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NOTES ON THE BIOLOGY OF GYNACANTHA NERVOSA
RAMBUR (AESCHNINÆ), A CREPUSCULAR
DRAGONFLY IN GUATEMALA

BY FRANCIS X. WILLIAMS
Honolulu, T. H.

One of the most interesting dragonflies found in Guatemala is Gynacantha nervosa, a large somber brownish species (Fig. 1, male) with some green markings particularly at the base of the abdomen and on the back between wings that expand to somewhat more than four inches. Light and airy, with a slender body and wings relatively ample, it is well fitted for a very rapid flight. Appearing mainly towards dusk and at dawn, Gynacantha passes the bright hours of the day in some shady wood or in areas under cultivation, among sufficiently dense plant growth, resting alertly head up, its clawed feet gripping some leaf, twig or other support. Sometimes a dull sky will tempt it from its place of concealment earlier than usual, but it is sure to be seen towards sunset a little before the bats and nocturnal insects bestir themselves, remaining on the wing until the fireflies are twinkling in the gathering obscurity. It is seen to less advantage at sunrise.

During one of my earliest sunset walks alongside a small field planted to several varieties of sugar cane, a few of these dragonflies were observed flying low and in a swift undulatory manner over a narrow and then unused irrigation ditch that hugged the edge of the field. Now and then one of these insects would dart upwards and then descend to its “beat”, or another would steal between the cane rows, while another still, rising in air, would pursue its rapid wavy course over the cane tops and into the fading sunset. From time to time and with some difficulty a specimen was captured, for purposes of identification, by a scoop of the net from the rear. In my observations extending from April to July, 1934, at El Salto, Escuintla, no other species of crepuscular dragonfly was noted. Other species
of *Eschnine* dragonflies that fly about during the day frequently remain on the wing until dusk when many small insects are flying about. In this subfamily, to quote G. Ting-wei Lew (Ent. Americana, XIV, 1933, page 42), "The enlargement of the eyes reaches its maximum development". In the family Libellulidae we find the species of *Neurocordulia* (Corduliinae) of crepuscular habit.

Besides patronizing the edge of the cane field, *Gynacantha* was seen patrolling many other places. Several individuals were observed flying over a stream to which they were most probably attracted by the small mayflies (Ephemera) that were rising slowly and steeply from it. Along an open trail some half dozen of these dragonflies were flying back and forth concentrating about an area when a nuptial flight of small ants was taking place. The insect may also fly at some height alongside trees that skirt a wood, and not infrequently appears about verandas if food is there available. Early in the evening of April 24, 1934, several of these dragonflies were flying about the peak and end wall of a building. They were evidently preying upon winged termites that issued in numbers from the wall, seizing these weakly-flying insects and eating them on the wing so that a thin shower of termite wings floated to the ground. A few days later, observations were made on the early morning flight of this dragonfly. May 1, at 5:21 a. m., I saw my first *Gynacantha*, an obscure gray object flying low over the running water of the little ditch alongside the cane field. At 5:35 in the pink dawn, the sun's rays were just striking the three great volcanic peaks of Agua, Fuego and Acatenango. At 5:44 a female *Gynacantha* was flying about as if seeking a place to lay her eggs. Sunrise over the adjoining meadow revealed innumerable little insects, many of which were ants, swarming in the air and from time to time large dragonflies, of which some were apparently *Gynacantha*, zigzagged swiftly among these insects.

By visiting the margin of the cane field, evening after evening, a few *Gynacantha* were observed inserting their eggs in the ditch bank. Several eggs were thus obtained and one dragonfly thereby reared to maturity. A female about to oviposit is very wary, and a note of April 18, will well illustrate this point. At 5:57 p. m. a *Gynacantha* was cautiously inspecting an area along the small waterless ditch that bordered the cane field. She
flew back and forth over this space, hovered with motionless body, darted forward and hovered again. Finally, alighting in the side of the ditch, she curved the abdomen forward and beneath her and applied its extremity to the soil. She remained working thus with outspread wings for less than a minute when, notwithstanding my caution and ample distance, she dashed off. At another date when the ditch contained flowing water, one was observed laying her eggs in soil well above the water line.1 The

1 Williamson, E. B. (Univ. Mich. Mus. Zool., Misc. Publ. No. 9, 1923) on page 42 mentions the oviposition of Gynacantha nervosa in Columbia. several female Gynacantha caught in the field all had their long superior anal appendages broken. This is probably done during oviposition, when these rather delicate processes are pushed against the soil while the slender sword-like ovipositor and the two-pronged fork beyond it are digging the egg cavity. The reared specimen had these superior anal appendages perfect (Fig. 6, A). The egg (Fig. 4) before it is deposited is clear yellow and somewhat finely roughened; when in the ground it may have a somewhat duller finish. It is about 2.25 millimeters long, slightly bent, with one extremity more tapering than the other.

Fletcher, T. B. (Rep. Proc. Fourth Ent. Meet. Pusa, 1921) on pages 270-271 describes the oviposition of Gynacantha bainbriggei Fraser in Assam. In the evening he saw several of these insects ovipositing in the bank of a small culvert, the bank being “at most slightly moist” and “It should be added that there was no water in this culvert and there certainly can only be water here when it rains, and the nearest standing water was distant over one hundred yards.” Dr. Fletcher’s figures of the anal segment of the female Gynacantha greatly resemble those of the Guatemalan species and they likewise show the superior appendages broken.

It seems that some other Æschnine dragonflies that are day-fliers or crepuscular, approach the manner of oviposition of Gynacantha. A note by Dr. Annandale transmitted by F. F. Laidlaw (Rec. Indian Mus., XXII, 1921, pages 38 and 39), referring to the oriental Æschna ornithocephala McLachl., reads thus in part: “A number of females were observed ovipositing (in October, after the rains) in a tank of fairly dry earth at the edge of the lake one or two feet above the water level.”
Three eggs were located in a bit of soil in which *Gynacantha* was seen working and in all four eggs were found; the three on April 7 and the fourth on April 17. One of these eggs soon decayed; the others were kept in the soil for a time and then immersed with soil, in water. When this material was examined on May 5, a tiny dragonfly larva with a pale cross-like pattern on its head, and apparently in the second stage, was found. This individual, together with a larger one taken from a small pool, were raised to maturity. The larva secured from the egg transformed on June 21 into a nice large female measuring 116 millimeters across outspread wings. Like the more grown field specimen it was relatively quiet in its larval stages, though capable of swift movements, and could squirt a drop or two of water from the apex of its body for a considerable distance in the air. At first it was fed chiefly the larvae of aquatic diptera, i.e. mosquito wrigglers, but more particularly those of the bloodworm type (*Chironomidae*); as it increased in size it devoured with avidity tiny fish so numerous in the streams and reservoirs. Not all its moults or instars were noted. What appeared to be the second moult from the prenymphal stage took place by May 9, when it measured nearly six millimeters in length. Its somewhat ashy gray shade was relieved by dark-banded legs and a pale line inwards from each eye that joined at the middle line, was extended along the top of the thorax and was diffused along the abdomen, which, with other parts of the body, was varied by pale and dark marks. The sides of abdominal segments 7-9 were armed with a distinct backward-projecting spine, also represented, though feebly, on segment six. Other moults noted took place on May 20, 24 or 25 and finally the last one on May 31 or June 1. Immediately after each moult the insect is very pallid, but it soon assumes the brownish shade variegated by lighter and paler marks and with the legs dark-banded. In form much like *Anax* but rather more slender, it is a much quieter larva than those of the *Anax* with which I am acquainted. (Fig. 5, final exuvium.) At last it reaches a length of about 40 millimeters. Soon we see indications of approaching emergence in the swollen wing pads and thorax above. It takes no nourishment during the last several days of its larval life and assumes more of a wood-brown shade. About midday June 15, it had
reversed its customary head down position on a submerged twig, its head now being partly out of water. More and more it made use of the large thoracic spiracle for breathing. On later occasions it appeared to have issued quite or nearly out of water, but the time evidently not being ripe for the moult to maturity, it had reversed its position and was again found head down and partly in water. Finally on June 19 it was found entirely out of water, though but a few millimeters above it. As far as I could watch the larva, it maintained this head-down, out of water position for about 24 hours (June 19-20). On the night of June 20 it crawled out to the extremity of the twig and there awaited transformation. When I examined it at 1:43 a. m. the following morning, June 21, it had rather lately emerged, for pale and tender, it clung to the empty shell, its abdomen still a little thick, its wings of glassy silver and as yet held close together over the back. By dawn its silvery wings were in the usual horizontal position and at 6:55 a. m., when I disturbed it, the insect still clung to its exuvium. Thus development from egg to adult required about two and one-half months.

The specimen taken as a partly grown larva in a small pool also grew rapidly under the influence of sufficient food, and its final transformations were observed with more success than in the case of the egg-reared individual. As far as noted, it remained quite out of water in a head-down position for somewhat more than two days. I finally poked it so that it went completely under water but in less than five minutes had reversed its position and crawled upwards so that on my return from dinner an hour later it had gained the extremity of the twig and was hanging from its underside. It went through several movements, including violent twitchings or writhings, as if to free its adult body from the hard larval case. It also "muscled up" with its legs. A swelling at the base of the abdomen beneath became apparent. Shortly after half past twelve a. m. the top of the thorax split, and head and thorax of the adult insect swelled through this enlarging fissure so that it was soon hanging head downwards by the base of the abdomen. A wriggle or jerk of the body now and then and some movement of the folded legs and at last, at about 1 p. m., the emerging insect suddenly bent upwards and grasping the shell at the empty head and thorax pulled its abdomen out of its encasement. An
awkward soft creature with stubby wrinkled wings, it developed quickly into the slender graceful insect of the fields. As the wings finally hang down together their full length they are of a dead whitish color; later in the morning they glisten with the beautiful transparency characteristic of such newborn insects. The abdomen lengthens and becomes slenderer, the skin toughens and the dragonfly, still frail and weakly colored, but already fairly proficient on the wing, seeks the early light at the window.

“The genus *Gynacantha* . . . is in some respects the most specialized of all the *Æschines*; it is so far as I know the only Odonate genus that is definitely crepuscular in its habits”. (Laidlaw, F.F., Proc. U. S. Natl. Mus., 62, Art. 21, 1923, p. 20.)

Williamson, E. B. (1923, p. 41) graphically describes the flight of *Gynacantha nervosa* in the American tropics. He observed how they suddenly filled the air in rapidly coming darkness and as suddenly disappeared twenty or thirty minutes later.

Tillyard, R. J. (London, Jl. Linn. Soc., Zool., 33, 1916, on page 72) writing on *Gynacantha mocsaryi* Förster says: “This species is rarer than the preceding, but occurs not uncommonly in North Queensland, where I have taken it in the dense scrub, in railway tunnels, and also at light. Two specimens were taken by me in the long tunnel No. 15 on the Cairns-Kuranda railway. They were flying slowly up and down, at about noon, and their brilliant green eyes appeared most remarkable in the gloom.”

Lieftinck, M. A., in his “Annotated list of Javan Odonata” (Treubia, XIV, p. 446) has some interesting notes on *Gynacantha subinterrupta* (Ramb.), in part as follows: “The first individuals appear on the wing about half an hour before dusk falls; leave their resting places and commence a rapid skipping flight in the open. About thirty minutes before sundown, at 6:15 p. m. in the wet season, it may commonly be seen hunting for mosquitoes in the darkened verandas of bungalows, in forest-clearings, over roadside brooks, etc. As twilight comes the insects quickly augment to form small flocks and continue their flight in dark situations, e.g. muddy ditches and among pools under the banks of some small stream, where both sexes skim the surface of the ground, stuffing themselves with immense numbers of mosquitoes. In such places, as night has set in for good, they may only be captured by watching for their silhouette.”
"The oviposition was observed by me in wet earth under the over-hanging bank of a shallow pool near Tjisolok (Wijnkoops Bay) in the Karimoen Djaua Islands, where this species is very abundant. I have watched several females ovipositing in the wet soil of a mangrove pool, just before sunset. Few females are taken with the tiny anal appendages whole, these usually having been fractured off during the process of egg-laying, or are gnawed to pieces by the male during copulation. In a forest marsh near the Wijnkoops Bay, I caught two females in the act
of transformation at 10 a. m., the exuviae hanging on semi-aquatic plants, a few inches above water level. Sometimes, however, the larvae form burrows or canals in the mud of a ditch or dry-pool, and on emergence ascend a convenient reed stem or stick."

Gynacantha is predominantly a holotropical genus, only a few species extending into temperate regions. In the Pacific it extends well into Polynesia, Fraser describing G. apiensis and G. stevensoni from Samoa (Insects of Samoa, Part VII, Odonata, pp. 19-44, 5 text figs, 1927).

Gynacantha nervosa is one of our common species being widely distributed in the American tropics and ranging into Florida and California.

I am indebted to Dr. J. G. Needham for determining Gynacantha nervosa and for indicating literature referring to it.

Note on Idiocerus provancheri Van D.

In the General Bulletin No. 346, 1920 (p. 19), of the Pennsylvania Department of Agriculture Messers Sanders and DeLong have placed my Idiocerus provancheri as a synonym of Zinneca flavidorsum A. & S. In 1888 when I began studying the Bythoscopidae of the eastern United States I made this same erroneous determination and until 1890 this insect stood in my collection as Zinneca flavidorsum A. & S. However a careful restudy of the description by Amyot and Serville soon convinced me that their insect had nothing to do with out eastern species. Zinneca flavidorsum was described as from "Amerique septentrionale," not from Pennsylvania, and probably was from the West Indies, Mexico or from farther south. The reference to "Pa." in my Catalogue was, I think, taken from Rathvon’s list in Mombert’s History of Lancaster County, Pennsylvania, published in 1869. Unfortunately I did not have access to this work when I was preparing my Catalogue so that reference was omitted. The head narrower than the pronotum and the entirely coriaceous elytra are sufficient to throw our insect out of Zinneca at once. Also the colors given for flavidorsum do not apply at all to provancheri. Dr. DeLong may have already made this correction but if so I have failed to record it.—E. P. Van Duzee.
A STUDY OF THE NORTH AMERICAN ODYNERUS HIDALGO
DE SAUSSURE (=DUCTUS CRESSON)
(Hymenoptera, Vespidae)

BY J. BEQUAERT

Department of Tropical Medicine
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Odynerus hidalgo de Saussure, first described from "the warmer parts of Mexico," occurs throughout the United States in three color forms. All these agree in the following structural characters:

Clypeus slightly wider than long, ending in both sexes in a wide, squarely truncate apical margin with rounded edges; its surface coarsely striato-punctate. Posterior ocelli separated by a broad furrow. Antenna of male with a long, finger-shaped, slightly curved terminal hook-like segment, very bluntly rounded at apex. Thorax stubby, but longer than wide; propodeum with broad and long sides, the dorsal lateral areas well set off; concavity deep, shiny, with fine, oblique striae which are more or less effaced in the upper half, the upper sides being often practically smooth; superior, inferior and lateral ridges well-marked; only the superior ridge with a somewhat wavy carina, ending above in a strong angle, which is separated from the sides of the postscutellum by a deep notch; inferior ridge not crenulate; lateral angles almost square, but rounded off. Postscutellum with a slight, crenulate, transverse ridge, not depressed in the middle. Head and thorax coarsely punctate. Abdomen stubby; first tergite abruptly basally and produced anteriorly in the middle, so that the horizontal posterior, and the vertical anterior faces, meet at a right angle with broadly rounded edge; second and third tergites, with a broad, thin and translucent, apical lamella, which is distinctly raised and slightly wider on the sides than in the middle; second sternite with a deep, longitudinal, median furrow at base; first tergite mostly impunctate, but with a group of rather large punctures at extreme sides and sometimes a few in the center; second tergite with fine to moderately large, scattered punctures over basal three-quarters, the apical portion with much coarser and denser punctuation; third and fourth tergites mostly covered with very deep and large punctures; fifth and sixth tergites more superficially punctate; ventrally the punctures are fine and sparse, rather uniformly scattered over the second sternite, more restricted to the apical half on the succeeding sternites. Terminal segments of maxillary palpi gradually decreasing in length. Length (head + thorax + tergites 1 + 2); ♀ 11 to 12 mm.; ♂, 7 to 9 mm.
The combination of nearly impunctate first tergite and second and third tergites ending in a translucent lamella, separates *O. hidalgo* from all other North American *Odynerus*. The three color forms may be separated as follows:

1. Body black, extensively marked with ferruginous-red or rufous in addition to the yellow spots and bands; second abdominal tergite mostly rufous, with a broad yellow apical band and usually without, more rarely with, lateral yellow spots. Wings moderately infuscated............................typical *O. hidalgo*.

... Body black, with yellow markings, without or with few rufous spots; second abdominal tergite predominantly black and yellow, without or with mere traces of rufous...............2.

2. Yellow markings of moderate extent, almost reduced to narrow apical bands on the abdomen; second tergite without lateral spots and with the apical band not appreciably widened on the sides. Wings dark fusco-violaceous............................

.........................................................var. boreo-orientalis.

... Yellow markings very extensive; the apical bands of the abdomen broad, that of the second tergite connected or fused with large lateral spots. Wings moderately infuscate, somewhat yellowish ...........................................var. boreo-occidentalis.

**Odynerus hidalgo**, typical form

*Odynerus hidalgo* H. de Saussure, 1857, Rev. Mag. Zool., (2) IX, p. 275 (no sex; "les parties chaudes du Mexique").

*Odynerus* (*Odynerus*) *hidalgo* H. de Saussure, 1875, Smiths Misc. Coll., No. 254, p. 252 (♀♂; in part: "Varietias Mexicana ... I caught 2♀, 1♂, var., in the hot part of the province of Mexico, near Cuautta and Cuernavaca. Tamaulipas 1♀ ... Louisiana").

*Odynerus ductus* Cresson, 1875, Trans. Am. Ent. Soc., IV, p. 238 (♀♂; Texas; collected by Belfrage and therefore probably from Bosque Co.).

Specimens examined. **MISSISSIPPI**: Oxford, La Fayette Co. (F. M. Hull). **LOUISIANA**: Darrow, Ascencion Co. (J. Bequaert); Mound, Madison Co. (C. R. Jones). **MISSOURI**: Springfield, Green Co., (H. H Knight). **IOWA**: Ledges State Park, Boone Co. (H. A. Scullen). **KANSAS**: Wellington, Sumner Co. (T. H. Parks); Clark Co. (F. H. Snow); Baldwin, Douglas Co. (J. C. Bridwell); Clay Co. (J. C. Bridwell). **OKLAHOMA**: Ardmore, Carter Co. (C. R. Jones); Okmulgee, Okmulgee Co., at flowers of *Coreopsis* (J. D. Mitchell). **TEXAS**: Austin (C. T. Brues); Fedor, Lee Co. (Birkmann); Columbus, Colorado Co.; New Braunfels, at flowers of *Ratibida columnaris* (J. Bequaert); Galveston (F. H. Snow); Helotes, Bexar Co. (J. C. Bradley); Wharton, Wharton Co. (J. Bequaert); Cypress Mill, Blanco Co. (W. H. Ashmead); Dallas
(R. M. Gaines); Brownsville (T. C. Barber); College Station, Brazos Co., at flowers of Callirrhoe involucrata (H. J. Reinhard); Seguin, Guadalupe Co. (S. K. Jones); Taylor, Williamson Co. (J. C. Gaines); Hill Co.; Terrell Co.; Dilley, Frio Co. NEW MEXICO: Las Cruces (T. D. A. Cockerell); 35 miles East of Santa Fé, 6900 ft. (H. A. Scullen). COLORADO: Ft. Reynolds (Miller); Berkeley, Arapahoe Co. (U. S. N. M.). ARIZONA: Tucson (W. H. Mann); Wheatfields near Globe (D. K. Duncan); Prescott (R. C. Kunze); Catalina Springs (H. G. Hubbard and E. A. Schwarz); Huachuca Mts., Cochise Co. CALIFORNIA: Diablo Mts., Alcalde, Fresno Co. (J. C. Bradley). MEXICO: Meadow Valley, Chihuahua (C. T. Townsend); Tlahualilo, Durango (A. W. Morrill); Vicinity of Mexico City (C. W. Barrett); Victoria, Durango (T. C. Barber and T. E. Holloway).

I have seen upward of 100 specimens. The extent of ferruginous varies considerably but I have seen no true intergrades with the other two forms, although some may be expected in northwestern Florida and Alabama, or Southern California, Nevada and Utah. I have seen only five specimens (all males) which have some yellow on the sides of the second tergite, usually connected with the apical yellow band. These came from Texas, Arizona (Catalina Springs), California (Alcalde) and Mexico City.

I have seen the types of Cresson’s ductus at the Academy of Natural Sciences, Philadelphia. Also similar specimens, collected by Belfrage in Texas, at the Museum of Comparative Zoology and the United States National Museum. All these are of the form of O. hidalgo extensively marked with rufous or ferruginous, especially on the second tergite. This was the form first described by de Saussure in 1857, which should be regarded as typical for the species. Cresson did not compare his species with hidalgo.

A female from Dallas was found stylopized by Pseudoxenos hookeri Pierce (Bequaert and Salt, 1921, Psyche, XXXVI, p. 256).

O. hidalgo boreo-orientalis Bequaert, n. var.


Female. Black with the following markings yellow: a spot on each side of the clypeus; a transverse spot between the antennæ; the ocular sinuses; an elongate spot in upper part of outer orbits;
most of outer surface of mandibles; scape beneath; broad humeral margin of pronotum; tegulae (except for a median ferruginous spot); a transverse band on postscutellum; a small spot in upper plate of mesepisternum, beneath base of wing; outer side of tibia; a broad apical band on first tergite, much widened laterally; narrow apical bands on second and third tergites and sternites. Apical portion of femora, under side of tibia and entire tarsi ferruginous. In some specimens some of the yellow markings may be more or less suffused or bordered with ferruginous, particularly on the pronotum and first tergite; the propodeum also is sometimes more or less ferruginous. Wings infuscated, with a purplish effulgence, clearer toward the base.

**Male.** Clypeus entirely yellow. Dorsal areas of propodeum partly yellow. Otherwise as in the female.


**Paratypes.** **Massachusetts:** Nonsuch Pond, Natick (A. P. Morse); Forest Hills, Boston (O. E. Plath). **Connecticut:** Colebrook (W. M. Wheeler). **New York:** Prospect Park, Brooklyn (G. P. Engelhardt); Cold Spring Harbor (J. Bequaert; R. Dow); Ithaca (Chittenden). **Ohio:** Laura Co. (C. H. Kennedy). **New Jersey:** Ocean Grove (W. H. Ashmead); Camden Co. **Pennsylvania:** Pocono Lake (C. T. Greene); Braddock (H. A. Scullen); Philadelphia (U. S. N. M.); Harrisburg (P. R. Myers). **Virginia:** Falls Church (N. Banks); Great Falls (N. Banks); Glencarlyn (R. A. Cushman); Arlington (Chittenden). **West Virginia:** French Creek (F. E. Brooks). **North Carolina:** North Fork Swannanoa River, Black Mountains (N. Banks). **South Carolina:** Greenville Co. (H. K. Townes, Jr.); Horry Co. (H. Townes). **Georgia:** Savannah (U. S. N. M.); St. Simons Island (J. C. Bradley); Billy's Island, Okefenokee Swamp (J. C. Bradley). **Florida:** Greenville, Madison Co. (G. Fairchild); Gulfport, Pinellas Co. (Reynolds); Arcadia, De Soto Co. (U. S. N. M.); Orlando, Orange Co. (O. C. McBride). At the U. S. N. M. there is also a specimen of this variety labelled "Mound, La.", but I regard this label as due to some error.

This variety from the eastern United States, of which I have seen some forty specimens, is remarkably constant in color pattern. The most aberrant specimen seen is a male from Arcadia, Florida, which has the propodeum almost entirely ferruginous-red; yet the second tergite shows no ferruginous at all.
This is the form of the species recorded as *O. hidalgo* in J. B. Smith's "Insects of New Jersey" (1910) (record from Camden, New Jersey), and in M. D. Leonard's "List of the Insects of New York" (1928).

*O. hidalgo boreo-occidentalis* Bequaert, n. var.

**Female.** Black with the following markings yellow: clypeus; a large, wedge-shaped mark on the frons between the antennae; outer surface of mandibles; ocular sinuses; most of outer orbits; scape beneath; most of dorsal face of pronotum; tegula (except for a median ferruginous spot); most of scutellum (narrowly divided by a median black line); most of postscutellum; sides of propodeum; most of upper plate of mesepisternum; most of legs; very broad apical bands on all tergites and sternites, those of the first and second tergites slightly or considerably widened on the sides to connect with lateral spots (the black often forming a lozange-shaped mark on the first, and an hourglass-shaped mark on the second tergite; the second sternite is sometimes almost entirely yellow). Some of the yellow markings are edged with ferruginous, especially on the pronotum; scape above and knees ferruginous. Wings slightly infuscated, with a yellowish tinge; the radial cell darker and somewhat purplish.

**Male.** Scutellum black; yellow band on postscutellum narrow; yellow spots on propodeum and mesepisternum small; otherwise like the female.


**Paratypes.** California: Sisson near Mt. Shasta, Siskiyou Co. (Wickham); Dunsmuir, Siskiyou Co. (Wickham); Los Angeles Co. (D. W. Coquillett); mountains near Claremont, Los Angeles Co. (C. F. Baker); Three Rivers, Tulare Co., 600 to 800 ft. (J. C. Bradley); Midfork Kaweah River, Sequoia National Park, Tulare Co., 1700 ft. (J. C. Bradley); Warrens, San Diego Co. (J. C. Bradley). Washington State: Wawawai, Whitman Co. (W. M. Mann); Squaw Creek, Yakima, Yakima Co. (S. Henshaw); L. McElroy, Paha, Adams Co. (M. C. Lane).

I have seen fifteen specimens. The extent of yellow varies, especially on first and second tergites. Specimens from Washington State have the yellow markings more reduced than most of those of California, while the ferruginous color is more extended, notably on the pronotum. They may possibly repre-
sent a fourth color form; but my material from the Pacific Coast is far too limited to decide the matter.

The var. *boreo-occidentalis* is homeochromic with several other wasps of the Pacific Coast, notably *Ancistrocerus halophila* Viereck and *Odynerus sulfureus* de Saussure.

**BIOLOGICAL CONTROL**

The Biological Control of Insects. By Harvey L. Sweetman, with a Foreword by L. O. Howard, pp. xxii+461, 6 portraits and 143 figures. 1936. Comstock Publishing Co., Inc. Ithaca, N. Y. $3.75

Well turned out in the usual excellent style of the Comstock Publishing Company we are here presented with the first general treatise on this highly important and timely subject. It is apparent that Prof. Sweetman has an unusually fine grasp of the subject as a whole. Some idea of the scope of the work may be had from a brief review of the chapter headings. Chap. 1, Theoretical Basis of Biological Control; 2, Use of Resistant Hosts; 3, Use of Microorganisms, Bacteria and Fungi; 4, Viruses and Protozoa; 5, Use of Parasitic Invertebrate Animals, Nematominthes; 6, Hexapoda, Diptera; 7, Hymenoptera; 8, Arachnida and Hexapoda; 9, Some Biological Relations of Insect Parasites and Predators; 10, Factors to Be Considered in the Utilization of Insect Parasites and Predators; 11, Introduction of Insect Parasites and Predators; 12, Use of Predatory Vertebrate Animals; 13, Results of Biological Control Experiments Against Animals; 14, Biological Control of Pest Plants.

The Anthocoridae are mentioned as predominantly plant feeders whereas all of the species whose habits are known to the reviewer, either in the field or through literature, are predaceous.

Among the most desirable features of the book are the glossary of over five pages in which terms are meticulously defined, and the extensive bibliography arranged at the end of the book by chapters. Entomologists are deeply indebted to Professor Sweetman for bringing together as an easily accessible and fundamental work the foundations of this young branch of our science. It justly deserves a place in the library of everyone who would keep abreast of the kaleidoscopic developments in the swiftly advancing science of entomology.—R. L. Usinger.
A COLLECTION OF TERMITES FROM CEYLON AND JAVA

BY S. F. LIGHT

Department of Zoology, University of California, Berkeley

The termites discussed in this note were collected in Java and Ceylon by Miss Jane Collier for Professor L. R. Cleveland of Harvard University. Their intestinal Protozoa are being studied by Professor Cleveland and Professor Harold Kirby of the University of California. Dr. Cleveland kindly sent me the termites for study.

Our knowledge of the taxonomy of the termites of most regions is still very preliminary in nature. Many new species remain to be discovered and described, and for known species either the alate or the soldier is often unknown. More distressing, however, is the paucity of our knowledge of the range of intraspecific variation and therefore, of the validity of the characters used to distinguish species. Without such knowledge it remains impossible, of course, to effect satisfactory revisions of the described species, many of which I believe should be in synonymy. Each new collection adds to our knowledge of geographical and ecologic distribution and should also add definiteness to knowledge of this variational range. It has seemed worth while, therefore, to present such information as has been obtained from a study of this collection although it contains no species new to science.

The species appearing in the collection are given below in separate lists for Ceylon and Java. After each is given the locality and such notes as are available as to habitat. Those species presenting points of special interest are separately discussed.

CEYLON

1. Neotermes greeni (Desneux). In wood of Pittosporum vividiflorum Sims, Peradeniya.
2. Neotermes militaris (Desneux). In wood of tea, Thea sinensis, Masheliga.

JAVA

1. *Neotermes dalbergiae* Kalshoven.
2. *Neotermes tectonae* (Dammerman). In living teak wood, Djember, Eastern Java.
4. *Cryptotermes* (Cr.) *cynocephalus* Light. In piece of very dry wood from a native house.
7. *Coptotermes travians* (Haviland). From large piece of wood from teak forest, Kedorngdjati.
9. *Odontotermes* (Odontotermes) *grandiceps* (Holmgren). Two collections both from Tjibodes; one from a fungus growing between the stones of a walk, and one from decayed wood.
10. *Nasutitermes* (Nasutitermes) *pusillus* (Holmgren). Two collections both from decayed wood at Depok.

**Glyptotermes dilatatus** Bugnion and Popoff 1910

The excellent collection including numerous alates, and soldiers allows for presentation of certain points not brought out in previous descriptions.

*Alate*: Kemner (1926) gives the number of segments in the antennae as fourteen while the six alates before me with perfect antennae each have fifteen segments. The eye is elongated in an obliquely anteroposterior direction and is separated from the lower margin of the head capsule by about two thirds its shorter diameter. The radius is even shorter than stated by Kemner, being confined to the basal one-fifth of the fore wing. The median, which is separate throughout the membrane of the fore wing, arises from the radius sector in the basal one-eighth of the hind wing. Weak venation of an irregular type often simulates a longitudinal vein near the cubitus with numerous anterior branches to the median.

Measurements in millimeters of alate of *Glyptotermes dilatatus* Bugnion and Popoff: Width of head and eyes 1.32; width of pronotum 1.32; length of pronotum 0.68; maximum diameter of eye 0.30; least diameter of eye 0.24; long diameter of ocellus 0.15;
short diameter of ocellus 0.10; distance from eye to ocellus 0.03; distance of eye from lower margin of head 0.18; length of forewing 9.00; length of forewing without scale 8.00.

**Soldier:** The posterior and dorsal margins of the antennal foveole project, being visible beyond the lateral margins of the head capsule when seen in ventral view, while in *G. montanus* Kemner (see below) they hardly project at all and are not at all visible from below. The gulamentum is strongly narrowed near its middle and bears a smoothly concave notch at the point of articulation of the maxillae. This is in contrast to the gulamentum of *G. montanus* which shows no such notch, its sides gradually approaching in their posterior two-thirds.

The demarcation between the dorsal surface of the head and the frons is very sharp, the frons appearing concave due to the anterior projection of the angular tubercles marking the laterodorsal rims of the frons.

Measurements in millimeters of a soldier of *Glyptotermes dilatatus* Bugnion and Popoff: Length of head capsule 1.98; width of head capsule 1.35; length of left mandible 1.14; width of pronotum (in place) 1.38; length of pronotum 0.71; maximum width of gulamentum 0.48; minimum width of gulamentum 0.22.

