median line evident only basally, surface deeply and coarsely punctate, more densely so toward margins, punctures on disc separated by about their own diameters or less. Scutellum prominent, elongate, convex, densely punctate and pubescent.

Elytra slightly wider than pronotum, about two and one-half times as long as wide, the sides straight and parallel to a little behind middle, evenly arcuate to apices, which are bluntly rounded; orange color covering humeral region sharply defined diagonally from middle of side of scutellum posteriorly to fourth striæ, hence slightly anterior to margin of elytron near mesosternal epimeron; striæ well defined, coarsely, deeply punctate, the intervals flat with two irregular rows of fine punctures.

Propleura densely, shallowly punctured; sternopleural plate somewhat excavated and flared in front only; posterior margin of propleura deeply notched, produced posterior angles sharply rectangular, inner angle sometimes acute. Prosternum deeply, coarsely punctured, densely so on mucro, which is only slightly concave between procoxæ. Metasternum and abdomen finely, densely punctate. Ædeagus as figured.

Female. Length 8.9-11.6 mm., width 2.3-3.2 mm. Differs from male in being slightly larger on the average, with antennæ reaching only to posterior angles of pronotum, the last segment being noticeably thickened.

Type locality—Forest Grove, Oregon.

Type and allotype—Catalogue No. 54847, United States National Museum. Paratypes in collections of M. C. Lane, M. H. Hatch, H. P. Lanchester, K. M. Fender, and Oregon State College. Described from six males and ten females, all from wet coastal portion of Oregon and Washington. The type and allotype were collected at Forest Grove, Oregon, March 16, 1919, and April 10, 1938; the paratypes were collected at Corvallis, Oregon, March 1 to April 18 (Ferguson, Scullen, Schuh, Starker); Baker Creek, Lincoln County, Oregon, May 10 to 15 (Fender); McMinnville, Oregon, March (Fender); Hood River, Oregon, April 15 (Childs); Electron, Wash., June 11 (W. W. Baker); Seattle, Wash., April 8 to 20 (Hatch).

This series of specimens varies somewhat in size, but very little in form or coloration. The orange color of the humeral angles of the elytra is restricted and more sharply defined than in any similarly colored species of the genus. This species has also been confused with *crotchi* but can easily be separated from that species by its smaller orange area, larger terminal segment of antennæ, explanate anterior angles of pronotum, convex scutellum, and the ædeagus. It differs from *rufihumeralis* by the same characters, and by the regular vestiture and outline of the last abdominal segment.

Limonius humidus is also related to the eastern *stigma* (Hbst.) (*armus* Say) by color and by the character of the posterior propleural margin and the last antennal segment, but differs by its larger size, more heavily punctate pronotum, and shorter antennæ.

THREE NEW AMERICAN TINGITIDÆ
(Hemiptera)

BY CARL J. DRAKE

Iowa State College, Ames

The present paper contains the description of one South American and two North American Tingitidæ. The types have been deposited as indicated under each species.

Teleonemia lutzi Drake, new species

Large, broad, testaceous, with large, prominent, dark-fuscous markings, the antennæ and legs fuscous-black. Head black, with five, short, blunt, testaceous spines, the median porrect and a little longer. Eyes oblique, black. Bucculæ broad, testaceous, darker in front. Rostrum long, extending to end of sulcus, brownish, black at apex; rostral channel deep, wide, becoming a little wider posteriorly, the sides nearly straight, entirely open behind. Antennæ long, shortly pilose; segment I short, slightly longer and stouter than II; III very long, slightly bent, three times as long as IV.

Pronotum strongly convex, pitted, moderately narrowed anteriorly, dark chocolate-brown, the triangular process testaceous; carinæ stout, dark chocolate-brown on disc, becoming testaceous in front and behind, foliaceous, each composed or one row of areolæ; lateral carinæ subparallel, slightly concave within in front; paranota testaceous, strongly reflexed, narrow, slightly broader in front; mostly uniseriate, indistinctly biseriate in front. Elytra broad, strongly over lapping and jointly rounded behind; costal

area moderately broad, testaceous, mostly biseriate, triseriate in widest part; subcosta area broad, mostly triseriate, testaceous, a large spot a little in front of middle fuscous-black; discoidal area large, not quite reaching middle of elytra, widest slightly beyond middle, narrow at base and apex, mostly fuscous-black, a small triangular area at base and a narrow border at apex testaceous; discoidal area almost entirely clouded with fuscous black. Legs long and slender.

Length, 5.60 mm.; width, 2.65 mm.

Holotype, male, 45 east of Horqueta, Paraguay, named in honor of John C. Lutz, in Drake collection.

This species belongs to the group of *Teleonemia* having a wide costal area. *T. annæ* (Kirk.) and *T. triangularis* (Blanch.) have much wider costal areas.

Teleonemia huachucæ Drake, new species

Very similar to *T. schwarzi* Drake, but readily separated from it by the shorter antennæ and legs and especially by the distinctly less convex paranota. Head black, the median and frontal spines much reduced, tubercle-like and dark in color, the hind pair short, appressed and testaceous. Rostrum brownish black, extending to meso-metasternal suture; rostral laminæ testaceous, widely separated and cordate on metasternum; antennæ brownish black, short, rather stout, densely and shortly pilose; segment III twice as long as IV.

Pronotum moderately convex, coarsely pitted, fuscous-black, the triangular process becoming testaceous behind, there the areolæ opaque and whitish. Collar raised, areolate, subtruncate in front; paranota very narrow, reflexed, grayish testaceous, indistinctly uniseriate; carinæ distinct, each composed of one row of very low, elongate areolæ, the lateral carinæ moderately diverging anteriorly. Elytra dark testaceous, with the nervelets considerably infuscated; costal area very narrow, uniseriate, the transverse nervelets dark fuscous, the tibiæ distally becoming brownish. Uni-biseriate discoidal area moderately large, widest near middle, there five areolæ deep, the outer margin nearly straight; sutural area more widely reticulated, the nervelets mostly dark fuscous, the areolæ whitish, opaque. Legs moderately short, rather slender, brownish fuscous, the tibiæ distally becoming brownish.

Length, 2.65 mm.; width, 1.00 mm.

Holotype, male, and allotype, female, Nos. 5174 and 5175, Calif. Acad. Sci., Ent., and several paratypes, Huachuca Mts., Carr County, Arizona, August 5, 1924, taken by J. O. Martin, in the collection of the California Academy of Sciences.

Teleonemia schwarzi Drake

Teleonemia schwarzi Drake, Ohio Jour. Sci., XVIII, 1918, p. 326.
Teleonemia sororcula Van Duzee, Calif. Acad. Sci. XII, 1923, p. 142.

T. schwarzi Drake and *T. sororcula* Van D. are identical forms and the former name has priority. Several examples were taken at Palm Springs, California, May 18 and 20, 1917, and July 5, 1924, by E. P. Van Duzee, and May 24, 1940, by R. L. Usinger, these last on *Beloperone californica*. Known only from California and Lower California.

Leptoypha nubilis Drake, new species

Very closely related to *L. drakei* McAtee, but easily separated from it by its broader form, darker color and shorter antennæ. Legs short, yellowish brown, all femora fuscous-black. Antennæ rather short, slightly variable in length, fuscous-black, the apex of third segment pale. Pronotum and elytra dark yellowish brown, considerably marked with fuscous-black more or less covered with whitish exudation, the pubescence very short and golden. Costal area narrow, uniseriate.

Length, 2.20 mm.; width, 0.95 mm.

Holotype, male, and allotype, female, Nos. 5176 and 5177, Calif. Acad. Sci., Ent., and numerous paratypes, Independence, Inyo County, Calif., June 11, 12, and 13, 1929, collected by E. P. Van Duzee and R. L. Usinger on *Ceanothus*.

On account of form, color and markings it seems advisable to treat *nubilis* as a distinct species. More specimens and information concerning its habits may prove that it is not more than a race or variety of *drakei* McAtee.

A REVIEW OF THE GENUS PHYSOCEPHALA OF THE WESTERN UNITED STATES

(Diptera, Conopidæ)

BY GEORGE E. BOHART

Davis, California

The area in the United States west of the Rocky Mountains apparently contains only two valid species of *Physocephala* Schiner, *P. affinis* (Williston) and *P. burgessi* (Williston). These were the first species described from the West and were placed in the genus *Conops* by Williston who considered the closely allied genera, *Physocephala* and *Conops*, to be identical.

Physocephala texana Williston was recorded from Colorado and Ormsby County, Nevada, by Kröber (1914), but these specimens are not available to American students and the records have not since been corroborated. The several species and subspecies which were described from western material by M. C. Van Duzee (1927, 1934) are all referable to one or the other of the original two species. I have examined the holotypes, most of the other type material, and specimens determined by Mr. Van Duzee and have compared these with long series comprising several hundred specimens of *affinis* and *burgessi* in my collection and in the California Academy of Sciences. When a sufficient number of specimens from any locality is examined, the range of variation clearly includes such variant types as were used to establish the Van Duzee species. In the case of *affinis* this was found to be true in a series of over one hundred specimens bred from a single colony of bembicid wasps.

The characters which Mr. Van Duzee used to distinguish his species, although useful at times as supplementary features or even primary characters when strikingly distinct, are subject to considerable variation among specimens from a single population or even, in the case of antennal measurements, in a single insect depending upon the degree of inflation of the ptilinum or the angle to which the terminal structures are turned upon their axes. Not even subspecific rank can be assigned these names since their ranges are in all cases coincident or one within another.

Physocephala affinis (Williston)

Conops affinis Williston, 1883, Trans. Conn. Acad. Sci. 4:339.
Physocephala affinis, Kröber, 1914, Arch. f. Naturgesch. 50:105.
Physocephala affinis, Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:579.
Physocephala humeralis Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:580.
Physocephala humeralis simulans, Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:581.
Physocephala aurifacies Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:581.
Physocephala buccalis Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:582.
Physocephala rubida Van Duzee, 1934, Ann. Ent. Soc. Amer. 27:315.
Physocephala simulans Van Duzee, 1934, Ann. Ent. Soc. Amer. 27:321.

Physocephala affinis may be differentiated structurally from *burgessi* by the following table of measurements. The figures represent averages taken from fourteen specimens of *affinis* and eight of *burgessi*. The measurements of lengths of antennal segments were made from a dorsal view, along the line of greatest length of the second segment. Antennal widths were made for each segment at its widst point. There was found to be no overlapping of comparative figures between the two species except in total length which proved to be a character of general significance only.

TABLE I. STRUCTURAL DIFFERENCES BETWEEN PHYSOCEPHALA AFFINIS (WILLISTON) AND BURGESSI (WILLISTON).

Mesonotum breadth to length burgessi	Mesonotum breadth to length affinis	Total length of insect* burgessi	Total length of insect* affinis
1 : 1.06	1 : 1.24	11.4 mm.	12.2 mm.

Antennal segment	Comparative length to breadth burgessi	Comparative length to breadth affinis	Length proportionate to segment 1 burgessi	Length proportionate to segment 1 affinis
1	2 : 1	2.6 : 1	1	1
2	3.58 : 1	5.25 : 1	3.9	2.9
3	2.43 : 1	2.25 : 1	2.5	1.6

*Exclusive of antennæ.

In addition to these structural features, several usually reliable color distinctions are manifested. *Affinis* is paler red than *burgessi*, the former approaching terra cotta in color and the latter dark, brick red. Some specimens of *affinis*, however, are also dark red. *Affinis*, if with dark markings on the mesonotum, has a pair of lateral longitudinal bands as well developed as the median one. *Burgessi*, on the other hand, usually has a single broad, median black band. *Affinis* is more extensively covered with golden pollenose tomentum than *burgessi*.

Affinis is the more abundant of the two species. It ranges throughout the western United States from eastern Washington, east to Wyoming, south to Arizona, and from there west to the Pacific. This area comprises largely the Great Basin and the

State of California. Kröber (1914) recorded a specimen of this species from Michigan but it seems likely that this was a pale colored *sagittaria* Say. There appears to be a slight tendency for the production of smaller, darker forms in the northern extension of the range of *affinis* but even there most of the specimens are typical. In my collection are four specimens from the Owens Valley, California, which are uniformly smaller than the average *affinis* and have slightly shorter third antennal segments. It may be that more extensive collecting in the Great Basin will reveal nameable subspecies.

Affinis is most often encountered in open, semi-desert brush lands at all elevations up to 9000 feet. I have collected it several times in the forested areas of the Sierra but in these instances always in extensive clearings or in sandy areas around large lakes. Its life history has recently been reported upon as a parasite of *Bembix* wasps[1].

Physocephala burgessi (Williston)

Conops burgessi Williston, 1883, Trans. Conn. Acad. Sci. 4:340.
Physocephala burgessi, Kröber, 1914, Arch. f. Naturgesch. 80: 106.
Physocephala burgessi, Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:579.
Physocephala brevicornis Van Duzee, 1927, Proc. Calif. Acad. Sci. (4) 16:580.

Although nearly as widespread as *affinis*, this species is less abundant and more scattered in distribution. It occupies the moister regions in the Sierra and Coast Ranges of California, and timbered areas of Oregon, Washington, Idaho, Utah, Wyoming, and Montana. It presents a very uniform appearance throughout its range. Although it may occur in a wooded area bordering open country which harbors *affinis*, the two species are never taken together. This is illustrated in Wyoming where one finds *affinis* in the open brush lands of Jackson Hole and *burgessi* in the forests of the bordering moraines.

The life history of *burgessi* is unknown. I once observed an individual pursuing a large specimen of *Odynerus* wasp but could not find conclusive evidence of parasitism. This fly has been collected on flowers of *Prunus* and *Ceanothus*.

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[1] Bohart, G. E. and J. W. MacSwain 1939. The life history of the sand wasp *Bembix occidentalis beutenmuelleri* and its parasites. Bull. South. Calif. Acad. Sci. 38:84-97.

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CONTENTS

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ADDITIONAL OBSERVATIONS AND DESCRIPTIONS OF SOME SPECIES OF PLEOCOMA

(Coleoptera, Scarabæidæ)

BY E. GORTON LINSLEY

University of California

The following observations on *Pleocoma* have been accumulated by the writer since the publication of miscellaneous notes on the genus in 1938.[1] For the privilege of studying material from their own collections or collections in their care, the writer is indebted to Mr. Charles Harbison of the San Diego Society of Natural History, Mr. J. C. von Bloeker of the Los Angeles Museum, Dr. J. M. Linsdale of the University of California, Mr. Fred Platt, Mr. J. W. Johnson, Mr. A. T. McClay, and Mr. George Mansfield.

Pleocoma conjungens Horn

This species is but little larger than the coastal form of *P. hirticollis* Schaufuss, and all of the examples at hand are less than 24 mm. in length. Specimens from Ben Lomond, Santa Cruz Mts., Calif., sent for identification by Mr. V. R. Jones, differ from Mr. Davis' figure (Bull. So. Calif. Acad. Sci., 34, pl. 1, f. 10, 1935) by having the lamella of the fifth antennal segment only about one-half as long as that of the sixth. Possibly Mr. Davis' figure was made from a specimen of *hirsuta* Davis rather than of *conjungens* Horn, since in his description of the latter species (l. c., p. 28-29) he states that the lamella of the fifth segment is about five-eighths as long as that of the sixth. In any event it is probable that this character is variable and the Ben Lomond specimens are without a doubt referable to *P. conjungens* Horn.