**Cryptotermes (Planocryptotermes) dudleyi** Banks

*Planocryptotermes* nocens Light, 1921

*Cryptotermes* (Planocryptotermes) nocens Light, 1930.

*Cryptotermes* (Planocryptotermes) primus Kemner, 1932

*nec* Cryptotermes primus Hill, 1926.

*Cryptotermes* (P.) javanicus Kemner, 1933

*Calotermes* (Cryptotermes) jacobsoni Holmgren, 1913

*Cryptotermes* (Planocryptotermes) jacobsoni Kemner, 1933.

A careful comparison of the soldiers of a colony from Ceylon, evidently Kemner’s *Cryptotermes* (Planocryptotermes) primus (1932), and a single soldier from Java, evidently Kemner’s *Cr. (P.) javanicus* (1933), with numerous soldiers of *Cr. (P.) nocens* Light (1921) from Manila shows very close agreement and fails to show any consistent differences. I am constrained therefore to maintain the existence of a single species ranging from the Philippines to Ceylon. Nor is this to be considered unusual or unexpected. As I point out below, a similar situation seems to exist in the case of the small *Cryptotermes* species, *Cr. cynocephalus* (=? *Cr. domesticus* Haviland). *Macrotermes gilvus* is another Oriental species known to have wide range.

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1 Prof. Alfred Emerson of Chicago informs me (in litt.) that careful comparison shows *Cryptotermes dudleyi* Banks of Panama to be identical with *Planocryptotermes nocens* Light. *Cr. dudleyi* being older, *P. nocens* Light falls into synonymy with it.
No doubt increasing knowledge will bring to light extended ranges for other species of Termites in the Orient bringing into synonymy more and more of the local names. This has been found to be true in the case of certain species of North America, Central America and the Pacific Islands. For example, in a previous report (1932) I have shown that *Kalotermes immigans* Snyder originally known only from Hawaii ranges from Hawaii through Fanning Island to the Marquesas; and in a later paper I have shown it to be common in the Galapagos Islands and in the coastal region of Ecuador. As an example of a continental species with a great range I may cite *Kalotermes* (*Paraneotermes*) *simplicicornis* Banks (1920) which ranges from southeastern Texas to southern California and from southern Nevada at least as far south as San Blas de Sinaloa in Mexico (Light, in Kofoid, Light et al 1934).

I append measurements of the head of the soldier of *Cryptotermes* (*P.*) *nocens* from Java, of three soldiers from Ceylon and of a single soldier from Manila chosen at random, to show (1) the range of variation within so small a sample of soldiers (four) from the single colony from Java and (2) the fact that the individuals from Ceylon and Manila fall within the range of variation set by these three soldiers from a single colony. Clearly, as was indicated by my footnote (1921) to the diagnosis of *Planocryptotermes*, we must choose between considering this a single variable species or erecting a large series of closely related species, only, as I believe, to have them fall into synonymy with increasing knowledge.

Measurements, in millimeters, of soldiers of *Cryptotermes* (*Planocryptotermes*) *nocens* Light: (1) from Ceylon; (2), (3), and (4) from Java; and (5) from Manila.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head</td>
<td>1.77</td>
<td>1.80</td>
<td>1.71</td>
<td>1.68</td>
<td>1.80</td>
</tr>
<tr>
<td>Width of head</td>
<td>1.35</td>
<td>1.38</td>
<td>1.32</td>
<td>1.26</td>
<td>1.38</td>
</tr>
<tr>
<td>Head index</td>
<td>0.76</td>
<td>0.77</td>
<td>0.77</td>
<td>0.75</td>
<td>0.77</td>
</tr>
</tbody>
</table>

**COPTOTERMES CELYONICUS** Holmgren, 1911

The collection contains many soldiers and workers. These soldiers are light in color for the genus, the head being whitish-yellow, the mandible yellowish-red at base and light red distally.
The range of size among these soldiers is so great as to suggest at first the probability that two species or at least two colonies of different ages were represented. Certain individuals, however, show intergradation. Measurements of two individuals are given to give the range of their size variation.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head with mandible</td>
<td>2.40</td>
<td></td>
</tr>
<tr>
<td>Length of head</td>
<td>2.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Width of head</td>
<td>1.02</td>
<td>0.93</td>
</tr>
<tr>
<td>Length of left mandible</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Width of pronotum</td>
<td>0.72</td>
<td>0.90</td>
</tr>
<tr>
<td>Maximum width of gula</td>
<td>0.41</td>
<td>0.55</td>
</tr>
<tr>
<td>Minimum width of gula</td>
<td>0.17</td>
<td>0.23</td>
</tr>
</tbody>
</table>

It will be seen that these larger soldiers considerably exceed in certain dimensions the maxima given by Holmgren (1913).

**Odontotermes (Hypotermes) obscuriceps** (Wasmann)

The single collection contains three soldiers which agree closely in measurements. As the measurements given below will show they agree fairly well with *O. (H.) obscuriceps* Wasmann as described by Holmgren (1913).

Measurements of soldiers of *Odontotermes Hypotermes obscuriceps* (Wasmann) from Peradeniya: Length of head with mandibles 1.74; length of head 1.20; length of left mandible 1.23; width of head 1.02; width of pronotum 0.75.

The anterior margin of the pronotum shows a distinct median notch as noted by Wasmann (1896) but not by Holmgren and as found by Kemner in *O. (H.) marshalli*. The antennae show 16 segments of which the second and third are very small and subequal which emphasizes again the danger of using this growing zone of the antennae as of diagnostic value.

It will be noted that these soldiers are larger in several dimensions than shown by Holmgren's measurements. It seems probable that more extensive series will show the two species *O. obscuriceps* and *O. marshalli* Kemner to represent extremes of a single variable species.

The workers present, all of the same size, are evidently the larger workers since the head is about 1.20 millimeters in width.
Odontotermes (Odontotermes) ceylonicus (Wasmann).

The soldiers of this collection agree well with those described by Holmgren (1913). Measurements are as follows in millimeters: Length of head with mandibles 2.88; length of head, 1.80; width of head 1.32; width of pronotum 0.96; width of gula 0.48.

The antennæ are of 15 or 16 segments. When 15 the third is shortest.

Large and small workers have a head width respectively of about 1.35 and 0.90 millimeters.

Odontotermes (Odontotermes) horni (Wasmann)

The numerous soldiers in this single collection show a wide range not only of head dimensions but of proportions as brought out by the measurements below of extreme individual.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head</td>
<td>2.28</td>
<td>2.70</td>
</tr>
<tr>
<td>Width of head</td>
<td>1.86</td>
<td>2.04</td>
</tr>
<tr>
<td>Head index</td>
<td>0.82</td>
<td>0.76</td>
</tr>
</tbody>
</table>

It will be noted that these measurements approximate most closely those of O. horni var. minor Kemner (1933) but overlap them. Here again I feel certain that complete series will show this variation to be intercolonial and not characteristic of races or varieties.

Glyptotermes montanus Kemner 1933

This large and distinct species is represented by numerous soldiers in the collection at hand. I had described it as a new species prior to receipt of Kemner’s paper (1933). The description of the soldier is included as being more complete than that of Kemner and giving information as to range of variation.

Soldier. Body pale yellowish; pronotum light yellow brown; head pale yellow brown behind to red brown in front, somewhat infuscate from middle on; Y-suture distinct, white; frons and bases of mandibles smoky red; mandibles reddish black distally; antennæ and palpi yellow-brown.

Head paralleled or with sides converging slightly anteriorly; antero-lateral corners sharp, somewhat projecting; postero-lateral corners rounded; posterior margin straight; head high but not so high as broad, head-height index about 0.9. Frons sloping at an
angle of about 45°, upper margin two-lobed due to central groove running back to point of bifurcation of Y-suture; these two lobes, located on a line posterior to the dark mandibular articulations and dorsal to and slightly anterior to the prominent white, vertically crescentic eyes, are set off as low anteriorly projecting cones by a flat groove which runs across the anterior area of the frons. Eye narrow, dorso-ventrally elongated, separated from posterior rim of antennal foveola by slightly more than its own short diameter; rim of foveola only very slightly produced. Labrum scarcely longer than wide, widest behind middle, anterior end rounded.

Gulamentum narrow, narrowest behind middle, gular width index 0.75 (0.45 for G. dilatatus!).

Antennae of twelve segments, third shortest with indications of a basal division to make thirteen segments, the new third being very short.

Pronotum somewhat concave in front, antero-lateral corners shortly rounded, projecting somewhat anteriorly, sides weakly convex in front, receding strongly from in front of middle and curving broadly into the narrow, straight or weakly convex, posterior border which shows only the faintest trace of a median notch. Femora relatively weak; all tibiae with three spines. Tenth tergite elongated, paler than other terga, with a somewhat swollen appearance.

Measurements in millimeters and indices of a soldier of Glyptotermes montanus Kemner: Length of entire animal 8.00; length of head with mandibles crossed 3.70; length of head capsule 2.61; height of head 1.50; width of head 1.64; length of left mandible 1.20; length of pronotum 0.65; width of pronotum 1.56; length of labrum, dissected 0.50; width of labrum 0.49; length of gulamentum 1.74; maximum width of gulamentum 0.42; minimum width of gulamentum 0.27; head index 0.63; head height index 0.91; pronotal index 0.50.

Systematic position: G. montanus is the largest Oriental species of the subgenus save G. satsumensis. From all other species which approach it in size and indeed from all Oriental species it differs in that the left mandible has three subequal, approximately equally spaced triangular teeth.

Cryptotermes cynocephalus Light

? Cryptotermes huitenzorgi Kemner 1933.

A collection containing numerous soldiers and alates agrees completely as regards all castes with Cr. cynocephalus Light of the Philippines, and so far as I am able to determine from the figures and descriptions with Cr. huitenzorgi Kemner (1933)
which would therefore become a synonym of *Cr. cynocephalus*. It should be pointed out that collections of *Cr. cynocephalus* obtained subsequently to the published description (1921) show the head to be as wide as 1.00 mm. in some soldiers.

In the absence of authoritatively diagnosed comparative material of *Cryptotermes domesticus* (Haviland) it seems unwise as yet to reduce both *Cr. cynocephalus* and *Cr. buitenzorgi* species to synonymy with *Cr. domesticus* which I believe will be the fate of these species and perhaps of *Cr. perforatus* Kemner (1932).

**COPTOTERMES TRAVIANS** (Haviland)

The single collection with numerous soldiers agrees closely with Kemner's description (1933). It seems probable that *C. vastator* Light common throughout the Philippines, and other medium sized oriental species, will prove to belong to this species.

**ODONTOTERMES (ODONTOTERMES) GRANDICEPS** (Holmgren) (?)

Two collections each containing a number of soldiers. While these soldiers are considerably larger than any yet described from Java, save *O. bogoriensis* Kemner, and have actually broader heads, relatively much broader, it seems better to place them in this species with which they agree in tooth characters and shape of head and gula.

Unpublished work involving measurements of soldiers from a very large series of Philippine *Odontotermes* has convinced me that an extremely wide range of variation with regard to size, proportions of the head, and position of tooth is characteristic of the species of this genus. Study of large series will ultimately, I believe, reduce very greatly the number of species. Meanwhile the systematist has the unfortunate choice of adding on the one hand to an already swollen list of species or burying the very information necessary to a solution of the situation. The happy medium is often hard to find. In the present instance, I have chosen the latter course since alates are not present and since, the two collections having been allowed to dry out at some time, the characters of the soldier are not all available. Measurements follow to be of aid to the future investigator of this knotty problem.
Two collections, one with alates, agree with the description of the species which is based on soldiers. Soldier measurements follow as also a description of the heretofore unknown alate.

Measurements in millimeters, and indices, of soldiers of *Nasutitermes pusillus* Holmgren to show the range of variation.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head with mandibles</td>
<td>3.48</td>
<td>4.20</td>
<td></td>
</tr>
<tr>
<td>Length of head</td>
<td>2.70</td>
<td>2.88</td>
<td></td>
</tr>
<tr>
<td>Width of head</td>
<td>2.12</td>
<td>2.34</td>
<td></td>
</tr>
<tr>
<td>Length of mandible</td>
<td>1.26</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>Distance from tooth to tip</td>
<td></td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>Distance from tooth to base</td>
<td></td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>Tooth position index</td>
<td></td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Head index</td>
<td></td>
<td>0.70</td>
<td></td>
</tr>
</tbody>
</table>

*Description: Alate.* Abdominal tergites very dark brown, head and abdominal sternites lighter brown; lateral thoracic sclerites light smoky brown; antenna light brown; palpi, labrum, postclypeus, legs and nota brownish yellow; pleural membranes white, conspicuous.

Antennal foveolae in deep grooves on side of head which converge anteriorly. Labrum shorter than broad, broadest at about middle. Postclypeus short, about four times as wide as long, hardly swollen. Fontanel large, white, conspicuous, oval, located behind line joining middle of eyes. Ocelli broad oval, strongly oblique, separated from eye by short diameter or more. Eye large but not strongly projecting, separated from lower margin of head by about one-sixth its diameter, from dorsal margin by about one-third its diameter. Antennae of 15 segments, somewhat elongated; second segment smallest, third longer than 4th, 5th, or 6th which are subequal.

Anterior margin of pronotum entire, straight or faintly convex; posterior margin weakly emarginate; corners rounded; sides straight, converging. Mesonotum with broadly and evenly con-
cave posterior margin and sharply rounded corners. Posterior margin of metanotum arcuate, corners broadly rounded.

Wings about twice as long as thorax and abdomen; membrane pale gray-brown, veins brown; a dark chocolate line posterior to radius section succeeded by a broad diffuse yellowish zone (costal stripe).

Measurements in millimeters of typical alate of *Nasutitermes pusillus* (Holmgren): Length over all, 15.5; length of fore wing, 13.8; width of fore wing, 3.63; length of head, 1.51; length of head capsule, 0.99; width of head capsule, 1.07; width of head with eyes, 1.42; length of pronotum, 0.77; width of pronotum, 1.22; long diameter of eye, 0.45; short diameter of eye, 0.41; long diameter of ocellus, 0.18; short diameter of ocellus, 0.16; distance of ocellus from eye, 0.12.

### Collecting Notes

A female specimen of *Dyslobus squamipunctatus* Pierce now in the collection of the writer was taken by Miss Evelyn Daybell at Eureka, California, in the spring of 1935. This is, so far as is known, the third specimen in collections. The species was described by Pierce in 1909 from two male specimens taken by H. S. Barber at Eureka and was not collected again for twenty-six years. The specimen was determined by Dr. Van Dyke's key to the species of *Dyslobus* (Pan-Pacific Entomologist, 1933) and sent to Mr. L. L. Buchanan who compared it with the type, confirming the identification.

On February 20, 1937, Mr. Mont Cazier and the writer took fifteen larvae of the beetle *Dascilllus davidsoni* around the roots of snowberry, *Symphoricarpus*, at Stevens Creek, Santa Clara County, California. Hundreds of adults were observed emerging at this spot the year before on May 3. The larvae of this beetle as well as of most beetles are seldom collected and this note may be of interest to those interested in immature stages of insects. The same day twenty-one specimens of the rather uncommon weevil *Peritelopsis globiventris* were taken at Half Moon Bay, San Mateo County, on the sea side daisy, *Erigeron glaucus*. Mr. Harry Lange recently reported this weevil doing some damage to globe artichoke in San Cruz County (Pan-Pacific Entomologist, 1936).—P. C. Ting.
A FEW NEW HEMIPTERA

BY E. P. VAN DUZEE

The following descriptions represent species in the collection of the California Academy of Sciences that do not seem to have been previously published.

Peribalus hirtus Van Duzee, n. sp.

Size and aspect of tristis Van Duzee but clothed with short stiff grey hairs, the connexivum but narrowly edged with pale. Length 9 mm.

Female: Head broad as in tristis but somewhat shorter, the cheeks not quite meeting before the tylius; antennæ as in tristis, segments IV and V subequal, longer and thicker than II and III; rostrum nearly attaining the hind coxae. Pronotum rugosely punctate, the sides thickened with the adjoining disk depressed; apex of scutellum scarcely narrower than in tristis. Whole upper surface irregularly, coarsely, in places almost rugosely, punctate, the punctures being somewhat closer on the disk of the corium. Beneath closely, deeply punctate, the punctures on the venter smaller and confused.

Color about as in tristis, testaceous brown, much obscured by the coarse black punctures giving the whole insect a blackish appearance. Tip of scutellum, lateral margins of pronotum and connexivum narrowly pale; tarsi paler or somewhat piceous in places; antennæ pale or fuscous with pale incisures; rostrum pale, piceous at tip. Whole surface clothed with long pale hairs which become shorter on the disk of the corium and venter, the longer hairs as long as the thickness of the hind tibiae.

Holotype, female, No. 4207, Mus. Calif. Acad. Sci. Ent., taken at Potwisha, Sequoia National Park, at about 4,000 feet elevation, June 20, 1929; paratypes four females taken at the same place from May 20 to June 2, 1929, all by Dr. E. C. Van Dyke, and one female taken by Mr. F. T. Scott at the same place in March, 1936. The shorter head, rougher punctation, thickened sides of pronotum, shorter rostrum and especially the long stiff pale vestiture will at once distinguish this species. This is one of a number of new or interesting Hemiptera taken by Dr. Van Dyke in the Sequoia National Park.

Arocera elongata Uhler, MS.

Deep black; head before the eyes, segment I of the antennæ, apex of scutellum, base and apex of elytra, and base of the
abdomen red: Latero-posterior margins of the pronotum deeply excavated. Length 18-20 mm.

Head and pronotum impunctate or nearly so; cheeks obscurely striate; latero-posterior margin of pronotum deeply sinuate. Segment II of antennæ about one-half as long as III; scutellum with sparse fine, nearly obsolete, punctures. Elytra wrinkled and obscurely, minutely punctate, more distinctly so at apex. Rostrum attaining middle of fourth ventral segment.

Color deep black; head, except base of vertex, apex of scutellum, a spot at base and at apex of the elytra, the former including the base of the clavus, basal segment of the rostrum and the venter red. Outer angle of fifth ventral segment, all of the sixth and usually the basal and lateral plates of the female terminalia black. Ventrals II, III, and IV with a black marginal spot, V sometimes with a round median spot and there may be a red marginal spot on the meso- and metapleuræ; antennal I and base of II red.

Merida, Venezuela, one female from the author's collection in the museum of the California Academy of Sciences. This specimen was in a collection purchased by the author from a dealer in Germany about 30 years ago. The Carnegie Museum has one from Chapada, Brazil, and two from Province del Sara, Bolivia. This is apparently the species figured in the July, 1929 number of the National Geographic Magazine, plate V fig. 1, where it is given the name used above, evidently a MS name never published by Dr. Uhler.

An interesting question comes in here. Does the publication of this figure in the National Geographic Magazine establish the species, and if so what is the type of the species and who is its author? Uhler cannot be the authority for the name as he neither described nor figured it. Mr. Franklin L. Fisher apparently selected the specimens for illustration in this article and Mr. E. L. Wisherd photographed them. I cannot learn that either of these men was interested in entomology, at least from a systematic standpoint. As we cannot give Dr. Uhler as authority for the species should we credit it to Mr. Fisher and Mr. Wisherd, or to Mr. Grosvenor as editor of the National Geographic Magazine, who appropriated the funds for the preparation and illustration of the paper, or should the present brief description be used as authority of the species. I know of no other case exactly parallel to this and am sure we would
who has given this matter serious consideration. There might seem to be here an argument in favor of the omission of the name of the authority for systematic names, but frequently the name of the author of a species, especially if followed by the date, will enable the student to turn at once to the description without having to refer to a catalogue.

**Catacanthus eximius** Van Duzee, n. sp.

Allied to *carrenoi* but easily distinguished by having the pronotum entirely of a deep greenish blue except for a small red spot behind the humeri, and different male genital characters. Length 25 mm.

Striae of cheeks more feeble than in *carrenoi* and the elytra more closely punctate; antennals II and III equal in the male, III longer in the female; apex of scutellum acute as in *carrenoi*. Apical margin of male pygofer subacute, not broadly rounded as in *carrenoi*, the setose lateral plate armed within with a nearly horizontal stout black tooth not found in the allied species, the median triangular plate more deeply notched. Female genital pieces much as in *carrenoi* and similarly marked with black.

Head, antennae, pronotum except the small post humeral spot, scutellum to near the apex of the frenum, a large discal elytral spot somewhat produced anteriorly on the costa and narrowly attaining, or almost attaining, the inner angle, narrow inner edge of the clavus, basal two-thirds of the membrane, legs, four spots either side the venter, most of the rostrum and the narrow inferior edge of the pronotum, blue-black or somewhat tinged with green; lower surface except as noted, connexivum, apex of scutellum, frenum and a small spot behind the humeri, clear sanguineous; elytra whitish testaceous marked with blue-black as noted; apex of membrane slightly enfumed.

Holotype, male No. 4208, and allotype, female, No. 4209, Mus. Calif. Acad. Sci., Ent., taken on Mindanao, Philippine Islands, the male May 5, at 2050 feet, the female taken before July 17th at 1000 ft., and 14 paratypes taken with the types. Two nymphs taken May 5th have the tergum sanguineous with three large median, and a row of marginal spots blue-black. This evidently is the insect designated as variety *b* of *tricolor* (equals *carrenoi*) by Stal but it is a good species.
Chariesterus brevipennis Van Duzee, n. sp.

Castaneous-brown varied with fuscous; antennal III lanceolate; elytra attaining middle of fifth dorsal segment; margin of pronotum coarsely tuberculate. Length 10-11 mm.

Head nearly square; vertex deeply sulcate on median line between anterior angles of the eyes and with a deep preocular pit; antenniferous tubercles produced in an acute black spine; antennal I as long as from anterior angle of eye to base of pronotum, without marginal tubercles; the segmental lengths as 48:35:30:16; III expanded from base, lanceolate, its width about one-fourth its length; IV elongate fusiform, two-thirds as wide as I. Pronotum nearly as long as its humeral width; sides coarsely denticulate, scarcely sinuate, surface granulate posteriorly. Elytra closely punctate, appearing granulate; corium attaining middle of tergal IV, the membrane middle of V. Rostrum scarcely attaining coxae II, segment I reaching the posterior line of the eyes. Apical spines of the femora minute. Genital segment of male truncate; apical plates of female more obtuse and arcuate exteriorly than in antennator.

Color dark castaneous becoming blackish on base of head either side of the median line, on the anterior and lateral margins of the pronotum and slightly so on the area of the callosities, more obscurely on the costa, lateral area of tergum, apical portion of femora, tibiae, coxae, trochanters and antennals III and IV; rostrum black; eyes red; membrane deep fuscous; beneath lighter castaneous, the stemmata black.

Holotype, male (No. 4210) and allotype, female (No. 4211) Mus. Calif. Acad. Sci., Ent.) taken on Clarion Island, Mexico, February 27, 1928, by Thomas Craig and presented by him to the Academy.

It may be noted here that in this genus there is a recurrent vein in the wing cell as in genus Coriomeris, near which genus it should, perhaps, be placed.

Darmistus crassicornis Van Duzee, n. sp.

A little stouter than subvittatus; antennae thicker and, with the legs, heavily setose; cheeks not distinctly passing the tylus. Length 11 mm.

Head as in subvittatus except that the cheeks, viewed from the side, do not obviously surpass the tylus; bucculæ elliptical, not longer than high as in subvittatus. Rostrum attaining hind margin of middle coxae. Antennae about twice as thick as in the
allied species, the segments as 20:40:34:35; I, II and III rather closely set with stiff hairs mostly as long as the thickness of the segment; IV pale pubescent. Pronotum as long as its basal width; collum broad and flat, scarcely distinguished. Scutellum acutely triangular; apex of corium less acute than in subvittatus, the posterior angle of the metapleura more produced. Male genital characters about as in subvittatus, the median tooth narrower at base and not surpassed by the smaller stiles as in the allied form.

Color as in the allied species; testaceous yellow, coarsely fusco-punctate and clothed with short stiff pale hairs becoming long pale setæ on the antennæ and legs; two obscure vitæ on vertex, four on pronotum, three on scutellum and disk of the corium more or less infuscated; base of head, side of pronotum, tip of scutellum and costa paler; beneath paler yellow; venter infuscated, irrorate or washed with sanguineous; median line from buccula to apex of venter, another on the anterior coxae and sides of the mesosternum, a cloud along the side of the head and propleura, and the median line and apical segment of the rostrum black or blackish; middle of hind coxae with a blackish cloud; legs fusco-punctate at base of spines; middle of venter sparsely pale setose; membrane brown, the veins margined with pale.

Holotype, male (No. 4212) Calif. Acad. Sci., Ent.,) and four male paratypes taken by Mr. C. D. Duncan on the Chisos Mts., Texas, in July, 1921 and two males taken by Mr. Duncan at Sheffield, Pocos Co., Texas, July 24. The stout antennæ and long-setose legs and antennæ will at once distinguish this species.

Darmistus dunciVan Duze, n. sp.

A little larger and darker than subvittatus with polished piceous antennæ, clothed with longer and sparser setose hairs. Length 11 mm.

Head as in the related species but with the cheeks not exceeding the tylus. Antennæ slender as in subvittatus; segments as 20:35:25:40; I. II and III polished, piceous, with scattering setæ which are about as long as the thickness of II and III; IV brown with pale pubescence and a few longer setæ; legs sparsely long-setose. Beneath pale yellowish, venter and disk of the pleurae smooth with a few blackish punctures; venter obscurely irrorate with sanguineous with a few black points at base and along the sides; median line of the metasternum and apex and median line of rostrum black; membrane uniformly brown; pale median line of pronotum distinct as in crassicornis; median tooth of male genital segment broad, elongate triangular, much exceeding the short stiles.
Holotype, male (No. 4213) and allotype, female (No. 4214), Mus. Calif. Acad. Sci., Ent., taken by Mr. D. K. Duncan at base of Penal Mts., Arizona. This species is nearest to *subvittatus* but may be distinguished by the shorter cheeks, piceous-black and somewhat polished antennae, the poorly developed median black vitta beneath and the distinct male genital characters. *D. subvittatus* is represented in the Academy collection by material from Colorado, Arizona and southern California.

**Key to our species of Darmistus**

1. Antennae stout, heavily armed with setae nearly as long as the thickness of the segment; segment I one-half the length of II, one-third as thick as long.......................... *crassicornis*

   ... Antennae more slender, less setose, segment I two-thirds the length of II, one-fourth as thick as long.......................... *2*

2. Antennae smooth, piceous, more sparingly beset with longer setae; segment IV dull castaneous, minutely pubescent, cheeks not exceeding the tylius.......................... *duncani*

   ... Antennae paler, brown-punctate, segment I and apex of II and III infuscated; IV pale castaneous, minutely pale pubescent; cheeks more produced, distinctly exceeding the tylius

.................................................................................................................. *subvittatus*

**Trapezonotus vandykei** Van Duzee, n. sp.

Aspect of *rufipes* Stal but slightly larger with the pronotum more narrowed anteriorly; black, opaque, with the basal segment of antennae and the legs in part pale. Length 4 mm.

Head as long as wide between the eyes, coarsely, closely punctate, the punctures becoming subobsolete posteriorly where the surface is dull and opaque; tip of tylius pale. Antennae stout; segment I passing apex of head by one-third its length; II about twice the length of I, III one-half longer than I, IV a fourth longer than II; I and extreme apex of II and III ochraceous; surface minutely pilose with a few longer setae. Pronotum anteriorly scarcely wider than head, its surface opaque black, coarsely punctate, the punctures subobsolete across disk of anterior lobe; lateral margins slenderly explanate and pale; posterior lobe usually more or less invaded with ochraceous. Scutellum rather obscurely punctate. Elytra coarsely punctate, obscurely so on disk of corium; clavus with three rows of punctures, the inner more irregular; surface brownish ochraceous, sometimes almost entirely black; membrane abbreviated, black, nervures white. Beneath black, polished on the venter; narrow edge of prosternum, acetabula and hind angle of mesopleuræ ochraceous. Rostrum and
legs clearer ochraceous; hind tibiae and tarsi black, the anterior and intermediate embrowned; anterior femora thickened, armed below with two short teeth and a few minute serrations; anterior tibiae moderately curved at base, hind tibiae short-pilose with a row of about six slender spines beneath; tarsal I about as long as II and III together. Rostrum reaching to between the intermediate coxae, dark ochraceous, becoming black at apex. Upper surface of insect normally clothed with sparse appressed pale hairs.

Holotype, male (No. 4215) and allotype, female (No. 4216), Mus. Calif. Acad. Sci., Ent., taken at Cumbres Pass, Colorado, at 10,000 ft. elevation, July 20, 1935, by Dr. E. C. Van Dyke, and one female taken by Dr. Van Dyke at Longs Peak Inn, Colorado, July 2, 1926, at 9000 ft., all presented to the Academy by the collector. This is a most interesting high mountain form recalling rufipes Stal but belonging to the genus Trapezonotus.

A Peculiar Structure in a Fulgorid

While studying some Hemiptera taken by Mr. Templeton Crocker on the Solomon Islands I found one possessing a structure quite new to me. This insect, a species of Bennaria pertaining to the subfamily Cixiinae, has on each side a rod-like appendage articulated to the basal abdominal segment. It is as long as the width of the elytra at that point and at its extremity it is enlarged to a cup shaped container that is filled with a waxy secretion. This structure recalls the halteres found on the metathorax of the Diptera where they replace the hind pair of wings. These rods or balancers occur in two Indo-Australian genera of cixiids, Benna and Bennaria, but I know of no suggestions having been made relative to their functions. They must serve some useful purpose and an investigation of this would prove most interesting. One other genus of the Fulgoridae, Achilixius, has two processes on either side of the basal abdominal segment but these are much shorter and apparently are not articulated, but they do carry similar cup-shaped depressions. Their functions, however, have not been worked out.—E. P. Van Duzee.
SOME NEW DELTOCEPHALOID LEAFHOPPERS
(HOMOPTERA CICADELLIDÆ)
FROM ILLINOIS

BY DWIGHT M. DeLONG
Ohio State University

Flexamia prairiana DeLong, n. sp.

Resembling reflexus in form and general appearance and previously confused with it but with distinct genitalia. Length 4-4.5 mm.

Vertex strongly produced, apex blunt, one-fifth longer at middle than basal width between eyes.

Color: Vertex yellowish with a dark ring at apex and the broken cross band before anterior margin of the eyes. Thorax yellowish with faint longitudinal striae. Elytra yellowish, veins bordered with brown especially heavy along reflexed veins to costa.

Genitalia: Female last ventral segment rather deeply emarginate either side of median produced third which is rounded at apex and notched so as to form several minute teeth. Male plates long, tapered to pointed apices which are slightly divergent. Ædagus bearing three anteriorly directed apical processes as in the case of reflexus but differing by having no process on dorsal side and with the large process on ventral portion. Also in prairiana a smaller lateral process is finely serrate while in reflexus the large process bears two large spines near base.

Described from a series of 64 females and 47 males collected at Evergreen, Illinois, August 23, 1934 (Ross & DeLong); 9 females same locality July 1, 1935 (Ross & DeLong); 15 females and 16 males, Alsip, Illinois, August 23, 1935 (Ross & DeLong); 12 females and 6 males, Summit, Illinois, July 17, 1935 (Ross & DeLong); and 8 females, Zion, Illinois, August 7, 1935 (Ross & DeLong).

Holotype male, allotype female and male and female paratypes in Illinois Natural History Survey collection. Male and female paratypes in author’s collection.

This species is common on the prairie and has been confused with reflexus which it closely resembles.

Polyamia rossi DeLong, n. sp.

Resembling obtectus in coloration and general appearance but with distinct genitalia. Length 3 mm.
Vertex bluntly angled, as long at middle as basal width between eyes.

Color: Face with two rows of fine arcs, the upper row visible on margin of vertex from above. Apex with a pair of proximal pale spots, a darker one next either eye. A black transverse band between anterior margins of eyes, broken at middle. Thorax pale brownish, a black spot back of each eye. Elytra white, veins bordered with brown and with brownish spots on middle of clavus and disc of elytra.

Genitalia: Female last ventral segment with side margins sloping to posterior margin which is almost truncate and dark margined. Side lobes of underlying membrane conspicuous. Male plates triangular, apices rather long, tapered to acute tips. Óedagus in ventral view with the ventral keeled edge usually conspicuous between plates. In lateral view it is long, slender on basal two-thirds, then suddenly enlarged, the ventral portion broadly curved, semicircular with a short apical process extending dorsally and anteriorly, and a basal dorsally directed spur.