Pleocoma lucia Linsley, new species

Male. Form oblong-ovate, moderately large, color dark piceous; pubescence golden. *Head* distinctly, rather closely punctate; clypeus reflexed, anterior process moderately shallowly notched at apex, angles moderately obtuse, surface closely punctate, clothed

[1] Linsley, E. G., 1938. Notes on the habits, distribution, and status of some species of *Pleocoma*. Pan-Pac. Ent., 14:49-58, 97-104.

with coarse, erect, golden setæ, vertical horn obtuse, apex very feebly notched; ocular canthi rounded apically, projecting at an angle, punctate and pubescent; antennæ reddish brown, scape conical, second segment moniliform, broader than long, third segment less than three times as long as greatest width, subangulate, fourth segment without a lamella, fifth segment with a very short lamella, lamella of sixth segment about two-thirds as long as that of seventh segment, remaining segments forming club, eleventh segment distinctly shorter than tenth segment. *Pronotum* transverse, shining, widest behind the middle, basal angles rounded, surface moderately finely, not closely punctate, lateral discal impressions deep, very distinct, basal impressions moderate; scutellum glabrous, shining, almost impunctate. *Elytra* oblong-ovate, finely punctate; geminate striæ very feeble. *Legs* hairy; tarsi longer than tibiæ. *Abdomen* with sternites rufo-testaceous, clothed with golden pubescence. Length, 23 mm.

Female. Form elongate oval; color reddish brown; clypeus shallowly emarginate at middle, vertical horn short, broad; antennæ reddish brown, fifth segment angulate, sixth segment with a short lamella, segments seven to eleven forming club; pronotum transverse, finely, not closely punctate, widest at posterior angles, disk without a transverse elevation; scutellum glabrous, almost impunctate; elytra suboval, widest behind middle, surface shallowly, not closely punctate. Length, 40-42 mm.

Holotype, male, No. 5180, Calif. Acad. Sci., Ent., collected by J. M. Linsdale at the Frances Simes Hastings Natural History Reservation, near Jamesburg, Santa Lucia Mountains, Monterey County, California, January 21, 1939. Allotype, female, No. 5181, and one paratype, female (collection of Hastings Natural History Survey) also collected near Jamesburg and submitted by Dr. Linsdale.

This species appears to be related to *P. conjungens* Horn. It may be distinguished by the structure of the male antennæ (club composed of only five full length lamellæ with the lamella of the fifth segment vestigal and that of the fourth segment lacking) and the form of the pronotum (widest behind the middle with prominent basal angles and deep lateral discal impressions).

Pleocoma hirsuta (Davis)

An examination of the type confirms the opinion previously expressed by the writer that *hirsuta* should be regarded as a distinct species (or at the very least a subspecies) and not as a variety of *conjungens*. The type bears the following data: "Ridge

Route, 1-22-33, R. D. Lusk. Found about 7 mi. this side [toward Los Angeles] of the summit [Sandbergs]—hundreds flying through the air just below the snow line about 5:00 P.M."

In the collection of the Los Angeles Museum there is an example from Bee Rock, Griffith Park, Los Angeles, California (Brereton), which appears to be referable to *hirsuta* and which thus slightly extends the known range.

Pleocoma nitida Linsley, new species

Male. Form large, robust, broadly oval, only moderately convex; integument mostly dark brown, legs reddish brown, elytra black, shining; pubescence golden. *Head* coarsely, closely punctate except for a broad smooth band near inner anterior margin of eye; clypeus very coarsely punctate at middle, the punctures becoming smaller laterally and anteriorly, anterior process scarcely reflexed, deeply, obtusely notched, angles acute, produced, vertical horn elongate, sides nearly parallel, apex notched, surface clothed with long hairs; ocular canthi with anterior margin projecting slightly forward from a right angle, apex moderately acute; antennæ with segments reddish and lamellæ dark brown, scape conical, second segment moniliform, third segment elongate, slender, curved, widest at apex, fourth segment with an acute process, fifth segment with a lamella about one-half as long as that of sixth segment, lamella of ninth segment longest, lamellæ of tenth and eleventh segments and those of segments eight, seven, and six, decreasing in length from that of ninth segment. *Pronotum* nearly two and one-half times as wide as greatest length, widest at base, posterior angles prominent, slightly produced, anterior concavity very coarsely, closely punctate, clothed with long hairs, posterior median impression feeble, lateral discal pits not evident; scutellum black, punctation denser along median line, pubescence fine, sparse; legs reddish brown, densely clothed with long, golden hairs. *Elytra* together about one-eighth longer than wide; integument black, shining, sparsely punctate; geminate striæ very feeble, indicated by rows of shallow punctures; sutural striæ shallow. *Abdomen* with sternites reddish brown, densely clothed with golden hairs. Length, 28 mm.

Female. Form broadly oval, widest behind middle; color reddish brown, elytra paler. *Head* moderately coarsely punctate; clypeus dull, anterior process shallowly emarginate, vertical horn low, apex bifid, area behind and on each side of vertical horn smooth, polished, sparsely punctate, antennæ with basal segments pale, club dark brown, fourth segment angulate, segments five to eleven forming club. *Pronotum* shaped much as in male, nearly twice as wide as long, widest at posterior margin, posterior angles

prominent, a little produced, surface moderately, coarsely, closely, irregularly punctate, posterior median impression shallow but distinct; scutellum less coarsely punctate than pronotum, with a few fine hairs. *Elytra* pale reddish brown, surface smooth, polished, shining, finely, sparsely punctate; sutural striæ shallow but distinct; costæ distinct at base, becoming evanescent posteriorly. Length, 31.5 mm.; breadth across apical one-third of elytra, 21 mm.

Holotype, male, No. 5182, Calif. Acad. Sci., Ent., collected one mile south of Atascadero, San Luis Obispo County, California, December 19, 1940, 6:30 A.M.; temperature, 45° F. ["There was a very heavy radiation fog that morning and visibility was very limited. It was caught about three-quarter hour before sunrise at a light on the front porch of a house."] and allotype, female, No. 5183, from 6 miles east of Santa Margarita, San Luis Obispo County, California, on the Calf Canyon Road, January 24, 1941. Both specimens were sent by Mr. George Mansfield, to whom the writer is indebted for the privilege of studying them. Mr. Mansfield writes of the allotype, "I asked the person who gave it to me as to the habitat in which he found it and he describes it as follows: 'It was dug out of ground. Chemise and manzanita brush and also greasewood.' I presume he means *Adenostoma fasciculatum*, *Arctostaphylos* sp., and *Baccharis* sp."

P. nitida is related to *P. hirsuta* Davis and may prove to be only subspecifically distinct. It differs from *hirsuta* primarily in the wider pronotum, sparsely hairy head, form of the clypeal process, glabrous scutellum, and highly polished elytra. In size, *nitida* is suggestive of *blaisdelli* but may be separated by the broad pronotum with prominent posterior angles, the less convex form, and shining pronotum and elytra. From both *conjungens* and *lucia* it may be distinguished by its larger size, smoother and more shining elytra, rough, pubescent anterior pronotal concavity, and more elongate antennal club. From *lucia* it further differs in the absence of lateral pronotal pits, strong posterior angles of the pronotum, broad, bifid, vertical clypeal horn, and acutely angulate process of clypeus.

Pleocoma sp.

In the collection of the Los Angeles Museum there is a female of the *conjungens* group from Santa Barbara, California, March

9, 1933, collected by Dr. J. A. Comstock. It differs from the female of *nitida* in the form and proportions of the pronotum and antennæ. It probably represents a distinct species although it may prove to be the female of *P. hirsuta* Davis.

The males of the various species mentioned above (as well as that of *blaisdelli* Linsley) will run in Mr. Davis' key (Bull. So. Calif. Acad. Sci., 34: 7-8, 1935) to *Pleocoma conjungens* Horn. Since they are all somewhat similar, the following key has been prepared to facilitate their separation. It is probable that some of the characters used below will prove to be variable when longer series are available for study and in case of discrepancies the full descriptions should be consulted.

Key to Males of Conjungens Group

1. Anterior impression of pronotum a little more coarsely, closely punctate than disk, sparsely hairy; average size about 22 mm. (range 20-23.5 mm.) 2
–. Anterior impression of pronotum coarsely, closely punctate, densely hairy; average size about 26 mm. (range 24.5-28 mm) .. 3
2. Antennal club composed of six full-length lamellæ, lamella of fifth segment at least one-half as long as sixth, fourth segment with a short lamella; ocular canthi almost right-angular, surface polished, impunctate; pronotum widest at basal angles, basal angles prominent, lateral discal impressions very feeble or lacking. Santa Cruz Mountains ..... *conjungens*
–. Antennal club composed of five full-length lamellæ, lamella of sixth segment more than half as long as seventh, lamella of fifth segment vestigial, fourth segment not lamellate; ocular canthi rounded, projecting at an angle, surface closely punctate; pronotum widest behind middle, basal angles rounded, lateral discal impressions deep. Northern Santa Lucia Mountains ..... *lucia*
3. Pronotum shining, posterior angles prominent, slightly produced 4
–. Pronotum dullish, posterior angles obtuse, not produced; greatest width of pronotum about twice greatest length; hairs of upper surface of head mostly confined to vertical horn and anterior process of clypeus. Foothills of Calaveras County. ..... *blaisdelli*
4. Greatest width of pronotum at most twice greatest length; dorsal surface of head very hairy; anterior process of clypeus strongly reflexed, lateral angles acute but scarcely produced, emargination almost right-angular; elytra moderately shining; scutellum thinly clothed with long hairs. Los Angeles County. ..... *hirsuta*

–. Greatest width of pronotum nearly two and one-half times greatest length; dorsal surface of head sparsely hairy; anterior process of clypeus not reflexed; lateral angles very acute, produced, emargination obtuse, rounded; elytra highly polished; scutellum without long hairs. Coast Ranges of San Luis Obispo County.....*nitida*

Pleocoma hirticollis vandykei Linsley

The description of the female of this subspecies was inadvertently omitted from a previous paper. It is therefore presented at this time.

Female. Form small, convex; color brown. *Head* rugose; clypeus with anterior process broadly rounded at sides, shallowly emarginate at apex, vertical horn very short; ocular canthi triangular; antennæ pale at base, club dark, segments five to eleven forming club, relative proportions of lamellæ much as in male. *Pronotum* about twice as wide as long, coarsely rugoso-punctate, surface with a few fine scattered hairs; scutellum shining, subglabrous, punctured at base; legs short, very hairy. *Elytra* scarcely longer than broad, widest at apical one-third; surface shining, sparsely punctate; sutural striæ shallow; geminate striæ feeble. Length, 22 mm.; width, 14.5 mm.

Neallotype, female, No. 5184, Calif. Acad. Sci., Ent., from Eldridge, Sonoma County, California, May 30, 1917, in the collection of Dr. E. C. Van Dyke.

Pleocoma hoppingi Fall

Mr. Darwin Tiemann has recently collected five males of this species in Yosemite National Park, making a considerable northern extension of the previously known range. Four of these specimens were taken at Camp Cascades, elevation 4000 feet, on January 18 and 27, 1939, and on January 12, 1940. The fifth specimen was captured at Grouse Creek, elevation 6000 feet, on February 5, 1940.

Mr. Hopping[2] has recorded the probable host of this species as the mountain misery, *Chamæbatia foliolosa* Benth.

Pleocoma edwardsii LeConte

A male of this rare species was captured at Grass Valley, November 17, 1938, by Mr. William Perry, who kindly presented it to the writer.

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[2] Hopping, R., Proc. Pac. Coast Ent. Soc. (62nd meeting, 1916), p. 137.

PLEOCOMA DUBITALIS Davis

I have recently examined two males of *P. dubitalis dubitalis* Davis from McMinnville, Yamhill County, Oregon, December, 1936, in the collection of Mr. A. T. McClay. This locality is of special interest because it partially fills the existing break in the known distribution of this subspecies (see map, Pan-Pac. Ent., 14:103, 1938).

PLEOCOMA CARINATA Linsley

Through the kindness of Mr. McClay, I have also had the privilege of examining three examples of *P. carinata* Linsley from Dead Indian Soda Springs, Oregon. They were captured in a rainstorm on October 20, 1934, by Mr. L. G. Gentner. Two of the specimens have the anterior longitudinal impression of the pronotum clothed with long, erect hairs, emphasizing a relationship with *P. simi* Davis.

PLEOCOMA SHASTENSIS Van Dyke

Pleocoma shastensis Van Dyke flies in the early morning from about 6 A.M. to about 10 A.M. and again in the afternoon and evening from about 3 P.M. to 9 P.M. Specimens have also been captured at light. Rivers (Ent. Amer., 5:17, 1889), on the authority of Oscar Baron, has recorded the latter habit for *P. fimbriata* LeConte and it has also been recently observed in *P. nitida* Linsley and *P. rickseckeri* Horn, but I am not aware that it has been reported for other species. Davis (Bull. So. Calif. Acad. Sci., 33:129, 1934) states that he was unable to attract *P badia* Fall to automobile headlights, and similar attempts with *P. behrensii* LeConte have also failed. However, Davis also reports an observation by Kenneth Monroe that some "large brown bugs" were flying into a fire during a rain at Pine Flats, near Pasadena, California, and suggests that these may have been *Pleocoma.*

The color of the pubescence in *shastensis* varies in much the same way as has been recorded for *puncticollis* Rivers (Linsley, 1938:97). In the majority of specimens the hairs are brownish black but in occasional examples they are light brown. The latter specimens would run in Davis' key (1935:7) near *simi* Davis but may be distinguished by the glabrous pronotal impression. They also suggest *carinata* Linsley, but in this last species

the pubescence is golden, the form more oval, and the ocular canthi are at right angles to the longitudinal axis of the clypeus.

PLEOCOMA AUSTRALIS Fall

This species is apparently much more widely distributed than has been previously recognized. Prior to 1937, it was known only from Mt. Wilson, California. In the latter year, Moore (Occ. Pap. San Diego Soc. Nat. Hist., 2:83, 1937) recorded specimens from Hot Springs Mountain, near Warner's Hot Springs, San Diego County, California. These specimens have recently been studied and the identification confirmed. Through the efforts of Mr. F. R. Platt, a portion of the existing gap in the known distribution has been filled by the capture of a fine series of specimens at Lake Hemet, San Jacinto Mountains, Calif., on October 26, 1940. This is the first record of a species of *Pleocoma* from this range of mountains[3]. The range of *P. australis* has also been extended eastward by the capture of a male and female by Mr. J. W. Johnson at San Sevaine Ridge, near Lytle Creek, San Gabriel Mountains, San Bernardino County, California.

PLEOCOMA BEHRENSII LeConte

Additional data on the distribution of this species have been obtained through the capture of a male and female at Sharp Park, San Mateo County, California, October 30, 1940, by W. H. Lange, Jr. The female is smaller than usual for *behrensii*, with the geminate striæ more strongly impressed and the pronotum more densely and deeply punctate. The male, like others from San Mateo County as well as one at hand from Angel Island, San Francisco Bay, differs from those of typical *behrensii* by having the pronotum a little more closely punctate and the integument is slightly duller and more hairy. It is possible that the San Mateo County form represents a subspecies of *P. behrensii*.

PLEOCOMA PUNCTICOLLIS Rivers

In the collection of the San Diego Society of Natural History there are several examples of this species from Ramona, San Diego County, California, collected by John W. Snyder and also specimens from Alamo, Lower California, December 5, 1926.