It is a pleasure to dedicate this unique species to Dr. H. H. Ross who has collected so much interesting material in this field and with whom the writer has spent so many pleasant hours in the field and laboratory during the past three seasons.

Polyamia dilata DeLong, n. sp.

Resembling compactus in form and general appearance but with the vertex slightly more produced, faint markings on vertex and with male Óedagus distinct. Length 2.5-2.75 mm.

Vertex bluntly angled, a little longer at middle than basal width between eyes. Elytra short exceeded by last two visible segments.

Color: Face dark with pale arcs above. Vertex whitish, ocelli and a proximal anterior mesal spot black. A pair of proximal triangular spots just above apex pale brown or orange. Indications of a pale orange band at anterior margin of eyes, and a pair of oblique marks each side at base. Pronotum brown with pale longitudinal stripes. Scutellum pale brown. Elytra pale brown, veins broadly white heavily margined with dark brown.
Genitalia: Female last ventral segment broadly roundedly produced, with a slightly produced rounded lobe on central fourth. Lateral lobes of underlying segment conspicuous. Male plates long, concavely narrowed to acutely pointed apices. Male oedagus in lateral view with the body rather broad, scarcely narrowed anteriorly, posteriorly gradually narrowed to form a long narrow apical third which is produced caudally and curved dorsally.


Lævicephalus pravus DeLong, n. sp.

Resembling unicolorata in form and appearance but with distinct genitalia. Length 3-3.5 mm.

Vertex bluntly angled, a little wider between eyes than median length.

Color: Bright yellow unmarked, ocelli black, ovipositor black. Genitalia: Female last ventral segment roundedly produced, almost truncate. Male plates long, tapered to acute apices. Male oedagus in lateral view narrowed at half its length and tapered in a long thread-like attenuated apex. In ventral view broad at base, rapidly narrowed and produced, slightly enlarged just before apex and with teeth on the outer margin, apex bluntly pointed.


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THE GENUS CHLOROTETTIX
(HOMOPTERA CICADELLIDÆ):
SOME NOTES ON SYNONYMY
BY DWIGHT M. DELONG

During the past few years several species of Chlorotettix have been redescribed. This has apparently been due to two factors. Either the species was originally described in another genus and was not recognized as a member of Chlorotettix, or the one who redescribed it was not familiar with the original description and specific characters. In order to clarify the
literature it seems advisable to discuss briefly the synonymy of these species.

*Chlorotettix lucidus* (Baker) originally described as a species of *Thamnotettix* was redescribed as *C. delta* Ball and as *C. acus* DeL. and Dav. *C. orbonatus* Ball was originally described as a member of *Thamnotettix* and was redescribed as *C. productus* S. and DeL. *C. fallax* S. and DeL. was described from the male sex only and was redescribed from females only as *C. latifrons* S. and DeL. by the same authors. The allotype of *C. latifrons* as described by Brown is therefore a synonym of *C. fallax*.

Brown recently made a study of the genus *Chlorotettix* and failed to recognize *melanotus* DeLong which was originally described as a variety of *tergatus* V.D. He therefore placed this southern form, *melanotus*, which superficially resembles *tergatus* so closely, under the name *fumidus* S. and DeL. After having mistaken *fumidus* he proceeded to redescribe it under the name *fuscus* Brown. He also failed to recognize *C. floridanus* DeL. and redescribed it as *C. rubidus* Brown. Although he cited the name *C. borealis* S. and DeL. he failed to recognize the identity and characters of this widespread species and redescribed it as *C. angustus* Brown. All these species except *fuscus* have been checked by the use of the male genitalia which have excellent diagnostic characters in this genus. A list of the species cited above is given with their synonyms.

*C. lucidus* (Baker), (*C. delta* Ball and *C. acus* DeL. and Dav.)
*C. orbonatus* (Ball), (*C. productus* S. and DeL.)
*C. fallax* S. and DeL., (*C. latifrons* S. and DeL.)
*C. melanotus* DeL., (*C. fumidus* as cited by Brown, not DeLong)
*C. fumidus* S. and DeL., (*C. fuscus* Brown)
*C. floridanus* DeL., (*C. rubidus* Brown)
*C. borealis* S. and DeL., (*C. angustus* Brown)

**Our Double Number**

Circumstances made it necessary for our Publication Committee to find another printer for the Pan-Pacific Entomologist. This change caused such a delay in printing the January number that it seemed best to publish a double number to cover the January and April issues. We regret the delay and trust it may not occur again.
Collection of Historical Material by the Pacific Coast Entomological Society

During the course of development of entomology in the western United States a great deal of historical material in the form of correspondence with entomologists the world over, pictures, itineraries, etc., has accumulated. Some of this has reached the laboratories of the California Academy of Sciences by one means or another but a great deal of it remains in the hands of individuals or is among the effects of deceased workers in the charge of persons oftimes unaware of its value. To preserve and make this material available a collection was started by a Pacific Coast Entomological Society Committee of three members, E. P. Van Duzee, E. G. Linsley, and R. L. Usinger, which was appointed by President E. O. Essig at the 137th meeting on September 1, 1934. This committee purchased a four drawer standard metal filing case with funds contributed by members of the Society. A system of filing has been tentatively adopted which keeps the entire correspondence of an individual together, the letters being filed chronologically for each writer and alphabetically for the various writers making up an individual’s correspondence.

Material already on hand in the laboratories of the California Academy of Sciences has been incorporated through the cooperation of those in whose care it has been entrusted. This will remain as a permanent loan with the proviso that it will always be located at the Academy and can be segregated as a separate collection at any time should circumstances make that desirable. It forms a basis for the collection and includes the correspondence of W. G. Wright, J. G. Grundel, E. P. Van Duzee and others with numerous photographs from various sources.

The original committee reported at the 139th meeting of the Society on March 3, 1935, and was enlarged to five members and made a permanent committee of the Society to pursue a uniform policy over a period of years. The Society takes this opportunity to solicit the interest and cooperation of all western entomologists in this work. Any information concerning suitable material should be communicated to some member of the committee.

C. D. Duncan
E. G. Linsley

E. P. Van Duzee
R. L. Usinger, Chairman
ASILIDÆ, NEW AND OTHERWISE, FROM THE SOUTHWEST, WITH A KEY TO THE GENUS STICTOPOGON

BY J. WILCOX

(Continued from Vol. XII, p. 212)

Blepharepium secabilis (Walker)

This genus has not been reported from the United States previously. A key to the species is given by Bromley¹. Specimens are at hand from the following localities.


Blepharepium is most closely related to Diogmites and is distinguished from it usually by the following characters (quoted from Bromley ¹); “posterior pulvilli much shorter than the elongate claws; scutellum without bristles”. The claws and pulvilli of secabilis measure as follows: hind claw 35, pulvilli 15; middle claw 30, pulvilli 15; and fore claw 30, pulvilli 24; both claws and pulvilli were measured from base of pulvilli.

Lestomyia Williston

It is rather difficult to classify the species of this genus, but the one described below should be readily recognized. Five species in the genus have been described. Four from California and one from Wyoming, but the genus occurs all over the western part of North America. Several other new species are at hand, but they will not be described until larger and more representative series have been seen. The length of the pulvilli is believed to be of specific importance. Where measurements of the claws and pulvilli are given, those of the hind legs are used, and both the claws and pulvilli are measured from the apex of the fifth tarsal joint.

Lestomyia atripes Wilcox, new species

Male: Length 10 mm. Head black; cheeks, palpi, and proboscis shining; remainder densely pruinose with a slight tinge of yellow on the front. Hairs and bristles white except two of the eight bristles on ocellar tubercle, the hairs on second palpal joint and two or three bristles on underside of second antennal joint, which are black. Antennae black; apex of second joint and base

of third slightly reddish; first two joints subequal in length; third as long as first two together, narrow on basal third, broadest at apical two-thirds, from which it narrows to apex; style truncate, about one-fifth as long as third joint, cylindrical, longer than broad and with a minute spine at apex.

Thorax black, largely covered with gray pollen; laterally, dorso-central stripes and a pair of broad central stripes separated by a gray stripe of equal width, golden. Hairs white; bristles black except three humeral and one posthumeral which are yellowish; four presutural, two supra-alar, two post-alar and seven anterior and three posterior dorso-central bristles. Scutellum covered with yellowish gray pollen, with eight marginal bristles, four blackish and four whitish. Pleurae and coxae covered with gray pollen; hairs and bristles white.

Abdomen black, largely covered with gray pollen; second to fifth segments with large lateral triangular black spots, widest basally and not reaching lateral or posterior margins; all segments with a central anterior smaller oval black spot; hairs and bristles white; four lateral bristles on first segment. Venter covered with gray pollen and white-pilose. Hypopygium reddish brown, as broad as long, white-pilose.

Legs dull black, except apical one-fifth of femora and about basal one-fourth of tibiae, which are reddish; hairs white; femoral bristles and about one-half of the tibial white; most of tarsal bristles black. Claws black, very narrowly reddish at base; pulvilli whitish; empodium brown; pulvilli three-fourths as long as claws (15:20).

Alulae pale yellowish with white fringe. Base of halteres brown, stem and knob pale yellow. Wings clear hyaline; veins, except at the base, brown; anterior cross-vein at four-seventh the distance from base of discal cell; fourth posterior cell slightly narrowed.

Female: Length 11 mm. Similar to male. Head slightly yellowish; apical three-fourths of ocellar bristles black. Thoracic and mesonotal bristles black except those on the humeri. Median and lateral black spots on the abdomen confluent basally; sixth and following segments shining black; eight brown spines at apex. Wings slightly brownish in area around discal cross-vein.

The largely black legs will distinguish this species from previously described forms.

**Cophura sculleni** Wilcox, new species

**Male:** Length 7 mm. Head black, densely pruinose, except cheeks narrowly, the palpi and the proboscis, which are black. Hairs and bristles white; mystax bristle-like, confined to oral margin; hairs of face fine and short. Face slightly diverging below; front nearly parallel-sided; face at antenna about two-thirds width of one eye. First antennal joint one and one-half times length of second and narrower, both bearing white hairs, two of these bristle-like below on second joint; third joint one and one-half times the length of first two joints together, about as broad as second joint and narrowed on apical one-third; style short, slender, with a minute seta at apex, about one-sixth the length of third joint.

Mesonotum densely covered with pollen; humeri and anterior part gray, the remainder yellowish; hairs rather long, white; bristles yellowish, two presutural and the following fine ones hardly distinguishable from the hairs; two supra-alar, two postalar, and four dorsocentral bristles mostly posterior. Scutellum densely pollinose, broad posterior margin shining black; two pairs of very fine yellowish bristle-like hairs on posterior margin. Pleurae and coxae densely pollinose, propodeum and coxae grayish; hairs and bristle-like hairs of hypopleura yellowish white.

Abdomen shining, narrow sides and venter covered with gray pollen; first segment and anterior one-fifth and sides of second black; remaining segments yellowish red; hairs yellowish white, rather long on the sides. Hypopygium shining black, concealed beneath sixth and seventh segments, not visible from above.

Trochanters black; femora except for a very small black spot at tip and tibiae except apex (about apical one-fourth of hind tibiae) shining yellowish red; tip of tibiae and tarsi, except basal half of metatarsi which are reddish, brownish black; claws black, reddish basally; pulvilli light brown; hairs and bristles yellowish white.

Halteres yellow; stem at base brown. Alulae brown, with a broad yellowish margin and fringe. Basal two-thirds of wings brown, the brown extending from apex of auxiliary vein obliquely across wing, filling out discal and fourth posterior cells; apex of wings hyaline; veins brown. Anal cell narrowly open; fourth posterior cell somewhat narrowed; anterior cross-vein at seventeenths distance from base of discal cell; third vein branched beyond discal cross-vein.

**Female:** Length 7 mm. Very similar. Five erect bristle-like hairs on posterior margin of scutellum. Segments 6-8 of abdomen entirely shining reddish; apical spines brown.

In Curran's key a this species would run to couplet 3, where it differs from bella and sodalis by the color of the thorax and the markings of the wings.

Atomosiella Wilcox, new genus

Small species resembling Atomosia, differing by having only four posterior cells and lacking scutellar bristles. Head nearly twice as broad as high; face about three-fifths the width of one eye; sides nearly parallel, narrowly carinate along eye margin, slightly concave at middle; oral margin and base of antennae slightly elevated. Front deeply excavated, about one-third wider than face (in Atomosia, front coarctate, never wider at vertex than at antennae); ocellar tubercle narrow, bearing a pair of divaricate bristles. First antennal joint twice length of second, third twice length of first two together and having a minute spine on upper side at apical three-fifths. Proboscis short, cylindrical, truncate at apex; palpi very slender and about as long as proboscis. Mesonotum about as broad as long; short, sparsely pilose, sparsely punctate, bearing a strong supra-alar and a postalar bristle. Scutellum sparsely punctate and with fine, short, sparse hairs. Metanotum with a few short hairs and bristles. Pleurae somewhat bulging and in large part pruinose, sparsely pilose except hypopleura which bears a dense clump of bristle-like hairs. Abdomen short, broad, very densely punctate; hairs numerous but short, fine, and inconspicuous; four lateral stout, short bristles on first segment, two on second, and one each on third to sixth; seventh and the hypopygium and ovipositor more or less concealed by the sixth segment. Legs rather short and stout but not conspicuously thickened on any part. Petiole of marginal cell slightly longer than anterior cross-vein; branches of third vein broadly divaricate, anterior branch reaching wing margin well in front of apex and posterior one well beyond apex; first posterior cell open or closed at wing margin; third posterior cell (fourth in most genera) closed and petiolate, petiole about equal in length to anterior cross-vein; anal cell closed before wing margin; anterior cross-vein beyond middle of discal cell.

Genotype: Atomosia antennata Banks

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Figure 2. Wing of Atomosiella, new genus (X-10)
ATOMOSIELLA ANTENNATA (Banks)


This species was described from two male specimens collected at Douglas, Ariz., August (L. H. Snow) and now on deposit in the Museum of Comparative Zoology. Marston Bates has kindly compared specimens with the types and has verified the generic status of the species. As there are some differences in the specimens and as the female has not been described, the following description is given:

Male: Length 5 mm. Head black, proboscis shining; face, front and occiput covered with yellowish white pollen (the face a sparse row of longer hairs on oral margin and more numerous shorter hairs, a pair of stouter long hairs a little above oral margin and shorter sparse hairs extending to antennae; ocellar bristles black; occipital bristles yellowish white; beard and hairs of proboscis white. Antennae black; first joint clothed with short yellowish hairs and one longer hair on anterior side; second joint with short black hair.

Mesonotum and scutellum rather bright metallic blue; hairs golden; bristles yellowish white. Pleurae dark purple where bare of pollen; pleurae and coxae pruinose except greater part of mesopleura, metasternum, and pteropleura; hypopleural hairs yellowish white; hairs of coxae whitish.

Abdomen, except first segment which is of same color as mesonotum, dark bluish green; hairs golden; bristles yellowish white.

Basal half of fore femora brown, apical half yellow; middle femora yellowish except a small brown spot above at base; hind femora entirely yellow. Tibiae, except about basal one-third which is yellowish, and tarsi brown. Claws black, yellowish at base; pulvilli light brown; empodium brownish. Hairs yellowish, short, appressed, except a rather dense erect fringe on venter of hind tibiae; bristles yellowish, except a long one on anterior side at apex of basal and second segments of fore tarsi; very short bristles on outer joints of fore tarsi, short bristles on outer three joints of middle tarsi, a longer bristle on next to basal segment on anterior side of middle tarsi, and bristles on last three joints of hind tarsi, black.

Base of halteres dull brown; upper stem and knob milky white. Alulae yellowish with a yellowish-white fringe. Wings uniformly grayish hyaline; veins brown; anterior cross-vein at two-thirds distance from base of discal cell.

Female: Length 6 mm. Similar to male, abdomen broader. Femora entirely yellowish. Longer bristles on basal two joints of tarsi yellowish white, except anterior ones on fore tarsi.
Described from specimens collected at Phoenix, Ariz., August (D. K. Duncan).


There is considerable variation in the coloration of the specimens, the thorax varying from bright blue and purple to black and the abdomen in some specimens being nearly black; the color of the second antennal joint varies from dull yellow to nearly black; and in most specimens the femora are entirely yellowish, varying to reddish brown. The first posterior cell varies from being closed and very slightly petiolate to being open as wide as the length of the anterior cross-vein.

Atonia duncani Wilcox, new species

Male. Length 5 mm. Head black, densely pruinose, with a tinge of yellow on the face; mystax white, composed of six long bristles on oral margin and a number of short hairs; at about one-fourth distance from oral margin to antennae is a pair of long black bristles, and on each side of face a vertical row of shorter white hairs reaching from oral margin nearly to antennae. Front with a single black bristle on each side near eyes and just behind antennae, and several short white hairs on sides of ocellar tubercle; ocellar tubercle with a pair of short black bristles; occipital bristles black, four short ones on each side; beard sparse, short and white. Antennae black, thinly pollinose; first and second joints each with two short, black bristles below, subequal in length and about twice as long as broad; third joint bare, one and one-half times length of first two together, gradually widening apically, about one-fourth as wide as long at widest point; style about one-half width of third joint, somewhat conical, one-fifth length of third joint, with a short, stout bristle arising from upper side near base.

Mesonotum and scutellum shining black, rather densely covered with short, recumbent yellow hairs; bristles black, one presutural, one supra-alar, and one postalar; very narrowly pruinose on sides above wing base and posteriorly before scutellum. Scutellum without bristles. Mesonotum densely pruinose; on each side with a clump of about six short, stout, black bristles. Pleuræ densely pruinose, except neck, mesopleuræ, sternopleuræ, and ptero-
pleurae, which are largely shining black; hairs short, white, hypopleural hairs long, about 10 on each side.

Abdomen black, shining, finely punctate; hairs white, longer posteriorly and on sides of segments; about four whitish lateral bristles on first segment.

Coxæ pruinose; fore pair black, middle and hind pairs more or less yellowish. Legs shining black, except the narrow base and apex of femora, about basal one-fourth of tibiae, and the tarsal joints (becoming darker apically) which are dull yellow. Hairs and bristles white except bristles on outer tarsal joints which are black; a definite fringe of rather dense hairs ventrally on hind tibiae and metatarsi; claws and empodium black; pulvilli yellowish.

Halteres yellow, base and lower stem brown. Wings hyaline, veins brown; anterior cross-vein before middle of discal cell.

Female: Length 5.5 mm. Similar to male. Oral bristles largely black; face and front with a more evident tinge of yellow; anterior cross-vein at middle of discal cell.


This is apparently the first record of this genus from the United States; Curran* figures the head and wing venation.

Promachina pilosa Wilcox, new species

Male: Length 14 mm. Head shining black, thinly covered with golden brown pollen; mystax and hairs of palpi yellowish white, becoming white on upper face; sparse erect hairs on front mixed black and white; hairs on ocellar tubercle largely black; beard and hairs on upper occiput and proboscis white; occipital bristles black, about eight on each side. Antennæ black; first joint white-haired and twice length of second; second with mixed short black and white hairs; third one and one-third times length of first two joints together, equal in width at base to width of second, tapering apically; style three-fourths the length of third joint.

Thorax and coxae black, covered with golden brown pollen, subshining; mesonotum with a broad median, narrowly bisected, black stripe; recumbent hairs white, numerous interspersed black hairs erect; bristles black, two presutural, one supra-alar, and

*North American Diptera, p. 168, fig. 42; p. 173, fig. 110, 1934.
three post-alar. Scutellum black, thinly covered with golden brown pollen with numerous long white hairs arranged in a clump on each side. Hypopleural hairs long, yellowish; a thinner clump of long black hairs on metasternum, and a few similar hairs above on hind coxae.

Abdomen black, broadly brownish on sides, becoming still broader apically; hairs long, yellowish white, more numerous on the sides, black on dorsum of first segment. Genitalia black, about equal in length to fourth and fifth segments together, hairs yellowish white. Venter uniformly covered with brownish pollen, with short recumbent white hairs and on segments I-V with longer, sparse, erect black hairs.

Legs shining black; fore and middle tibiae reddish brown on posterior side, hind femora reddish brown dorsally, hind tibiae this color on about basal one-fourth. Hairs yellowish white, more or less recumbent, with some black hairs on dorsum of fore and middle femora, and dorsally and posteriorly on hind femora; bristles black; claws black; pulvilli brown; empodium yellowish.

Alulae brown, margin yellowish, with numerous white marginal hairs. Knob of halteres brownish black; base and stem yellowish brown. Wings light brownish, more intense anteriorly; veins brown; first posterior cell open; fourth posterior cell closed and petiolate, also petiolate at base, these petioles about equal in length to anterior cross-vein; anal cell closed and petiolate, the petiole about one-half the length of anterior cross-vein; anterior cross-vein at five-ninths distance from base of discal cell.

Female: Length 14 mm. Similar to male. Hairs on sides of abdominal segments I-V white, yellowish dorsally except on I, where they are black; VI and VII and ovipositor entirely white-haired except tip of ovipositor, which is short yellow-haired; ovipositor black, about equal in length to fourth and fifth segments together. Wings nearly hyaline, yellowish anteriorly; petiole of anal cell about equal in length to anterior cross-vein; anterior cross-vein at middle of discal cell.

Holotype: Male, lower Sabino Canyon, Santa Catalina Mts., Ariz., elevation 3,200 feet, IV-6-1934 (D. K. Duncan). Allotype: Female, same data. Paratypes: Five females with same data as type; one female, Florence Junction, Ariz., elevation 2,200 feet, IV-7-1934 (D. K. Duncan); one male Sabino Canyon, Santa Catalina Mts., Ariz., August (D. K. Duncan), the latter male and two females in D. K. Duncan’s collection; one female, Tucson, Ariz., IV-2-1934 (Bryant, 440), and two females, Ajo Mts., Ariz., IV-2-1934 (Owen Bryant), in Owen Bryant’s collection. The specimens range in length from 12 to 14 mm.

Differs from trapezoidalis (Bellardi) by its smaller size,
partly reddish-brown femora, white hairs on scutellum, and absence of black bristles on scutellum. For key to species see Bromley.10

There seems little doubt that this is the proper genus for this species. Because of the obtuse claws and general piloseness, it is more closely related to Mallophorina Curran; the longer genitalia and ovipositor (similar to those of Promachus), the more slender hind tibiae, and the narrow second to fourth joints of the hind tarsi (in Mallophorina these joints are about twice as broad as long, while in this species they are about as broad as long) apparently exclude it from Mallophorina.

Eccritosia zamon (Townsend)

This is apparently the Mexican species reported from Arizona by Schaeffer11, and more recently from Texas by Bromley12 as E. amphinome Walker. Curran13 has recently shown differences between these two species and gives a key to the species.

The genus is closely related to Proctacanthus but differs in having the wings longer than the abdomen, the thorax more robust, the spines at the tip of the ovipositor extending over the entire dorsum of the apex of the eighth tergite, and the hairs on the sides of the first three abdominal segments longer and denser than in Proctacanthus. The third vein branches before the discal cross-vein, which separates it from most of the species of Proctacanthus found in the United States.

This species should be recognized by the following brief description:

Length 30 mm. Dark brown except hind tibiae and tarsi, which are yellowish, and third and following abdominal segments, which are yellowish red. Hairs black except mystax and hairs on hind tibiae and third and following abdominal segments, which are yellowish; hairs on sides of first four abdominal segments long and dense, mostly black on first two segments, strongly contrasting with yellowish hairs on apical part of second, and on third and fourth segments.

Described from specimens collected in the following localities: Roosevelt Lake, September (D. K. Duncan); Gila Valley, Graham County, August (D. K. Duncan); and San Carlos Lake, July (D. K. Duncan); all in Arizona.

A NEW APHID FROM CALIFORNIA'
(HOMOPTERA—APHIDÆ')

BY E. O. ESSIG

THE PUSTULATE WILLOW APHID

Cavariella pustula Essig, n. sp.

*Apterous viviparous female.* A small slender, flattened species in which the surface has a most curiously pitted appearance as shown in Fig. 1, B. The color varies from pale greenish-yellow to orange, with the tips of the antenna, leg segments, including all of the tarsi, and the cornicles dusky. The tip of the abdomen is extended into a pointed tubercle which completely hides the cauda from above. The head is set into the thorax without special differentiation. Frontal tubercles developed; antennae short, the length of the segments: I, 0.05 mm.; II, 0.03 mm.; III, 0.16 mm.; IV, 0.08 mm.; V, 0.07 mm.; VI, 0.17 mm. (base, 0.10 mm.; unguis, 0.07 mm.); total, 0.56 mm. The legs, especially the first pair, are short; the tibiae being considerably dilated apically. Rostrum rather slender apically, extending to the third coxae. The cornicles are long, narrow basally, swollen in the apical half, restricted at the tip to form a flanged opening. The outside margin is nearly straight whereas the inner margin is swollen so as to give the appearance of recurred organs. They extend slightly beyond the tip of the abdomen, being 0.39 mm. in length. The abdominal tubercle is pointed and terminated by two short lateral spines; including last segment, 0.16 mm. in length. Length of the body 1.6 mm., width 0.8 mm.

*Alate viviparous female.* Rather slender; the head and thoracic lobes are black; the remainder of the body pale greenish-yellow with two light green longitudinal stripes on the dorsum of abdomen in living specimens. The antennæ, tips of the tibiae, the tarsi, and cauda are dusky; the cornicles concolorous with the abdomen. In mounted specimens dusky patches may be noted on the dorsum of the abdomen. The pustulate surface, so conspicuous in the apterae, is only faintly so in the alate. The antennæ are shorter than the body, the lengths of the segments I, 0.07 mm.; II, 0.04 mm.; III, 0.29 mm.; IV, 0.16 mm.; V, 0.12 mm.; VI, 0.24 mm.; (base 0.14 mm.; unguis 0.10 mm.); total 0.93 mm. Large, and rarely small, circular secondary sensoria are arranged in a row on segment III. The number varies from 5 to 9 with 6 as the most usual. Rostrum extending midway between the second and

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1 The drawings were made possible through aid received from the WP.A.
2 The writer has come to the conclusion that there is no longer any good reason why the superfluous spelling: Aphidæ should be continued for the family name, and is therefore adopting the above form along with other modern aphidologists, as the correct family designation. Derived as it is from the Linnean genus Aphis, there appears to be no other alternative.
third coxae. Legs short, tips of tibiae and the tarsi black. Cornicles as illustrated, extending beyond tip of cauda; dusky; length 0.31 mm. Cauda dark; nearly pyramidal in shape; with 2 or 3 pairs of hairs; length 0.12 mm. Dorsal abdominal tubercle, small, terminated by two short spines; 0.05 mm. long. Length of body 1.5 mm.; width 0.7 mm.; length of fore wing 2.6 mm.
This aphid has been collected only in several localities in the San Francisco Bay region on the tender shoots and undersides of the leaves of willow, Salix sp. The first specimens were taken by C. F. Roesling, February 28, March 1, and April 19, 1923. In March, 1925, Eric Walther found the same species in Golden Gate Park, San Francisco. I took a large series of specimens in Strawberry Canyon on April 19 and 29, 1935. The aphids occurred abundantly only on a single tree. E. A. Drews also collected specimens on willows growing in the rock quarry near Grizzley Peak Boulevard, Berkeley, March 27, 1936.

The species has been described from a large number of specimens designated as cotypes in the author's collection.

Cavariella pustula n. sp. is readily separated from other related species by the short unguis, the small number of secondary sensoria of antennal segment III of the alatae, and the pitted surface of the apterae.

Food Plant Records for Two Epinotia Species

Epinotia johnsonana (Kearfoot). A series of six adults of this very striking brick-red species have been examined. These were reared from cream bush, Holodiscus discolor (Pursh) Maxim. during April and May, 1927 and 1934, by Mr. H. H. Keifer, from Phoenix Lake, Marin County, California. Apparently the food plant has previously been reported for this species.

Epinotia solandriana (Linn.) Mature larvae of this species were first observed on April 5, 1936, rolling and feeding on the leaves of red alder, Alnus rubra Bong. in Strawberry Canyon, Berkeley, California. Adults first emerged on April 28, 1936. A previous record on crab-apple is reported by Heinrich, and European records of willow and birch. The determination of this species was kindly made by Mr. Carl Heinrich.—W. Harry Lange, Jr. March 22, 1937.
A PRELIMINARY STUDY OF THE GENUS STYLOPS
IN CALIFORNIA (Part II)¹

(Strepsiptera, Stylopidae)

BY RICHARD M. BOHART

University of California, Berkeley

Seven species of Stylops have been recorded from California. In the present paper five new species are described. The variation existing among the females of a single species throws considerable doubt upon the validity of the numerous species which have been named in the past on the basis of single females. The chief difficulty arises from the fact that characters which are constant in the females of one species may be inconstant in another. Unless otherwise stated types of the new species are in the collection of the California Academy of Sciences.

The following key is necessarily cumbersome because of the rarity of unique specific characteristics. It is by no means intended to be final as many of the less common species have yet to be described.

**Key to the Females of the Genus Stylops**

**Recorded from California**

1. Mandibles with a prominent basal tubercle (Part I, figs. 18, 21)¹ Prominent basal tubercle lacking (vandykei Bohart)

2. Cephalothorax with the spiracles located very far back so that the distance between the spiracles and the apex is at least eight-tenths as long as the distance between the spiracles; cephalothorax longer than broad (figs. 14, 15, 18) elongatus Bohart

3. With two transverse pigment spots on either side of the middle at the anterior limit of the spiracular region; cephalothorax narrowed strongly toward the apex; basal band darker on the posterior half, with the anterior margin wavy and indistinctly outlined (figs. 10, 11) apicalis Bohart

4. Cephalothorax longer than broad; wide at the mandibles; outer rim of the mandibles with a swelling just above the middle and with a usually discernible ventral tubercle above the swelling (figs. 17, 20) dubois Bohart

... Without the above combination of characters..........................5
5. Spiracular area transparent and well defined; anterior margin of basal band convex; cephalothorax broader than long (figs. 16, 19) .......................................................... centroclarus Bohart
... Without the above combination of characters........................6
6. Cephalothorax spade-shaped with the apical angles sharp; mandibles usually not incurved above the middle; anterior margin of basal band usually strongly convex..................7
... Cephalothorax more or less shovel-shaped with the apical angles very broad and rounded; or if not, mandibles incurved above the middle, or anterior margin of the basal band not convex ...........................................8
7. Lateral margins bent distinctly outward at the base of the head which is very broad (Part I, figs. 16, 22) .......................................................... timberlakei Bohart
... Lateral margins straight or slightly convex from spiracles to apical angles; base of head relatively narrow (Part I, figs. 15, 20) .......................................................... pacificus Bohart
8. Spiracles prominent laterally; mandibles incurved beneath the strongly rounded outer apex; apex of cephalothorax broadly truncate .......................................................... california Pierce
... Spiracles at most barely exceeding the margins; or if slightly prominent, mandibles not strongly rounded at outer apex, or cephalothorax not broadly truncate at apex.................................9
9. Basal band much lighter on the posterior one-half, convex on anterior margin; rim of mandibles thick (figs. 12, 13) .......................................................... heterocingulatus Bohart
... Basal band evenly colored, not convex on anterior margin; rim of mandibles not unusually thick.................................10
10. Lateral margins angled behind the spiracles; mandibles incurved below the outer apex, usually protruding over the margins of the apical angles of the cephalothorax (Part I, figs. 17, 19) .......................................................... medionitans Pierce
... Lateral margins usually smoothly rounded behind the spiracles; mandibles not incurved below the outer apex, lying wholly within the outlines of the cephalothorax........ subcandidae Pierce

Stylops centroclarus Bohart, new species

(Figs. 1, 5, 7, 16, and 19)

The male of centroclarus can be distinguished by the form of its aedeagus from all other described species with the possible exception of cuneiformis Bohart from which the shape of the scutellum readily separates it. The female differs from all other thus far described species by the clear, colorless, well-defined spiracular area. It belongs to the group of species para-
sitic on bees of the subgenus *Trachandrena* and may be further separated from *claytoniae* Pierce and *hippotes* Pierce by its more prominent spiracles and its reduced area in front of the mandibles; and from *salicifloris* Pierce by the convexity of the anterior margin of the basal band.

Male. Black, abdomen fuscous, tarsi light. Antennae relatively long, segments three to six with the length ratio 49:22:14:20 respectively. Metaprescutum broad and rounded, distinctly separated from the scutellum by a depressed scutal area; scutellum very broad posteriorly and evenly rounded toward the apex; postlumbium short and broad; postscutellum longer than the rest of the metathorax, broadly rounded posteriorly. Aedeagus very slender and angulate, bent at less than a right angle, apical margin slightly more than one-third the length of the main axis. Length excluding the antennae, 3.35 mm.; length of antennae, 0.97 mm.; width of head, 0.99 mm.; wing expanse, about 5.8 mm.

Female. Cephalothorax with a ferrugino-testaceous lateral margin extending inward as much as one-fourth the width of the thorax, central portion pale, spiracular area almost transparent, colorless, and bounded anteriorly by a transverse darkened area, basal band fuscous. Cephalothorax broader than long, apical margin straight, lateral margins irregularly convex, angled behind the spiracles; mouth hemispherical, area in front of mandibles very small, mandibles bluntly toothed apically, outer edge rounded, inner edge bent at the middle and straight from the bend to the apex; spiracles large and prominent; basal band evenly colored, half as long as wide, convex along the anterior margin, and more than half on the cephalothorax. Width of cephalothorax at spiracles, 0.97 mm.; width at base of mandibles, 0.35 mm.; width at base of head, 0.50 mm.; width at base of cephalothorax, 0.70 mm.; length from front edge of spiracles to apex, 0.64 mm.; length of cephalothorax, 0.90 mm.

Triungulinid. Body oblong-ovate, broadest at the middle; length of body excluding stylets, 0.156 mm.; length of stylets, 0.068 mm.; width of head, 0.034 mm.

Holotype, male, Berkeley, California, March 24, 1936. Allotype, female, Calaveras Dam, Santa Clara Co., California, April 14, 1936 (with triungulinids). Paratypes, one female, Berkeley, California, March 14, 1936; two females, same data as allotype. All type material collected by G. E. Bohart.

Host. *Andrena* (*Trachandrena*) sp. near *salicifloris* Ckll. (det. by P. H. Timberlake) taken on blackberry and poison oak.
Styllops duboisii Bohart, new species

(Figs. 2, 3, 6, 8, 17, and 20)

The manner in which the fourth antennal segment arises from the third separates the male of this species at once. Also the sixth antennal segment is longer than the fourth and the prescutum is almost a perfect pentagon. The female is also easy to distinguish on the basis of the shape and uniform color of the basal band, the angled outline of the cephalothorax, the small size, and particularly the form of the mandibles.

In addition to the collection and donation of many other specimens, Mr. J. J. Du Bois furnished most of the type series of this species and I take pleasure in naming it in his honor.

Male. Black, abdomen fuscous, tarsi light. Antennae with fourth segment inserted about half its length from the base of the third segment, fifth antennal segment bearing a distinct pore at the middle of the inner surface, antennal segments three to six with the length ratio 49:17:15:22 respectively; head relatively small, with a weakly sclerotized area dorsally in back of each antennal base. Metaprescutum almost a perfect pentagon, distinctly separated from the scutellum by a broad, depressed scutal area; scutellum broad and evenly rounded; postlumbium almost as long as wide; postscutellum longer than the rest of the metathorax, broadly rounded posteriorly. Aedeagus not strongly angulate, apical process relatively stout, apical margin about one-third the length of the main axis. Length excluding antennae, 3.22 mm.; length of antennae, 0.80 mm.; width of head, 0.77 mm.; wing expanse, about 5.4 mm.

Male puparium cap. Maxillae represented by a pair of oval rings separated from each other by more than three times their diameter, mandibles separated by once and a half their breadth, eye sockets separated by three times their breadth.

Female. Cephalothorax testaceous, slightly darker toward the margins and lighter in the spiracular area, basal band fuscous. Cephalothorax longer than broad, apical margin straight, lateral margins nearly straight from the apical angles to an angle behind the spiracles; mouth oval, mandibles narrowed toward the apex and with a very small apical tooth, outer rim of mandibles not incurved but strongly swollen above the middle and with a hardly discernible ventral tubercle; spiracles exceeding the margins, large but flattened and receding into the cephalothorax; basal band more than half on the cephalothorax, evenly colored, half as long as wide, straight along the anterior margin. Width of cephalothorax at spiracles, 0.53 mm.; width at base of mandibles, 0.21 mm.;
width at base of head, 0.46 mm.; width at base of cephalothorax, 0.39 mm.; length from front edge of spiracles to apex, 0.37 mm.; length of cephalothorax, 0.56 mm.

Holotype, male, Davis, California, no date. Allotype, female, Davis, California, April 1, 1936. Paratypes, seven females, same data as allotype; one female, Davis, California, April 6, 1936, collected by the author. Unless otherwise stated, all type material was collected by J. J. Du Bois.

Host. *Andrena* (Micrandrena) sp. (det. by P. H. Timberlake) taken on willow.

Stylops elongatus Bohart, new species

(Figs. 4, 9, 14, 15, and 18)

The male of this species approaches *medionitans* Pierce in general appearance, but the scutellum of the latter is less rounded and the last antennal segment is considerably less than twice as long as the fifth. The female is unique in its great length of the cephalothorax in front of the spiracles. In extreme specimens this distance surpasses the breadth at the spiracles. The mandibles are peculiar and variable (two different types are illustrated). The apical area in front of the mandibles and the anterior margin of the basal band is usually convex.

Male. Black, abdomen fuscous, tarsi light. Head broad, eyes small; antennae with segment four more than twice as long as five, segments three to six with the length ratio 50:23:10:19 respectively; maxillae small, second segment relatively slender and shorter than antennal segment four. Metaprescutum rounded, separated from the scutellum by a depressed scutal area; scutellum very short and broad at the base; postlumbium wider than long; postscutellum longer than the rest of the metathorax, narrowly rounded posteriorly. Aedeagus slender toward the apex, not incised behind the process, apical margin bent at an obtuse angle below the inner process, apical process slender (tip of process broken in mounting). Length excluding antennae, 3.05 mm.; length of antennae, 0.79 mm.; width of head, 0.80 mm.; wing expanse, about 5.0 mm.

Male puparium cap. Maxillae represented by a pair of oval rings separated from each other by twice their diameter, mandibles separated by once and a half their breadth, eye sockets separated by four times their breadth.

Female. Cephalothorax ferrugino-testaceous, lighter in the spiracular area which is bounded anteriorly by a transverse dark-
ened area, basal band fuscous. Cephalothorax longer than broad, apical margin not convex, lateral margins convex, strongly constricted behind the spiracles; area in front of the mandibles prominent, mouth oval, mandibles very bluntly toothed apically and with a very small lateral projection on the inner margin below the apical tooth, margin incurved on the outer side and with a prominent hump below the middle; spiracles exceeding the margins and placed very far back on the cephalothorax; basal band strongly convex on anterior margin and evenly colored. Width of cephalothorax at spiracles, 1.09 mm.; width at base of mandibles, 0.38 mm.; width at base of head, 0.61 mm.; width at base of cephalothorax, 0.68 mm.; length from front edge of spiracles to apex, 0.87 mm.; length of cephalothorax, 1.16 mm.

Holotype, male, Soboba Hot Springs, Riverside Co., California, February 26, 1936. Allotype, female, Riverside, California, April 26, 1934. Paratypes, five females, March and April in Riverside, California; two females, December and March respectively, Needles, California; and three females, Claremont, California. All type material was collected by P. H. Timberlake.

Host. The holotype and allotype were extracted from two specimens of *Andrena* sp. near *blaisdelli* Ckll. (A. *onotherae* Timberlake in manuscript). All paratypes were taken from *Andrena* *blaisdelli* Ckll. (det. by P. H. Timberlake).

Styllops apicalis Bohart, new species

(Figs. 10 and 11)

The two elongate transverse spots marking the anterior limit of the spiracular area will serve to distinguish the female of this species from *nubecula* Pierce and *swenki* Pierce which it resembles in general. Also, the unusual character of the basal band is outstanding.

Female. Ferrugino-testaceous at the sides, lighter toward the center; spiracular area bounded anteriorly by two elongate dark spots; basal band fuscous, becoming lighter toward the front. Cephalothorax as broad as long, strongly narrowed toward the mandibles, apical margin not convex at the middle, lateral margins convexly undulate; area in front of the mandibles prominent, mouth oval, mandibles incurved on the outer edge, outer rim not swollen above the middle but strongly calloused from the middle to the base, apical tooth large; spiracles small but exceeding the margins; basal band with anterior margin not well defined, irregular, depressed on each side of the middle. Width of cephalothorax
at spiracles, 1.07 mm.; width at base of mandibles, 0.40; width at base of head, 0.60 mm.; width at base of cephalothorax, 0.88 mm.; length from front edge of spiracles to apex, 0.75 mm.; length of cephalothorax, 1.07 mm.

Triungulinid. Body stout, oblong-ovate, head large. Length of body excluding stylets, 0.195 mm.; length of stylets, 0.092 mm.; width of head, 0.047 mm.

Holotype, female, Berkeley, California, April 17, 1935, G. E. Bohart collector. Paratypes, two females, Carmel, California, March 24, 1919; one female, Sausalito, California, May 2, 1920, C. L. Fox collector; one female, Berkeley, California, June 16, 1933 (with triungulinids), P. H. Timberlake collector.


**Stylops heterocingulatus** Bohart, new species

(Figs. 12 and 13)

The odd coloration of the basal band and the thick-rimmed mandibles, which are often merely pointed, separate this species from *advarians* Pierce, *subcanidæ* Pierce, *claytonicæ* Pierce, and *vicinae* Pierce which are somewhat similar in cephalothoracic outline. *Heterocingulatus* is the first species of *Stylops* to appear in the San Francisco Bay region where it occurs in February. In the Sacramento Valley it is most often taken in April.

Female. Cephalothorax ferrugino-testaceous, lighter in the spiracular area, basal band fusco-testaceous on the thorax, lighter on the abdomen. Cephalothorax a little longer than wide, apex straight at the middle, lateral margins convex, constricted at the base of the mandibles; mouth oval, mandibles with a thick rim which is incurved on the outer side and thickened below the middle, mandibles broad apically and strongly rounded at the outer apex, apical tooth small and not well defined; spiracles large but set in and hence not prominent laterally; basal band convex anteriorly, more than half on the cephalothorax. Width of cephalothorax at spiracles, 0.76 mm.; width at base of mandibles, 0.30 mm.; width at base of head, 0.48 mm.; width at base of cephalothorax, 0.52 mm.; length from front edge of spiracles to apex, 0.50 mm.; length of cephalothorax, 0.80 mm.

Triungulinid. Body slender, long oval. Length of body excluding stylets, 0.204 mm.; length of stylets, 0.094 mm.; width of head, 0.036 mm.
Holotype, female, Davis, California, April 1, 1936, J. J. Du Bois collector. Paratypes, one female, same data as holotype; four females, Yolo Causeway, Yolo Co., California, April 24, 1936; two females, Yolo Causeway, Yolo Co., California, May 4, 1936 (with triungulinids). All paratypes were collected by the author unless otherwise indicated.

Host. Andrena pensilis (Timberlake manuscript) and Andrena sp. near angustitarsata Vier. (Berkeley, California) (determinations by P. H. Timberlake).

Correction: In Part I of this paper, Pan-Pacific Entomologist Vol. XII, No. 1, on page 13, line 12, "prescutum" should be changed to scutellum" and in line 13 of the same page, the second "wide" should be changed to “long.”

Explanation of Plate

Fig. 1. centroclarus, venter of male metathorax. Fig. 2. duboisi, venter of male metathorax. Fig. 3. duboisi, antenna. Fig. 4. elongatus, antenna. Fig. 5. centroclarus, aedeagus. Fig. 6. duboisi, aedeagus. Fig. 7. centroclarus, male. Fig. 8. duboisi, male. Fig. 9. elongatus, male Fig. 10. apicalis, female mandible. Fig. 11. apicalis, female cephalothorax. Fig. 12. heterocingulatus, female cephalothorax. Fig. 13. heterocingulatus, female mandible. Figs. 14 and 15. elongatus, female mandibles. Fig. 16. centroclarus, female mandible. Fig. 17. duboisi, female mandible. Fig. 18. elongatus, female cephalothorax. Fig. 19. centroclarus, female cephalothorax. Fig. 20. duboisi, female cephalothorax.

A New Locality for Grylloblatta

Upon a recent trip, November 27, 1936, through southern Oregon, I collected near Crater Lake, two specimens of the quite rare Grylloblatta, both females. To my knowledge this is a new locality, the nearest record being in Plumas County, California.

Both specimens were found beneath the same rock near a spring at an elevation of about 6500 feet. Further investigation produced no more individuals.

Although both females are only 16 mm. long, they appear to be mature and seem to be of the same species, Grylloblatta campodeiformis, described by Walker from Banff, Alberta in 1914.—James E. Elsea.
THE LIFE HISTORY OF Gaurax arene COQ. (DIPTERA-CHLOROPIDÆ), AN EGG PREDATOR OF THE BLACK WIDOW SPIDER, Latrodectus mactans (FABR.)

BY EDWARD L. KESSEL AND BERTA B. KESSEL

University of San Francisco

Gaurax arene is a dipterous predator of the eggs of the black widow spider, Latrodectus mactans. It is a common species in the San Francisco Bay region, and at Mill Valley some 40% of an extensive series of black widow egg sacs collected by the authors were found infested thereby. It does not appear to be solely a predator of Latrodectus, however. Essig (1926) states that it was reared from the egg sac of another spider, Argiope riparia Hentz many years ago. Its significance was not recognized at that time, however, as it was regarded as a scavenger. Its true predatory nature was first pointed out by Herms et al (1935) when it was found destroying the eggs of Latrodectus in several parts of California. No reports on the life history of this predator appear to have been published heretofore, with the exception of a recent, ably illustrated popular account by Jenks (1936). His report disagrees, however, on several important points with the results herein recorded.

The first adults used in the present study were reared from pupæ collected in the field. The breeding cages were kept in the laboratory where the temperature averaged 68° F. It was found necessary to feed the flies in order to get them to oviposit. This was done by placing a piece of banana or other fruit in the cage. Properly nourished flies oviposit readily on the surface of the spider’s egg sac at any point. Each female lays from 15 to 25 eggs which measure approximately .5 mm. by .12 mm. The chorion is glistening white and deeply ridged longitudinally. The incubation period is six days. The newly emerged larvæ average .6 mm. in length.

Almost at once, following eclosion, the larvæ exhibit a tendency to migrate toward the suspending end of the egg sac, the path taken, however, being very erratic. At intervals along the way the larvæ pause and attempt to penetrate the fabric of the egg sac. Such attempts appear never to be successful, although a larva may spend several minutes standing on end trying to
force an opening with its mouthparts. Normally, entrance into the egg sac seems to be accomplished only by passing through the loosely woven primary layer of silk where it is left incompletely covered by the secondary tough protective coat at the suspending end. The larvae perish on the surface if they do not succeed in making their way into the cavity of the sac within a few hours after hatching.

After gaining an entrance, the young larvae begin feeding on the spider eggs. The larval period is eight days, pupation invariably occurring on the fourteenth day after the eggs are laid. The full grown larvae vary in length from 3 mm. to 4 mm., depending upon their number and the number of spider eggs originally present in the egg case. (In one instance a number of flies were allowed to oviposit on the same egg sac and together they deposited about 400 ova. The number of spider eggs in the sac proved insufficient to supply nourishment for so many predators, for, after destroying all the eggs, the larvae died without reaching maturity.)

When ready to pupate, the Gaurax larvae pull apart the inner loosely woven fabric of the spider's egg sac, separating it from the tough outer covering so that the former comes to form a loose mass in the interior of the sac. The larvae then tear away, at scattered points, the inner portion of the tough fabric so that it becomes extremely thin in these spots. Pupation occurs any place within the cavity, either next to the outer wall or suspended among the tangled strands of the inner sac. The pupae measure some 3 mm. in length.

The pupal period lasts fourteen days. The emerged flies escape from the spider's egg case by forcing their way through one or more of the thinned regions prepared in the silken fabric by the larvae.

Ordinarily, a black widow egg sac harbors only one brood of these predators. However, one sac was taken in the field which produced two broods of Gaurax with several days difference in their ages. Both broods were small, and it is probable that they were derived from eggs deposited by two females at different times.

Because of the relatively high incidence of infestation observed during this study of Gaurax on Latrodectus, it is evident that this fly is an important factor in reducing the number of
black widow spiders in the field. No infested egg sacs were taken from enclosed environments such as under houses or in garages or outhouses. Gaurax therefore appears to be insignificant in the control of Latrodectus in human habitations where the latter is a particular menace to humans.

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NOTE ON ARGYNNIS SKINNERI HOLLAND  
(Lepidoptera-Nymphalidae)  
BY WILLIAM HOVANITZ  
University of California, Berkeley

In the revised edition of the Butterfly Book (p. 95) Dr. W. J. Holland (1931) makes the following statement: "The specific name sakuntala is dangerously near to Argynnis sakontala Kollar, which designates a race of A. childreni from the Himalayas. It would appear to be desirable to change the specific name, and in that case it would be most appropriate to name the form A. skinneri in honor of the first describer." In this statement and his use of sakuntala in other parts of his work, it seems to be obvious, though I may be in error, that Dr. Holland is not intending to rename sakuntala Skinner (1911) but is merely stating that it ought to be so named in case it is found necessary. However, in such cases we cannot quibble about what he meant or did not mean and must regard the name as being proposed, as has been done in the Zoological Record. Skinneri is not needed as sakuntala Skinner (1911) and sakontala Kollar (1844) are not from the same root and the former, therefore, is not a homonym. As a matter of form: Arg. skinneri Holland = Arg. sakuntala Skinner.
THE GENUS COMANTELLA CURRAN
(DIPTERA, ASILIDÆ)

BY MAURICE T. JAMES

Colorado State College, Fort Collins

Examination of a splendid collection of Asilidæ made by Rev. Fr. Bernard Rotger, C. R., in the vicinity of Durango, Colo., has revealed a fourth species of Comantella Curran (1923). This is described in the present paper. I am indebted to Mr. J. Wilcox for the loan of specimens and for helpful suggestions, and to Mr. C. H. Martin for the loan of a male of C. cristata (Coq.).

KEY TO SPECIES

1. Style one-third as long as the long slender third antennal segments; venter black-haired, at least on the anterior segments .................................................................2
   ... Style over half as long as the shorter, laterally gently convex, third antennal segment; venter wholly pale haired..........3
2. Thoracic mane set on a definitely demarcated black vitta ..............................................................rotgeri, n. sp.
   ... Medial vitta of thorax at most but poorly defined..fallei (Back)
3. Scutellum with 4-6 bristles...........................................cristata (Coq.)
   ... Scutellum with 10 or more bristles..................pacific Curran

Comantella rotgeri James, new species

Close to fallei (Back); the mystax, however, is considerably coarser and is not white-tipped; the first antennal segment is more slender; the general body color is darker; the pale hairs and bristles are a deeper yellow, and the thoracic mane is set on a black vitta which is definitely demarcated from the pale-pollinose part of the thorax. The pale pile of the body is coarser but less dense than in fallei, and the pile of the venter is coarser and more extensively black. Otherwise, it agrees well with Curran's redescriptions of fallei (Canadian Ent., 58; 311-312), with the holotype of that species, and with series from several localities in eastern Colorado.

Holotype, ♂, Stollsteimer, Colo., 6500 ft., Oct. 29, 1935 (Rotger); allotype, ♀, same date; paratypotypes, 3 ♂, 2 ♀, same data; paratypes, 2 ♀, 1 ♂, Arboles, Colo., 6000 ft., Oct. 30, 1935 (Rotger); 1 ♂, Pagosa Junction, Archuleta Co. 6275 ft., March 16, 1936 (Rotger); 23 ♀, 19 ♂, Grand Co., N. M., Nov. 11-19 (R. T. Kellogg); 1 ♀, Silver City, N. M., Nov. 17, 1933 (R. T.
Kellogg); 2 ♂, Silver City, N. M., Nov. 17, 1933 (R. T. Kellogg); 21 ♀, 23 ♂, Medicine Hat, Alta., Canada, Oct. 14, 15, and 22, 1932, Mar. 18 and 25, 1933, and Apr. 1, 15, and 22, 1933 (F. S. Carr).

Stollsteimer (or Francis), which I do not find on the map, is, Father Rotger informs me, situated between the Piedra River and Nutrio Creek, 12 miles north of Arboles.

**Comantella cristata** (Coq.)

Only the female of this species has been described.

Male. Head black, clothed with whitish pollen; the mystax composed of black bristles, some of which terminate in yellow, interspersed with finer yellow hairs; the strong bristles of the vertex black, the stiff hairs of the vertex and front mostly yellow, with a few black ones interspersed; hairs of proboscis, cheeks, and occiput abundant, silky, yellow to white; antennae and proboscis black. First and second antennal segments subequal, short, rather stout, with yellow hairs above and black bristles apically below; the third segment slightly longer than the first and second combined, carrot-shaped, broad basally and tapering apically; the style as long as the first two segments combined. Thorax black, yellow pollinose, with three stripes of white pollen on the dorsum behind the suture, the middle one extending to the base of the scutellum and spreading out to each posterior callus, the lateral ones disappearing about half way between the suture and the scutellum; a small white-pollinose spot on each side laterally behind the suture. The mane consists of dense, black bristles set on a glossy black vitta anteriorly (this merges, through yellow pollen, into the white-pollinose median vitta behind the suture); bristles of thorax, including legs, otherwise yellow, the pile also yellow. Scutellum with six black bristles and abundant silky pale-yellow hair, which extends anteriorly onto the thorax. Wings typical of genus. Abdomen black; the bases of segments two, three, and four, except laterally, the sides of all segments, and arcuate areas extending somewhat anteriorly from the posterior corners of the segments, pale yellow pollinose. Pile of abdomen entirely yellow, bushy on the sides and ventrally, short on the middle of the dorsum.

Neallotype, male, Mill Creek Canyon, Calif., Nov. 9, 1930 (C. H. & D. Martin), in Mr. Martin’s collection.

I have the following records of other members of this genus. *C. pacifica* Curran; Moses Coulee, Wash., April 2, 1933 (C. H. & Dorothy Martin, J. Wilcox); Vantage, Wash., April 1, 1933 (C. H. & Dorothy Martin). *C. fallei* (Back): Kirk, Colo., April
7, 1933 (J. L. Hoerner); Ft. Collins, Colo., April 22, 1907; Denver, Colo., March 3, 1902, and Oct. 26, 1901 (S. A. Johnson); Colorado Springs, Colo., April 1, 1932, and April 5 and 14, 1930.

The peculiar seasonal distribution of the genus (very late fall, very early spring) is curious. Spring specimens appear too fresh to have undergone hibernation as adults. Possibly there is a partial emergence of the brood in the fall, with a continuance of the emergence the following spring.

NOTE ON THE COLEOPTERA FAUNA OF ALASKA

BY MELVILLE H. HATCH

University of Washington, Seattle, Wash.

The two principal lists of Alaskan Coleoptera are those by Hamilton (Trans. Am. Ent. Soc., XXI, 1894, pp. 1-38) and Fall (Pan-Pac. Ent., II, 1926, pp. 127-154, 191-208). The former lists 572 species, the latter 448, including 117 species not in the former, so that the two together list 779 species. Scattered records, mostly compiled from the Leng Catalogue, raise this figure to 914. Of this number, however, 202 are without specific locality other than "Alaska," leaving a total of 712 species to be considered below.

<table>
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<th>Region</th>
<th>No.</th>
<th>Percentage of total species of (712)</th>
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<td>Southeastern Alaska</td>
<td>403</td>
<td>57%</td>
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<td>50%</td>
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These data are taken from a manuscript catalogue of the Coleoptera of Alaska prepared under my supervision by Miss Harriet Ruth Smith, a student at the University of Washington, employed by the Works Progress Administration.
NEW HORSEFLIES (TABANIDÆ, DIPTERA) FROM THE SOUTHWESTERN UNITED STATES

BY CORNELIUS B. PHILIP

Hamilton, Montana

A new variety of Tabanus tetricus Mart. (syn. hirtulus Big.) from southern Colorado and Arizona, and one new Tabanus s. str. from Arizona are herewith described. The red on the sides of both sexes of the first is so extensive as to suggest relationship to the affinis group, and more pronounced than any seen in a long series of typical tetricus from Montana and other northern localities. Until the male was associated, it was thought to be distinct, but I suspect that complete intergradation will eventually be found and the present name is offered to call attention to this extreme variation which would otherwise confuse assignment of individual specimens or small series from the region.

My reasons for considering tetricus and hirtulus synonymous, in spite of the respective difference of denudation and pollinosity of the subcallus, are given elsewhere (1935, 1936); the present variety is closer structurally to hirtulus but tinctorially to tetricus. Type material, unless otherwise mentioned, is in the collection of the author.

Tabanus tetricus rubrilatus Philip, n. var.

Antennæ dark red basally, black distal of the low prominence on the third segment; latter in ♀ chunky, rather wide, hardly excised, annulate portion short. Second palpal joints (♀) pale, creamy, strongly incrassate basally and tapering rapidly to a point. Ante-alar tubercles reddish. Abdomen dark reddish laterally with a broad, black irregular interval inclosing a row of pale discontinuous triangles, largest on the second segment, and an equivalent row of pale dashes superimposed on the red on either side, composed mostly of pale hairs. Wings hyaline, the costal and 1st M cells tinged with dilute yellowish, a pronounced spur on the “fork” of vein R5.

Female. Length 15 mm. Eyes hairy, with four green bands on a purple ground (relaxed). Front about three times as high as basal width, distinctly convergent, grayish pollinose with short
black hairs; callosity black, subquadrate, occupying full width of front and narrowly joined to a linear extension scarcely half the height of the front; ocelligerous tubercle small but distinctly brownish. Subcallus and face dark gray pollinose, the latter heavily pale pilose. Third antennal joint 1.14 mm. in total length by 0.5 basal breadth, the annuli 0.54 mm. Palpi about three quarters the length of the stylets, with many pale, and a few black hairs, 1.05 x 0.6 mm. in length and maximum thickness. Thorax dull black, with the usual gray lines; pleura smoky. Legs with all femora, the fore tibiae distally and fore tarsi blackish, remainder dull red, darkening distally. Abdominal dorsal incisures pale-haired, interrupted narrowly by black on either side of the bases of the median triangles only. Red extending onto sides of first tergite, one-half or less its width, fading posteriorly on the fourth and fifth segments. Venter dull reddish covered with appressed yellowish hairs, darker distally.

Male, 15 mm. Differs from the ♀ in the usual sexual characters, the third antennal joint more slender and a little more excavated, 0.36 x 1.14 mm. in breadth and length, the annuli 0.54; the terminal palpal segments pale yellowish, subovoid, 0.48 x 0.9 mm. without the apical nipple of *T. hirtulus* allotype (Philip, 1936). Thorax blackish, the gray lines evanescent anteriorly. Red on sides of abdomen extensive on tergites II and III encroaching on IV, almost crossing I laterally and involving the first four sternites almost completely; the lateral pale dashes evident but not as prominent as in the ♀, the black intervals on tergites II and III subquadrate, somewhat widened behind. Outer fore tarsal claws about a fourth longer than the inner.


The Conejos specimens are the least extreme with the antennae and palpi a little less chunky than in the holotype. The abdomen has an orange-brownish cast on the sides of well preserved specimens due to the heavy vestiture of black hairs outside the triangles, but in one worn specimen from Custer Co.,
Colorado, the red appears more pinkish and extensive, connected across the incisures, the triangles almost obliterated.

Separated from confusable members of the *affinis* group by the lack of faint clouds on the wings or of intense costal and basal infuscation, the presence of a long stump-vein, and the incrassate, more sharply pointed pale palpi.

*Tabanus eurycerus* Philip, n. sp.¹

So closely resembles *T. laticornis* Hine as not to have been suspected until the males appeared. The eyes are glabrous, pattern (relaxed) two green bands on a purple ground (in male confined to area of small facets); antennae bright red, annuli black, first joint a little swollen, third as wide as long, sub-rectangulate and slightly excised above, strongly bowed below; wings including the costal cell hyaline, “fork” of R5 not appendiculate.

Female. Length 13.5 mm. Front a little over four times as high as the width of the callosity, convergent below, gray, the black, subquadrate callosity occupying its full width, except for a narrow line on either side, not normally joined to the spindle-shaped median callosity above. Subcallus, face and cheeks grayish pollinose and latter thickly covered with white pile. Palpi elongate, attenuated sharply and strongly incrassate basally on the second joint, pale creamy, many white and a few scattered black hairs. Disc of thorax dark gray with five paler lines covered with long gray pile and scattering, short, appressed rufous hairs (yellowish in *laticornis*). Antealar tubercles reddish, pleurae gray pollinose and whitish pilose, tufts of white pile above the base of the wings. Legs dark, the fore tibiae basally and the middle and hind tibiae except at tips reddish. Abdomen reddish on the first three segments, superimposed by oblique whitish pilose spots, the rather broad black interval inclosing a median row of slender pale triangles widened abruptly on the posterior incisures. Venter reddish, darker from the fourth sternite caudally.

Male, 14 mm. Except for the usual sexual differences and a strongly attenuated abdomen, rather closely resembles the female. Area of enlarged facets strongly developed occupying a little less than three-quarters of the total area. Palpi yellowish, rather small, scarcely one and a half times as long as thick; very few black hairs. Abdomen dusty, pale brownish, the oblique lateral dashes accentuated much as the pattern seen in the males of *T. hirtulus*.

¹ Gr., broad horned.

The bare eyes and hyaline costal cells of the wings will at once distinguish this from *T. laticornis* Hine.

References


A NEW SPECIES OF DENDROPHILUS FROM CALIFORNIA

(Coleoptera, Histeridae)

BY EDWARD S. ROSS

University of California, Berkeley

Dendrophilus tularensis Ross, new species

Elongate oval, brownish piceous, surface dull, alutaceous. Head finely closely punctate, punctures separated by a space less than their width. Pronotum feebly convex; surface uniformly punctate, punctures large, interspaces as wide as their diameter; sides more finely and closely punctate, somewhat coarser along base. Elytra densely subevenly punctate over entire surface, punctures distinct deeply impressed, generally separated by spaces less than their width; inflexed portion very coarsely punctate, unistriate, stria confused medially; humeral stria deeply impressed, entire, carinate along outer edge; inner humeral feebly, short, medial; oblique humeral distinct, almost joining base of inner humeral; all dorsal striae deeply impressed and broad at basal half, becoming weaker approaching apex and finally lost in the punctures at apical fifth; first dorsal longest, only slightly abbreviated at apex, others decreasing gradually in length from outer to inner; sutural stria as long as first dorsal and equally impressed. Pygidium coarsely punctate medially, punctures separated by half their own diameter; punctures at apex very fine and close. Punctures of metasternum very large and moderately close at coxal angles, becoming smaller and sparser medially, interspaces with occasional still finer punctures. Length 3.5 mm., width 2.25 mm.
Holotype (No. 4327, Mus. Calif. Acad. Sci., Ent.) collected at Kaweah, Calif. (Tulare Co.) May 10, 1931, by Mr. R. S. Wagner, to whom I am indebted for the privilege of studying this species.

This is the third species of this genus to be described from North America and the second from California. It is at once distinguished from the previously described species, punctulatus and californicus by its uniform strong punctuation and by the deeply impressed complete elytral striation.

The latter species, californicus Horn, described from Santa Clara Co., Calif., is rare in collections and the few records of its capture seem to indicate a wide distribution on the Pacific Coast. In the collections of Dr. E. C. Van Dyke and Dr. F. E. Blaisdell I was able to study a good series of this species taken at San Francisco, Calif. in “rotting vegetation,” one from Tuolumne Co., Calif. and another from Stockton, Calif. In the collection of Mr. H. B. Leech several specimens from Vancouver, B. C., were also examined; these were collected in a “culture of Tenebrio etc. in bran.” The above series shows a remarkable uniformity in both size (L. 3 mm., W. 2 mm.) and sculpture.