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[3] In the summer of 1939, Mr. E. S. Ross and the writer found *Pleocoma* elytra at Herkey Creek, not far from Lake Hemet, but it was not possible to identify the species involved.

EXTERNAL SEX CHARACTERS OF TWO IMPORTANT NATIVE PREDATORS OF THE MOUNTAIN PINE BEETLE IN SUGAR PINE

(Coleoptera: Ostomatidæ, Cleridæ)

BY G. R. STRUBLE[1] AND L. H. CARPELAN[2]

INTRODUCTION

The green trogositid, *Temnochila virescens* (F.) var. *chlorodia* Mann. (Ostomatidæ), and the red-bellied clerid, *Enoclerus sphegeus* F. (Cleridæ), are the most important insect enemies of the mountain pine beetle (*Dendroctonus monticolæ* Hopk.) in sugar pine. Both these beetles are consistently associated with *Dendroctonus* infestations, but neither of them ever occurs in numbers sufficient to check the development and spread of outbreaks of the mountain pine beetle.

In biological studies pertaining to the two species, a handicap was found in setting up mating pairs for oviposition, owing to an apparent lack of any differentiating external sexual character by which the males and females could be segregated. This was partially overcome by placing a number of adults of a given species in a container and later separating out pairs inclined to mate. While this method was rather successful, the adults often resorted to fighting which resulted in injury or death. This factor, in addition to the time required in making a proper setup, emphasized more than ever the need for the discovery of a constant sexual character by which the adults could be separated. Furthermore, the segregation of sexes on the basis of mating behavior often resulted in pairs of the same sex.

METHODS

In the search for a character or characters, each species was studied assiduously under the binocular microscope. Characters commonly used by coleopterists to differentiate between sexes were examined. First consideration was given to differences which might be found in number and relative size of antennal segments, size and number of tarsal segments, differences in punctation and striation, and differences in external genitalia. To facilitate these observations, microscope glass slides were especially prepared of appendages, genitalia, and exoskeletons from both sexes.

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Description of Sex Characters

These studies resulted in the discovery of a character for each species of predator which is constant and fairly easy to distinguish with the aid of an 8X hand lens or low-power binocular microscope. Detailed illustrations of the character for each species are presented in Figures 1 and 2.

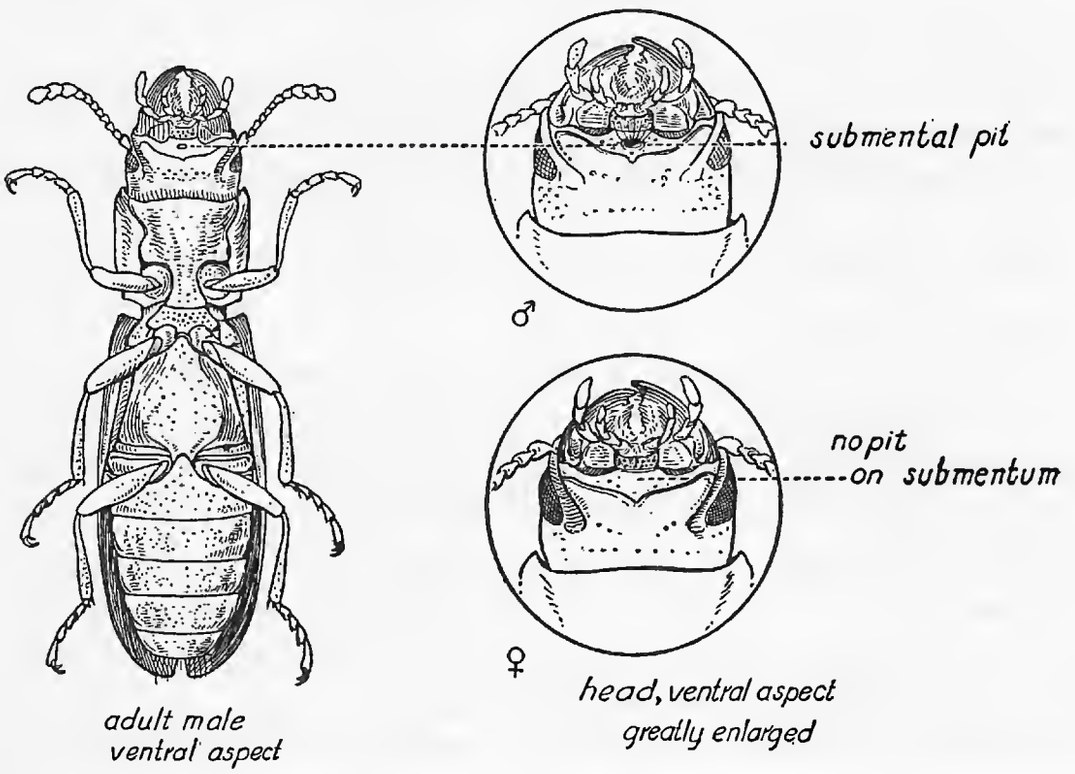

Figure 1. *Temnochila virescens chlorodia* (Mann.), showing difference between sexes.

Temnochila virescens (Fabr.)

On the broad central area of the submentum of the male there is a median pit[1] containing a group of hairs. This sclerite is fairly broad medially, with lateral extensions narrow. Both pit and submentum are sufficiently large to be seen under an 8X hand lens. Examinations of the genitalia of five individuals with the submental pit and five without it indicated that those beetles possessing the pit were definitely males, while those lacking the pit were females.

It was thus fairly clear that the male could be differentiated from the female by this character. In order to substantiate this

[1] This pit has not been referred to in the literature in describing the genus or species. (See References.)

belief without further dissection the following observations were made:

(1) Four mated pairs, which had been the most productive egg layers in the laboratory, were examined, and in each case found to contain one individual with and one without the submental pit. Observations of mating behavior indicated that the male possessed the character.

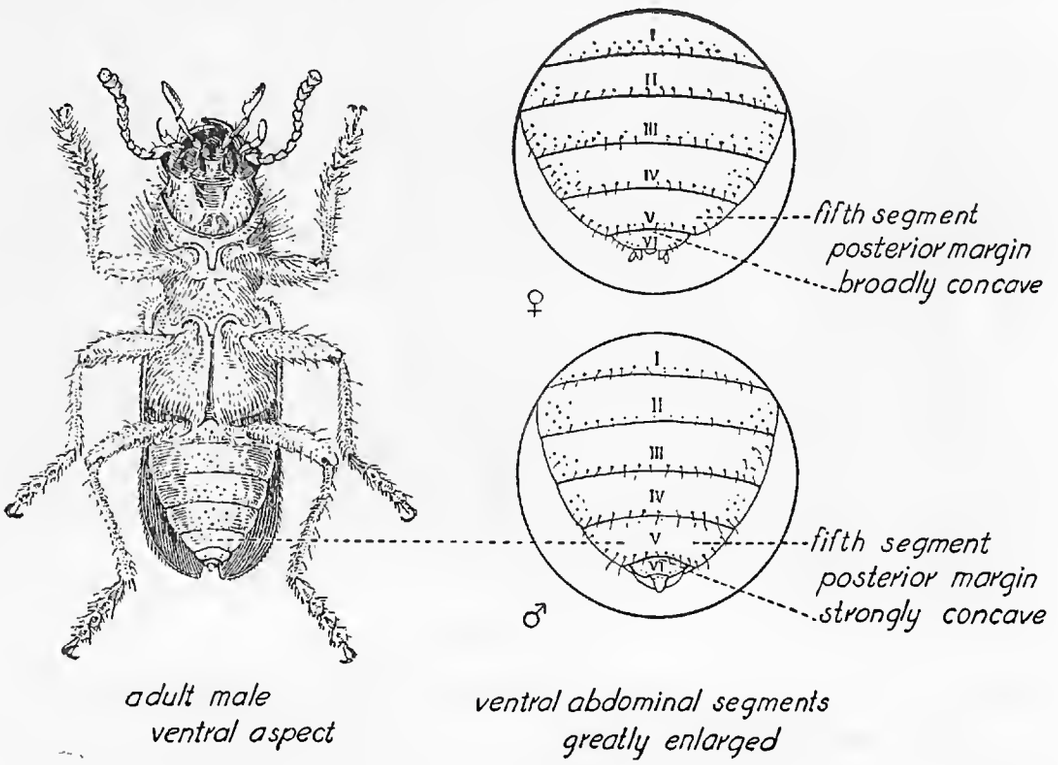

Figure 2. *Enoclerus sphegeus* (Fabr.), showing difference between sexes.

(2) A similar condition existed in eight of ten pairs set up on the basis of mating behavior. In the other two pairs of this group, both the individuals had the pit, *i.e.*, both were males. This is the situation mentioned previously, whereby as a result of mating behavior, pairs of beetles are often mismated.

(3) On the basis of presence or absence of the pit, forty-six individuals were segregated into two homogeneous groups. Mating was not observed within either of these groups, thus indicating that the sexes had been properly separated. When the groups were combined so that equal sex distribution was obtained, mating was observed immediately. A careful examination of each mated pair showed the presence of the submental pit in the male and the total absence of this structure in the female.

ENOCLERUS SPHEGEUS (Fabr.)

The only constant sexual character found on this species is in the fifth (penultimate) abdominal sternite. In the male the posterior margin of this sternite is definitely concave. In the female the curve is not so pronounced. This character can be used successfully and accurately after some experience.

In alcoholic or mounted specimens the character is sufficiently good to allow perfect accuracy (as checked by examination of genitalia) in determining differences between sexes. In the living individual, examined under a hand lens or dissecting microscope, observation of this character is made difficult by the great activity of this species. The insect also has the habit of curling up the abdomen, and as a consequence the penultimate sternite is difficult to observe carefully.

The use of an anesthetic to quiet the beetles, or of refrigeration to slow them down, would make the determination fairly easy. While this character is constant, it is complicated by the behavior of the active beetle, and had best be regarded as a temporary aid in distinguishing the sexes.

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A NEW SPECIES OF ELEODES FROM OREGON, BELONGING TO THE SUBGENUS BLAPYLIS

(Coleoptera, Tenebrionidæ)

BY FRANK E. BLAISDELL, SR.

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The author has recently received a series of a species of *Eleodes* which belongs to the subgenus *Blapylis*. This species apparently inhabits a limited geographical area in Oregon.

Eleodes (Blapylis) oregona Blaisdell, new species

Form moderately robust, differing in the sexes from oblong-suboval to ovate and about twice as long as wide. Color black, luster dull. Not pubescent, punctures inconspicuously setose.

Head moderately small, in width about equal to one-half that of pronotum and not quite as wide as pronotal apex; twice as wide as long before post-ocular line; sides scarcely more prominent than eyes, margins arcuate over antennal insertions, thence convergent and less arcuate, continuously so with sides of epistoma, and as a whole broadly and slightly sinuate across the position of oblique sutures; epistomal angles evenly arcuate, apex moderately emarginate. Frons slightly convex, more strongly so over antennal insertions and declivous against eyes; feebly impressed on the positions of transverse and oblique sutures, the former obsolete, the latter more or less indicated; surface very densely and coarsely punctate, punctures rather strongly impressed, less so on epistoma. Labrum relatively small, transverse, sides and angles evenly arcuate and convergent to apical emargination, the latter median, narrow and as wide as deep; surface feebly convex, equally divided by a fine transverse carinule into an apical and basal portion; the latter smooth and sculptureless, the former slightly declivous, finely and densely punctate, punctures setigerous, the marginal setæ longer, forming a fringe. In the specimens studied the articulating membrane is only visible at apical epistomal emargination. Eyes moderately short, superior lobe small. Tempora not strongly convex, gradually convergent posteriorly from margin of eyes.

Antennæ moderate in length and comparatively slender, about attaining pronotal base; second segment subannular, as long as wide, somewhat convergent basally; third elongate, obconical, about three times as long as wide at apex and three times as long as second; segments four and five equal in length, one-third longer than wide at apex; six, seven and eight inclusive, obconical, surface lines of fourth quite parallel, those of five, six and seven slightly arcuate; fourth to eighth inclusive equal in width of apices; segments nine, ten and eleven slightly wider and feebly compressed; ninth subspherical, tenth irregularly spherical in outline, eleventh obovate and truncate at apex.

Pronotum moderately transverse, one-third wider than long, widest at middle; apex moderately emarginate, angles evenly rounded, not in the least prominent anteriorly; sides broadly and strongly arcuate, moderately convergent anteriorly to apical angles, slightly less arcuate in posterior third, briefly sinuate in basal seventh, angles small and more or less rectangular; base broadly arcuate and one-fourth wider than apex; disk moderately and quite evenly convex, densely, coarsely and irregularly punctate, intervals noticeably varying in width; laterally punctures

less deep and smaller in the unimpressed submarginal area; marginal bead very fine throughout, slightly obliterated on apex.

Elytra differing more or less in form in the sexes, a little more than twice as long as pronotum, viewed from above; moderately convex in central area and arcuately declivous laterally, arcuately and vertically precipitous at apex; base transverse without marginal bead; humeri obsolete, continuously rounded with the sides, rarely slightly angulate; sides broadly and rather strongly arcuate, apex obtusely rounded; surface in the central area with well separated punctures, which are slightly impressed and not strongly defined, not in the least muricate, intervals flat; laterally and apically gradually becoming small; oblique muricate tubercles intermixed in the humeral regions; extreme sides and apical declivity with scattered, round, smooth, shining points; epipleuræ sparsely punctate, punctures moderately small and more or less distinctly defined. *Scutellum* arcuate at apex, surface closely punctate, punctures small.

Ventral surface more shining and more or less polished. Pronotal sides quite strongly convex and rather densely set with small muricate points and somewhat rugose, especially on coxal convexities. Sterna and episterna densely punctate, punctures small and submuricate. Abdomen smooth, sparsely punctate, punctures small, somewhat denser at sides of first abdominal segment. Legs moderate in length and stoutness. Meta- and mesofemora not inflated and parallel. Metafemora and metatibiæ subequal in length, the latter moderately slender, slightly arcuate in basal fourth and gradually widened in apical fourth. Metatarsi three-fifths as long as their tibiæ; fourth segments about a third longer than the first, twice as long as the third, the latter about one-third longer than the second.

Male. Narrower, oblong-suboval. Elytra subparallel, sides less strongly arcuate. Antennæ a little longer. Abdomen flattened in middle third of first three segments; first segment densely punctate and more or less rugulose, others less densely so with some rugulation.

Female. Ovate and more robust. Elytra but little longer than wide, nearly circular in outline viewed from above, sometimes slightly straighter and convergent in about basal third to base; sides more or less evenly and strongly arcuate, continuously so with the humeri. Abdomen moderately convex, flattened between the coxæ, rather less strongly sculptured.

Measurements of types. Male: length 15 mm.; width 7 mm. Female: length 15 mm.; width 8.5 mm.

Holotype, female, No. 5188, Calif. Acad. Sci., Ent., Bear Springs, Oregon, May 18, 1940 (K. M. and D. M. Fender) in the Blaisdell collection. Allotype, male, No. 5189, Calif. Acad. Sci., Ent., same data, except collected on May 26. Paratypes,

forty specimens with same data, distributed as follows: collection of the California Academy of Sciences and that of the author, 11; American Entomological Society, 4; and K. M. and D. M. Fender, 28.

Oregona belongs to the Cordata Group of the subgenus *Blapylis*. Other species that may occur in the same faunal region are as follows: typical *cordata* Esch., *rotundipennis* Lec., *patulicollis* Blais. and *verrucula* Blais.