I am grateful to the above mentioned individuals for their generous loan of material for this study.

Lawrence Bruner

It is with deep regret that we record the death of Lawrence Bruner which occurred January 30, 1937, at the home of his daughter in Berkeley where he has lived much of the time since he came to California in 1915. He was born in Catsauga, Pennsylvania, March 2, 1856, but most of his active life was spent in Nebraska where he was connected with the United States Entomological Commission and the Nebraska Experiment Station, and later was Professor of Entomology at the University of Nebraska. He will be best known for his systematic work on the Orthoptera in the study of which he followed Cyrus Thomas and Samuel H. Scudder. A good sketch of his life can be found in the March, 1937 number of the Proceedings of the Entomological Society of Washington. A bibliography of his entomological papers would be a most welcome supplement to that notice.—E. P. Van Duzee.
NEW SPECIES OF *ANDRENA* FROM CALIFORNIA (HYMENOPTERA)

BY P. H. TIMBERLAKE

*Citrus Experiment Station, Riverside, California*

The four black species of *Andrena* described herewith belong to the *pertristis-blaisdelli* group. The descriptions are submitted for publication at this time in order that Mr. E. Gorton Linsley may include an account of these species in his study of the black *Andrena* of California.

The types of the species described herewith are in the collection of the Citrus Experiment Station, Riverside, California, with the exception of those paratypes whose disposition is mentioned later under the respective species.

*Andrena oenotherae* Timberlake, n. sp.

Closely allied and similar to *A. blaisdelli* Ckll., but somewhat larger, with finer punctures on the abdomen. In *blaisdelli* the punctures leave a broad, smooth margin at the apex of tergites 1 to 4; in *oenotherae* this smooth margin is comparatively narrow.

Female. Black, with entirely black hair. Head broader than long, the clypeus more produced than in *blaisdelli*. Facial foveæ very broad above, ending below in a broadly rounded point slightly below level of antennal sockets. Clypeus convex, shining, finely and closely punctured, without indication of a median smooth line. Remainder of face below antennæ shining, more finely punctured than clypeus. Frons longitudinally striate. Process of labrum with a triangular base and an apical prolongation that is longer than wide and is constricted where it joins the basal triangle. (In *blaisdelli* the apical part of the process is as wide as, or wider than, long, and shows no sharp differentiation from the basal part.) Malar space very short, but not so linear as in *blaisdelli*. Third antennal joint slightly longer than the next two joints combined. Flagellum very dark brown beneath, more reddish toward apex. Mesoscutum and scutellum very dull, finely and closely punctured, the punctures becoming slightly sparser and more distinct on the posterior middle of scutum. Mesopleura densely granular punctate. Enclosure of propodeum rather well defined and with a coarser wrinkling than in *blaisdelli*. Rest of dorsal surface of propodeum with a similar but finer sculpture than mesopleura. Sides of propodeum below the floculus more shining, finely punctured and hairy. Wings subhyaline, and prac-
tically as in "blaisdelli," but larger. Abdomen shining, finely and closely punctured. The punctures of abdomen, especially of first tergite, obviously finer and sparser than in "blaisdelli," and leave a very narrow smooth apical margin on the first four segments. On the first tergite the punctures are mostly about four or five puncture widths apart. Pygidium broadly rounded at apex, its surface planate. Pubescence abundant, but not dense enough anywhere to conceal the surface. On mesonotum the hair is mostly rather short and erect, with a few longer hairs intermixed. On the mesopleura it is considerably longer. Floccus of propodeum moderately short, rather dense and straight. Flocculus of hind trochanters long and curled. Scopa of hind tibiae long and spreading, practically as in "blaisdelli," the hair on the dorsal margin being long, erect and not at all plumose. Hair of tergite II to IV short and erect, moderately dense. Length, about 12.5 mm.; fore wing, 9.2 mm.

In the series listed below there is only slight variation in the characters described above, but the length varies from about 11 to 13 mm., and that of the fore wing from 8.5 to 9.5 mm.

Described from 16 females (holotype and paratypes) from the Gavilan, Riverside County, California, February 20 to March 20 (C. M. Dammers) and mostly, if not all, collected on flowers of *E*no*thera* (the holotype collected March 20, 1932); and the following paratypes: 3 females, Riverside, on *Eriogonum fasciculatum* and *Cryptantha intermedia*, February 16 to March 25 (Timberlake); 1 female, on Salix, Soboba Hot Springs, February 22 (Timberlake); 3 females, Claremont (Baker); 1 female, Alamitos Bay, on *Oenothera spiralis*, May 6 (Timberlake); 1 female, 3 miles northwest of Newton, San Diego County, on *Cryptantha*, April 14 (Timberlake); 1 female, Azusa, (E. Holbirt); 1 female, 10 miles west of San Bernardino, May 26 (Linsley); 2 females, Mohave Desert, March 12 (Linsley); 1 female, 11 miles southwest of Victorville, Mohave Desert, on *Ericameria cooperi*, May 5 (Linsley); 1 female, San Francisco, April 20 (Linsley); 1 female, Oakland Hills, March 12 (Linsley); 1 female, Palmdale, April 11 (G. E. and R. M. Bohart); 1 female, Cave Creek, Chiricahua Mts., Ariz., July 4 (Linsley).

The paratypes collected by Mr. Linsley and by Messrs. G. E. and R. M. Bohart have been returned to their respective owners.

The male of *A. e*no*therae* is rather uncertain, hence the following material is not included in the type series, but a series of 18 males collected at Azusa by E. Holbirt probably belongs
with *anotherea*. They are very similar to what I have considered for a long time to be the male of *A. blaisdelli* Ckll. The latter has hair of head, pleura, propodeum, legs and abdomen black, that of the notum of thorax dull white. Hair of occiput, of first tergite, and often more or less at anterior end of cheeks also white. The Azusa males have the hair of head and thorax mainly dull white, with black hair on each side of face, on cheeks behind summit of eyes, and some on the antennal scapes and a little on pleura just below base of wings. Several of this series from Azusa, however, have hair of cheeks and pleura mainly black, and more than the usual amount on the scapes and sides of face, but still differ from *blaisdelli* males in having white hair on middle of face (especially clypeus) and on dorsum of propodeum. Hair of legs and abdomen black, but the long hair fringing the femora behind (very little on hind femora, however) and hair on first tergite white. In sculpture and structural characters, including genitalia, the two species are practically identical, except that in the putative *anotherea* male, the fourth antennal joint is somewhat longer than in *blaisdelli* and not greatly shorter than either the third or fifth joint. In *blaisdelli* the fourth joint on its short side is hardly longer than thick.

*Andrena linsleyi* Timberlake, n. sp.

This is another derivative of the *blaisdelli* group, and differs from *blaisdelli* and *anotherea* in having the clypeus much more sparsely punctured, the process of labrum differently shaped, and the mesoscutum distinctly less dull and more distinctly punctured. The scopæ of hind tibiae is also much thinner than in either of those species.

Female. Black, with entirely black hair. **Head and foveæ as in *anotherea*.** Clypeus more produced than in *blaisdelli*, and the malar space less linear. Clypeus convex, polished, sparsely punctured, with little or no indication of a medium smooth line, the punctures becoming closer on the lateral margins. Sides of face below antennæ very finely and densely punctured. Frons longitudinally striate on each side and rugulose in middle. Process of labrum triangular, rather broader at base than high, and with apex of the triangle narrowly truncated. Third antennal joint about equal to the next two combined. Flagellum dark reddish brown beneath. Mesoscutum dullish, finely and closely punctured, the punctures on posterior middle of disk about one to two punc-
ture widths apart with the interspaces very minutely tessellate. Scutellum similarly punctured and rather shiny at base. Mesopleura somewhat duller than the scutum and more obscurely punctured. Basal enclosure of propodeum well defined and finely rugose as in *blaisdelli*. The remainder of dorsal surface of propodeum very finely granular-rugulose and obscurely punctured. Sides of propodeum below the foveus slightly dullish, hairy but without distinct punctures. Wings hyaline, clearer than in *blaisdelli*, the veneration and stigma nearly black. Abdomen shining, punctured almost as closely as in *blaisdelli*, but a little more finely on the first tergite. Punctureless apical margin of tergites II to IV rather wide as in *blaisdelli*, but very narrow on I. Pubescence in general as in *blaisdelli* and *another*, but hair of clypeus thinner and the scopia of hind tibiae remarkably long and loose. Length, about 12 mm.; fore wing, 8.5 mm.


The paratype differs slightly in having the legs especially femora, the venter, the hair on under side of tarsi and the veins and stigma more reddish.

**Andrena flandersi** Timberlake, n. sp.

This insect is probably more similar to *A. irana* Ckll. than to any other previously described. It differs from that species in having the clypeus closely punctured, mesoscutum more coarsely and almost densely punctured, the punctureless apical margin of tergites extremely broad, etc. From *blaisdelli* and other similar species it differs in having the mesoscutum shiny instead of dull and in the wider smooth apical area on the tergites.

**Female.** Black, with entirely black pubescence. Head wider than long. Clypeus but little produced, moderately convex, shining, closely and deeply punctured. Side of face below antennæ and supraclypeal area finely and densely punctured. (In *irana* the whole face below the antennæ appears to be much more shiny because the punctures are considerably sparser). Frons longitudinally striate. Foveæ very broad, narrowed to a rounded point just below level of antennæ. Process of labrum with a low broadly rounded basal part and a median prolongation at apex. The latter portion is more or less bulbous, a little restricted where it joins the basal part, about as wide at apex as long, and depresso-emargi-
nate in the middle of the apical margin. Malar space linear. Third antennal joint as long as IV plus V. Flagellum only very slightly brownish beneath, toward apex. Mesoscutum and scutellum shining, strongly and very closely punctured, the punctures mostly not more than one puncture width apart. Mesopleura densely ruguloso-punctate. Dorsal surface of propodeum with similar but finer sculpture than mesopleura. The enclosure hardly defined except by the difference in sculpture, which consists of a fine wrinkling about as in *blaisdelli*. (In *irana* the enclosure is very minutely rugulose and dull like remainder of dorsal surface). Wings subhyaline, with blackish veins and stigma, the venation practically as in *blaisdelli*. Abdomen shining, polished, very finely punctured. Punctures of first tergite very sparse, so that the segment, unless carefully examined, almost appears to be impunctate. Next four tergites closely punctured about as *blaisdelli*, the punctured area reaching almost to the apical margin at the sides of the segments, but in the middle not extending on to the apical depression. Tergites II to IV each depressed in middle about two-fifths. Pygidium planate, broadly rounded at apex. Pubescence in general shorter than in *blaisdelli* or *irana*. On mesoscutum it is very short, erect and plumose, but much too sparse to conceal the surface. Tergite I with a few long hairs on lateral margins, but the disk almost nude. Tergites II to IV with short, erect hairs as in *blaisdelli* and *irana*. Scopa of middle tibie long and rather loose as in *blaisdelli*. (In *irana* the scopa is more compact and depressed.) Length, 11.5 mm.; fore wing, 8 mm.

Described from three females (holotype and paratypes) collected about 11 miles southwest of Victorville (on highway), Mohave Desert, Calif., at flowers of *Ericameria cooperi*, May 5, 1936 (Linsley and Timberlake). Also one female (paratype) without locality label that was given to me some years ago by Mr. Stanley Flanders, and which was probably collected in southern California. The specimens from *Ericameria* were not collecting pollen. The smallest paratype is 10 mm. long, with fore wing measuring 7.8 mm. One paratype collected by Mr. Linsley has been returned to his collection.

**Andrena deserticola** Timberlake, n. sp.

This species resembles *A. irana* Ckll. and *A. flandersi* Timb., differing from the former in the closely punctured clypeus, finely wrinkled enclosure of propodeum, much longer hairs on mesoscutum, more shining and morse sparsely punctured abdomen, etc. From *flandersi* it differs in having hair on the mesoscutum long, punctureless apical margin of tergites narrow, etc.
Female. Black, with black pubescence, the hair on inner side of tarsi dark reddish brown, and some of the hairs on mesoscutum and dorsal margin of hind tibiae and basitarsi with dilute pigmentation and appearing as if faded or bleached. Head shaped much as in flandersi, with the clypeus but little produced, moderately convex. Whole face below antenna shining, finely and very closely punctured. The punctures on clypeus considerably coarser than on rest of face and mostly not more than one puncture width apart. Frons longitudinally striate. Foveae and process of labrum as in flandersi, except that the apical prolongation of the process is rather broader than long, with parallel sides and emarginate apex but no groove down the middle. Third antennal joint somewhat longer than 4 and 5. Flagellum very slightly brownish beneath at apex. Mesoscutum polished, finely and closely punctured, the punctures mostly one to two puncture widths apart. Disk of scutellum like the scutum except that the punctures are a little coarser and sparser. Mesopleura moderately coarsely rugulose, without evident punctures. Dorsal surface of propodeum with a similar but finer sculpture. Enclosure clearly defined, finely wrinkled much as in blaisdelli. Sides of propodeum tessellate and shining, not distinctly punctured, except in area in middle of dorsal part next to the floccus. Wings subhyaline with dark stigma and veins. Venation about as in blaisdelli. Abdomen polished, very finely and moderately closely punctured. First tergite sparsely punctured, as in anotherw, but the punctures slightly finer. Next three tergites punctured a little more sparsely than in anotherw, the punctureless apical margin of the segments narrow as in that species. Pygidium planate, not so broadly rounded at apex as in the other species. Pubescence abundant, long, but not concealing surface, that on mesoscutum nearly as long as that on the pleura. Scopa with very long spreading hairs, about as dense as in blaisdelli. Hair on tergite I sparse and long, that on II to IV short and erect. Length, 11.5 mm.; fore wing, 8.5 mm.

Described from one female (holotype), collected at flowers of Baileya multiradiata (but perhaps not collecting pollen), one mile south of Adelanto, Mohave Desert, Calif., May 28, 1932 (Timberlake); and one female (paratype), collected at Palmdale, Calif., April 11, 1936 (G. E. and R. M. Bohart) in the Bohart collection.

The paratype measures 13 mm., due to the greater extension of the abdominal segments.
SOME NEW GENERA AND SPECIES OF NORTH AMERICAN PARASITIC BEES
(Hymenoptera)

BY E. GORTON LINSLEY AND CHARLES D. MICHENER

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Protepeolus Linsley and Michener, new genus

Female. Head nearly as wide as thorax, inner orbits slightly converging below; antennae with pedicel as long as second flagellar segment; first flagellar segment almost as long as second and third together; labrum bituberculate; mandibles with an inner tooth before apex; maxillary palpi short, about one-seventh as long as labial palpi, arising from a tubercle, three-segmented, first segment about one and one-half times as long as second, third slender, slightly longer than first; labial palpi elongate, four-segmented, first segment a little more than twice as long as second, last two short, together scarcely half as long as second, fourth shorter than third. Axillae not dentate; scutellum weakly bilobed; fore wings with three submarginal cells, all approximately equal in length on cubital side, first recurrent vein practically meeting second transverse cubital, second recurrent vein slightly basad of third transverse cubital, marginal cell rounded and separated from costa at apex, a little more than two-thirds as long as discoidal cell; middle and hind legs robust, their tibial spurs rather short, stout; pulvilli nearly as long as the claws, enlarged at apex. Abdomen with a deep, transverse, ventral constriction near base, posterior face of constriction with an arcuate carina enclosing a semi-lunar area, a short distance behind which is a transverse, impressed line (suture?) extending completely across the sternite; fourth and fifth sternites truncate at apex; sixth exerted, tapering and narrowly rounded apically; fifth tergite medially emarginate at apex with a small, transverse, shining, false pygidial area within the emargination; sixth tergite greatly reduced in size, with a median ligulate, pygidial process, on each side of which is a row of stout, parallel spines interspersed with bristles.

Genotype: Protepeolus singularis n. sp.

This genus differs from all others known to the writers by the peculiar ventral constriction of the abdomen. Interpretation of the sclerites in this region is very difficult on the basis of the unique type, and it is not certain whether the first sternite ends in the constriction or at the transverse line behind the enclosed, semi-lunar area (see figure). The nearest relative of Protepeolus appear to be the South American Isepeolus and
*Leiopodus*, but it may be distinguished from these by the three-segmented maxillary palpi and the position of the second recurrent vein which is nearly interstitial with the second transverse cubital vein. From *Viereckella*, with which it agrees in the exposed, tapering, sixth abdominal sternite of the female, *Protepeolus* may be separated by the scale-like (rather than plumose) abdominal hairs, the ligulate pygidial process of the female, and the three-segmented maxillary palpi.

**Protepeolus singularis** Linsley and Michener, new species

Female. Black, with small amounts of red on legs and body, clothed with brownish and white pubescence which forms a pattern of spots and bands on the thorax and abdomen. *Head* with trans-facial line considerably longer than facial line, surface shining, finely and not very densely punctured, pubescence sparse, whitish, except on vertex and frons where it is brown, short; antennae suffused with reddish, flagellum darker above, scape red basally; clypeus with anterior margin narrowly red; labrum reddish; mandibles with basal two-thirds red. *Thorax* with punctuation, where visible, somewhat coarser than that of head, tegulae and tubercles red, scutellum, axillae, and metanotum dark reddish; pronotum with a narrow posterior margin of white pubescence; scutum margined with white pubescence, clothed with dark brown hairs which are sparser posteriorly, anterior half of disk with a clearly defined, longitudinal, cream-colored fascia which is swollen posteriorly and slightly broadened anteriorly to meet the marginal band; the marginal band, adjacent to tegulae, produced to a point which extends inward and forward; scutellum clothed with brown pubescence, with a narrow, median, longitudinal band of white; axillae and metanotum with some whitish pubescence; sides of thorax clothed with white hairs intermixed with patches of brown; wings grayish, a dusky streak along costal margin beyond marginal cell; legs red, coxae blackish, under side of anterior femora suffused with blackish, underside of middle and hind femora at base, and most of inner side of hind tibiae, including spurs, black. *Abdomen* black, apical margins of segments, first two segments at sides, sixth tergite at base, and most of sixth sternite, reddish; tergites very finely punctured, the fifth more closely so than the preceding; first tergite with a broad, transverse, cream-colored band of pubescence which is abruptly broken at middle; second and third tergites with a similarly colored basal fascia, that of the third tergite narrowed near the lateral margin; fourth tergite with areas of whitish pubescence at sides; fifth tergite with the apical portion slightly elevated, clothed with black hair, false pygidial area glabrous and impunctate, margined anteriorly by
a low carina; pygidial process of sixth tergite shining, with a low, median, longitudinal ridge; first to third sternites with whitish fasciae on disk, those of second and third segments interrupted at middle; concavity at base of second sternite glabrous, impunctate, polished. Length 9.5 mm., anterior wing 6 mm.


This fine species may be easily distinguished from all other known Nomadine bees by the generic characters.

**Hexepeolus** Linsley and Michener, new genus

Head nearly as wide as thorax, inner orbits converging below; antennae with pedicel nearly as long as second flagellar segment, first flagellar segment distinctly longer than second; mandibles with inner margin more or less evenly rounded, simple, without an inner tooth; maxillary palpi four-fifths as long as labial palpi, six-segmented, first segment slightly more than half as long as second, remaining segments becoming perceptibly shorter and more slender to the apical segment; labial palpi four-segmented, first segment elongated, surpassing in length the remaining segments taken together, second segment approximately one-third as long as first, third segment about three-fifths as long as second, fourth segment subequal in length to third. Axillae not dentate; scutellum convex, longitudinally impressed along median line, feebly bilobed; forewings with either two or three submarginal cells, if two, the cells are of about equal length on the cubital side, if three, the first cell is longer on cubital side than the second or third, the second smaller than the third and greatly narrowed anteriorly, marginal cell rounded and separated from costa at apex, a little shorter than discoidal cell; middle and hind legs only moderately robust, tibial spurs slender, pulvilli short, not distinctly enlarged at apex. Abdomen with tergites broadly depressed and densely pubescent along apical margin.

Female. Antennae with first flagellar segment only a little longer than second; fifth abdominal tergite with a small false pygidial area; sixth tergite with a broadly rounded pygidial area, margined laterally by a carina; sixth sternite with a median keel between two concavities, apex bilobed, margined externally by a comb-like row of curved spines which become shorter, finer, laterally where they extend forward along the outer margins of the concavities.

Male. Antennæ with first flagellar segment subequal in length to the two following together; seventh abdominal tergite with a projecting, apically rounded, pygidial plate, the dorsal surface
of which is flattened, bounded by a carina; sixth sternite with a broad, transverse, discal groove.

Genotype: *Hexepeolus mojavensis* n. sp.

This genus presents the facies of *Argyroselenis, Epeolus*, or *Tripeolus*, sharing with them the apically rounded marginal cell which is distinctly separated from the costa. If differs markedly from these groups, however, in the long, six-segmented maxillary palpi, simple axilae, and structure of the abdomen in the female (six visible sternites). In these last characters *Hexepeolus* agrees with *Nomada* and *Gnathias*, but may be distinguished from them by the closely appressed lateral margins of the first tergite (in *Nomada* and *Gnathias* these margins project as conspicuous, transparent, ventral flaps), the pubescent fasciae of the abdomen, and the bilobed sixth sternite of the female.

The number of submarginal cells in the forewings is variable, several examples having only two such cells in one or both wings, although the normal number appears to be three. A similar condition exists in many other species of bees which are normally three-celled.

*Hexepeolus mojavensis* Linsley and Michener, new species

Black, sparsely clothed with white pubescence, denser on face, pleura, and venter, forming patches on notum and fasciae on abdominal tergites. **Head** with transfacial line longer than facial line; antennae black, suffused with reddish, particularly along under side of flagellum; upper frons and vertex moderately coarsely, subcontiguously punctured; face densely clothed with long white hairs; clypeus broadly truncate at apex, surface finely, closely punctured on disk, more coarsely at sides; labrum coarsely, irregularly punctured, with a longitudinal carina becoming evanescent at base; mandibles with apices reddish; segments of palpi with pale annulations. **Thorax** with scutum coarsely, closely punctured, the punctures averaging less than one puncture width apart, surface very finely, inconspicuously clothed with short, suberect, pale hairs in addition to the conspicuous white patches; pronotum, above tubercles, with a patch of dense white pubescence, tubercles coarsely punctured, clothed with white hairs; scutellum a little more closely punctured than scutum, with a dense patch of white hairs at the anterior angles; metanotum coarsely, closely punctured, clothed with long, white hairs; propodeum with triangular area nearly nude, finely, closely punctured, with a few oblique ruge at base, remaining surface of propodeum coarsely, closely punctured, moderately densely clothed with long, white hairs;
mesepisterna very coarsely, closely punctured, irregularly clothed with suberect, white hairs; tegulae reddish; wings lightly infuscated, veins brownish; legs clothed with moderately short, appressed hairs. *Abdomen* with dorsal surface clothed with fine, inconspicuous, prostrate, black hairs, apical margin of segments with broad bands of white pubescence, interrupted at middle to form separate fasciae, first segment with a white patch on each side at base in addition to fasciae; tergites coarsely punctured, the punctures averaging less than one puncture width apart; the depressed, pubescent apical margins more finely, closely punctured; sternites coarsely, closely punctured, moderately densely clothed with white hairs, broad apical margin of sternites reddish.

**Female.** Pronotum with tubercles reddish; scutum with a dense patch of white pubescence along median line from middle of disk to anterior margin, a short line on each side anteriorly, a small patch adjacent to tegulae, and similar patches at posterior angles. Legs red, suffused with variable amounts of black on femora and tibiae; abdomen red, first five tergites fasciate, the fascia of the fifth segment continuous; fifth tergite piceous to black, more uniformly punctured than preceding segments, the punctures moderately coarse and subcontiguous except on the small, transverse, false pygidial area, which is finely, shallowly punctured and densely clothed with fine, pale, silken pubescence; sixth tergite moderately densely clothed with white hairs except on pygidial area, which is finely, closely, shallowly punctured and sparsely clothed with very fine, short, inconspicuous, pale hairs; processes on each side of sting strap-like, black, densely pubescent; sixth sternite and margins of preceding sternites polished. Length 8 mm., anterior wing 6.5 mm.

**Male.** Pronotal tubercles black; scutum lacking median white patch, anterior angles with a vague spot of white hairs; legs black, with small amounts of red on femora, tibiae, and tarsi; abdomen black, sides of first tergite reddish, tergites five and six with continuous white bands, that of the fifth notched at the middle; pygidial plate of seventh segment reddish. Length 8 mm., anterior wing 6.5 mm.

Holotype female (No. 4345, Calif. Acad. Sci. Ent.), captured at the junction of Deep Creek and Mojave River, Mojave Desert, San Bernardino Co., California, April 26, 1936 (Linsley). Allotype male (No. 4346, Calif. Acad. Sci. Ent.), from the same locality May 6, 1936 (Linsley). Paratypes, three females and twelve males with the same data as the allotype, one pair of which will be deposited in the collection of Dr. T. D. A. Cockerell at Boulder, Colorado, a pair in the Michener
collection, the remainder will be retained in the Linsley collection. Additional paratypes (5 ♀ ♂; 6 ♂ ♂) from the same locality and date are in the collection of Mr. P. H. Timberlake, at the Citrus Experiment Station. All examples were visiting flowers of Eriodictyon trichocalyx.

This species is closely related to the following and differs in the smaller size, dull, closely punctate frons, and the black legs of the male.

**Hexepeolus rhodogyne** Linsley and Michener, new species

Black, sparsely clothed with white pubescence, denser on face, pleura, and venter, forming patches on notum and fasciae on abdomen. *Head* with its transfacial line longer than its facial line; face densely clothed with white pubescence; upper frons below ocelli polished, moderately coarsely but not closely punctured, the punctures averaging one or more puncture widths apart; clypeus broadly truncate at apex, surface finely, closely punctured on disk, more coarsely at sides; labrum coarsely, irregularly punctured, with a longitudinal carina which becomes evanescent at base; apical half of mandibles reddish; segments of palpi with pale annulations. *Pronotum*, above tubercles, with a patch of dense, white hair, tubercles coarsely punctured, clothed with white pubescence; scutum coarsely, closely punctured, the punctures averaging less than one puncture width apart and finer than those of vertex, surface finely, inconspicuously clothed with short, pale, suberect hairs in addition to conspicuous white patches at anterior and posterior angles; scutellum more coarsely punctured than scutum; metanotum coarsely, closely punctured, clothed with long, white hairs; propodeum with triangular area nude, finely, closely punctured, with a row of oblique rugae at base, remaining surface of propodeum coarsely, closely punctured, moderately densely clothed with long, white hairs; mesepisterna coarsely, closely punctured, clothed with suberect white hairs; tegulae red; wings lightly infuscated; legs red, clothed with moderately short, white hairs. *Abdomen* clothed with fine, prostrate, black hairs on dorsal surface, depressed apical margin of segments with broad bands of dense white pubescence, interrupted at middle to form separate fasciae; tergites coarsely punctured, the punctures averaging less than one puncture width apart; sternites densely clothed with white pubescence, closely punctured except for the polished, reddish, apical margins.

**Female.** Antennae red, apical segments of flagellum dusky; tubercles of pronotum reddish; scutum with at most a feeble median white patch of pubescence; abdomen red with third and fourth tergites darker, the fifth and sixth tergites piceous except for pygidial and false pygidial areas; fifth tergite with a small,
shallowly punctured, false pygidial area, which is clothed with fine, pale, silken pubescence; sixth tergite moderately densely clothed with white hairs except for pygidial area which is very finely, shallowly, closely punctured and sparsely clothed with fine, short, inconspicuous pale hairs; sixth sternite polished. Length 9 mm., anterior wing 7.3 mm.

Male. Antennae black, lightly suffused with reddish, especially along under side of pedicel and first flagellar segment; tubercles of pronotum black; abdomen black, the sides of the first tergite reddish, the white band of tergite five broken at middle, that of tergite six continuous; pygidial plate of seventh segment black. Length 10 mm., anterior wing 7.3 mm.

Holotype female (No. 4347, Calif. Acad. Sci. Ent.), taken two miles east of Cathedral City, Riverside Co., California, April 10, 1936 (Linsley), and allotype male (No. 4348, Calif. Acad. Sci. Ent.), from Palm Canyon, Borego Valley, San Diego Co., California, March 29, 1936 (Linsley). Paratypes, two males, taken at the same time and place as the allotype, in the collection of Mr. P. H. Timberlake. All four examples were visiting flowers of *Larrea glutinosa*.

The differences between this and the preceding species may be brought out in the following table:

**FEMALES**

Upper frons, below ocelli, dull, uniformly closely, subcontiguously punctured, the punctures averaging much less than one puncture width apart; antennae black, lightly suffused with reddish on under side of flagellum. 8 mm. Mojave Desert, California...

................................................................. mojavensis

Upper frons, below ocelli, shining, irregularly, not closely punctured, the punctures averaging one or more puncture widths apart; antennae red. 9 mm. Colorado Desert, California...

................................................................. rhodogyne

**MALES**

Upper frons, below ocelli, dull, uniformly closely, subcontiguously punctured, the punctures averaging much less than one puncture width apart; legs black, with small amounts of red; pygidial area reddish. 8 mm. Mojave Desert, California.....mojavensis

Upper frons, below ocelli, shining, irregularly, not closely punctured, the punctures averaging one or more puncture widths apart; legs red; pygidial area black. 10 mm. Colorado Desert, California..............rhodogyne
Paranomada Linsley and Michener, new genus

Female. Head distinctly narrower than thorax, inner orbits slightly converging below; antennæ short, flagellar segments subequal in length, wider than long, the first slightly longer than the following; vertex polished, impunctate; frontal carina wanting; mandibles simple; maxillary palpi shorter than second segment of labial palpi, five-segmented, basal segment very short; second segment as long as the following two together, third segment two-thirds as long as second, fourth segment one-half as long as third, fifth segment slightly shorter than the fourth, the two together approximately as long as third segment; labial palpi four-segmented, first segment surpassing in length the remaining segments taken together, second about one-half as long as first, last two segments subequal in length, together about one-half as long as second. Thorax broad and dorso-ventrally compressed; scutum more or less flat, highly polished; scutellum large, flat, level with scutum, also highly polished; tegulae large, shining; mesosternum broad, flat, shining, with a pair of sutures running anteriorly from mid coxae and meeting at about middle of segment; coxae drawn out externally in the form of a prominent lamella, fore coxae not spined, middle and hind coxae with a dorsal carina; legs short, stout, pubescent, femora flattened; wings infuscated, anterior pair with three submarginal cells. Abdomen polished, tergites two to four with broad, continuous, bands of white pubescence along apical margins, white band of fifth tergite interrupted at middle, sixth tergite with a broadly truncate pygidial area; sternites polished, moderately pubescent, sixth sternite retracted, represented externally only by a pair of projecting, slightly curved processes, bearing on inner sides a few inconspicuous spines.

Genotype: Paranomada nitida n. sp.

This genus is apparently related to the West Indian Noma-dosoma Rohwer1 with which it agrees in the smooth, shining integument, flat scutum and scutellum, indistinct frontal carina, and fasciate abdomen, but differs in the short five-segmented maxillary palpi, dusky wings with three submarginal cells, and short flagellar segments of the antennæ (the first scarcely longer than the second segment). From the Argentinan Brachynomada Holmberg2 which has five-segmented maxillary palpi, Paranomada may be distinguished by the absence of a frontal suture, the broad, flat, highly polished thorax, and the short flagellar

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segments of the antennae. The peculiar structure of the coxae, which are drawn out externally in the form of a conspicuous lamella, is unlike that in any other Nomadine bees which we have seen.

Paranomada nitida Linsley and Michener, new species

Female. Reddish brown, shining, clothed with white pubescence. Head nearly glabrous on vertex; antennae piceous, scape and pedicel reddish; frons and clypeus irregularly clothed with white hairs, surface with a few scattered punctures; labrum very densely pubescent; mandibles reddish, edges piceous. Thorax shining; pronotal tubercles clothed with white pubescence; scutum nearly glabrous and impunctate, disk suffused with brownish; scutellum glabrous, impunctate; metanotum feebly shining, finely, closely punctured, densely pubescent at sides; propodeum with triangular area glabrous at middle, densely pubescent at sides, remaining dorsal surface, except a small area on each side of triangle, densely clothed with prostrate white pubescence; mesepisterna densely clothed with white hairs; anterior coxae and mesosternum moderately sparsely punctured and pubescent; legs shining, femora sparsely, but distinctly punctured, sparsely clothed with long, white pubescence, tibiae and tarsi rather densely pubescent; wings brownish, with a pale area before apex. Abdomen shining, first tergite glabrous, very finely, sparsely punctured except apical depression which is moderately finely punctured and sparsely clothed with short, fine, inconspicuous brownish hairs, second tergite finely, sparsely punctured and pubescent, apical depression and lateral margins with a broad band of white pubescence, interrupted at middle, third and fourth segments similarly punctured, although a little more densely pubescent, apical white fasciae continuous; apex of fifth tergite fine, closely punctured and pubescent; pygidial area with a piceous, elevated margin and a median, longitudinal ridge; sternites moderately clothed with long, white hairs, denser on fifth segment. Length 7.5 mm., anterior wing 6 mm.

Holotype female (No. 4349, Calif. Acad. Sci. Ent.), from Phoenix, Arizona, October 23, 1924 (J. D. Gunder), in the collection of the California Academy of Sciences. The writers are indebted to Mr. E. P. Van Duzee for the privilege of studying this interesting species.

Paranomada nitida shares many characters with the West Indian Nomadosoma pilipes (Cresson), from which it may be distinguished by the five-segmented maxillary palpi, infuscated

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wings, three submarginal cells, and the arrangement of the abdominal fasciae. In *N. pilipes* there are pale fasciae on the middle of the first, second, fourth, and fifth tergites, that of the fourth segment being interrupted at the middle.

NOTES ON THE DYTISCID BEETLE, **AGABUS LINEELUS** (LEC.)

*Agabus lineellus* (LeConte) seems to be of such scarcity, at least in collections, as to merit the following notes.

On March 29, 1936, while collecting on the University Farm at Davis, California, I had the good luck to take eight specimens of *Agabus lineellus*. The creek from which these specimens were obtained runs along the southern border of the farm. At that time of the year the creek consisted of muddy, stagnant pools that were scattered along its course. There happened to be an old burlap sack lying in the edge of one of the rather large pools and on pulling this out I discovered that a number of dytiscids had been hiding under it. These beetles became active at once and started crawling back into the water. However, I succeeded in capturing eight of them. These specimens remained in my collection until a few months later when I gave four of them to Hugh B. Leech who identified them as *Agabus lineellus* (Lec.).

The specimens agree perfectly with the description in Dr. H. C. Fall's paper of 1922, "A Revision of the North American Species of *Agabus". They are readily separable from *A. disintegratus* (Cr.) which is the only other vittate species of the genus known to occur in California.

To show past recorded history of this species the following extract from Dr. Fall's paper is cited... "This very rare species is represented in the LeConte collection by the unique type taken by Murray in California, precise locality not stated. Aside from the type I have seen only a single example collected by G. R. Pilate at Mills College, California and sent me for identification by Mr. Dury, who retains a second specimen in his own cabinet."

Out of the series of eight specimens, three males and one female are in the H. B. Leech collection, two males are in Dr. E. C. Van Dyke's collection and a male and female are retained in my own collection.—Burdette E. White, University of California.
TWO NEW MAYFLIES FROM THE PACIFIC COAST

BY W. M. UPHOLT

University of California, Berkeley

During the months of June and July, 1936, the author collected ephemerids in the San Joaquin Valley. Two species were especially plentiful. A *Hexagenia*, the first member of this genus to be reported from any of the Western States, was collected in large numbers around lights over a period of ten days or two weeks, after which only an occasional lone specimen was found. A species of *Callibætis*, however, could be found in fair numbers around lights throughout the summer.

These two species, belonging to the families Ephemeridae and Bætide respectively, are here described for the first time. I wish to acknowledge the invaluable assistance given me by Dr. Jay R. Traver of Cornell University who so kindly compared these specimens with closely related species and added much to the descriptions as they finally stand.

**Hexagenia californica** Upholt, new species

A yellow species, marked prominently with reddish-brown; outer margin of hind wing usually dark-bordered; ventral triangles attain anterior margin. Size: Male, body 17-20 mm., wing 17 mm., caudal filaments 47-50 mm.; female, body 20-25 mm., wing 18-22 mm., caudal filaments 25-35 mm.

**Male**: Head yellowish; eyes yellow above. Pronotum pale yellow with two dorsal dark red-brown stripes on either side of median line; dark reddish-brown spot between fore coxae. Terga and pleura of meso- and meta-thorax pale yellow except for the reddish-brown lateral margin of mesoscutum, reddish-brown tip of mesoscutellum, and a reddish-brown streak extending from the base of the wing antero-ventrally through the pleurotrochantin. Meso- and meta-sternum reddish-brown, grading to yellow marginally. Fore legs dark red-brown, the femora lighter than tibiae and tarsi. Middle and hind legs yellow with a greenish tinge; claws, distal tarsal segments except at base, and joints of other tarsal segments light purplish-brown. Wings hyaline, the costal margins tinged with reddish-brown; veins piceous, many cross veins margined with reddish-brown. Outer margin of hind wing usually with a prominent reddish-brown border. Abdominal tergites pale yellow, suffused with red except medially and on lateral
margins. Dark Indian-red brown streaks medianly and on each tergite from antero-lateral margin to posterior border medianly. Abdominal sternites pale yellow except for a reddish-brown triangle that extends to the anterior margin. Genitalia reddish-brown, second segment of forceps yellowish basally. Penes more or less hook-like, similar to those of occulta Walker. Caudal filaments pale reddish-brown, distinctly darker at joints.

Female: Very similar to male but much lighter in color, sometimes being nearly white. Wings occasionally all yellow with very little brown pigmentation. Fore legs rather uniformly reddish-brown, much shorter than in the male. Larger in size but with shorter caudal filaments.

Egg masses large, pale yellow-orange.

Holotype: (Dried male imago) No. 4350, Calif. Acad. Sci. Ent., taken June 30, 1936, at Kingsburg, Fresno County, California, by Upholt. Allotype: (Dried female imago) No. 4351, C. A. S. Ent., and a series of paratypes as follows: (In alcohol) 2 male subimagoes, 21 female imagoes; (dried) 1 male subimago, 15 female imagoes, and 3 female subimagoes, June 23-July 6, 1936; same locality as holotype; in the collection of the California Academy of Sciences, J. R. Traver, and the author.

This species may be distinguished from occulta Walker by its paler color generally and by numerous differences in the color pattern of the thorax. In color this species more nearly approaches marilandica Traver from which it differs in its larger size, in having the outer margins of hind wings margined, and in the ventral abdominal triangles which attain the anterior margin.

Callibaetis traveræ Upholt, new species

Male yellowish white marked with brown; female pale reddish-yellow; cross veins intermediate in number; marginal intercalaries single; wings of male unpigmented; vitta of female wing discontinuous. Size: Male, body 5.5-7 mm., wing 7 mm., caudal filament 10 mm. or more. Female, body 6-7 mm., wing 3 mm., caudal filaments 10 mm. or more.

Male: Head and thorax deep Van Dyke brown; sclerites margined in pale brown; pleura somewhat lighter in color than notum. (In alcoholic specimens, this difference between notum and pleura is more pronounced, both being much lighter and with more of a yellow tinge; also groups of two or three reddish-brown dots are present on the pleura just above each leg and below each wing
base). Eyes deep brown, lower half piceous. (Upper half of eyes yellow in alcoholic specimens). Legs white with very faint indications of brown preapical bands on femora; tarsal claws and joints brown (legs entirely white except for an occasional brown tarsal joint in alcoholic specimens). Abdominal tergites very pale brownish-white with a broad longitudinal median brown band interrupted by a narrow median pale line; also narrow submarginal brown streaks (not always present in alcoholic specimens). Sternites entirely white except for irregular submedian brown streaks. (In alcoholic material especially, the sternites and lateral aspects of the tergites are very similar in color, being nearly white). Forceps white; caudal filaments white except for very faint tinge of reddish-brown at base and a tendency toward yellowish joints.

Female: Head brownish-red (white, in alcoholic specimens, with reddish marks above the antennae and at the back of the head). Eyes piceous. Body uniformly testaceous speckled with reddish-brown, except for deeper brown areas dorsally. (In alcoholic specimens, the body is entirely white except for a broad median pale smoky-brown band extending the length of the dorsum and with a paler median line as in the male). Legs similar to body in basic color, minutely irrorated with dull brown and with a line of larger brown spots along the front surface of femora; fore femora each with a thin brown line extending most of its length on the posterior surface; (in alcoholic specimens, legs entirely white without these brown spots and lines); tarsal joints deeper brown; claws black. Wings hyaline; longitudinal veins intermittently brown and white; cross veins all white, intermediate in number (about 30-35 behind Radius I). Vitta extremely variable but always discontinuous and very irregular; pale, smoky-brown except where it contacts longitudinal veins basally; in these spots it is deep brown; hyaline spots in costal and subcostal spaces numerous to dominant; vitta broader basally. Caudal filaments reddish-yellow, slightly deeper at base.


This species may be distinguished from fluctuans Walsh by its more reddish-yellow color and more plentiful cross veins. It is probably very close to montanus Eaton but differs markedly in the discontinuous nature of the vitta and in the coloring and number of cross veins. Dr. Traver has doubtfully associated a
specimen in her collection from San Angelo, Texas, with this species. I take great pleasure in naming this species for Dr. Jay R. Traver, of Cornell University, in appreciation of the kind and invaluable assistance and encouragement she has given me throughout my brief study of western ephemerids.

A NEW RACE OF PLEBEIUS SCUDDERII
BY FRANK CLAY CROSS

Plebeius scudderii ricei Cross, subsp. nov.

Expanse: 28 to 29 mm. Holotype, male; upper side of wings, purplish blue with a greenish cast when viewed aslant. Fringes white with a narrow, dark brown, or blackish band bounding them inwardly. Allotype, female; upper side of wings, brown with a coppery glint. Fringes and marginal band as of the male. Two very faint and ill defined yellowish crescents on the secondaries, near the anal angle.

On the under side the wings of both sexes are a dusty, whitish gray. The submarginal yellow crescents, typical of scudderii, are either obsolescent or entirely absent in most specimens. Among twelve types on which the race is founded, four lack these crescents entirely, five have them very faintly discernible, and only three have them in more conspicuous evidence. The discal and basal black spots on the secondaries are usually very small, or sometimes, like the crescents, altogether lacking, leaving the wing immaculate. The spots on the forewings, however, are always present though much reduced in size.

This race of scudderii is obviously quite variable, but the predominant form tends to lose all its markings. Among seven females, three have no crescents at all discernible on the upper side of the secondaries (both wings are a uniform brown); three others exhibit them very faintly; and only one shows them at all clearly.

The twelve type specimens were taken in August, 1936, in the vicinity of Big Cultus Lake, Oregon, by Mr. Harold E. Rice, of Eugene, for whom the race is named. Holotype, allotype and eight paratypes in the author’s collection in the Colorado Museum of Natural History; two paratypes go to the California Academy of Sciences.
THE JONES COLLECTION OF THYSANOPTERA

BY STANLEY F. BAILEY

University of California, Berkeley

In 1912 Paul R. Jones published (4) descriptions of thirteen species of thrips of which two, *Thrips femoralis* and *Philaethrips jennei*, were from Georgia and the remainder from California. These species of Jones are listed below with their synonymy.


2. **Microcephalothrips abdominalis** (Crawford), 1910.
   - 1912. *Thrips femoralis* Jones, pp. 4-5, pl. I, figs. 5-8.
   - 1923. *Thrips microcephalus* Priesner, Ent. Mitt., 12:116-117, fig. 7 (p. 120).

3. **Sericothrips albus** Jones, 1912, pp. 6-7, pl. II, figs. 2-5.
4. **Sericothrips moultoni** Jones, 1912, pp. 7-8, pl. II, figs. 6-9.
   - 1912. *Limothrips setarius* Jones, pp. 8-10, pl. III, figs. 1-5.
6. **Mycterothrips longirostrum** (Jones), 1912.

*The writer has not seen this reference.*

7. *Tæniothrips costalis* (Jones), 1912.


8. *Scirtothrips albus* (Jones), 1912.

1912. *Anaphothrips albus* Jones, pp. 16-17, pl. IV, figs. 5-8.


10 and 11. *Karnyothrips flavipes* (Jones), 1912.

1912. *Anthothrips flavipes* Jones, p. 18-19, pl. V, figs. 5-7.

1912. *Cryptothrips salicis* Jones, p. 20-21, pl. VI, figs. 1-3.


12. *Hoplandrothrips jennei* (Jones), 1912.

1912. *Phleothrips jennei* Jones, pp. 21-22, pl. VI, figs. 4-6.


During the course of the investigations of the pear (1, 2) and citrus thrips (3) in California by the Federal Bureau of Entomology, Mr. Jones collected thrips quite generally from about 1907 to 1912. During this time he sent material to J. D. Hood* of Rochester, New York, who has retained it. Also it is to be noted that Dudley Moulton has classified and numbered many of Jones' specimens. About 1920 the Jones collection was deposited with E. O. Essig at the University of California. It is indeed unfortunate that of the nine valid species the type of only one, Sericothrips moultoni, is still to be found in the collection. All attempts on the part of the writer to locate the eight missing types have failed, although it is thought that they are still existent.

Since the writer is making a detailed study of the thrips of California, and since Mr. Jones is no longer working with this group of insects, it was thought desirable to catalog this collection in order to preserve its unity and make the information available to those interested. Through the kindness of Professor Essig, this has been done and the catalog is presented below. The genera have been listed alphabetically for convenience. Unless otherwise stated, the species are from California.

**Threbrantia:**

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<td></td>
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<td>Aelothrips fasciatus (Linn.)</td>
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<td>Aelothrips aureus Moulton</td>
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<td>Paratypes</td>
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<td>Aelothrips bicolor Hinds</td>
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<td>Anaphothrips obscurus Müller</td>
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<td>(≡A. stanfordii Moulton?)</td>
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<td>Anaphothrips reticulatus Moulton</td>
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TUBULIFERA:

*Hoplodrothrips funebris* Hood 1 Virginia

*Hoplothrips ulmi* (Fab.) 1 Pennsylvania

*Leptothrips mali* (Fitch) 35 Calif., Ga., Ohio, Tenn.

*Liothrips mantanus* Hood 1 Montana

*Neoheegeria verbasci* (Osb.) 2 Mich., Tenn.

*Rhynchothrips ilex* (Moulton) 46 (2 ♂’s) All stages

Tubuliferous larva (unidentified) 3 Ohio

The published works of P. R. Jones on thrips are listed below.


**WEEVIL LARVAE ANNOYING TO HOUSEHOLDERS**

A. E. Michelbacher reports that during the early part of April, 1936, numerous larvae and decently developed adults of a poplar weevil, tentatively identified as *Dorytomus nubiculinus* Casey, were dropping from a large poplar tree on to a house in Sacramento and worming their way into the rooms through the cracks surrounding the screens, much to the annoyance of the owners. This weevil is rather uncommon in this state, having been found previously only at Sacramento and in the mountains of northern Trinity County.—Edwin C. Van Dyke.
July 26, same locality, by Paul Oman. Nine specimens studied. Seven paratypes, four in the collection of the University of Kansas; three in that of the author, Museum of the California Academy of Sciences.

*Simplex* is most closely related to *wagneri* Blais, and can quickly be recognized by the male having the protibiae unmodified and less widened apically, resembling that of the female. The protibiae are straight, their ventral surfaces not grooved, the margins loosely tuberculate. The pubescent area on the ventral surfaces of the metatibia is longer and heavier than in *wagneri*. The profemora are only slightly inflated. The labial palpi and apices of the maxillary palpi are rufous.

In *wagneri* the ventral surfaces of the protibiae are distinctly grooved and the outer or posterior margin of each groove is the most prominent, with four or five irregularly spaced larger tubercules; the less prominent inner or anterior margin is feebly and irregularly subtuberculate. The pubescent area on the ventral surface of each metatibia is located in the middle third, the hairs are coarse, longer and directed apicad, on and from each side of the median plane, the area is narrow basad and gradually widens toward the apex.

In *punctatus* Blais. the protibiae are quite like those of *wagneri*: broadly sinuate on the ventral surface as viewed from the side. The profemora are distinctly inflated. The ventral surfaces of the metatibia and mesofemora are sparsely punctate, each puncture with a short seta.

In *parallelus* Lec. the pubescent areas of the ventral surfaces of the metatibia and mesofemora consist of dense, short and soft pile, distinctly different from that observed in the other species; besides the protibiae are more arcuate, the femora are more contracted and subcylindrical basally and the metatibiae have a larger tuft of pubescence as viewed from behind.

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**Note**

The undersigned finds it necessary for the present to discontinue the identification of Coleoptera. The task demands too much time and interferes too much with other studies he now has on hand.—Frank E. Blaisdell Sr.
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A REPRESENTATIVE OF AN OLD WORLD SUBFAMILY OF 
ACRIDIDAE IN SOUTH-WESTERN NORTH AMERICA 

BY B. P. UVAROV, D.Sc. 

British Museum of Natural History 

In 1889 L. Bruner described a curious Acridid from Lower 
California which he called 'Dracotettix monstrosus' and placed 
into the subfamily Pyrgomorphinae (Proc. U. S. Nat. Mus., XII, 
1889, p. 49). Later on, he removed the genus, while describing 
two more species of it, again from California, to the subfamily 
Catantopinae, in the vicinity of Tropirotus (Biologia Centrali-
Americana, Acrid., p. 226, 1907). This position of the genus 
appeared to satisfy other American orthopterists. 

Having had a recent occasion to examine a pair of speci-
mens of Dracotettix monstrosus, I was immediately struck by 
the great resemblance of the insect to members of the sub-
family Pamphaginae, hitherto known only from the Old World. 
A more detailed study confirmed the correctness of this impres-
sion, supported by the following morphological data. 

The structure of antennae in Dracotettix, while not impos-
sible for a member of Catantopinae, is certainly such as is very 
common amongst genera of Pamphaginae with moderately 
specialized antennae. In Dracotettix they are fairly stoutly built, 
and the basal joints are distinctly incrassate, thus exhibiting a 
tendency to a differentiation into ensiculus and flagellum of the 
more highly specialized Pamphaginae. 

The frontal ridge of Dracotettix is of a type very characteristic 
for Pamphaginae, though similar structure of the ridge can be 
observed in certain genera of Catantopinae. It is, however, the 
structure of the fastigium of vertex which proves beyond any 
doubt the Pamphagine affinity of Dracotettix. The fastigium is 
oveal in shape, strongly concave, with acute raised margins which 
tend to bifurcate near the eyes, although becoming less dist-
tinct posteriorly. The bifurcated fastigial margins are amongst 
the essential characters of the subfamily Pamphaginae and the 
degree of their development in Dracotettix is exactly the same 
as in Larmorckiana, one of the most typical genera of that sub-

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family. It is interesting to note that *Dracotettix* shares with *Lamarckiana* another detail in the structure of the fastigium, namely, the absence of an apical median sulcus which is well developed in many other genera of *Pamphaginæ*, but not in all of them. Its absence in *Dracotettix*, therefore, cannot be used as an argument against including the genus into *Pamphaginæ*.

The structure of pronotum in *Dracotettix* appears very different from that in all known Old World *Pamphaginæ*, because of the strongly developed lateral carinae, while the median carina and the transverse sulci are of the type to be expected in the subfamily. However, a tendency to the development of lateral pronotal carinae can be observed in many genera of *Pamphaginæ*, not closely related to each other, such as *Ocneridia* (e.g. *canonica* Fisch.), *Euryparyphes*, *Nocarodes*, *Adephagus*, and especially *Akicera*. In the last named genus, the lateral carinae are developed particularly well, and it is interesting to note that the general shape of the median carina in *Dracotettix* is also very similar to that in *Akicera*.

Apparently, the reason for including *Dracotettix* into *Catantopinæ* was the presence of a prominent prosternal tubercle. I had already an opportunity to point out (Ann. & Mag. Nat. Hist., ser. 10, vol. XIV, 1934, p. 469) that this character has no absolute value, and the tubercle may be well developed, or almost absent, in species of *Catantopinæ* belonging to the same genus (e.g. *Dericorys*). On the other hand, the tubercle is well developed in many *Pamphaginæ*, but always arising from the anterior margin of the prosternum, not from its disc. The tubercle in *Dracotettix* is exactly of this type characteristic for *Pamphaginæ*, since it is flattened in front and with the anterior edges formed by the prolongation of the anterior margin of prosternum, while its posterior surface is sloping and rugose. On this character alone, *Dracotettix* should be referred to *Pamphaginæ* without any hesitation.

There is, however, a further highly important character supporting my view, although its presence in *Pamphaginæ* has been underestimated by previous workers. I refer to the specialized (rugulose, or striate) plate at the antero-inferior angle of the second abdominal tergite. Such a plate is a well-known character of the group *Batrachotetrigini* (*Eremobiites* of Saussure,
who also mentioned its presence in Pamphaginæ) of the sub-family Oedipodinae, but my examination of a large number of genera of Pamphaginæ proved that it is not only present in many of them, but often more highly developed than in Batrachotetrignini. Thus, the plate is very distinct and provided with dense parallel ridges in Lamarckiana, Porthetis, Hololopa, Eunapiodes, Ocnerosodes, Akicera, Pamphagus, while in Acinipe, Amigus and Euryparyphes the plate is distinct, but only granulate, not ridged. No plate, or only a very rudimentary one is observed in Ocneridia, Tropidauchen, Nocaracris, Nocarodes, Glauia, Orachamus, Prionosthenus and Pamphagulus. If, therefore, the absence of this plate cannot be regarded as a character excluding a genus from Pamphaginæ, its presence in well developed form in Dracotettix constitutes a very strong argument in favor of including this genus into that subfamily, or into the group Batrachotetrignini. The structure of the vertex in our genus is, however, definitely against the latter possibility.

If still further arguments are needed, the shape of posterior femur and the irregular disposition of the pinnate ridges on its externomedian area in Dracotettix are such as are usual for Pamphaginæ, but not for Catantopinæ. The armature of posterior tibia is also as in Pamphaginæ.

Finally, the male abdomen of Dracotettix is recurved towards the apex which is compressed laterally, with the subgenital plate truncate and tuberculate, as in many Pamphaginæ, but very unlike the various types of abdomen observed in Catantopinæ.

It would be superfluous to quote further minor points in support of my firm conviction that Dracotettix represents a genus of Pamphaginæ. Unfortunately, I have no specimens of another Californian genus Leptoscirtus L. Bruner, considered by American authors closely allied to Dracotettix, which therefore, for the time being remains the sole representative in the New World of the essentially Old World subfamily Pamphaginæ.

The distribution of Pamphaginæ is of unusual interest, as will be seen from the appended map (fig. 1). Its representatives occur mostly in dry rocky regions of South and East Africa, North-West Africa, Iberian peninsula, Western Asia and in the Canary Islands. This type of distribution is, however, not exceptional and numerous parallel cases can be quoted. For instance,
a very aberrant group Orgeriini of the family Dictyopharidæ (Homoptera) includes a considerable number of genera spread over drier parts of the Mediterranean region and into Turkestan, several genera occurring in South Africa, and has representatives in south-western North America. It is particularly significant that the genus Orgerius includes about 20 Mediterranean species and at least four occurring in California, Colorado and Utah (Oshanin, Revue Russe d'Entom., XIII, 1913, p. 135; Melichar, Abh.k.k. zool.-bot.Ges.Wien, VII, Heft 1, 1912). In the Neuropterous family Bittacidæ there are two allied flightless genera, Apterobittacus MacLach. occurring in California, and Anomalobittacus Kimmins of South Africa (Kimmins, Ann. & Mag. Nat. Hist., ser. 10, I, 1928, p. 395; Wood, l.c., ser. 10, XII, 1933, p. 536). A type of distribution very similar to that outlined for Pamphaginæ is observed, amongst plants, in the case of the genus Fagonia of the order Zygophyllaceæ (Popov, Bull. Middle Asian State Univ. 15 1927, p. 248).

Figure 1

It may remain a matter of opinion whether discontinuous distribution of this type should be regarded as giving support to the former existence of an Atlantis, or to Wegener's theory of continental drift. In any case, there is a series of definitely established facts of an ancient faunistic and floristic relationship between the dry semi-desert and desert countries of the Mediterranean region and South Africa, on one hand, and arid south-western North America, on the other.

I am very grateful to my friends, Mr. W. E. China and Mr. D. E. Kimmins, for reference to the literature on their special groups of insects.
A NEW GENUS AND SPECIES OF STREPSIPTERA FROM CANADA

BY RICHARD M. BOHART

University of California, Berkeley

A good series of specimens of both sexes of a remarkable strepsipterous insect of the family Halictophagidae has been sent the author by Miss Margaret Mackay of the University of Saskatchewan. The material was collected by her at Vonda, Saskatchewan, parasitic on leafhoppers of the genus *Deltiocephalus*. On the basis of wing venation, thoracic structure, genitalia, and particularly the peculiar tibiae of this insect, it has been deemed advisable to erect for it a new genus, *Pseudopatella*.

At first glance the legs of the male of this form appear to have an extra segment interpolated between the femur and tibia corresponding to the patella as found in most Arachnida. However, as closer examination reveals no articulation between the apparent segment and the tibia proper, the indication is that the tibia has undergone a basal differentiation. This character is most pronounced in the forelegs, where the "patella" bears a stout, sharp, sclerotized lateral projection (figs. 1, 3, and 5). This condition is unique among the Halictophagidae, to which *Pseudopatella* obviously belongs, by virtue of its seven-segmented antennae and three-segmented tarsi.

For the present the use to which the projection on the front legs is put can only be a matter for conjecture. It appears feasible, however, that it might assist the male in emerging from his puparium. The author has had the opportunity of observing at various times the emergence of several male Strepsiptera from their puparia in wasps and bees. In these forms the male pops off the head or cap of the puparium by pushing against it with its mandibles. It then works its way out with more or less of a wriggling motion, poises for an instant on the edge of the puparium as it unfolds its wings, and flies off. Occasionally the male experiences difficulty in emerging and the author has caught specimens of bees and wasps bearing males dead within their headless puparia. Apparently they had been unable to emerge even after thrusting off the puparium cap.
A projection on the forelegs which could be hooked over the edge of the puparium, thereby increasing the leverage, would obviously be useful during emergence. In *Pseudopatella* this would be especially true as the puparium cap is not completely dehiscent but is connected by a broad ventral hinge with the rest of the puparium (fig. 2), and may likely interfere with emergence.

Other features of *Pseudopatella* in addition to the legs distinguish it in the male from related halictophagid genera. The antennae are less compact than those of *Pentozoe* Pierce, *Cyrtacaraxenos* Pierce, or *Pyrilloxenos* Pierce, but are similar to these in that the segmental prolongations become progressively shorter toward the apex. The second segment of the palpus is slightly longer than the first but is not pointed or strongly tapering as in *Pyrilloxenos*, *Delphacixenos* Pierce, and *Pentacladocera* Pierce. The prothorax is not sunken into the head as in *Pentozoe* and *Stenocranophilus* Pierce and the general relationship of head, pro- and meso-thorax is similar to that of *Pyrilloxenos*. The venation of the hind wings is typical of the more primitive halictophagids, the anal area possessing three veins. The general proportions of the dorsum of the metathorax are most closely paralleled by *Pentozoe* which, however, has a relatively larger prescutum. The ædeagus is more inflated at the base than in *Pentozocera* Pierce or *Cyrtacaraxenos* and more slender than in *Pyrilloxenos*.

The characters of female Strepsiptera parasitic on the Homoptera are so little known that an attempt to ally this form in the female is impossible. The same can be said of first larvae, the figures and descriptions of which have never been entirely satisfactory. The first larva of *Pseudopatella* has five ocelli in each eye, of which the anterior two are directed forward and are sometimes difficult to distinguish. Never more than four and usually only three ocelli have been shown in the figures of previous workers in this family.

**Pseudopatella** Bohart, new genus

(Figs. 1-8)

Male. Antennæ seven-segmented with the last five segments laterally produced; segment four with a large basal sensorium. Eyes with fewer and larger facets below than above. Prothorax
and mesothorax not crowded toward the head. Hind wings with three anal veins. Tibiae basally differentiated, front tibia with a sharp lateral prolongation at the base; tarsi three-segmented, segments nearly equal in size. Metaprescutum small, nearly triangular; postlumbium almost half as long as wide. Ædeagus slender, inflated at the base.

Female. Mandibles with a large apical tooth and sometimes with a very small outer subapical tooth visible. Abdomen apparently five-segmented; first ventral segment with an irregular median darkened area; three transverse median genital openings present on segments two, three, and four, respectively.

First stage larva. Body composed of head, three thoracic, and ten abdominal segments. Eyes with five ocelli. Thoracic segments with two pairs of latero-dorsal bristles each. Tibiae each with a bristle above the middle. Tarsi similar and spatulate. Ninth abdominal segment latero-dorsally with a pair of short bristles, latero-ventrally with a pair of short tubercles bearing long bristles, and with a single apical bristle in the median ventral line. Tenth abdominal segment with a long pair of latero-dorsal bristles and the usual pair of terminal styles.

Pseudopatella mackayi Bohart, new species

(Figs. 1-8)

Male. Body dark brown, hind wings and tarsi pale, second and third abdominal segments each with a pair of dark ventral spots, fourth to eighth abdominal segments each with single large median ventral patches. Head wide V-shaped in dorsal aspect, tapering toward the front; mandibles long-triangular and sharply pointed; maxillae composed of two nearly equal segments, the slightly longer second segment stout, rounded at the tip, and covered with sensoria; antennae with the prolongations of the third to seventh segments becoming progressively shorter toward the apex, segments not closely compressed. Prothorax band-like, not sunken into the head. Mesothorax transverse, composed of two dorsal parts, the anterior of which bears the slender paddle-shaped elytra. Metaprescutum small, almost triangular; each scutum divided into an upper and a lower section by an oblique line; scutellum broad, five-cornered; postlumbium relatively large, depressed, postcutellum evenly rounded, half the length of the entire metathorax. Legs slender; tibia of front leg about twice as long as its basal projection; hind femora slender, arcuate. Abdomen somewhat depressed dorsally; Ædeagus moderately inflated at the base, very slender toward the apex, apical process sharply pointed, forming an acute angle with the main axis. Length of body excluding the antennae, 1.15 mm.; length of the antennae, 0.32 mm.; width of the head, 0.39 mm.; wing expanse, 2.15 mm.
Female. Head yellowish-brown except for the mandibles and apical lobe which are dark brown, thorax very dark brown, abdomen with an irregular patch on the first ventral segment which is brown with a yellowish-brown border and similar in size and shape to the outline of the cephalothorax. Shape of the cephalothorax irregular and angled, strengthened dorsally by rod-like thickenings which pass from the base of the thorax to the posterior portion of the head. Mandibles bent sharply outward near the apex, apical tooth sharp. Base of head with a strong, dark-colored thickening on either side reaching from the edges of the brood passage almost to the hind angles of the head. Spiracles not reaching the margins, less than their diameter from the hind angles of the head. Width of the cephalothorax at the spiracles, 0.22 mm.; width at base of mandibles, 0.14 mm.; width at base of head, 0.24 mm.; width at base of cephalothorax, 0.18 mm.; length from brood canal opening to apex, 0.09 mm.; length from base of cephalothorax to apex, 0.22 mm.

First stage larva. Length of body excluding stylets, 0.175 mm.; length of stylets, 0.065 mm.

Holotype male, allotype female, and eighteen paratypes (four males and fourteen females). All type material collected at Vonda, Saskatchewan, Canada.

Host: *Deltocephalus affinis* G. and B. (det. by E. P. Van Duzee).