Oregona is to be recognized by its ovate form and dull luster. It is moderately robust and the elytra are quite circular, appearing slightly inflated. It is further distinguished by the moderately oblong-oval form of the male; the dull luster; the elytra narrower oval with sides more parallel; the pronotum transverse; the lateral margins broadly arcuate, most strongly so in middle third, less so posteriorly, but never broadly sinuate behind the middle where the margin is simply less arcuate or a little straighter; the sinuation feeble, strongest just before the small basal constriction and angles; humeri obsolete. The pronotal and elytral sculpturing is similar to but less coarse than in typical *cordata* Esch. where the pronotal lateral margins are obtusely subangulate at middle and distinctly more or less broadly sinuate behind the middle to the constricted base; the humeri are more or less obtusely angulate.

Rotundipennis Lec. is a smaller species and rather less robust, varying considerably in size and body form; the luster is more or less shining; the pronotal sides are distinctly more oblique behind the middle, more constricted at base and the angles more rectangular.

Patulicollis Blais. of the Parvicollis Group may occur with *oregona*. The species is oblong-oval in form, sometimes feebly subovate when the pronotum is less transverse; surface luster dull, the pronotum and elytra less convex; sides of the pronotum evenly arcuate to very near the base, the latter scarcely constricted; the pronotal surface less coarsely and densely punctate, punctures distinct, feebly impressed with intervals flat. Habitat: near Lake McElroy, Baha, Washington. One specimen came to hand with the series of *oregona* from the type locality.

Verrucula Blais. has the sides of the pronotum distinctly obtusely angulate, the disk very densely punctate, punctures quite equal in size; elytra densely tuberculate.

TINGITIDÆ FROM AMBOINA ISLAND

(Hemiptera)

BY C. J. DRAKE AND M. E. POOR

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The present paper is based upon a small collection of lace bugs from Amboina, Amboina Island, Molucca Islands, East Indies, presented to the California Academy of Sciences by the late F. Muir. This collection contains fifteen specimens, distributed among five genera and six species. Two genera and five species are described below as new to science. The types of all the new species are in the California Academy of Sciences.

Diconocoris javanus Mayr

Diconocoris javanus Mayr, Verh. Zool.-Bot. Ges. Wien, 15:442, 1865.
Diconocoris javanus, Drake, Lingnan Sci. Jour., 16:386, figs. 1, a and b, 1937.

One male specimen from Amboina agrees pretty well with the original description and also with the type as figured by Drake. It is a very large and striking species of a brownish black color. The costal area of the elytra is rather broad with the nervures dark brown to dark fuscous and most of the heavy transverse nervures black; some of the areolæ along the inner margins are clouded with brown to fuscous, the others hyaline. The legs are slender, testaceous, the tarsi brown.

Cysteochila aspera Drake and Poor, new species

Brown, the elytra with indication of median band and a transverse spot a little before apex, fuscous. *Head* with five rather short spines, the median longest and directed downward, the hind pair appressed. *Rostral channel* deep, not very wide, the rostrum brown, extending a little beyond mesosternum. *Antennæ* moderately long, indistinctly pilose, brown; segment I short, much stouter but not much longer than II; III very slender, almost three times as long as IV, the latter fusiform. *Legs* brown, rather slender and fairly short. *Pronotum* tricarinate, the strongly developed paranota sharply reflexed and meeting above disc so as to conceal all the dorsal surface save hood and triangular process; hood small, the front margin faintly produced; paranota very large, extending considerably above disc of pronotum, with strongly developed, bulbous, lateral humeral projections; lateral carinæ foliaceous, uniseriate, slightly converging posteriorly,

marginal veins thick; median carina more strongly raised, much higher on disc, there the paranota resting on it; triangular process areolate, the carinæ hairy. *Elytra* considerably longer than abdomen, the sides nearly parallel, strongly overlapping and jointly rounded behind when at rest; costal area moderately wide, biseriate, the areolæ moderately large; subcostal area a little wider, biseriate; discoidal area very long, wide, extending considerably beyond middle of elytra, pointed and slightly raised at apex, widest at middle, there six to seven areolæ deep, the inner boundary raised and obtusely angulate between middle and apex; sutural area large, more closely reticulated. *Genital segments* of male very broad. Hypocostal ridge biseriate at base, becoming uniseriate posteriorly. Length, 3.60 mm.; width, 1.37 mm.

Holotype, male, No. 5197, Calif. Acad. Sci., Ent., Amboina. The prominent lateral protuberances of humeri, the carinæ, paranota and broad male genital segments are distinguishing characters. The costal margins of the elytra are reflexed along the basal three-fifths.

Orotingis Drake and Poor, new genus

Pronotum convex, coarsely pitted, unicarinate; hood wanting; paranota not expanded or areolate, represented by a very narrow, carina-like ridge; collar present, truncate in front. *Head* short, without spines, the eyes large. *Antennæ* rather slender, segment I rather short, a little stouter and longer than II; III not much slenderer than other segments, scarcely longer than IV. *Bucculæ* short, open in front. *Rostral channel* very broad on meso- and metasternum, the laminæ low, rostrum rather long. Antenniferous tubercles inconspicuous. Orifice present. *Elytra* very broad, the outer marginal nervure strongly costate, costal and sutural areas widely reticulated, each distinctly defined; subcostal and costal areas more closely reticulated, the boundary between them not clearly defined, the pronotum and reticulation of elytra without vestiture.

Type of genus: *Orotingis muiri* Drake and Poor, n. sp.

This genus seems to be most closely allied to *Eteoneus* Distant, but is easily separated from it by the long fourth antennal segment. In *Eteoneus* the fourth antennal segment is much shorter and the areas of the elytra are sharply set off from each other.

Orotingis muiri Drake and Poor, new species

Head black, almost flat above, the eyes very large and blackish. Antennæ moderately stout, testaceous, indistinctly hairy; segment I moderately long, faintly embrowned at base, about one and one-

half times as long as II, the latter slenderer and rather long; III straight; IV very long, clothed with longer and more numerous hairs, faintly stouter, subequal in length to the preceding. *Rostrum* extending almost to base of mesosternum; channel widest on mesosternum, there with the sides concave within, slightly narrower and cordate on metasternum. *Pronotum* strongly convex, truncate in front, black, shiny, the pits very large; triangular process moderately large, somewhat brownish, the pits small, somewhat rounded at apex; median carina sharply raised, thick, non-areolate; paranota represented by an inconspicuous carina; collar cylindrical, not elevated. *Elytra* very broad, sharply widened at base, widest opposite apex of triangular process; costal area very broad, the outer nervure very thick, biseriate at base and in widest part, triseriate in transverse band, a small spot at base, a wide band in front of middle and apical portion dark fuscous (including areolæ), the rest pale testaceous with clear areolæ, the areolæ in widest part very large; discoidal and sutural areas dark fuscous, the nervures separating them not clearly defined, the areolæ of sutural area with centers pale and hyaline. *Legs* rather slender, pale testaceous. Length, 2.60 mm.; width, 1.65 mm.

Holotype, male, No. 5198, allotype, female, No. 5199, Calif. Acad. Sci., Ent., and one male and two female paratypes, Amboina, January, 1908.

In some specimens the third and fourth antennal segments are subequal in length. The discoidal area extends faintly beyond the middle of the elytra and is four areolæ deep in widest part.

Cottothucha Drake and Poor, new genus

Head short, without spines. Bucculæ contiguous in front. Orifice present. *Rostrum* moderately long; rostral channel very wide on metasternum, the laminæ not meeting behind. Antennæ long, slender; segments I and II short, the latter shorter; III very long, slenderest; IV long, slightly thicker than III. Antenniferous tubercles not prominent, small. Elytra considerably longer than abdomen, divided into the usual areas, without inflations. Pronotal cyst extremely large, not divided, concealing base of head and most of pronotum, except small portion of lateral margins and tip of triangular process. Reticulations distinctly lacy.

Type of genus: *Cottothucha oceanæ* Drake and Poor, n. sp.

This genus differs from *Idiocysta* China in having a differently formed and undivided hood or cyst, no visible lateral carinæ on triangular process and foliaceous paranota reflexed against the sides of the cysts. In *Idiocysta,* the paranota form the semiglobose hoods.

Xenotingis Drake and *Holophygdon* Kirkaldy have hoods of a different type and different derivation. *Alloithucha* Drake has widely expanded elytra with apices separated when at rest. The origin and structure of the pronotal hoods and cysts of the above genera and other genera need to be studied, but it is difficult to secure material in most of these genera for dissection and morphological studies.

Cottothucha oceanæ Drake and Poor, new species

Head short, black, almost flat; eyes large, blackish. *Rostrum* testaceous, extending to base of mesosternum. *Rostral channel* deep and parallel-sided on mesosternum, becoming very wide with the laminæ flaring and more widely areolate on metasternum, the laminæ not meeting at middle posteriorly. *Legs* slender, pale testaceous, the tarsi brownish. *Antennæ* long, slender, indistinctly pilose, pale testaceous; segment I not very long, stouter and twice the length of II; III very slender, straight; IV long, slightly thickened, seven-tenths the length of III. *Pronotum* black, almost totally concealed by the hood; hood extremely large, extending truncately over base of head as viewed dorsally, dark fuscous, with the veinlets darker, the median nervure a little more prominent than others, longer than high, strongly inflated, higher than wide; paranota strongly foliaceous, reflexed back against the sides of the hood, practically projecting vertically, biseriate, the areolæ large. *Elytra* rather narrow with subparallel sides, slightly constricted beyond middle, jointly rounded behind, dark fuscous, the widest part of costal and bordering portion of subcostal areas testaceous, there the areolæ hyaline; costal area reduced to a costate nervure along the basal portion, with five or six large areolæ distally (opposite apex of discoidal area); subcostal area narrow, uniseriate; discoidal area extending to middle of elytra and almost to end of abdomen, widest a little beyond middle, there four areolæ deep; sutural area large, the areolæ moderately large, some of them with pale centers. Hypocostal ridge uniseriate. Length, 3.00 mm.; width, 1.94 mm.

Holotype, male, No. 5200, allotype, female, No. 5201, Calif. Acad. Sci., Ent., and one male paratype, Amboina, November, 1907.

Stephanitis amboinæ Drake and Poor, new species

Large, broad, pale testaceous, some of the nervures embrowned. *Antennæ* long, slender, testaceous, shortly pilose; segment I moderately stout, long, narrowed distally to near the apex and then enlarged, five times the length of II, the latter short; III slender,

moderately long, nearly straight; IV very long, very slightly enlarged, three-fourths of the length of III, slightly embrowned. *Rostral channel* widening distally, the rostrum extending to middle of metasternum. *Head* concealed by hood, the spines whitish, rather short and directed forward. *Legs* slender, testaceous, the tips of tibiæ and tarsi embrowned. *Pronotum* dark brown, covered with a white exudation, slightly convex; hood very large, inflated, constricted in front of middle, extending considerably in front of head, about one and one-third times as long as high; median carina strongly foliaceous, nearly as high as hood, and a little shorter, the dorsal margin rounded; lateral carinæ short, not extending back onto triangular process nor forward beyond highest part of disc, high, each composed of two or three rectangular areolæ; triangular process narrow, membranous, reticulated; paranota large, reflexed, recurved in front and behind, the outer margin nearly straight and parallel, composed of several irregular rows of moderately large areolæ. Elytra with outer margin strongly sinuate, widened to beyond the middle, the tips somewhat narrower and widely separated; tumid elevation sharply raised, moderately large, impressed within, subcostal portion convex, discoidal area partially concave and merging with sutural area without distinct differentiation. Reticulation of paranota, hood, carina and elytra partly embrowned, the areolæ moderately large, the margins of elytra and paranota with short, fine hairs. Length, 4.18 mm.; width, 3.10 mm. at widest point of elytra.

Holotype, female, No. 5202, Calif. Acad. Sci., Ent., Amboina, November, 1907.

The short, high lateral carinæ and very strikingly shaped paranota and elytra are distinguishing characters. The crest of the tumid elevation is the boundary between discoidal and subcostal areas, the former occupying the inner portion; the boundary between discoidal and sutural areas is not definitely defined. It is not easily confused with its congeners from the East Indies.

Stephanitis astralis Drake and Poor, new species

Moderately large, pale testaceous, some of the veinlets embrowned, *Antennæ* long, slender, testaceous, shortly pilose; segment I moderately long, rather swollen at ends, not quite four times as long as II, the latter short; III very long, nearly straight, about two and three-fourths times as long as IV, IV moderately long, slightly enlarged. *Rostral channel* deep, widening distally, the laminæ testaceous; rostrum stout, testaceous, dark at apex, extending beyond middle of metasternum. *Legs* testaceous, the tips of tibiæ and tarsi embrowned. *Pronotum* brown, unicarinate, moderately convex, triangular portion narrow, membranous,

areolate; hood rather small, very narrow, extending forward slightly beyond apex of head and backward not as far as highest part of disc; median carina strongly foliaceous, long, a little higher than hood and more than twice as long when measured on dorsal edge, biseriate, the areolæ large; paranota wide, long, nearly rectangular in outline, reflexed, posterior margin curved inward, triseriate, the areolæ large. Elytra broad, the tips separated but not widely, the tumid elevation long, high, impressed within, extending barely beyond middle of elytra. Transverse veinlets of marginal row of areolæ, paranota and elytra embrowned, also a few of the other veinlets; areolæ hyaline, the discoidal area quadriseriate, evenly concave, occupying the inner slope of tumid elevation and truncate behind; subcostal area biseriate, almost vertical; sutural area biseriate at base, triseriate beyond. Length, 3.50 mm.; width, 2.10 mm.

Holotype, male, No. 5203, allotype, female, No. 5204, Calif. Acad. Sci., Ent., and two paratypes, Amboina, November, 1907.

The long median carina and long tumid elevation of elytra are distinguishing characters. The costal area of elytra is wide, triseriate to widest part, there the areolæ are a little smaller and five deep.

SOME ADDITIONAL INTERSEXES IN MEGACHILE*

(Hymenoptera, Megachilidæ)

BY THEODORE B. MITCHELL

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Since the publication[4] several years ago of descriptions of a number of sexually anomalous specimens of leaf-cutter bees (*Megachile*), several additional specimens have been discovered and are herewith reported and described.

MEGACHILE (DELOMEGACHILE) VIDUA Smith, Intersex

The head and thorax of this specimen are entirely male in character, the antennæ being 13-segmented, the anterior tarsi broadly dilated, and all other secondary sex characters just as in a typical male. The more basal segments of the abdomen, also, seem to be more male in character, for the pubescence is entirely pale on the first three basal terga, whereas in females the second and third have conspicuous dark pubescence across the discs. The terminal segments are more definitely female, although the apical fasciæ are much narrower than in the female, and the sixth tergum is less broad, with finer puncturation. The venter of the

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abdomen has six exposed sterna, all of which are smooth and impunctate, although tessellate, and are entirely devoid of pubescence or scopal hairs, except for a few on the sixth sternum.

Nordegg, Alberta, July 5, 1926, (E. H. Strickland) [Univ. of Alberta].

This is the third intersexual specimen of this species to be found, and all three were collected in Alberta.

MEGACHILE (CHELOSTOMOIDES) ANGELARUM Cockerell, Intersex No. 1

The head and thorax are preponderantly male in character, but with a slight degree of femaleness evident. The antennæ are both 12-segmented, as in the female, but the pedicel resembles that in the male, being about intermediate in length between the first and second segments of the flagellum. In the female, this is about as long as both of these segments combined. The upper part of the clypeus, also, seems to be slightly female in character, having the puncturation somewhat more coarse and deep than in most males, with the surface slightly more exposed by the thinner pubescence. The mandible and cheeks seem to be entirely male, and on the thorax, the legs are quite definitely male. The abdomen seems to be more distinctly female, with six exposed sternal plates, a fairly well developed scopa and a sting. The scopa partakes somewhat of the male in that it tends to be decumbent and is composed of finer and slightly plumose hairs, and is more sparse laterally.

Pine Valley, San Diego County, California, August 1, 1927 (F. W. Kelsey) [San Diego Mus.].

MEGACHILE (CHELOSTOMOIDES) ANGELARUM Cockerell, Intersex No. 2

This specimen is very nearly identical with the preceding one, answering to the description in all essential details, and showing only minor differences. The upper portion of the clypeus is somewhat more closely and finely punctate, being thereby a trifle more male in character than in the other specimen, but the front tarsi are not quite so broadly dilated as in that specimen, hence are not quite so distinctly male in character. The antennæ, mandibles and abdomen seem to be very similar in the two specimens.

Twain-Harte, Tuolumne County, California, 4,000 feet, July, 1937 (F. E. Blaisdell) on *Grindelia* [Calif. Acad. Sci.].

MEGACHILE (PSEUDOCENTRON) CURVIPES Smith, Intersex

The thorax and legs are entirely male in character, showing no evident differences from the condition in a normal male. The head, however, is to a degree intermediate. The mandibles are quite

distinctly of the female type, but the teeth are slightly modified from the condition in a typical female. The face is slightly broader than in the male, and the pubescence on the upper portion of the clypeus is intermixed light and dark, instead of being conspicuously black as in the male. The pubescence of the lower portion is dense enough to hide the surface, but is not quite of the male type. The clypeus is thus about intermediate between the typical male and female condition. The apical joints of both antennæ are missing, and since the basal portions of these appendages are not markedly dimorphic, we cannot determine their condition.

The basal portion of the abdomen seems to be slightly more male than female in character, although dimorphism here also is slight and differences are thus harder to detect. Six sterna are at least partially exposed, the fifth being in large part hidden under the fourth, but this is due apparently to the position of the abdomen rather than to any modification of the plate. The sterna are largely devoid of a scopa, but the apical margins of the second to the fifth are fringed with long thin pubescence, much as in the male. The sixth is largely bare, with a short subapical fringe and sparse hairs basally and laterally, which is typical of females in the subgenus *Pseudocentron* to which *curvipes* belongs. The second to fifth terga have conspicuous entire yellow apical fasciæ, as in females of *fossoris*, but the disc of the fifth is covered with short thin greyish tomentum and longer erect hairs which are pale in general, with but a few intermixed dark hairs. The sixth tergum has entirely pale pubescence, this partly as appressed tomentum and partly erect hairs. This condition of the fifth and sixth terga does not agree with the condition in *M. fossoris* Smith, which I have thought to be the female of *curvipes*, but because of the anomalous character of this specimen we are not warranted probably in arriving at any positive opinions on this point.

S. Geronimo, Guatemala (Champion) [Brit. Mus.; Godwin-Salvin coll. 1911-24].

MEGACHILE (ARGYROPILE) PARALLELA Smith, Intersex

This specimen is male in large part, entirely so in both head and thorax. The abdominal terga, also, seem to be quite male in character, but the sixth is definitely female, and a sting protrudes between it and the sixth sternum. The other abdominal sterna are female in general form, lacking any of the modifications characteristic of the male, but the scopa is very thin and poorly developed.

Twain-Harte, Tuolumne County, California, 4,000 feet, July, 1937 (F. E. Blaisdell) on *Grindelia* [Calif. Acad. Sci.].

This is the second intersexual specimen of this species to be collected.

MEGACHILE (LITOMEGACHILE) ONOBRYCHIDIS Cockerell, Intersex?

This is a quite normal female in all respects but one, that being a degree of density of the pubescence on the clypeus which is not found in the female of this species, but is characteristic of the male. Beneath this pubescence, the surface of the clypeus is somewhat more finely punctured than in the normal female.

Lompoc, California, August 6, 1938 (Joan Russell) [Univ. of Kansas].

All of these specimens are considered to be intersexes rather than gynandromorphs, and the causes of their occurrence are quite probably physiological rather than genetic. Space will not be taken here to discuss the various facts and theories of sex determination. These were briefly summarized in the paper on sex anomalies[4], and for more complete information reference should be made to the works of Goldschmidt[2] or Crews[1]. A somewhat more recent work by Goldschmidt[3] reviews all of this information.

Two apparent gynandromorphs have been described in this genus, one of *M. willughbiella* Kirby by Stenton[6], and another of *M. latimanus* Say by myself[5]. In this latter specimen the right side is female and the left male, with the line of division between the two remarkably definite and distinct. Such conditions are considered to be due to genetic upsets, and are in sharp contrast with the conditions in the specimens described here. These are probably genotypic females which have had maleness impressed upon them in varying degrees, depending upon the length of time during development in which the causal factors have been operative. Of these six specimens, those of *vidua* and *parallela* are the most completely male in character, and it is likely therefore that a change in direction of development from femaleness to maleness occurred earlier in those specimens than in any of the others. In the case of the specimen of *onobrychidis*, it is evident that the change of direction occurred very late.

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[2] Goldschmidt, R. A further contribution to the theory of sex. Jour. Exp. Zool., 22:593-611, 1917.

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THREE NEW GENERA OF APTEROUS ARADIDÆ

(Hemiptera)

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The recent discovery of apterous Aradidæ of the genus *Chelonocoris* Miller* was a most remarkable advance in our concept of this group of insects. Localized geographically and exhibiting such remarkable characters, it was unhesitatingly made the type of a new subfamily, Chelonocorinæ. Now we find that a new genus, *Notoplocoris,* disrupts the geographical picture and a new genus, *Emydocoris,* destroys any structural homogeneity which the Chelonocorinæ may once have had. The nymphs of *Notoplocoris,* furthermore, link this form with typical Mezirinæ. Indeed, the genus *Barcinus* Stål, with long first antennal segment, strongly produced juga, and laterally located eighth segment stigmata, suggests a possible direct ancestor for *Chelonocoris* and *Phyllotingis* Walker suggests such an ancestral form for the American *Notoplocoris. Emydocoris* was very likely derived by aptery from a *Mezira*-like ancestor. Thus a polyphyletic origin of the apterous Aradidæ is indicated and the subfamily Chelonocorinæ is no longer tenable.

The present case throws light on the general problem of pterygopolymorphism in the Heteroptera. The Aradidæ are now known to exhibit brachyptery (*Mezira, Aradus*), stenoptery (*Aradus*) and aptery (*Chelonocoris, Notoplocoris, Emydocoris, Chelonoderus*). Such phenomena are commonplace in the Gerridæ and Veliidæ and are accompanied by equally remarkable structural modifications, particularly those correlated with wing development, *e.g.* thoracic modifications. Although a few Veliidæ and Gerridæ (*Trochopus, Halovelia* and *Halobates*) are permanently apterous, many others exhibit all degrees from macroptery to aptery within a single population.

The modern conception of hormone control of development suggests that apterous forms which retain many nymphal structures but which have fully developed reproductive organs may represent cases of arrested or retarded development of one set of organs. This is certainly less remarkable than the complete

* Miller, N. C. E. 1938. A new subfamily of Malaysian Dysodiidæ. Ann. Mag. Nat. Hist. (11) 1:498-510, 7 figs.

neoteny exhibited by larviform females of Lampyridæ or the pædogenesis which occurs in *Micromalthus*, the Cecidomyidæ, and in a few other groups.

Key to the Apterous Genera of Mezirinæ (Chelonocorinæ Miller)

1. Pronotum narrow, gradually constricted anteriorly where it is narrower than head. First antennal segment as long or longer than head. Antenniferous tubercles scarcely produced. Oriental ..... *Chelonocoris* Miller
–. Pronotum with well developed antero-lateral angles across which it is broader than head. First antennal segment shorter than head. Antenniferous tubercles well developed 2
2. Head subquadrate, with large subangular lobes behind the eyes. Body surface entirely naked. Connexival segments not produced, even on seventh segment. Neotropical.. *Emydocoris*, n. gen.
–. Head subtriangular, strongly narrowed behind the eyes. Body surface at least partially clothed with short, thick, appressed hairs. Connexival segments briefly arcuate posteriorly, the sixth and seventh segments more strongly produced into distinct lobes 3
3. Juga slender, subparallel, subacute at apices, not reaching middle of first antennal segment. Metanotum produced laterad as a plate-like cover over base of connexivum. Neotropical. ..... *Notoplocoris*, n. gen.
–. Juga broad, dilated anteriorly, and feebly, obliquely emarginate at apices, reaching nearly to apex of first antennal segment. Metanotum confined within narrow connexival plates, not reaching lateral margins. Australian..... *Chelonoderus*, n. gen.

Notoplocoris Usinger, new genus

Apterous, subtriangular in form, and irregularly clothed with erect or subappressed thick hairs. *Head* slightly longer than broad, strongly narrowed basally, without postocular spines; antenniferous tubercles prominent, divergent, acute; anterior portion of head reaching almost to middle of first antennal segment, the juga surpassing tylus by one-half their length, produced straight forward and tapering apically, forming a deep cleft between. *Antennæ* a little shorter than head and thorax combined, the first segment long, curved outward, stout, sparsely clothed with erect hairs, second segment slender, cylindrical and nude, half as long as first, third slender, cylindrical and wide, slightly longer than first, fourth shortest, pyriform, densely pilose on apical third. *Rostrum* not reaching base of head. *Pronotum* half again as wide as head across eyes, the sides roundly lobulate; meso and metanota progressively wider, produced laterally as rounded or subangulate lobes. Metasternal orifice channels visible from above between

meso and metanota. Meso and metanota without trace of wing pads, triangular scutellum absent. Trochanters distinctly separated from femora. *Abdomen* entirely exposed above, the terga forming a regular pattern of granules and plates. Connexival segments sinuate on their basal halves, briefly arcuately expanded on posterior halves, those of seventh segment produced as short, divergent lobes, rounded at apices, on either side of genital segment. Stigmata of all segments except eighth (genital lobes) located remote from lateral margins, genital lobes with stigmata placed on the sides and visible from above. Abdomen with sides concave to expanded seventh segment in male, oval in outline and broadest across sixth segment in female.

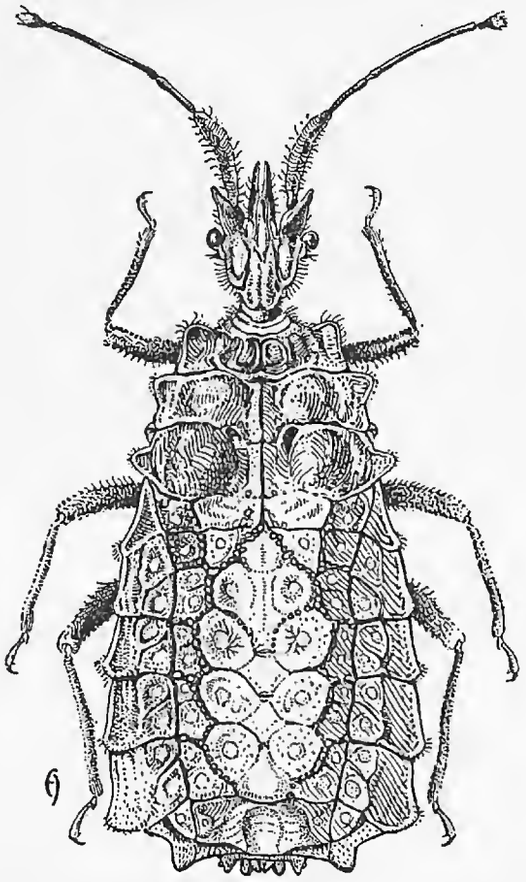

Figure 1. *Notoplocoris montei* Usinger, n. gen. and sp., female allotype.

Genotype: *Notoplocoris montei* Usinger, n. sp.

Suggestive of the Malay genus *Chelonocoris* Miller because of the apterous condition and plate-like pattern of the abdominal tergites. *Chelonocoris* differs in possessing relatively longer first antenal segments; a less deeply cleft apical process of head; shorter antenniferous tubercles; broader base of head with pronotum but little wider than head anteriorly and evenly widening posteriorly, without rounded lateral lobes on each thoracic segment; scuteller area rather distinctly indicated as a poste-

riorly produced triangular plate; connexival segments not roundly lobulate on their posterior halves, the seventh abdominal segment produced on either side of genital segments into long, rounded or subacute lobes; trochanters partially fused with the femora.

Notoplocoris montei Usinger, new species

(Figure 1)

Male. *Head,* one-fourth longer than broad across eyes, 50::39; apical process comprising about two-fifths of entire head length, the tylus extending about half of this distance, juga produced beyond apex of tylus for one-fifth of total length of head; juga tapering apically, their inner margins subparallel, forming a deep, narrow cleft; antenniferous tubercles very prominent, arising about at middle of head just in front of eyes and separated from apical process of head almost from their bases by deep clefts, broad on basal two-thirds, more attenuated and divergent on apical third beyond insertion of antennæ; eyes globular, small but strongly exserted, about one-sixth as wide as interocular space, 5::28; head strongly narrowed behind eyes, briefly angular immediately behind eyes, arcuately converging toward the middle of postocular region, less than half the width across eyes and subparallel at basal fifth, with a narrow, finely granular, constricted neck region at extreme base; upper surface roughened and polished except for a large smooth area laterally behind eyes; tylus moderately elevated, head with a broadly elevated median area, separated by ill defined depressions from lateral areas which are continuous with antenniferous tubercles and bear the eyes and antennæ; under surface convex, the under sides of antenniferous tubercles bulbous behind insertions of antennæ, apical process beneath tylus strongly convex; pubescence unevenly erect or subappressed except for smooth sublateral areas behind eyes, the lateral margins behind eyes with hairs on subangular prominence and two rows of closely placed hairs behind this. *Rostrum* inserted a little in front of middle and inside of a narrow slit in a strongly produced lobe; this apparently bilobed hood decreasing in elevation posteriorly to form the longitudinal carinæ of the rostral groove which join just before base of head; large, oblique wrinkles on either side of rostral groove; rostrum scarcely reaching end of rostral groove, its first segment very slender and located within the narrow cleft described above; terminal segments broader. *Antennæ* twice as long as head; proportion of segments one to four as 35:18:37:10; first segment seven-tenths as long as head, about half as thick as front femora, slightly narrowed basally, curved outward, beset with erect, stiff hairs; second and third segments about half as thick as first, cylindrical, with very short, sparse, appressed hairs.