Bibliography


Explanation of Plate. *Pseudopatella mackayi* Bohart. Fig. 1, holotype male, dorsal; Fig. 2, empty male puparium, ventral; Fig. 3, male, ventral; Fig. 4, end of male abdomen, lateral; Fig. 5, prothoracic leg enlarged; Fig. 6, allotype female, ventral (egg sac removed); Fig. 7, female mandible enlarged; Fig. 8, first stage larva, lateral.
STUDIES IN THE GENUS HISTER
(Coleoptera, Histeridae)

BY EDWARD S. ROSS

University of California

Subgenus SPILODISCUS Lewis

The Pacific Coast species of the militaris section of this subgenus, militaris Horn, oregonus Csy., electus Csy. and simplicipes Fall, are very closely allied if indeed they be distinct. The last originally described as a rather isolated species and later placed as a variety of oregonus was characterized by having the protibiae non-denticulate along the outer margins. Oregonus was separated from electus by its more coarsely sculptured elytral flanks, almost non-denticulate fore-tibiae, narrower form, finer pygidial punctuation and several other characters; electus being distinguished from militaris by its greater number of pro-tibial denticles.

In an attempt to determine the validity of some of these characters I have brought together as large a series of material relating to these species as I could. Most of this material, in addition to my own, was contained in the collections of Doctors E. C. Van Dyke and F. E. Blaisdell, Mr. J. O. Martin and Mr. L. S. Slevin, deposited in the Museum of the California Academy of Sciences. Unfortunately no specimens were available from Oregon or Washington from which states oregonus and electus were described; however the series contains representatives from many localities in California, from Lassen County in the north, south to San Diego. In spite of this wide range I have concluded that only one species is represented; that being militaris.

For the purpose of determining sex the genitalia of all the specimens were dissected out. A rather interesting correlation of characters was thus discovered; it was found that in every case regardless of distribution, the males possessed the non-denticulate fore-tibiae characterizing simplicipes while only the females had the "normal" denticulate tibiae. In addition the males were found to be on the whole smaller and more narrow with their pygidia distinctly more weakly punctate; otherwise further secondary sexual characters were not apparent. The striation of the pronotum and elytra showed no peculiarities correlating with sex but exhibited sufficient variability to exclude such characters from use in separating these species.
From these observations it is at once apparent that the form described as *simplicipes* is merely the male of *militaris*, also that the characters used for separating *oregonus* from *electus* seem to be secondary sexual in nature; the former undoubtedly being described from a male and the latter from a female. I cannot find in checking specimens of *militaris* with the descriptions of *electus* and *oregonus* any differences other than those subject to variation. However, except for *simplicipes*, the possible synonymy suggested above must not be regarded as conclusive until specimens from Oregon and Washington are available for examination.

Three specimens in this series from Laguna Beach, Calif., representing both sexes are totally black showing no indication of the usual red and black coloration of the elytra. This is not due to the decolorization of the red by exudation of grease as the specimens are perfectly clean and dry. This peculiarity also noted by Fall (1901), indicates that the red and black coloration of the elytra cannot be used as a general characteristic of this section as supposed by some workers.

**Hister s. str. Group Sextriatus**

This group, originally containing the one species *sexstriatus* Lec. (1851) from San Francisco, Calif., has since been enlarged by the addition of *maritimus* Csy. (1916) also from San Francisco and *jacobianus* Csy. (1916) from San Diego. The last was separated from the two northern species by the strong transverse frontal stria of the head which is weaker and inflexed in *sexstriatus* and interrupted medially in *maritimus*. The size and form of the species were also used as characters for their separation by Casey.

In examining over sixty specimens of this group from San Francisco and vicinity I find that the characters used for separating *maritimus* from *sexstriatus* are subject to considerable variation. The frontal stria on one hand may be entire, strong and only slightly inflexed while on the other represented by only weak lateral rudiments. These extremes and all degrees of variation between them may be seen in any large series even when collected in the same locality under identical conditions. Furthermore size and form seem to be in no way correlated with
any structural peculiarities; the length varies from 5 to 8 mm. and averages 6.5 mm. These facts suggest that *maritimus* is merely a variant form of *sexstriatus*.

The southern exponent, *jacobianus*, is readily distinguished by characters which are more constant and which correlate well with its distribution; however they are not sufficiently strong or clearly defined in specimens from its northern limit of range to warrant its status as a distinct species; it seems preferable to consider it as a subspecies of *sexstriatus*. This subspecies is characterized by its strongly impressed transverse frontal stria and by its less definite third dorsal elytral stria. The latter varies, being strong and entire as in *sexstriatus* in some individuals, or almost obsolete except for a fine rudiment in the basal third in others; this latter condition seems to be the most typical in spite of the fact that the form was described from an example having the third dorsal strong and entire. In all other respects including size variation this subspecies resembles *sexstriatus*. It is distributed from the southern San Joaquin Valley in the north, south along the coast and in the mountains to San Diego. I have also seen specimens from south central Arizona which are identical with the California material and which constitute a new record of distribution for the group.

The author wishes to express thanks to Mr. E. P. Van Duzee for permitting use of material in the collection of the California Academy of Sciences, to Dr. E. C. Van Dyke for loan of material from his collection as well as for reading the manuscript and to Mr. H. B. Leech for helpful criticisms and suggestions.

**Collecting Bees From Cactus Flowers**

In collecting bees from cactus flowers the use of a net is distinctly limited. Females of several species may be readily captured by merely placing the mouth of a collecting vial over the flowers from which they are gathering pollen. Males, however, do not always visit the flowers, but in certain species fly rapidly about the plant in constant search for females. This particularly applies in the case of *Diadasia*. These latter may be collected by placing a dead female in the center of a conspicuous flower. The male bees locate the female (apparently by sight) and alight upon the flower, remaining long enough to be easily captured.—E. Gorton Linsley.
NOTES ON THE MIGRATIONAL FLIGHTS OF VANESSA CARDUI IN UTAH

BY DR. JOHN W. SUGDEN

University of Utah, Salt Lake City, Utah

The periodic migrational or dispersional flights of the Painted Lady butterfly, Vanessa cardui, have been described and occasionally they have been so noticeable as to have excited comment in the daily press. The following Salt Lake City and Utah flights have been noted.

1924. The butterflies appeared in large numbers on April 13th and were flying in a northerly direction. They were common in all parts of the city, were seen in the downtown section and the flight continued most of the day. They were most numerous the first day at which time many were flying in pairs but for the remainder of the week only single individuals were on the wing. The insects were lighter in color than the usual mid-summer individuals and all were in good condition. With a hand net specimens were easily collected without moving from one spot as fast as it was possible to remove them from the net.

1930. Starting March 30th and continuing for several days the butterflies were seen fairly evenly distributed over the entire city including the downtown district. Three or four to six or eight could be seen in a city block while traveling in a car. After April 10th none were seen in flight.

1931. On May 3rd many light-colored insects were found all over the city and all were flying in a northerly direction. None were mating or hovering about. They were flying in a steady manner from three to twenty feet above the ground in a direct course deviating only to pass obstacles. During the last week of April a similar but larger flight took place but apparently it was much more extensive as it was noticed in other parts of the state.

1935. On May 7th and 8th very large flights were found from Richfield, Utah (Sevier County) north to the point of the mountain at the junction of Salt Lake and Utah counties, a distance of about 100 miles and a smaller flight was observed over Salt Lake City. The insects were flying north in the usual

\footnote{Pyrameis cardui (L) Cynthia cardui (L) Barnes and Benjamin, 1926 Vanessa cardui (L) Comstock, 1927}
steady manner. About the gardens a few individuals (the residents) were flitting about the flowers. In Richfield there was at the same time a flight of Pieris rapae.

These flights were all of light-colored individuals, flying in a northerly direction on the early warm days of spring. The 1924 flight apparently was very extensive as it has been reported as having been observed from the coast of Southern California as far east as Southern Colorado.

Personal Notes

Certain members of the Pacific Coast Entomological Society are now, or have been, in the field this season for collecting or for scientific research. Dr. Van Dyke spent a part of May and June in Owen’s Valley, California, in charge of The University of California’s summer class 99 in Entomology, making their headquarters at Lone Pine, Inyo Co. Judging from the fine series of insects he has turned over to the Academy he must have greatly depleted the insect fauna of the Valley. From this region the Academy has had little except the rather extensive series of Hymenoptera and diurnal Lepidoptera taken there by the late Chas. L. Fox, and something over 8,000 insects, mostly Coleoptera and Hemiptera taken by R. L. Usinger and the writer in 1929.

During May the writer collected on the Mojave Desert, working out from Palmdale into Mint Canyon and the Antelope Valley to the west and to Little Rock to the east, with one week’s work at Blythe where, however, conditions were too dry and hot for good results. At this writing (July 30) Dr. Van Dyke is working in Northern California and Dr. F. E. Blaisdell at Twain-Harte Lodge, or near there.

Three of the University boys, Mr. E. Gorton Linsley, Mr. Robert Usinger and Mr. Chas. D. Michener, are spending a month in the east visiting some of the more important collections of insects, studying certain groups in which they are interested and comparing specimens with some of the types there. They drove east by auto, visiting collections in Colorado, Kansas, Iowa, Washington, Philadelphia, New York and Boston. They expect to be back in early August.—E. P. Van Duzee.
THREE NEW BEETLES OF THE GENUS CRYPTOCEPHALUS (CHRYSOMELIDÆ)

BY B. E. WHITE

University of California

Extensive study of the genus Cryptocephalus has proven the existence of three new members. These are presented as a fore-runner to a revision that will include the American species from north of Mexico.

Cryptocephalus cerinus White, new species

Wax yellow, large, robust, especially proportionally broader at base of elytra, the third and fifth elytral intervals conspicuously wider, punctures on the elytral disk separated by at least their own diameters.

Female: Head pale, interocular impression and around antennal insertion slightly darker, surface smooth, sparsely punctured, antennæ reaching to first abdominal segment, outer segments darker; thorax two-thirds as long as wide, sides gradually narrowing toward apex then more arcuate to apical angles, hind angles directed backward, surface nearly impunctate, pale brown or slightly fuscous, with a pale yellow crescent-shaped area extending across the base, the tips directed forward, a smaller pale triangular area at the apical margin with the inner angle prolonged up the disk mid-way from the apex; elytra wax yellow with rows of brown punctures, scutellar stria short reaching basal third, first stria extending to middle, the second united at apex with the seventh, the third united at apex with the fourth, the fifth united at apex with the sixth, seventh united at the humeral angle with the marginal stria, all striae entire except sixth which is confused at humeral third, intervals feebly convex, shining and very feebly wrinkled, intervals wide; body beneath and femora pale; prosternum very broad and only feebly convex with the anterior cusp quite blunt and the posterior lateral prominence directed backwards; last ventral segment with a deep, round fovea. Length 6 mm., width 3.25 mm.

Male: Similar to female but smaller as usual, the anterior cusp of the prosternum much more pronounced and acute while the posterior prominences are more widely separated than in the female, only an inconspicuous indication of the fovea on the last ventral segment. Length 4.5 mm., width 2.5 mm.

Type locality: Lebec, California.

Host: Chrysothamnus nauseous subsp. mohavensis Hall.
Holotype female, allotype male, and nineteen paratypes collected by author are in his collection, two paratypes in collection of the California Academy of Sciences, two in A. R. Mead's collection, one in each of the following collections: A. T. McClay and M. A. Cazier, three in R. F. Peter's collection, two in the H. B. Leech collection and ten in the Roy S. Wagner collection.

The larger size, more robust form, arrangement of the elytral striae and punctures and the distinct difference of the prosternum will easily separate this species from *C. spurcus* Lec., which seems to be its nearest relative. *C. spurcus* is consistently found on *Isocoma* while *C. cerinus* seems restricted to *Chrysothamnus*.

**Cryptocephalus spurcus vandykei** White, new subspecies

Fuscous with three black vitta on each elytron confused, black markings on the pronotum, medium to large size, form robust, punctures heavy and close together.

Female: Head pale, a narrow inter-orbital impression and the area around the antennal insertion darker, surface moderately punctate with a single hair arising from each puncture, antennae reaching to basal third of elytra, uniformly dark; thorax twice as broad as long, feebly arcuate at sides, more strongly arcuate near apical angles, hind angles directed backward, color fuscous with lateral basal spots, a median triangular basal spot and two large lateral discal spots darker, the discal spots gradually fading laterally and then fusing with the lateral basal spots, surface moderately finely punctate, the punctuation more dense and coarse in the darker areas; elytra fuscous, minutely rugose with rows of coarse black punctures, scutellar stria short, not reaching base, first stria reaching to apical third, second nearly joining the submarginal at apex, the third and fourth united at apex, fifth and sixth united at apex, submarginal united at base with the marginal; punctures very close, nearly confluent in the striae; area between scutellar stria and suture black, interval between scutellar and first stria fuscous, third interval black, fourth fuscous from apex to basal fourth where it becomes black, fifth entirely black, sixth fuscous from base to apical fifth where it is black, seventh black from base to middle where it becomes fuscous, eighth fuscous from apical tip to humeral umbone which is black, marginal vitta black from apex to middle, fuscous from middle to base; body beneath piceous, paler at middle and sides; prosternum similar to that of *C. spurcus* Lec. but a little more convex and the posterior prominences more approximate; last ventral segment with a large deep fovea at the middle; pygidium dark and heavily punctate. Length 5.25 mm., width 3 mm.
Male: Similar to female but smaller and without the fovea on the last ventral segment. Length 4.25 mm., width 2.25 mm.

Type locality: Carpinteria, California.
Holotype female, allotype male, with twenty-five paratypes collected by the author are in his collection; several paratypes in collection of the California Academy of Sciences and two in each of the following collections: A. T. McClay, A. R. Mead, M. A. Cazier.

There seems to be very little variation in this subspecies other than in degree of color and that is not pronounced. The punctures on the elytral disk are quite constant and the color pattern is very similar in the 75 or 100 specimens examined. The size ranges from 4 to 6 mm. in length. This form has been included in collections with the typical *spurcus* which differs from it by being lighter and having the lighter areas dirty yellow where *vandykei* is fuscous. The markings on the prothorax and the elytral vittae are dissimilar. I take pleasure in naming this distinct geographical subspecies after Dr. E. C. Van Dyke.

*Cryptocephalus cerinus* nevadensis White, new subspecies

Wax yellow, large, robust, especially proportionally broader at base of elytra, the third and fifth elytral intervals conspicuously wider, punctures on the elytral disk separated by at least their own diameters, three well defined black vittae on each elytron occupying the second, fourth, and sixth intervals.

Female: Head pale, interocular impression and around antennal insertion slightly darker, sparsely, finely punctured and pubescent, antennae reaching to first abdominal segment, outer segments darker; thorax two-thirds as long as wide, sides gradually narrowing toward apex, then more arcuate to apical angles; hind angles directed backward; surface shining nearly impunctate, pale with the discal and lateral basal spots fuscous; elytra straw-yellow with three well defined vittae occupying the second, fourth, and sixth elytral intervals, scutellar stria short composed of nine to twelve punctures and extending to basal third, first stria reaching apical third where it nearly joins the second; second extending to apex where it meets the submarginal, third and fourth joined at apex as are the fifth and sixth, the sixth slightly confused behind humeral umbone; submarginal joining the marginal stria at the humeral angle, all striae regular with exception of
sixth, intervals very feebly convex and feebly wrinkled; body beneath and legs pale with occasional sclerites darker, last ventral segment with a deep longitudinal fovea. Length 6.25 mm., width 3.3 mm. Male: Similar to female but smaller and with the anterior cusp of the prosternum much more pronounced. Length 5 mm., width 2.5 mm.

Type locality: Carson Valley, Nevada.
Host: *Chrysothamnus*?
Holotype female (No. 4534), allotype male (No. 4535), in collection of the California Academy of Sciences; two paratypes in author’s collection, all collected by Dr. E. C. Van Dyke.

This form is similar to *C. cerinus* but differs by having very well developed black vitæ. The prosterna of the two forms are identical. Since this form has been confused with *C. confluens* Say it is desirable to give it a subspecific standing for its geographical range is apparently distinct from that of *cerinus*.

**CULTURE METHODS FOR INVERTEBRATE ANIMALS**

In this 8vo work of 590 pages a Committee of the American Association for the Advancement of Science has given us a most useful compendium of articles on the rearing of invertebrate animals for laboratory use and under laboratory conditions. The portion assigned to the rearing of insects fills 259 pages and is divided into 161 short articles, each written by, or abstracted from the writings of, someone who has done authoritative work in this field of entomology. It is distinctively a laboratory manual and will be of great value to anyone having occasion to raise insects for laboratory use or experimentation. Under each species treated we find a detailed account of the writer’s method of raising the insect in quantity under laboratory conditions.

This compendium will be found of equal value to any one interested in life history work on our insects as it will give him the results of carefully worked-out methods on the same or related species. No one interested in the breeding of our insects can afford to miss the results of others’ work as given in this book.—E. P. Van Duzee.

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FOUR NEW CALIFORNIA COLEOPTERA

(Buprestidæ, Scarabæidæ, and Cicindelidæ)

BY MONT A. CAZIER

University of California

Extensive work in the groups enumerated above has disclosed a number of new additions to the Coleoptera fauna of California. These are here presented as forerunners of more monographic works in each group.

Acmaeodera rossi Cazier, new species

Small, robust, flattened; cupreous black, disk of elytra with a wide yellow band extending from base, narrowing to apical sixth, a yellow arm extending around umbone to base, and a small spot isolated at apical third; margin black with cupreous lustre, often with faint yellow spots along discal edge; squamose on both dorsal and ventral surfaces; general shape as in A. insignis Horn. Head with front cribrate, densely clothed with elongate squamae; antennae with fourth segment abruptly wider than third, fifth slightly wider than fourth; clypeus emarginate. Pronotum unicolorous, cribrate, sides and base of disk densely squamose, anterior portion covered with elongate squamiform hairs; sides visible only at base, not wider than elytra, base with deep pit on either side. Elytral margin sinuate, each elytron individually rounded and serrate to middle or union of elytra, apices gradually narrowed, humeral umbone feebly prominent; surface striate, striæ with moderately coarse punctures, intervals slightly convex, each with a single row of setigerous punctures. Prosternum truncate in front. Beneath densely squamose, last ventral segment with single apical border. Length 4.5 mm.; width 2 mm.

Holotype in author's collection. Type locality Holtville, Cal. It is a unique female collected June 27, 1936, by E. S. Ross, after whom the species is gratefully named.

This species is closely allied to A. insignis Horn from which it differs by having the dorsal surface squamose, of a cupreous black color, and by having elytral margins serrate to middle of inner elytral margin. It can readily be distinguished by the densely squamose front and pronotum. Unfortunately no host record is available on this species. As far as I know, A. insignis is known only by the type and two or three additional specimens, all of which came from Lower California.
Phobetus sayl ori Cazier, new species

Small, narrow; head and pronotum black, elytral margins black, disk piceous, beneath black covered with long white pile. Head confluent punctured; terminal segment of palpi not greatly enlarged or grooved; dorsal portion flattened; antennae nine-segmented, club as long as, or longer than, funicle. Pronotum sparsely, evenly punctate, punctures at apex of disk larger; apical and basal margins sparsely clothed with long white pile. Elytra widest at middle, base sparsely clothed with long white pile, sutural striae evident, disk glabrous. Sternum black, thorax densely clothed and abdomen sparsely with long white pile, anterior tarsi longer than posterior, middle tarsi one-third shorter than posterior. Edeagus of the comatus type. Length 11.5 mm.; width 7 mm.

Holotype male in author's collection. Type locality, Little Rock, Los Angeles Co., California, April, 1930. I take great pleasure in naming this distinct species in honor of L. W. Saylor who presented the unique type specimen to me and loaned other material to aid in this study.

This species is remarkably distinct from anything yet described in this genus. The more important features are its small size, black color with elytral disks piceous, long white pile and differential length of the tarsi. All other species in the genus have the tarsi equal or with anterior pair slightly longer. I have not hesitated in describing this species from a unique because I am aware that there are other specimens in other collections. P. palpalis Saylor, the only other black species known, is completely black, larger, with terminal segments of palpi greatly enlarged and grooved, the pronotum is smooth and without pile.

Cicindela californica mojavi Cazier, new subspecies

Size, shape and sculpturing as in C. pretextata Lec.; markings consisting of a slight indentation indicating the inner tip of middle band, all lunules broadly united, pigmented area confined to discal area along suture, ending abruptly at apical fourth; color dull cupreous-green. Head and pronotum granulate- striate, pigmented area of elytra densely punctate; beneath densely clothed with decumbent hair. Length 11-14 mm.

Holotype male, allotype female and eight paratypes in author's collection, two paratypes in the collection of the California Academy of Sciences and seven paratypes in the collection of A. T. McClay. Type localities, Salt Lake and Mojave,
Cal., June 19, 1932. Collected by A. T. McClay and K. D. Sloop who very kindly turned the specimens over to me for study.

This subspecies is distinguished from the middle western C. circumpicta Laf. by its granulate-striate head and pronotum and the elytral markings. C. circumpicta is striate on head with pronotum almost smooth, and markings joined on margin but the lunules are distinct. From pretextata it differs in the type of markings, color and distribution.

In pretextata the markings are again well defined and the color is dull cupreous-brown. The distribution is confined to Arizona, New Mexico, Mexico, Utah and California. As far as I know, the only localities from California are along the Colorado River, and in Utah it occurs at St. George. Both of these localities are different ecologically and are separated by a number of miles from the type locality of mojavi.

The series of mojavi before me presents a variety of colors being cupreous-brown, cupreous-green, green, and blue. This is identical with the variations existing in C. circumpicta, which in one specimen also has the reduced markings as in mojavi. In my opinion this variation is a good subspecies because of its localized distribution, its reduced markings and variable color, as distinct from the closely related pretextata and californica. In color it parallels the variations existing in circumpicta but is structurally distinct from that species. It occurs about the salt lakes in the Mojave desert, along with C. nevadica.

C. californica, which is the species over pretextata, is the most fully marked species in this complex and is dark green in color. It has been recorded from Mexico, Texas, and California and can readily be distinguished by having the pigmented area connected to the margin anterior to the apical lunule.

Cicindela pusilla wagneri Cazier, new variety

Size, shape and markings as in lunalonga from which it differs by having the head and prothorax brilliant greenish-blue, elytra dark blue. Head and prothorax as in lunalonga; elytra more granulate than in that subspecies, these finely granulate areas black. Beneath as in lunalonga. Length 10-11 mm.

Holotype female in the author’s collection, allotype male and one paratype in the collection of Roy Wagner. Type locality, Friant, Fresno Co., Cal., May 21, 1920.
This variation occurs in pure stock at the type locality which is quite different from the habitat of *lunalonga*. It was taken along the banks of the San Joaquin River at Friant which is located in the dry foothills of the Sierra. The habitat of *lunalonga* is at higher elevations where it occurs along shady paths, streams, and in the meadows.

I take great pleasure in naming this variety in honor of Roy Wagner who presented the specimens to me for study. It represents a relatively stable color variation of *lunalonga* which is a subspecies of *C. pusilla* Say.

I would like to acknowledge the assistance given by Dr. E. C. Van Dyke and the generous loan of specimens from the following: E. P. Van Duzee, John H. Robinson, Roy Wagner, K. D. Sloop, A. T. McClay, L. W. Saylor and E. S. Ross.

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A NEW EPINOTIA FROM CALIFORNIA
(Lepidoptera-Olethreutidae)

BY W. HARRY LANGE, JR.

*University of California*

Epinotia keiferana Lange, n. sp.

Expanse 17-18 mm. Palpi long, with first joint silvery white, outwardly ferruginous, tipped with grayish scales; second and third joints ferruginous with grayish scales. Head and thorax ferruginous with scales tipped with grayish. Patagia same color as thorax with few grayish scales along inner edge. Antennae with scape grayish; flagellum yellowish above with black tufts projecting from joints and clothed with light colored hairs; underneath yellowish. Forewing unicolorous; background ferruginous, heavily irrorated with grayish scales, especially beyond discal cell; a distinct cupreous sheen; outer costal margin with cupreous tint and with an indefinite longitudinal area following median vein to outer margin of same color; cilia with dark ferruginous scales, tipped with gray. Hind wings white with distinct fuscous mottling; base of cilia fuscous, rest white with faint indication of sub-terminal fuscous band. Underside of forewings fuscous, irrorated along costal margin; outer margin, and inner margin with gray; underside hind wings white with fuscous mottling. Abdomen grayish. Legs grayish with fuscous scaling; pro- and mesothoracic legs outwardly with more fuscous scaling; tarsi with indication of single grayish annulus on each segment. Male genitalia with harpes broad and costal margin directed inwardly with
blunt apex; cucullus set with well developed spines. Uncus simple, spoon-shaped from beneath with apex bifid.

Holotype, male, collected by Mr. H. H. Keifer at San Francisco, April 14, 1932, as larva, on Salix lasiolepis Bentham, the adult emerging January 6, 1933. Allotype female with same data, the adult emerging January 10, 1933. Two male paratypes and one female paratype with the same data, the adults emerging January 5, 6, and 14, respectively.

This species runs in Heinrich's Key to Group B, without a costal fold, and in the unicolorous section close to arctostaphylna (Kearf.) The costal fold although absent, is indicated by an upturning of the costa for a considerable distance. A variation in the intensity of the reddish-brown background of this species is indicated, and in the irroration of grayish scaling. The allotype shows a much deeper reddish-brown color for the forewings, palpi, patagiae and thorax, the antennae lack the long clothing of hairs of the holotype and the distinct yellowish color is changed to a grayish tint. The male genitalia is distinct, with a camera lucida drawing of the holotype being figured. The forewing in one paratype indicates a darker transverse line beyond the discal cell.

The species is named for the collector, Mr. H. H. Keifer. Types deposited in the California Academy of Sciences, San Francisco (No. 4536, C.A.S., Ent.). Paratypes to be returned to H. H. Keifer.

Male genitalia of Epinotia keiferana Lange

Supplemental Notes on a Cicadellid

By E. P. Van Duzee

Ehromenellus oregonensis Baker

Recently Dr. E. C. Van Dyke has taken eight specimens of this interesting cicadellid, one at Hood River, Oregon, in June, the others at Longmire in the Rainier National Park, Washington, in July. As Baker’s description is insufficient for certain determination of this species I give here a supplemental description that should help. The subconical head, the two polished black points at base of the vertex and the distinct genitalic characters will readily distinguish this species.

A little shorter than uhleri with a more produced and convex head and distinct genital characters, the males with abbreviated elytra as in the females. Length 5-6.5 mm.

Male: Head obtusely conical with the apex broadly rounded, nearly one-half as long as broad across the eyes (15:35); vertex feebly convex, depressed about the ocelli and against the eyes; front distinctly longer than its basal width (25-18), a little more convex than in uhleri. Pronotum proportionately longer, as 14 to 32, in uhleri as 15 to 38; before and behind the callosities more strongly striate than in uhleri. Scutellum more strongly striate, with two transverse foveae; base covered by the pronotum nearly to the foveae as in brachypterous uhleri. Elytra nearly attaining apex of abdomen; costa broadly rounded; veins strongly elevated; basal areole shorter than in female uhleri. Last ventral segment feebly emarginate; plates polished, shorter and flatter than in uhleri, attaining apex of abdomen, with very few short hairs.

Color fulvo-testaceous varied with brown; base of vertex with a pair of polished round black spots; front blackish with pale lineations; sides of pronotum and region of callosities with black marks and vermiculations; basal angles of scutellum dusky, the foveae black; veins whitish varied with brown as are the areolae; base of clavus with a blackish cloud. Abdomen black, apex and a few points on tergum pale. Legs pale, lineate with brown.

Female about as in male, a little larger, the elytra usually showing a distinct oblique pale vitta near the base. Last ventral segment truncate with a feeble emargination; colors paler, especially on the abdomen, which is pale pointed with black.
THE GENUS DACTULIOTHRIPS MOULTON

BY STANLEY F. BAILEY

University of California

The family Dactuliothripidae was erected by Moulton for his Dactuliothrips spinosus in 1931 in this journal (Vol. 7: 173-174). Two new species in this genus have recently come to hand from southern California extending the distribution of this group of thrips some 450 miles south and still limiting the genus to California.

In addition to the generic characters well set out by Moulton, another, common to all three species, is to be noted, namely: the presence of spurs on the inner anterior margin of the fore femora.

This genus is most closely related to Ankothrips Crawford and Melanthrips Haliday since the maxillary palpi are three-segmented (fig. 6) and the labial palpi are two-segmented (fig. 5) in the three genera. The three genera may be separated by the following key:

Second antennal segment produced apically in the form of a tooth. Vertex produced anteriorly. Sensory areas at tip of antennal segments 3 and 4 in the form of a band or ring extending partly or almost entirely around the segments and at right angles to the longitudinal axis of the segments...

Second antennal segment normal; not produced.

Fore tibiae with a strong tooth at the tip. Fore tarsi without claws. Sensory areas on antennal segments 3 and 4 take the form of an oblique line or ring near the tip of the segments partly or almost entirely circling them. Annulations on antennal segments very weak.............. Melanthrips Haliday, 1836

Fore tibiae without teeth. Fore tarsi with a well-developed claw. Sensory areas on antennal segments 3 and 4 are represented by two circular to oval areas on each segment. Annulations on antennal segments strongly developed.................. Dactuliothrips Moulton, 1931

A key to the species of Dactuliothrips based on those characters observed to be constant in a long series follows.

KEY TO THE SPECIES OF DACTULIOTHRIPS MOULTON

Spurs on inner margin of fore femora weak, one to four in number, usually one or two (fig. 11). Head clearly wider than long.
1. Claw on fore tarsus (fig. 14) simple or with a very weak tooth near base. Spines on body fewer in number and less dense than in other two species. Third and basal three-fourths of 4th antennal segment yellow, remainder of segments brown .................................................. *D. xerophilus* Bailey

Spurs on inner margin of fore femora strongly developed, 2 to 9 in number. Head about as wide as long.

1. Claw on fore tarsus simple and knobbed (fig. 10). Spines on body very dense and strongly developed. Antennæ uniformly blackish-brown. Outer post-ocular bristles 91-97 microns; spurs on fore femora 4-9 .................. *D. boharti* Bailey

2. Claw on fore tarsus notched or with small tooth below tip (fig. 13). Antennæ dark brown with 3rd segment yellow. Outer post-ocular bristles 65-78 microns. Spurs on fore femora 2-5 ............................................. *D. spinosus* Moulton

**Dactuliothrips spinosus** Moulton, 1931. (Genotype)

**Distribution:** Willow Ranch, Siskiyou County, California. Cajon Pass, San Bernardino County, California. Valyermo, Los Angeles County, California.

**Hosts:** *Prunus dermissa* (choke-cherry), May 19, 1929, G. R. Struble; *Ceanothus* sp., April 12, 1936, R. M. Bohart.

Since no illustrations accompanied the original description of the genus a few of the more important characters of *spinosus* are presented with illustrations of aid in differentiating the species. All the *Dactuliothrips* specimens studied were mounted in modified Gater's medium which causes a slight swelling of the specimen but enables one to study the chaetotaxy much better. Measurements of structures do not include inter-segmental membranes. Mr. Moulton has kindly compared *boharti* with the type of *spinosus.*

**Dactuliothrips boharti** Bailey, n. sp.

**Female:** Color uniformly dark brown. Fore tibiae and tarsi lighter. Abdomen light grayish brown in newly emerged individuals. Wings uniformly grayish brown, nearly clear in basal fourth. Hind wing clear. All spines dark and very pronounced. Thorax often with slight red pigment. Antennæ uniformly dark brown to black.

**Measurements of type:** Total body length, 1.8 mm.; head, length, .20 mm., width, .20 mm.; prothorax, length, .14 mm., width, .31 mm.; mesothorax, width, .39 mm.; abdomen, greatest width, .45 mm. Length of antennal segments in mm.; I, .033; II, .049; III, .079; IV, .075; V, .075; VI, .077; VII, .067; VIII, .057; IX, .072,
total length, .572. Length of spines: intercellar, .084 mm.; postocular (outer), .097 mm.; (median), .058 mm.; posterior-lateral margin of prothorax, .13 mm.

Head (fig. 1) about as long as wide, cheeks slightly arched, eyes slightly protruding, sockets of antennae projecting forward beyond eyes. Three ocelli. Head reticulate on dorsum, reticulations transverse and becoming stronger on posterior margin. Mouth cone short. Antennae (fig. 9) slender, tapering to tip, rings or annulations present on all segments except I, faint on II. Two circular to oval sensory areas on each of segments III and IV, one smaller area on II. Rings not always constant in number or uniform.