Thorax subflattened above, the sutures between segments ill-defined. *Pronotum* on anterior two-fifths with two ring-like areas which bear dense erect hairs along their sides; widening abruptly posterior to this to one-fourth broader than head across eyes, the rounded lateral lobes a little elevated, bearing two rows of erect hairs along their edges anteriorly and numerous shorter hairs posteriorly; disk behind ring-like elevations with a narrow but deep impression longitudinally at middle, with posteriorly divergent elevated carinæ on either side of middle and irregular sublateral carinæ beyond subdepressed areas; posterior margin straight laterally, moderately convex medially. *Mesonotum* almost half again as broad across lateral lobes as across pronotal lobes, 75::55; lobes subroundly produced anteriorly, narrowed posteriorly; disk with a feebly developed median longitudinal elevation which is finely impressed along its middle; disk moderately elevated laterally at middle and strongly depressed into a broad deep pit on either side of middle at posterior margin and extending onto metanotum; posterior margin ill-defined at middle a little behind these impressions, then turning forward through the pits and extending as a concave arch to lateral margin at ostiolar cleft. *Metanotum* short, about half as long on median line as mesonotum, produced laterally as a narrow, plate-like lobe with rounded apex, the width across these lobes one-fourth greater than greatest width of mesonotum; metanotal disk with a finely impressed line along middle, feebly depressed on either side of middle behind deep anterior pits and broadly convex sublaterally; posterior margin very ill-defined, transverse at center, concavely sinuate on either side of middle and broadly convex sublaterally. *Ostiolar canals* produced outward as short, rounded lobes on either side between meso and metanota.

Abdomen with first segment visible only from above, practically fused with metanotum anteriorly, about as long as metanotum on median line and traversed by a continuation of the finely impressed longitudinal thoracic line; disk elevated at middle and sublaterally, with a subtriangular plate on either side cut off from abdominal margin by the connexival plate of second abdominal segment; broad, transverse areas on either side of middle bounded medially and anteriorly by low, rounded tubercles which are irregularly spaced. Main disk of abdomen sharply divided sublaterally by a deeply impressed suture into a broad lateral connexival area and the central abdominal tergum which is about three times as wide as connexivum. Connexival margins feebly concave on anterior portion of each segment, briefly, roundly produced on posterior fourth into small rounded lobes which increase in size from anterior to posterior segments and each of which bears a tuft of thick pale hairs. Sixth connexival segment strongly produced, the distance across expanded, angulately rounded lobes one-eighth greater

than greatest width across metathorax. Seventh connexival margin more narrowly produced, the lobes produced postero-laterally on either side of genital segments and rounded apically, not reaching level of tip of genital segments. Disk of each connexival segment except the subtriangular second segment, divided into an outer homogeneous half which is subdepressed posteriorly, and an inner half which is further subdivided by an oblique impressed line into two subtriangular areas, each with a paler, smooth rounded area at its center. Most of connexivum with short, subappressed hairs but with a tuft of longer, suberect hairs at middle of posterior margin of segments III to VI. Tergal plates likewise further subdivided, segments two to seven each with a pair of lateral smooth areas opposite those of connexival segments, each pair of cells slightly depressed, bounded along their inner margins by rows of rounded tubercles and each cell with a pale round spot at center. Central areas of tergites delimited by sutures or rows of tubercles or both and bearing a rounded smooth area at the middle of each side. Second segment composed of two subtriangular plates, one on either side of the anteriorly produced third segment which is broadly joined to first segment at middle. Third segment nearly half again as long as broad, very feebly longitudinally impressed along middle of anterior half, bounded along anterior and lateral margins by rounded tubercles, depressed a little behind middle and elevated at narrow transversely rugose posterior margin where the first dorsal abdominal scent gland opening is present. Fourth segment deeply emarginate anteriorly to receive the posteriorly produced third segment, roundly arcuate and bounded by tubercles laterally, slightly less strongly produced backwards than third segment, the narrow posterior tip finely transversely rugose and bearing the second scent gland at its apex. Disk on either side of produced third segment slightly depressed and bearing numerous long, subappressed hairs. Fifth segment likewise deeply notched for the reception of the posterior projection of fourth segment, subrounded and bounded laterally by rounded tubercles, posterior margin less strongly and more narrowly produced and slightly raised apically at middle at the third abdominal scent gland. Sixth segment nearly straight along posterior margin. Seventh segment strongly elevated and broadly concave at middle. First genital segment ring-like but longest at middle, produced on either side of second genital segment as knob-like genital lobes which do not reach level of apex of second segment. Second genital segment strongly convex, subrounded posteriorly with a broad, attenuated process dorsally which is curved downward apically. Genital segments and areas adjoining, clothed with thick pale hairs.

Under surface sparsely clothed with short, subappressed, pale hairs with a series of longitudinal subtriangular or oval smooth

areas along middle, one each on mesosternum, metasternum, and abdominal segments one to six. Abdomen with three rows of smooth round areas, the outermost row on ventral portion of connexivum. Spiracles of all but the eighth segment ventral, located about half way between sublateral longitudinal suture and lateral margin. Spiracles of eighth segment located laterally on the edges of strap-like posterior processes. Trochanters distinct. Femora moderately incrassate, without stout spines or processes. Legs clothed with erect or subappressed, thick pale hairs.

Color generally brown with ferrugineous disk-like areas, rostrum, trochanters, and ostiolar grooves, fulvous tarsi and testaceous pubescence.

Female. Similar to male but with the abdomen broader, the connexival margins forming an oval outline in contrast to the concave outline with posterior dilation of the male. Female abdomen widest across dilated portions of fifth segment, nearly as wide at this level as long. Sixth abdominal tergite strongly elevated at middle of posterior half, seventh tergite broadly elevated at middle with an arcuately rugose depression in the elevated area. Seventh segment produced postero-laterally on either side of genital segments as apically rounded lobes which do not attain level of apices of genital segments. First genital segment produced on either side of median process as subacute lobes, each bearing a spiracle on its outer edge which is visible from above. Median process reaching about to level of lobes of first genital segment, the genital valves slightly exceeding central oviduct.

Size: male, length 10.3, width (abdomen) 4.6 mm.; female, length 12 mm., width (abdomen) 5.5 mm.

Holotype, male, No. 5222, Calif. Acad. Sci., Ent., allotype, female, No. 5223, Calif. Acad. Sci., Ent., and one male and one female paratype, Angra, Estado Rio de Janeiro, Jussaral, October, 1935 (L. Travassos et Lopes).

Two nymphs of indeterminate instar are 8½ and 9 mm. in length and 4 mm. wide. They are very similar to nymphs of the genus *Mezira*, differing chiefly in the different antennal proportions (as described above for the adults), strongly produced juga, lack of mesonotal and metanotal wing pads, and lateral position of the spiracles of eighth abdominal segment. Most significant similarities to *Mezira* are the presence of postocular spines (absent in adult *Notoplocoris*) and nearly identical arrangement of thoracic and abdominal plates and depressed areas into a pattern which appears to be basic for the Mezirinae and which is certainly the precursor of the arrangement seen in adult *Notoplocoris*.

Emydocoris Usinger, new genus

Apterous, elongate-oval in form, convex below with a complicated pattern of pits and elevations above; surface in great part naked. Head subquadrate, as long as wide across the eyes, with sides subparallel, eyes only slightly protruding. Anterior portion of head relatively short, about one-third of total head length, juga surpassing tylus and contiguous beyond it, moderately dilated apically. Antenniferous tubercles relatively short, extending only about one-third the length of median portion of head, scarcely dilated apically, the outer side nearly parallel. Eyes longer than broad. Postocular portion of head dilated into thick lobules which complete the subquadrate outline. Rostrum short, not reaching posterior limits of deep rostral sulcus. Antennæ short, one-third longer than head, the first segment thickest, curved outward, second segment a little enlarged apically, shortest, one-third shorter than first, third segment longest, cylindrical, half again as long as first, fourth segment a little shorter than first, with a pyriform shape due to the great thickening subapically, densely pubescent apically.

Pronotum about three times as broad as head, strongly, roundly elevated at sides, narrowed to a depressed collar anteriorly, not produced laterally into lobes. Mesonotum short and roundly elevated laterally but scarcely produced laterally over ostiolar canals. Metanotum not reaching lateral margins, fused posteriorly with first abdominal segment. Meso and metanotal disks deeply pitted laterally, without trace of wing pads and without triangular scutellum. Trochanters distinctly separated from femora.

Abdomen entirely exposed above, elevated medially, depressed and lobulate sub-laterally, the broad connexival margins elevated laterally, the margins feebly rounded forming the subrounded contours of abdomen which are uninterrupted by lobes or processes except for genitalia. Stigmata of all but eighth abdominal segment located remote from lateral margins at or near the middle of their respective segments. Spiracles of eighth segment (genital lobes) located postero-laterally on the short lobes.

Genotype: *Emydocoris testudinatus* Usinger, n. sp.

Suggestive of *Mezira* in shape of anterior portion of head, antennæ, location of abdominal spiracles, and in female genitalia. Differing in the absence of postocular spines and in the apterous condition and remarkable arrangement of plates dorsally. *Emydocoris* differs from the other apterous Aradidæ thus far described in the subquadrate head with broad postocular

portion and in its non-lobulate thoracic and connexival angles and its glabrous body surface.

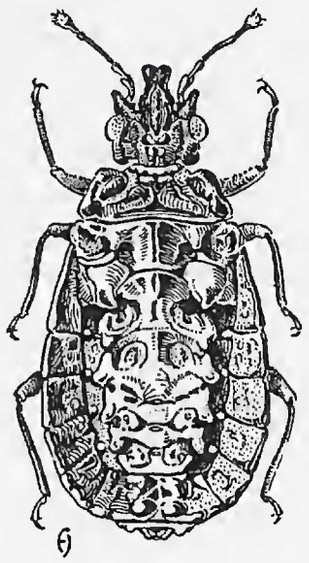

Figure 2. *Emydocoris testudinatus* Usinger, n. gen. and sp., female holotype.

Emydocoris testudinatus Usinger, new species

Female. *Head* slightly longer than broad across eyes, 37::34; apical process comprising about one-third of entire head length, the tylus extending only about half this distance, the juga contiguous beyond this, dilated into large rounded lobes apically; antenniferous tubercles short, the distance from front margin of an eye to apex of antenniferous tubercle equal to length of an eye; tubercles feebly anteriorly divergent and blunt at apices; eyes suboval, about two-thirds as broad as long, extending about one-third of their width beyond sides of head, about one-third as wide as interocular space, 7::20; postocular portion of head broad, the postero-lateral lobes depressed sublaterally, thickened laterally, the posterior angles subrounded, nearly touching pronotal collar. *Antennæ* slightly longer than head, 42::37; proportion of segments one to four as 10:8:14:10. *Rostrum* very short, less than half as long as head, 17::37; proportion of segments one to four as 2:3:5:7; rostral groove narrow and swollen anteriorly at base of rostrum, broad and very deep behind base, the strongly elevated sides of trough continuing around posterior end to completely enclose trough.

Pronotum two and one-half times as broad as long, 52::20; widest posteriorly, the sides thickly rounded and strongly elevated, antero-lateral angles broadly rounded, depressed toward the middle, anterior margin depressed and forming a smooth collar; disk

with an oblique rounded carina sublaterally near each antero-lateral angle, then with a deep collar to just within postero-lateral angles; with a broad oblique elevation on either side of middle, terminated by a small transverse carina just before collar and separated by a very deep median suture or fossa which widens and becomes shallower posteriorly to feebly elevated posterior margin. *Mesonotum* three times as broad as long, 60::18; longest at middle where it is nearly as long as pronotum, 18::19; disk briefly roundly elevated laterally over ostiolar canals, with a deep oblique pit on either side of middle, the sides of pit produced on either side as rounded tubercles with apices subcontiguous; middle of disk strongly elevated and feebly, longitudinally impressed; posterior margin strongly sinuate, straight at middle, bent strongly forward and then outward behind pits, and then again curved forward sublaterally just before connexivum. *Metanotum* fused with first abdominal segment.

Abdomen with disk separated into the usual connexival, subconnexival, discomarginal, and discal areas, the entire disk elevated along middle and depressed sublaterally along sutures which separate connexivum from disk; connexivum of first and second segments fused, very long, extending forward to lateral lobes of mesonotum; connexival segments with long, shallow depressions sublaterally, the third to sixth segments with ill-defined plate-like areas on inner half; disk of abdomen with a deep oblique pit laterally at base on either side of metanotum, the anterior and posterior margins of each pit roundly produced and nearly contiguous; marginal discal area of third to sixth segments depressed in the form of ovals, the posterior margins of third to fifth segments with an inner and outer tubercle converging with their apices nearly contiguous behind each depressed area; third segment longest, as long at middle as the remaining segments of disk, with a rounded depression either side of middle on basal half; apex of third segment transversely wrinkled, fourth and fifth segments much shorter, likewise transversely wrinkled posteriorly; sixth segment broad with two longitudinal elevations at middle and a small rounded lobe on either side of posterior margin sublaterally.

Under surface convex, thoracic pleura wrinkled, abdominal segments each with a small dull spot at middle and with a pair of dull, depressed spots on either side of sublateral sutures. Bases of ventral abdominal segments with pits and tubercles alternating across their entire width. *Genital lobes* very short, the terminal median lobe more prominent. Ventral plates strongly longitudinally wrinkled.

Color uniform brownish ferrugineous, the eyes, apices of antennæ, and tarsi paler, testaceous.

Size: female, length 8 mm., width (abdomen) 4 mm.

Holotype, female, No. 5224, Calif. Acad. Sci., Ent., Angra, Estado Rio de Janeiro, Jussaral, October, 1935 (L. Travassos et Lopes).

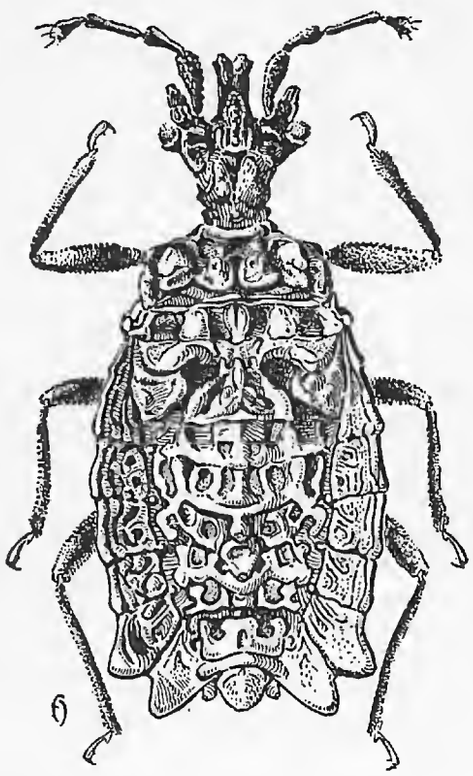

Figure 3. *Chelonoderus stylatus* Usinger, n. gen. and sp., male, holotype.

Chelonoderus Usinger, new genus

Apterous, elongate-oval in form, and clothed over most of the body with appressed, thick hairs. Head nearly as broad across eyes as long, 52::60, strongly narrowed behind the eyes into a slender neck region without postocular tubercles or spines. Anterior process comprising about one-third of total head length, narrowed at middle and feebly dilated apically with a small notch at middle of apex. Antenniferous tubercles long, divergent, subcylindrical, blunt at apex, reaching about to middle of first antennal segment. Eyes strongly exserted, suboval in form, located completely laterad of a line drawn from sides of antenniferous tubercles to sides of head at base. Antennæ slightly longer than head, the first segment thickest, curved outward, briefly surpassing apical process of head, second and third segments more slender, nearly cylindrical, fourth segment pyriform and pubescent apically.

Pronotum not quite one-fourth wider than head across eyes, the front margin depressed with a collar, sides strongly, roundly elevated, disk deeply pitted at middle with an irregular elevated lobe on either side of middle. Mesonotum wider, with a small lobe

above ostiolar opening, the disk depressed except for a large lobe on either side of middle and a median, longitudinally impressed elevation. Metanotum deeply, broadly impressed on either side of median elevation with the sides of oblique depressions lobulately produced and approximate at center. Third, fourth, and fifth connexival segments shallowly concave anteriorly and a little convex posteriorly, the sixth and seventh segments strongly lobed.

Stigmata located approximately at middle of ventral connexival plates on segments two to seven, those of eighth segment terminal. Trochanters distinct.

Genotype: *Chelonoderus stylatus* Usinger, n. sp.

Chelonoderus differs from the geographically neighboring species of *Chelonocoris* in its broad pronotum, well developed antenniferous tubercles, stylate eyes, and in the absence of a posterior prolongation of the mesonotum and posterior prolongations of the seventh abdominal segment. It is perhaps closest to the South American *Notoplocoris* but that genus lacks the dorsal pits and tubercles, has lateral metanotal lobes, and strongly produced styliform juga.

Chelonoderus stylatus Usinger, new species

Male. *Head* with upper surface roughly granular, tylus and paraclypeal lobes distinctly elevated, the disk of head with a deep pit on either side of this elevated area, the sides of pit extending as rounded tubercles toward each other at middle; constricted neck region about one-third as wide as head across eyes; juga subflattened, depressed, feebly dilated anteriorly, the apices broad and obliquely, shallowly emarginate, the entire apical process appearing feebly notched at middle because of divergent apices of juga. *Eyes* suboval in form, about one-seventh as wide as interocular space. *Antennæ* slightly longer than head, 67::60; proportion of segments one to four as 23:13:19:12. *Rostrum* about half as long as head, the rostral groove deep and completely enclosed.

Pronotum slightly broader than length of head, 64::60, about two and one-half times as broad as long on median line, 64::26; anterior margin depressed, forming a ring-like collar with a pair of rounded tubercles on each side opposing rounded tubercles from elevated pronotal disk, the apices of opening tubercles approximate; lateral pronotal margins greatly swollen, strongly elevated, sinuate on outer margins, with a longitudinal impression separating off an inner higher lobe; depressed central portion of disk with a prominent lobe on either side of middle separated by a

deep median longitudinal pit; posterior margin narrowly depressed beneath overhanging discal lobes, moderately sinuate. *Mesonotum* very short and broad, only half as long as pronotum and one-third wider across ostiolar lobes than width of pronotum; disk unevenly elevated laterally at ostiolar openings, broadly depressed sublaterally, with a large lobe on either side of middle entirely surrounded by a deep depression; each lobe projecting backward and nearly meeting a lobe extending across from central elevated area of metanotum; middle of mesonotum with a strongly elevated, longitudinally impressed, carina which broadens posteriorly into metanotum. *Metanotum* about as long as pronotum, enclosed by the connexivum from lateral margins; discal elevation highest along middle, depressed sublaterally on posterior half, the sides strongy elevated and dilated posteriorly, overhanging and approximating a corresponding lobe on lateral discal elevation with a deep, smooth, oblique depression on either side beneath and between the opposing lobes.

Abdominal disk moderately elevated medially, the first, second and third segments fused; fused area elevated anteriorly at middle, depressed laterally with tubercles as described above opposing those of metanotum over lateral depression; fused elevated area about as long as thorax, with a pair of oval or elongate oval depressions on either side of middle and with posterior portion narrowed to glandular opening at posterior margin. Fourth and fifth segments relatively short at middle and gradually decreasing in elevation to posterior margin of fifth segment. Sides of disk with two depressed areas on third segment, three on fourth and fifth, and two on sixth, with opposing tubercles between fourth and fifth and between fifth and sixth segments. Connexivum roughly sculptured, the first two segments fused, extending forward as a slender tip reaching ostiolar openings. Hind margins of second and third connexival segments, at least, elevated. Sixth and seventh connexival segments distinctly lobulate laterally, the seventh segment strongly elevated at middle. Lobes of eighth segment extremely short, reaching only to middle of genital lobe, this median lobe likewise comparatively short, subcordate, not reaching level of apices of lobes of seventh segment. Under surface rugose and impressed much as in related genera. Color rather uniform brown with the rostrum and tarsi somewhat paler.

Size: Male, length 11 mm., width (connexivum) 5¼ mm.

Holotype, male, No. 5225, Calif. Acad. Sci., Ent., N. Queensland, Australia, October 4, 1920, J. A. Kusche collector.

A NEW SPECIES OF MYZUS FROM HUMBOLDT COUNTY, CALIFORNIA

(Homoptera, Aphididæ)

BY E. O. ESSIG

University of California, Berkeley

Myzus humboldti Essig, new species

A medium-sized bright to pale green and slightly pulverulent species feeding on the tips of the new growth and on the buds and flowers of western viburnum or bridal wreath, *Viburnum ellipticum* Hook., at Bishop Pine Lodge, two miles north of Trinidad, Humboldt County, California. It was collected by the writer on June 2, 1938.

Color. Green and pulverulent, the alates with dusky or black head, antennæ, thorax, cornicles, and cauda; three distinct circular dusky marginal areas in front of a larger irregular dark area at the base of each and two smaller marginal dark areas behind cornicles; three sub-lateral dorsal dusky patches, and two quite large somewhat transverse dark areas on dorsum in front of a line connecting the bases of cornicles; and small groups of dark glandular areas arranged in two indefinite rows on dorsum and distinctly visible in cleared specimens. The wing veins are also faintly dusky-bordered. The apteræ are wholly green throughout or with head and appendages faintly dusky.

Winged viviparous female. Length, 2.6 mm.; width, 0.8 mm.; length of antennæ, 2.6 mm.; length of fore wing, 3 mm. Setæ on head and antennæ very short, somewhat thickened apically, and few in number; hairs thin and sparsely arranged on dorsum and tibial spines are short and stiff. A small prothoracic tubercle and a single small tubercle in each marginal dusky area. *Antennal segment* III with from seven to twelve circular, large and small secondary sensoria arranged somewhat in a row and confined to the basal one-half or two-thirds. *Rostrum* short, extending to second coxæ. *Cornicles* dark, swollen beyond basal constriction as illustrated; faintly imbricated throughout and with a few concentric lines and without true reticulation at apex; 0.45 mm. long. *Cauda* dusky, blunt, with two or three pairs of hairs; 0.25 mm. long.

Apterous viviparous female. Length, 2.8 mm.; width, 1.2 mm.; length of antennæ, 2.2 mm. Uniformly pale green throughout and pulverulent in life; antennæ, legs, cornicles, and rarely also the cauda may appear faintly dusky in cleared specimens. Frontal tubercles well developed and antennal segment I gibbose and roughened on inner surface. Setæ clavate or pointed, very short

and inconspicuous. *Antennal segment* III usually with either one or two small or large circular sensoria near the base. *Rostrum* extends to the second coxæ. *Cornicles* as illustrated; 0.55 mm. long. *Cauda* similar to that of alate; 0.30 mm. long.

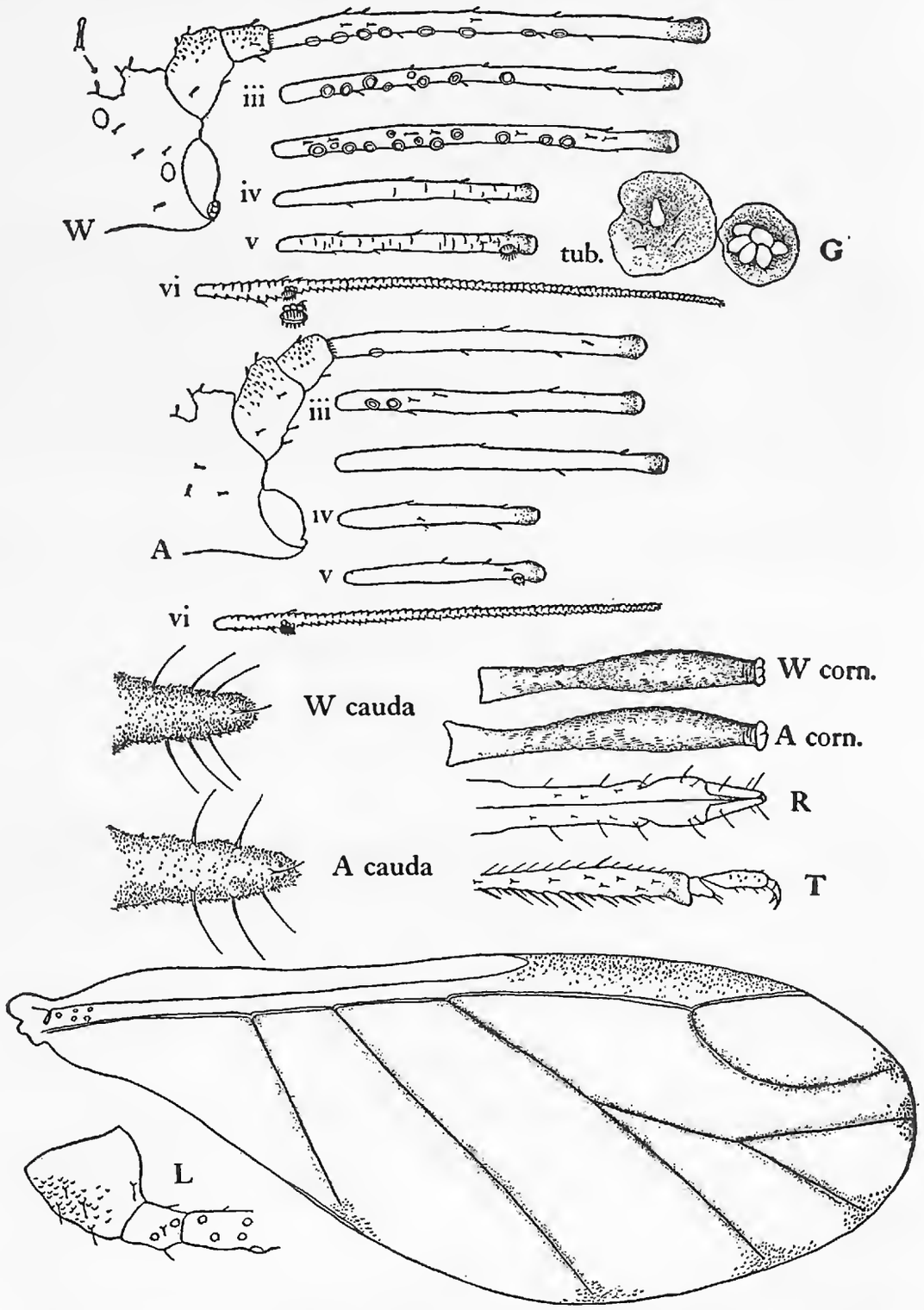

Fig. 1. *Myzus humboldti* Essig, n. sp. W, winged and A, apterous females; G, glandular area from dorsum; L, base of hind leg showing sensoria; R, rostrum; T, distal portion of hind leg; tub, marginal dusky area and tubercle.

This species is likely to be confused with *Myzus lilii* Mason* from which it may be distinguished by the green color, fewer sensoria on segment III of the alates, presence of sensoria on III of the apteræ, the swollen cornicles, and the absence of apical reticulations on the cornicles.

Myzus lilii Mason appears to be very close to if not synonymous with *Macrosiphum scoliopi* Essig which occurs on liliaceous plants in California and which might readily be included in the genus *Myzus.*

These descriptions were made from a series of sixty-three apterous and seven winged viviparous females mounted on twenty slides, two of which are in Belese medium. A single winged specimen is designated as the type and all others are indicated as paratypes. Paratypes have been deposited in the collections of the U. S. Bureau of Entomology and Plant Quarantine, Washington, D. C.

* Mason, P. W., 1940. A revision of the North American aphids of the genus Myzus. U. S. Dept. Agr. Miscl. Pub. No. 371:1-30.

NEW CHILOPODS FROM MEXICO

BY RALPH V. CHAMBERLIN

University of Utah, Salt Lake City

The six new species herein described are based upon material collected on the "Third Hoogstraal Mexican Biological Expedition" which was carried out during June and July of 1940. The specimens were collected by Harry Hoogstraal, leader of the expedition, and Kenneth Knight. All material is retained at the University of Utah.

SCOLOPENDRIDA

Scolopendra michoacana Chamberlin, new species

A relatively small form which is olive in color throughout, including antennæ and legs.

Head smooth, without sulci, freely overlapping the first dorsal plate. *Antennæ* composed of sixteen articles of which the first five are glabrous or nearly so. *Prosternum* smooth, the dental plates set off by sulci that meet at middle in a very obtuse angle; teeth distinct, 4—4, with the two innermost on each side fused except at distal end; basal process of femuroid of prehensors large, without

teeth. *First dorsal plate* smooth, without transverse sulcus or paired longitudinal sulci. Paired sulci rather indistinct on second dorsal plate, distinct on third and following plates. Lateral margination weak on eighteenth plate, distinct on nineteenth, twentieth, and twenty-first. Last dorsal plate without trace of median sulcus. *Last ventral plate* narrowed caudad, the caudal corners rounded, the caudal margin straight; without sulci. *Caudal process* of coxopleuræ of anal legs moderately short, bearing four spines distally; a spine on caudal margin of coxopleura; pores very fine and numerous. First to nineteenth *legs* with a single, ventral tarsal spine, twentieth and twenty-first without tarsal spines. Third joint of nineteenth and twentieth legs unarmed ventrally or dorsally. *Anal legs* with fourth joint strongly flattened dorsoventrally; the fifth joint flattened proximally but becoming cylindrical at distal end; the third joint flattened above and over distal portion beneath. Third joint of anal legs at distal end above with a conspicuous process bearing two distal spines; with five spines on mesal surface arranged 1–2–1; three ventral spines in line at mesal edge and seven toward outer side arranged approximately 1–1–2–1–2–1. Other joints unspined. Claw with two spines at base. Length, about 64 mm.

Locality. Michoacan: Tancitaro. Two specimens taken by Hoogstraal, July 20, 1940, at an elevation of 6500 feet under rock in moist woods.

Of specimens known from Mexico, apparently nearest to *S. morsitans,* but readily distinguished from that species in lacking a median sulcus on the last dorsal plate, smaller number of antennal articles, characteristic color, etc.

Geophilida

Genus Nuevona Chamberlin, new genus

A sogonid genus in which the first maxillæ have pale, slender, membranous lappets. Prosternum with chitinous lines fine or obscure, unarmed; prehensors unarmed. Last sternite broad; coxopleural pores small, typically four or five on each side, these covered by border of the sternite. Anal legs ending in a claw.

Genotype: *Nuevona leonensis* Chamberlin, new species.

Distinguished from all other genera referred to in the *Sogonidæ* except *Garrina,* another Mexican genus, in having the anal legs armed with claws. From *Garrina* it is readily distinguished in having several independently opening coxopleural pores on each side instead of two large pits.

Nuevona leonensis Chamberlin, new species

Head small, longer than wide; widest at about beginning of posterior third and then narrowing caudad and more conspicuously forward. Head overlapping basal plate. Prehensors covered by head; joints all unarmed. *Prosternum* unarmed; chitinous lines weak. *Ventral pores* in a conspicuous band across caudal border, this band widest at middle and angularly extended forward at this point. *Last ventral plate* wider than penult, sides and posterior margin together forming a semi-circle with posterior portion somewhat flattened. Pores four or five in number, covered, or mostly so, by the border of the ventral plate. *Anal legs* with proximal joints moderately thickened in the male; claw well developed. Pairs of legs, sixty-one. Length, 21 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa). One male taken by Hoogstraal and Knight in decaying wood, June 16, 1940, at an elevation of 1500 feet.

Polycricus nuevus Chamberlin, new species

Pale yellow. *Antennæ* of medium length; proximally filiform, distally slightly attenuated; ultimate article nearly as long as the two preceding together. *Head* with cephalic plate longer than broad, widest toward anterior end; anterior corners rounded, the posterior oblique; the sides between corners nearly straight, slightly conveging caudad. No frontal suture evident. Two well defined, pale, clypeal areas. Second maxillæ with coxal plates rather broadly joined, the median area less sclerotized; pores large, open on inner side, the mesal border being membranous or less sclerotized; no chitinous lines. *Spiracles* circular, the first decidedly largest, the second intermediate. *Ventral plates* without apparent pores. Last ventral plate narrow, the sides strongly converging caudad; coxopleural pores over entire surface, fine and very numerous. *Anal legs* without claw, the last joint long and slender, the penult joint of intermediate thickness, the more proximal joints thickest. Pairs of legs, 61. Length, about 30 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). One specimen taken in decaying stump by Hoogstraal and Knight, June 16, 1940, at an elevation of 1500 feet.

This specimen is assumed to be congeneric with *P. toltecus* (Humbert and Saussure), the holotype of which was originally described from the "Eastern Cordillera and Chizoba." Thus *Polycricus* would seem to be very close to *Pachymerium.* The present species seems to differ from *toltecus* in lacking a frontal suture on the head, and in the more strongly narrowed last ventral plate.

LITHOBIIDA

Labrobius major Chamberlin, new species

General color brown. *Head* with marginal lateral breaks slight. *Antennæ* of moderate length, composed of about forty-nine articles. Eyes small, composed of about fourteen ocelli arranged thus: 1, 1, 3, 3, 3; the single ocellus and that at top of patch large, those of bottom row much smallest. Prosternal teeth 2—2 as usual. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates produced, the produced angles broad across base with mesal side long, oblique and convex. *Ventral spines* of first legs 0, 0, 1, 1(2), 1; of the second, 0, 0, 1, 2, 1; of the third, 0, 0, 2, 2, 1. Dorsal spines of first legs 0, 0, 1, 1, 1; of the second, 0, 0, 2, 2, 1; of the third, 0, 0, 2, 2, 2. Posterior legs lost from types; no spines present on their coxæ. *Coxal pores* large and circular; 5, 4, 4, 4. Length, 24 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). Two males taken June 16, 1940, by Hoogstraal and Knight in decaying wood in the "Mesic temperate forest" at an elevation of 1500 feet.

Agreeing with *L. minor*, the genotype, in processes of seventh, ninth, eleventh and 13th dorsal plates, but readily distinguished by its much larger size—24 mm. as against 13 mm., difference in spining of anterior legs, and smaller eyes.

Mexicobius vistanus Chamberlin, new species

Light brownish yellow, with head and posterior end of somewhat orange tinge. Legs yellow. *Antennæ* short, composed in types of twenty-five to twenty-seven short articles. Ocelli 1, 1, 3, 2, those of bottom series much reduced, all pale. *Prosternal teeth* small and widely spaced, 2—2, the median sinus shallow and semicircular; lines of bases of teeth meeting at an obtuse reentrant angle. *Coxal pores* small, round, 3, 3, 4, 3. *Ventral spines* of first legs, 0, 0, 0, 0, 1. *Ventral spines* of penult legs, 0, 0, 1, 3, 3, 2; dorsal, 0, 0, 3, 2, 1; the claw double. Ventral spines of anal legs, 0, 1, 3, 2, 1; dorsal, 0(1), 0, 3, 1, 0; the claw double. Posterior coxæ unarmed. *Anal legs* of male long and slender. *Length* of male holotype about 11 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). Male holotype and a younger male taken June 16, 1940, by Hoogstraal and Knight in the "Mesic temperate forest" at an elevation of 1500 feet.

Readily distinguished from *M. hidalgoensis*, the genotype, in having the posterior coxæ unarmed, in the spining of the legs, and in the much fewer ocelli.

Genus Nuevobius Chamberlin, new genus

Head with distinct lateral marginal interruptions. *Antennæ* very long and composed of numerous articles. Eye-patch composed of numerous seriate ocelli. Prosternal teeth typically 6—6, the special marginal seta ectad of the series on each side. Posterior corners of eleventh and thirteenth dorsal plates well produced, those of the ninth plate scarcely produced. Coxal pits strongly transverse. In the male the anal legs slender throughout, no joint specially thickened but the fourth longitudinally sulcate above.

Genotype. *Nuevobius cavicolens* Chamberlin, new species.

It is with some hesitation that this form is separated generically from *Sozibius,* a genus known from three species occurring in the mountains of Tennessee, North Carolina, and Virginia. It differs, however, in having the posterior angles of the eleventh and thirteenth dorsal plates definitely produced, in the very long antennæ, and the relatively longer legs of which the last pair is especially long and slender. In the latter, the fourth joint in the male is not thickened as in the species of *Sozibius,* but is long and slender. The strongly transverse pores are also characteristic in comparison with the species of *Sozibius.*

Nuevobius cavicolens Chamberlin, new species

Color amber yellow, the legs somewhat lighter than the body. *Antennæ* very long, reaching beyond middle of body, composed of forty-six articles. *Ocelli* numerous; in an elliptic patch in six longitudinal series; single ocellus much largest, contiguous. *Head* with marginal interruptions. Prosternal teeth 6—6; the special seta ectad of series on each side. Posterior angles of nineteenth and thirteenth dorsal plates distinctly produced, those of eleventh slightly produced. *Coxal pores* transversely elongate, pits, some of which seem to have smaller pores, opening into them; 6, 6, 7, 5 arrangement. *Ventral spines* of last legs 0, 1, 3, 3, 2; dorsal, 1, 0, 3, 1, 0; claw unarmed. Ventral spines of penult legs, 0, 1, 3, 3, 2; of dorsal, 1, 0, 3, 1, 1; claw unarmed. Ventral spines of first legs 0, 0, 2, 2, 1. Last four pairs of coxæ dorsally armed, last three pairs also laterally. *Anal legs* of male very long, all joints slender, the fourth widely longitudinally furrowed above. Length, about 15 mm.

Locality. Mexico: State of Nuevo Leon, Villa Santiago (Hacienda Vista Hermosa—Horsetail Falls). One male taken June 16, 1940, by Hoogstraal "in dung of bat cave, one-quarter mile from entrance." "Mesic temperate forest," elevation 1500 feet.

A NEW SPECIES OF BRUCHUS WITH NOTES ON BRUCHUS MAJOR FALL AND JULIANUS HORN

(Coleoptera, Bruchidæ)

BY BURDETTE E. WHITE

Merced, California

On checking over the J. N. Knull collection of Bruchidæ recently, the writer had the pleasure of observing numerous specimens of *Bruchus julianus* Horn (=*ochreolineatus* Fall). The late Dr. H. C. Fall, in his brief description of *B. major*, in which he compares *julianus* with *major*, overlooked the most important diagnostic character separating the two species. This is the dentiform elevations of the basal margins of the elytra. It is best seen from a posterior view over the top of the elytra and shows as two small, approximate humps on each side of the scutellum midway between the humeri and the scutellum. In *julianus* the elevations are located between the second and fourth elytral striæ and are very approximate. In *major* these structures are more acute, more widely separated, and most important—are located between the fourth and fifth striæ. This character appears constant for some seventy-five specimens of *julianus* observed from various localities in Texas, Arizona, and Lower California, and for numerous examples of *major* from Brownsville, Texas.

Dr. Fall apparently had large, well characterized specimens of *major* in hand when he described the species. The material in the collections of Dr. Knull and the writer shows *major* to vary considerably in size and markings. In fact, the above described character was the only means for determining one badly rubbed specimen of *major*. In an earlier synopsis of the species of *Bruchus* (1910), Dr. Fall implied that this character is too variable to be important.

A specimen of the *julianus* complex from the Huachuca Mountains, Arizona, possesses such differences in character as to seem worthy of consideration. Later collections from this area may prove it to be a subspecies of *julianus;* but until further material manifests this possibility, the present specimen is described as a distinct species.

Bruchus knulli White, new species

Size and shape of *julianus* Horn but lacking the ochreous lines of pubescence on the elytra, with the antennæ entirely pale, and with the pygidium finely punctate whereas *julianus* has coarse

punctures. The shape of the body differs noticeably; *julianus* is parallel sided whereas *knulli* is gradually narrowed from middle to base of elytra. The punctures of the elytral striæ are coarse and strongly impressed in the former while they are fine and feebly impressed in the latter. Ferrugineous pubescence evenly clothes the surface of the elytral disk and pronotum of *knulli*. The basal elytral denticles are similar in both forms. Specimens of *julianus* are frequently rubbed, obscuring the ochreous lines of pubescence on the elytra, but this specimen of *knulli* has not been rubbed. Length, 4.5 mm.; width, 2.6 mm.

Holotype, female, collected by J. N. Knull in the Huachuca Mountains, Arizona, July 20, 1936, in the Knull collection at Ohio State University. The species is gratefully named in honor of its collector.

The usual technical description has been omitted because of the similarity to a description of *julianus*. The position of *knulli* in our list should be between *julianus* and *quadridentatus* Schffr.

GEOMETRID NOTES AND NEW SPECIES
(Lepidoptera)

BY EDWARD GUEDET
Napa, California

Nemoria mentastii Guedet, new species

Palpi pale ochreous tinged with reddish. *Front* tinged with reddish. *Collar* and thorax green. *Abdomen* with three white dorsal spots narrowly circled with reddish. *Primaries* light green; costa narrowly edged with pale ochreous; ante-median line white, starting about one-third out from base, perpendicular to costa and running with a slight outcurve to inner margin about three-fifths out from base where it rounds out meeting the post-median line; without discal dot; post-median line straight, parallel with outer margin, forming a V with the ante-median line; fringe ochreous with a very slight tinge of reddish at apex. *Secondaries* pale green, concolorous with primaries; ante-median line boldly and evenly outcurved; without discal dot; post-median line with a slight angle on the median vein; fringe as on primaries. *Beneath* paler green; without discal dot; lines above faintly showing through. *Expands* 27 mm.

Holotype, female, No. 5185, Calif. Acad. Sci., Ent., Glen Ellen, Sonoma County, California, May 12, 1940.

The distinctive feature of this species is the V-shaped lines of the primaries. The species is named after the Rev. R. Mentasti, of Sonoma, California, through whose kindness I received the unique type.

Hydriomena albifasciata, form beldenæ Guedet, new form

Barnes and McDunnough (Cont. Lep. N. A., iv. 10, 1917) described the form *punctocaudata* from Sonoma and Alameda Counties, California, featuring the dull olive-green color with smoky suffusion obscuring the maculation, and the distinct white subterminal spot with a tail. A series of specimens from Glen Ellen, Sonoma County, California, has the distinct white subterminal spot in a prominent very irregular zigzag subterminal white line running from the costa almost to the inner margin. The primaries are suffused with ruddy, much as in the form *resecta* Swett, but the black bands of the typical form are quite plain.

Holotype, male, No. 5186, Calif. Acad. Sci., Ent., Glen Ellen, Sonoma County, California, February 8, 1941. Allotype, female, and three male paratypes, same data, in my collection.

For this form I propose the name *beldenæ* in honor of the collector, Miss Rita Belden of Sonoma County.

Mesoleuca gratulata, form bakeri Guedet, new form

The median white band of the typical *gratulata* is strongly constricted below the cell, due to the outward bulge of the dark basal area and an inward bend of the outer dark area. Barnes and McDunnough (Cont. Lep. N. A., iii, 232, 1917) described a new variety *latialbata* in which the median white band is of much more even width throughout, the basal area being only slightly projected below the cell, and the outer line bent far less than in the typical form. In four male specimens from Oregon we find the opposite extreme, the dark basal area meets the dark outer area below vein four, reducing the median area to two white patches, one surrounding the discal spot and the other below, resting on the inner margin.

Holotype, male, No. 5187, Calif. Acad. Sci., Ent., Alsea, Oregon, April 12, 1930. Three paratypes, males, Corvallis, Oregon, May 14 and May 29, 1930, in my collection.

Named in honor of Mr. James Baker, of Baker City, Oregon, whose correspondence on entomological matters is greatly appreciated.

Amphidasis multidentata Guedet, new species

Palpi short. *Thorax* and *abdomen* stout, hairy. *Primaries* with black spot at extreme base; ante-median area white, irrorate with black; ante-median line black, generally outwardly oblique, with three large rounded outward curves; median area more irrorate with black, giving a darker appearance; discal dash large, black, almost vertical; post-median line black, composed of nine very irregular teeth pointed inwardly, coming close to the ante-median

line on the inner margin; post-median area about the shade of the basal area; vein ends marked with black lunules with white centers, the black extending in blotches into the wing. *Secondaries* smoky; discal spot large, smoky; post-median line diffuse, irregular; marginal line of lunules as on primaries, but broken; fringe checkered. *Beneath* much as above, maculation reflected. *Expands* 35 mm.

Holotype, female, No. 5206, Calif. Acad. Sci., Ent., Fly Peak, Chiricahua Mountains, Cochise County, Arizona, 9000-9300 feet, July 30, 1927. Two female paratypes, same locality, July 28, 1927, all collected by Mr. J. A. Kusche, and all in the collection of the California Academy of Sciences.

Lygris pulcherrima Guedet, new species

Palpi long. *Antennæ* of male bipectinate. *Hind* tibiæ with all spurs. *Thorax* with dorsal tuft posteriorly. *Abdomen* smooth. *Primaries* with basal area chocolate-brown, irrorate with lavender; ante-median line faint, lavender, bent out below costa, then slightly outwardly oblique, broken, with sharp outward tooth just before inner margin; median area darker brown, well defined; discal spot plain, lavender; post-median line white, with three large irregular teeth projecting outwardly; the first very sharp, the second angular with rounded point, the third well rounded, the general direction slightly outwardly oblique; beyond the first tooth with a small brown cloud, and beyond the second tooth with a larger brown cloud, both limited by a crenulate, irregular, subterminal white line; outer area whitish lavender, sprinkled with brownish blotches; fringes checkered with brown at vein ends. *Secondaries* orange in color on upper two-thirds; costa faintly marked with whitish; lower one-third whitish-lavender, sprinkled with brownish specks and dashes; without ante-median line; discal spot faint; post-median line faint, crenulate, irregular, narrowly shaded outwardly with lavender near anal angle; outer margin slightly crenulate; fringe whitish. *Beneath* primaries yellowish-white, veins marked with yellowish; without ante-median line; discal spot faint, blackish; post-median line well-marked, blackish, irregular; outer area lighter with large subapical blotch cut by veins; fringe checkered. *Secondaries* brownish-yellow on upper two-thirds; discal spot black; post-median line black, broad, prominent, disappearing before reaching inner margin, followed by a light shade; outer area soft chocolate-brown. *Expands* 31 mm.

Holotype, male, No. 5205, Calif. Acad. Sci., Ent., Cave Creek, Chiricahua Mountains, Arizona, July 4, 1930, J. O. Martin collector.

* New names in bold face type, synonyms in italics.

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CONTENTS OF VOLUME XVII

MAILING DATES FOR 1941 NUMBERS

No. 1, February 21, 1941; No. 2, May 15, 1941; No. 3, July 31, 1941; No. 4, November 7, 1941.