Prothorax (fig. 4) about twice as wide as long. Spines very strongly developed. Legs liberally covered with hairs and spines. Fore femora thickened and armed with from four to nine heavy spurs on inner anterior margin. Hind tibiae only with several well-developed spines at tip. Wings covered with very minute hairs. Fore-wing (fig. 2) broadly rounded at tip, slightly narrower at base. Usually four cross veins, two between ring vein and anterior longitudinal vein, one in center between the two longitudinal veins, and one between posterior longitudinal vein and posterior margin. Occasional specimens are seen with additional cross veins, partly or wholly developed. The number of regularly spaced bristles on the longitudinal veins vary; 13-17 on fore vein, 12-16 on hind vein. Hind wing clear, ring vein thickened near base with several slightly curved hairs and one hooked hair on anterior margin.

Abdomen (fig. 15) broadly ovate, tapering rather abruptly at tip. Faint transverse reticulations on dorsum of segments.

Male: Smaller than female. Tip of abdomen (fig. 3) spatulate. Total body length of male cotype, 1.5 mm.

Described from a long series of specimens collected by Richard M. Bohart, an authority on Strepsiptera, after whom it is named. Collections were made April 10 and 12, 1936, at Tehachapi Pass, California, and Valyermo, California, on Ceanothus sp. and an undetermined host. Additional specimens were collected by him at Palm Springs, California, on March 25, 1937, on a legume. Type locality, Tehachapi Pass, California. Female type (slide T10) and male cotype (slide T11) in author’s collection.

Dactuliothrips xerophilus Bailey, n. sp.

Female: Head, thorax, middle and hind legs dark brown. Fore legs yellowish brown. Antennae with segments I and II light brown, III light yellow, IV yellow, light brown at tip, remainder
of segments uniformly brown. Wings grayish brown, often entirely clear in basal 1/3.

Measurements of type: Total body length, 2.39 mm.; head, length, .20 mm.; width, .24 mm.; prothorax, length, .16 mm.; width, .34 mm.; mesothorax, width, .84 mm.; abdomen, greatest width, .66 mm. Length of antennal segments in mm.: I, .036; II, .059; III, .075; IV, .085; V, .089; VI, .082; VII, .069; VIII, .047; IX, .052; total length .585. Length of spines: interocellar, .084 mm.; postocular (outer) .099; (median), .046; posterior-lateral margin of prothorax, .11 mm.

Head definitely wider than long, cheeks not arched as in boharti and spinosus, widest posteriorly. Three ocelli present.
Reticulations on dorsum of head chiefly transverse and very distinct. All spines weaker than in other two species. Mouth cone short. Antennæ similar to boharti except coloration; sensory areas on segments III and IV somewhat smaller than boharti.

Prothorax (fig. 7) about twice as wide as long, spines more widely spaced and less dense than in other species (figs. 4 and 8). Reticulations distinct. Legs more slender with hairs and spurs weaker. Spurs (fig. 11) on inner anterior margin of fore femora weak and from 1 to 4 in number, usually one or two. Hind tibiae only with well developed spines at tip. Wings covered with very minute hairs. Fore-wing similar to boharti, 15-20 regularly spaced bristles on the anterior longitudinal vein and 12-18 on the posterior vein. Hind wing clear.

Abdomen ovate, tapering rather sharply to the tip. Reticulations transverse and distinct.

Male: Smaller than female. Tip of abdomen similar to boharti. Total body length of male cotype 1.64 mm.
Described from a large series collected by R. M. Bohart in Joshua tree flowers on March 23, 1937, at Mojave and Little Rock, California. Type locality, Mojave, California. Female type (slide T12) and male cotype (slide T13) in author’s collection. Additional specimens were taken by A. E. Michelbacher at Victorville, California, on April 13, 1937, from Joshua tree flowers.

**List of Illustrations**

THE APHID GENUS FLABELLOMICROSIPHUM IN UTAH

BY CLYDE F. SMITH

Genus Flabellomicrosiphum G. & P.


The genus Flabellomicrosiphum may be characterized as follows: Vertex slightly convex; frontal tubercles but slightly developed, not noticeably exceeding vertex; secondary sensoria circular; cornicles merely raised pores; cauda elongate, conical or cylindrical; anal plate rounded; hairs broadly flabellate; rostrum with terminal joint indistinct; ocular tubercles indistinct; lateral tubercles not evident; wing venation as in the genus Aphis.

Key

Unguis more than 2x base; femur dark..............knowltoni n. sp.
Unguis less than 2x base; femur light..............tridentata

Flabellomicrosiphum tridentatae (Wilson) [genotype]


Apterous vivipara. Pale green, appearing frosted due to the numerous fan-shaped hairs, 0.045 to 0.056 mm. long on the vertex and 0.034 to 0.045 on the sides of the abdomen; body 0.94 to 1.43 mm. long to base of cauda; antennae pale, 0.47 to 0.69; antennal III, 0.086 to 0.145; IV, 0.06 to 0.094; V, 0.078 to 0.125; VI, 0.06 to 0.094 plus 0.08 to 0.157; rostrum surpassing second coxae; rostral IV plus V, 0.08 to 0.114 mm. long and needle like; hind tibiae 0.33 to 0.5; hind tarsii 0.08 to 0.11; cornicles slightly truncate to hardly more than raised pores without flanges; cauda 0.12 to 0.17 mm. long.

Collections: On Artemisia, the usual species being tridentata.

Utah: Beaver, August 8, 1936 (G. F. Knowlton, Smith); Beaver Dam, June 3, 1927 (Knowlton); Blue Bench, August 17, 1935 (Knowlton); Blue Creek, May 25, 1927 (Knowlton), and August 1, 1936 (Knowlton, Smith); Clover, April 30, 1936 (Knowlton); Collinston, June 3, 1937 (Knowlton); Cornish, August 9, 1927 (Knowlton); Hansel’s Mountains, May 19, 1927 (Knowlton); Honeyville, July 19, 1927 (Knowlton); Howell, May 25, 1927 (Knowlton); Howell, August 1, 1936 (Knowlton, Smith); Kanab, August 10, 1936 (Knowlton, Smith); Lampo, August 1, 1936

1 Contribution from the Entomology Department, Utah Agricultural Experiment Station.
2 Research Assistant. Publication authorized by the Director.
(Knowlton, Smith); Manti, May 7, 1927 (Knowlton); Nephi, August 7, 1936 (Knowlton, Smith); Parowan, August 8, 1936 (Knowlton, Smith); Promontory, August 1, 1936 (Knowlton, Smith); Rattle Snake Pass, May 25, 1927 (Knowlton); Tropic, August 10 1936 (Knowlton, Smith); Thatcher, August 1, 1936 (Knowlton, Smith); Zion National Park, August 9, 1936 (Knowlton, Smith). Also collected at Yankey Jim Canyon, Idaho, June 12, 1936 (Crystle K. Smith), and at Palisades, Colorado, August 24, 1935 (Knowlton).

**Flabellomicrosiphum knowltoni** Smith, n. sp.

*Apterous vivipara.* Color dull, slaty to pinkish, overlaid with pale hairs which give it a frosted appearance; body 0.96 to 1.5 mm. long to base of cauda and bearing numerous spatulate hairs; hairs on vertex 0.04 to 0.056 mm. long; hairs on abdomen 0.026 to 0.045; antennae slightly dusky, 0.66 to 1.12; antennal III, 0.13 to 0.25; IV, 0.08 to 0.16; V, 0.11 to 0.19; VI, 0.07 to 0.11 plus 0.25 to 0.28; rostrum attaining third coxa; rostral IV plus V, 0.11; femora dark; hind tibie dusky, 0.4 to 0.68 mm. long and bearing blunt to pointed hairs 0.034 mm. long; hind tarsi 0.08 to 0.11; cornicles dusky, merely raised pores, 0.02 mm.; cauda dark, 0.11 to 0.17 mm. long for hard portion, 0.16 to 0.21 total length and bearing two to three pairs of lateral hairs and three to four dorsal or dorso-lateral hairs.

*Alate vivipara.* Color slightly darker than aptera; body 1.4 mm. long to base of cauda; antennae dusky, 1.19; antennal III, 0.3 mm. long and bearing 4 sensoria; IV, 0.2; V, 0.2; VI, 0.094 plus 0.28; rostrum surpassing second coxa; rostral IV plus V, 0.11; femora dark; hind tibie dusky, 0.77; hind tarsi 0.11; cornicles merely raised pores; cauda 0.125 for hard portion, 0.19 total length.

This species differs from *Flabellomicrosiphum tridentata* (Wilson) in being slaty colored and having dusky to black coxae, trochanters and femora; unguis being more than 2x base; rostrum attaining third coxae; rostral IV plus V longer than base of antennal VI; and antennae more than one-half the length of the body.

In Utah on *Artemisia tridentata* at source of Logan City drinking water system, Logan Canyon (type locality), July 4, 1936 (alate and aptera) (Smith), July 30 and August 23, 1936 (Smith, M. W. Allen, F. C. Harmston); Brigham, August 12, 1936 (G. F. Knowlton, Smith); Cedar Valley, May 10, 1936 (Knowlton, Smith); 5 miles north of Kanab, August 10, 1936 (Knowlton, Smith); mouth of Mueller's Park, July 2, 1935 (Knowlton), and
August 12, 1936 (Knowlton, Smith); Salt Lake City, April 25, 1936 (Smith); Spring City, August 11, 1936 (Knowlton, Smith).

Type in the U. S. National Museum. Paratypes in the G. F. Knowlton collection, and in the collection of the writer.

**LEGEND**

Fig. 1.—*Flabellomicrosiphum knowltoni* n. sp. Alata, A, F; Aptera, B-D, G, I; B, body hairs; I, cornicle. *F. tridentata* (Wilson). Aptera, E, H, J-L; K, body hairs; L, hairs on vertex.

**A NOTE ON GYRINID BEETLES FROM ESCUINTLA, GUATEMALA**

BY F. X. WILLIAMS

The Gyrinidae or Whiligig beetles are spectacular performers upon the surface of the water, and a company of these highly polished insects circling swiftly and in close formation upon a quiet pool, is something to look at and admire. In the well-shaded little Guachimtempeque stream a large gyrinid of the genus *Dineutes* was quite plentiful. Measuring up to nearly ¾ of an inch long, broadly oval, convex, with the outer sides of the prothorax and of the wing covers flared so as to form a sort of gunwale, gleaming like burnished metal, each individual of the flotilla moves as if propelled by a powerful motor as with rapid strokes of short, paddle-like legs that are quite invisible from above, it glides in swift and graceful curves among its fellows. Or, undisturbed, the beetles ride carefree upon placid waters, or else there is lazy motion among them but, if alarmed there is tremendous and powerful activity; lightning-like gyrations, or the company breaks up, some dashing off to another part of the pool while others dive and swim swiftly under water.

In captivity we may study their curbed activities at closer range. There are lazy or swift movements, or a lull of a few moments. We note a curved fringe of white hair bordering the front of the head at the water line and that together with the very short antennae may serve to inform the insect when it collides with something good to eat. Its vision is excellent, the compound
eyes being so divided as to enable it to see both above and beneath the water. A wounded insect dropped among the beetles may be quickly seized and devoured, a termite thus speedily disappearing, and a damselfly larva being partly consumed. When seizing prey or cleaning the fore part of the body, the relatively long forelegs, seeming perhaps to consist chiefly of elbows, are brought into play and now become visible from above. When not in use these legs are neatly folded back into a groove in the side of the thorax beneath and thus create little or no interruption in the streamline so necessary for smooth high speed.

The beetle flies well, but it crawls off the water in order to take wing.

The capacity for speed in the adult beetle is to some extent transmitted to its young that leads an underwater life and swims with considerable swiftness by (vertical) undulations of its gill-fringed body. The larva of Dineutes and that of Gyrinus, its smaller and often more abundant relative, are much alike. In addition to being larger however, Dineutes differs from Gyrinus in having the first two of the ten pairs of abdominal filaments or gills, naked, whereas in Gyrinus all of the ten pairs of filaments are hair-fringed or plumose. By scooping up a lot of fine debris in a foot-depth of quiet water of a large pool on which Dineutes was present, I netted three rather delicately made though active centipede-like larvae of a gyrinid beetle—probably Gyrinus, as all ten pairs of filaments were plumose.

These little, slender insects had the head and thorax more or less contrastingly pallid or whitish, with the fronto-clypeal portion of the head, the eye area and the anterior portion of the strong prothoracic shield dark. The head is set on a rather narrow neck. The rest of the body is weakly chitinized, and it is closely speckled with gray, with a more or less broken dorsal and subdorsal stripe. At the caudal end of the body are four chitinous hooks. The chitinized fore part and the terminal hooks suggest a concealed existence, and indeed the larvae spent a great part of their time more or less buried among the loose debris at the bottom of its prison. When disturbed they swim across the dish with really tremendous fish-like speed. Often one would be seen at the bottom of its prison undulating its body banner-like as though the air supply was poor. One of these larvae moulted once and attained a length of about 15 mm., but none completed its transformations.
COLLEMBOLA FOUND UNDER THE BARK OF DEAD TREES
IN CALIFORNIA, WITH DESCRIPTIONS OF
TWO NEW SPECIES
BY DAVID B. SCOTT, JR.
Stanford University

FAMILY SMINTHURIDÆ


FAMILY ENTOMOBRYIDÆ

Under bark of dead Jeffrey pine (Pinus jeffreyi) in the San Jacinto Mts.

Under bark of dead Quercus agrifolia near the Calaveras Reservoir, Diablo Range.


Under bark of many kinds of dead trees throughout California.

Under bark of dead oaks and various conifers throughout California.
A steel blue variety taken under the bark of dead alder in the Arroyo Seco, San Gabriel Mts.

Entomobrya suzannae Scott, n. sp.
Figs. 9-10

Color: Amber yellow with mottlings of dark blue. Head with lateral blue markings extending posteriorly from the eyes and a spot at the base of each antenna. The dorsal spines of the thoracic and first abdominal segments with blue markings, sometimes fairly even but very irregular in other instances. Fourth abdominal segment with transverse lateral bands of blue radiating from an irregular dorsal spot. Segment V with two lateral spots; segment VI unpigmented. Legs with very regular pigmentation: coxae with a compact blue spot; trochanters usually unpigmented: the fore femora slightly tinged with blue, middle and hind femora densely pigmented apically; tibio-tarsi with a well-defined wide median band of blue. Basal joint of antennae usually slightly pigmented; second joint with diffused coloring, the third and fourth entirely blue. Furcula entirely yellow as is the ventral tube. Pronotum thickly clothed with long clavate hairs. Manubrium nearly equal to dentes in length. Crenulations on the dens end at a distance from the apex equal to three times the length of the mucro. Mucone with two teeth and a basal spine reaching to the tip of the antepical tooth. Claws: Unguis slender with a slight incurve to the tip and a pair of lateral basal teeth; inner margin armed with a median pair of teeth and a large apical tooth. Unguicus slender, unarmed, two-thirds as long as unguis. Tenent hair shorter than unguis. Ocelli 16. Length 2.5 mm.

Type locality, Alpine Creek, Santa Cruz, Mts.
Paratypes, Stevens Creek, Santa Cruz Mts.; Calaveras Reservoir, Diablo Range.
Taken under the bark of dead alder in very damp and cool situations. Not common. November-February. This species is close to an eastern form, E. ligata Folsom, but it is larger than ligata and has definite structural differences.

Taken under the bark of dead Monterey Cypress (Cupressus macrocarpa) on the Stanford University campus and under the bark of dead Digger pine (Pinus sabiniana) near Madrone Hot Springs, Diablo Range.
JULY, 1937] SCOTT—COLLEMBOLA 133


**Family Poduridæ**

_**Xenylla helena**_ Scott, n. sp.

Figs. 1-5

Color: Ground color light blue with mottlings of dark olive brown. Integument granular. Antennæ four jointed, contiguous at base, each succeeding joint narrower than the last. Mouthparts in the form of a cone beneath the head. Two anal horns present on last abdominal segment. Furcula small and abortive, attached to antepenultimate segment; dentes slightly longer than manubrium. Mucrones two-thirds as long as dentes. Dentes with five dorsal spines. Mucrones with two long curved antapical teeth and a short and blunt apical tooth. Feet with a single, stout, unarmed, blunt claw. Ocelli 10. Length 1.12 mm.

Type locality: Arroyo Seco, San Gabriel Mts. Taken under the bark of dead alder in very damp and moldy surroundings. January.

**Family Aphoruridæ**

_**Onychiurus fimetarius**_ (Lubbock) (Lipura) Monograph of Collembola and Thysanura, p. 191, London, 1873. Taken in very moldy and slimy conditions under bark of dead California live oak (_Quercus agrifolia_). Also taken
on the inside of a decaying acorn which was found eight inches under ground. Altadena, Cal.

EXPLANATION OF PLATE

Note: All magnifications given below apply to the plate after it has been reduced one-half from the original.

*Xenylla helena* Scott, n. sp. Fig. 1. Head X 60; Fig. 2. Claw of left hind foot X 300; Fig. 3. Right mucro X 400; Fig. 4. Caudal horns X 150; Fig. 5. Manubrium and dentes showing arrangement of spines X 100.

*Drepanura californica* Schott. Fig. 6. Right mucro X 300; Fig. 7. Claw of left mid-foot X 300; Fig. 8. Left eye-spot X 100.

*Entomobrya suzanne* Scott n. sp. Fig. 9. Claw of right foot X 400. Fig. 10. Left mucro X 400.

NOTES ON CROSS MATING INVOLVING TROPAEA LUNA L. AND THE GENUS SAMIA

(Lepidoptera: Saturniidae)

BY J. BRUCE DUNCAN

University of Utah

Observations in 1935 and again in the spring of 1936 revealed that when females of *Tropaea luna* were confined in a cage containing males and females of *Samia gloveri*, males of the latter seemed to show a preference for copulating with the *luna* females while the females of *gloveri* remained unmated. On the other hand there seemed to be no tendency on the part of the *luna* males to mate with females of *gloveri*, although the two were confined together during ten different attempts to induce mating. Furthermore the females of *luna* were not interested at all in the presence of the male *gloveri* and discouraged scores of attempts made by the latter to mate with them.

Male *gloveri* invariably centered their attention by preference upon *luna* females. The males began their mating activities just before dawn each morning and would either have mated or ceased all mating activities long before the sun made its appearance. When several were in the cage they would beat their wings rapidly while walking on the wire screen and would circle around and around the female. Not until one had successfully mated with her would they direct their attention to the females of their own species in the breeding cage.

Copulations occurred in May, 1935, when two *gloveri*
females, one luna female, and one gloveri male were confined to a small breeding cage, and again in early June when two gloveri males, one cecropia male, two cecropia females, and one luna female were kept together over night. In the first case, the male gloveri mated with the luna female and the two gloveri females remained unmated. In the second case one gloveri male mated with the female luna while all other moths in the cage remained unmated. In April and early May, 1936, the experiments were repeated and three more copulations between luna and gloveri were obtained. In all three of these matings there were females of gloveri present which in one instance remained unmated and in the other two instances remained unmated until the luna were paired with males of gloveri. Each one of these five cross-matings involving luna were of the same type (that is, male gloveri X female luna) and although several attempts were made to produce the reciprocal cross, all attempts failed. The males of luna were easily persuaded to mate with females of their own species, but would not mate with females of other genera.

On May 6, 1936, a female luna and a male Samia cecropia copulated. Others in the breeding cage at the time were one male luna and one female cecropia, which remained unattached. At no other time could this mating be repeated although attempts were made at least nine times to induce it.

Although six cross-matings occurred with luna. These involved gloveri in five matings and cecropia in one. In many other instances gloveri males attempted to mate with luna, but were discouraged from doing so by the females. Of the six successful cross-matings, four with gloveri and the one with cecropia proved to be entirely unfertile. One mating, however, involving gloveri and luna, yielded unexpected results. The mating, which has already been mentioned as the second of two occurring in 1935 between a female of luna and a male of gloveri, produced three eggs which were able to hatch. The three young larvae were of the typical luna size but closer observation revealed them to be somewhat darker in color than luna. The larvae were tried on a number of food plants including sandbar willow (the native food plant of gloveri), apple, elderberry, and poplar, but they showed no tendency to do more than
nibble once at any of these plants. Unfortunately the food plants normally eaten by luna were not available for this experiment.

All three larvae died on the day following hatching and were lost through unavoidable circumstances before a more careful study could be made of them. It is impossible to say whether the small larvae would have survived for any length of time even if they had fed upon the available food.

It is difficult to attempt any explanation as to why the members of two such widely separated species should mate so readily when confined together. It cannot be explained merely by the desire to mate, without disregarding the presence of female gloveri in the same cage. To all appearances there was a definite choice by the male gloveri for the luna females, although the reason for such a choice is not apparent. Further experimenting and research may serve to throw more light on this problem.

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BIOLOGICAL NOTES ON TIMEMA CALIFORNICA SCUDDER

(Phasmoidea: Timemidæ)

BY LAURA M. HENRY

Stanford University, California

The genus Timema has but two recorded species, neither of which has been reported outside the state of California. Timema californicum Scudder is confined to the northern and central parts of the state. The following account of the general features of the biology of this species is not entirely complete since observations have not been carried through a full year, but it is a summary of at least the principal facts concerning its life history and habits.

The second species, Timema chumash Hebard, has been reported in southern California. On the basis of present records the two species do not overlap in their distribution.

Specimens of T. californicum have been recorded from the San Francisco Bay region, and from as far north as Humboldt County and south to Monterey and Fresno counties. All specimens have been taken from the Chaparral area. The vertical range of distribution is from 1,000 to 6,500 feet, which includes the Chaparral belts. The species has been recorded by other
authors (Essig, Ferris, Hebard) from Fir, Madrone, Deciduous Oaks, Redwood, Manzanita, Pitcher Sage, Ceanothus, and Garrya elliptica. It apparently feeds on the tender new shoots.

On May 29th, 1935, a trip was made to Loma Prieta Mountain where sixty-seven specimens were taken from Garrya elliptica. These were brought into the laboratory and kept alive, the tender hairs on the backs of the leaves and the new spring growth of Garrya serving as food. The specimens, however, died during the course of two weeks. In three cases tendencies of cannibalism were found.

A second trip was made on June 8th to Loma Prieta. Thirty-nine specimens were collected (4 immature, 18 adult males, and 17 adult females); eighteen of these were from Manzanita, the rest from Garrya. Manzanita proved to be the most successful food in the laboratory, the leaves and the spring bark being used. The plant material in the cages was placed in vials of water and corked with paper toweling. Any drops of excess water which the insects could reach was consumed by them. It appears from this that free water is necessary. The Chaparral regions are for the most part very dry in the summer. The source of water in the natural environment must be from dew and fog which collects on the leaves.

HABITS AND LIFE HISTORY

Records of previous studies by other authors show the earliest collecting of Timema as about May 18th, and that mating takes place during June and July. A trip was made to Loma Prieta on May 29th. At this time specimens were numerous, over sixty being gathered in the course of two hours. They were gathered by beating the Garrya elliptica or Manzanita and picking the fallen insects up from the ground. On August 1st no specimens were found in this same region.

All the females were green with a light yellow lateral line completely around the body; thorax and abdomen with an irregular pattern of green with yellow markings; appendages varying from yellow to rose brown; eyes yellow.

The males were the same green color, but the appendages were rose to brown, deepest in color at the base. Along the dorsal side of the thorax and abdomen dark green and black markings were found. The eyes were blackish. The intensity
of the coloration may vary with each specimen. Five males were found whose ventral side was yellow-green and the dorsal side yellow-brown.

Specimens have been reported which were very pink on the dorsal side and yellow-green on the ventral side.

The female insect is much larger than the male. The living adult female varied in length from 21 to 25 mm. The adult male measured 16 to 17 mm.

No information was obtained as to the number of molts that occur in the life cycle. All specimens gathered were in the last two instars. The latest date known for a specimen to molt into the adult form was June 10th, when one male molted during the night.

Mating. Some few days after the males and females reached maturity they were found pairing. The male crawled upon the back of a female. He placed the fore-legs on her meso-thorax the middle legs on the meta-thorax and the hind legs about one-third of the way down the abdomen. The female carried the male about in this manner throughout the mating and egg laying season of six to eight weeks. The male retained this position by hanging on with the tarsal claws. If a pair were forcibly separated they soon joined each other again. The adult female feeds a great deal, the male only occasionally leaves the female’s back in search of food.

Copulation takes place during the early part of June. The male slides down the back of the female. The tri-lobed clasper is placed under the genitalic plate and the bi-lobed clasper at the base of the plate on the ventral side. The abdomen of the female is bent to the right and slightly upward. This position is held for several hours. Copulation takes place several times during the egg laying period and at irregular intervals. During copulation the female moves about over the plants.

Egg Laying. The first eggs usually appeared about seven days after the first copulation. In one case eggs were produced five days after the first copulation. The eggs are extruded between the valvulæ and held in the cup-like cerci. A fluid is secreted about the egg from the genitalic organs, while it is carefully turned and patted by the cerci. The egg is held by its collar with the tip of the valvulæ. The turning and coating continues for five to ten minutes; when completed the valvulæ re-
lease the egg and it is held in the cerci until the coating is dry and has hardened. When the egg is dry the female may drop it to the ground, but in the majority of cases it is carefully placed on some object. The females deposited many eggs in the folds of the paper toweling which corked the vials, others were placed in the bottom of the cages. Often the female would carry the egg about in search of a proper place to lay it.

The whole process of laying a single egg takes from 12 to 15 minutes; as soon as one egg is deposited a second may be extruded. The number of eggs laid between copulations varied a great deal. Some days only one might be laid, on others five to ten, while often no eggs were laid on a given day. As far as is known, copulation usually takes place at intervals of two to five days during the egg laying period which lasts approximately forty-five days.

Eggs. The length of the egg is 1½-2 mm. and the width is 1 mm. There is a small micropile at one end and a hard collar-like arrangement at the other. The shell is very tough and hard, but not brittle. The eggs vary in color from tan to brown, resembling the ground in which they are normally deposited. When the eggs are first laid and not completely dry they oftentimes pick up debris which helps to cover and protect them.

Timema californicum is a spring and early summer form. The insect presumably passes the late summer and winter in the egg stage and emerges sometime in the spring when the new growth of leaves is developing. Circumstances point to the fact that the span of life is short and that there is only one generation a year.

Defense. The tergite of the prothorax is shield-shaped and at each anterior-lateral angle is a darkly pigmented spot which marks the opening of an odoriferous gland. If the insect is suddenly disturbed, a fluid is exuded from this gland. It is not entirely disagreeable but is rather strong.

Each odoriferous gland consists of a large reservoir and a gland which extends almost the entire length of the prothorax just under the hypodermal layer. The gland is pear-shaped and deeply grooved. The walls of the gland proper consist of cells with very large nuclei. The reservoir is irregular and lies between the gland and the body wall. The cells of this structure are large and have small nuclei. The gland and reservoir are
placed among the body muscles, but there are no muscles attached to them, they being held in place by the ligaments of the prothorax. The salivary gland of the same side of the body lies in close contact under the odoriferous gland.

**Parasites.** Two cases of parasitism were found, both involving adult females. A dead female was found with a parasitic round worm extruded from the body. In the other case an immature stage of a mite was found clinging to the thorax, apparently feeding.

**PROCEEDINGS OF THE PACIFIC COAST ENTOMOLOGICAL SOCIETY**

One Hundred and Thirty-sixth Meeting, June 19, 1934


Dr. Blaisdell read a paper entitled “Some Facts Regarding the Rearing of Tenebrionidae.”

His paper was followed by that of Mr. P. C. Ting, “On a Peculiar Arrangement of the Mouthparts in the Coffee Bean Weevil.” Illustrated.

The third paper was read by Prof. E. D. Ball, “The Number of Generations in a season in Leaf Hoppers.” Illustrated.

Mr. S. E. Flanders presented an illustrated paper on “A Correlation Between the Feeding Habits and the Development and Degeneration of Ovarian Eggs in Pteromalidae.”

Mr. Charles Woodworth read a paper entitled “The Internal Anatomy of a Wireworm,” illustrated by numerous drawings.

The final paper of the program was presented by Mr. F. H. Wymore, on “Observations of the Song of the Cicadidae.”
After discussion of the above papers the meeting adjourned.—J. O. Martin, Secretary.

One Hundred and Thirty-seventh Meeting, September 1, 1934


After the transaction of other business, the nominating committee consisting of Dr. Blaisdell, Dr. Van Dyke and Mr. Usinger proposed the following for officers for the ensuing year: for President, E. O. Essig; for Vice President, C. D. Duncan, and for Secretary-Treasurer, E. G. Linsley. The group was unanimously elected.

Upon recommendation of the membership committee, Mr. William Hovanitz, Mr. Kenneth D. Sloop, Mr. Fred R. Platt and Mr. Frank H. Parker were elected to membership in the Society.

Professor Essig announced the appointment of a Historical Committee consisting of Mr. Van Duzee, Mr. Linsley and Mr. Usinger (Chairman) to collect and preserve entomological material of historical interest for permanent deposition in the files of the Society.

The meeting was opened for a discussion of the summer experiences of the members. At Professor Essig’s invitation Dr. Van Dyke gave an account of a six weeks’ Entomology Field Course at Carrville, Trinity County, followed by a visit to the Forest Experiment Station in Modoc County, then a trip north to Crater Lake, returning by way of the California Coast. He expressed the opinion that the best collecting in this region was during May and June, becoming rapidly less productive following these two months.

Mr. Fred Platt, who had been a member of Dr. Van Dyke’s summer class at Carrville discussed his collecting experiences and exhibited some of the material which had been obtained by the group.

Mr. Parker reported poor collecting in Arizona due to abnormally dry weather.

Mr. Duncan exhibited fragments of scorpions and large insects which had been obtained by sweeping the floor beneath a bat roost. These fragments were remarkable in that they indicated that bats feed upon the ground. Mr. Duncan substantiated the latter assumption with an account of seeing a bat feed upon a Jerusalem cricket on the ground.

Dr. Blaisdell stated that he had done some collecting in Madera
County and exhibited drawings of the larvae and pupae of various Tenebrionidae which he had been studying.

Following Dr. Blaisdell's remarks the meeting adjourned.—J. O. Martin, Secretary.

One Hundred and Thirty-eighth Meeting, December 1, 1934


Upon recommendation of the membership committee, Miss Janet Mabray, Mr. Julius Freitag and Mr. Joseph Reitzel were elected to membership.

Dr. Van Dyke presented to the Academy, on behalf of L. W. Saylor, an early collection of California insects made by L. E. Ricksecker.

Professor Essig introduced Mr. J. E. Cottle, who addressed the Society upon "Some methods for the collection and study of the Lepidoptera." Mr. Cottle exhibited various types of nets and equipment for the capture of various types of butterflies and moths and discussed methods for the preservation of material after capture. Mr. Keifer added a few words about technique of collecting and mounting Microlepidoptera. Dr. Van Dyke mentioned the use of cellophane cages for rearing larvae, and Mr. Harrison stated that he had found copper useful in setting chlorophyll in green larvae.

Following Mr. Cottle's talk, Dr. Van Dyke addressed the group upon "Some famous California collecting places." Dr. Van Dyke discussed the various localities where he had encountered good collecting during his many years of field experience and remarked upon some of the rare species he had found in these areas.

Upon the conclusion of Dr. Van Dyke's paper, the meeting adjourned.—E. G. Linsley, Secretary.

One Hundred and Thirty-ninth Meeting, March 9, 1935


Upon the recommendation of the membership committee, Mr. John C. Lindahl and Mr. Arnold Mallis were elected to membership.

The historical committee, consisting of Messrs. Usinger, Van Duzee, and Linsley was made a permanent one, the Permanent Historical Committee of the Pacific Coast Entomological Society, and Dr. C. D. Duncan and Mr. H. L. McKenzie were added as regional members.

The President appointed Mr. Linsley and Dr. Killeen to represent the Society at the summer meetings of the Pacific Division of the American Association for the Advancement of Science to be held at the University of California at Los Angeles in June.

Mr. J. L. Gressitt, a member of the Society who has spent many years in the Orient, addressed the group upon "Some Aspects of Entomology in the Japanese Empire." He discussed the development of entomology in Japan, mentioning in particular the Imperial University, the Imperial Agricultural Stations, and the Central Research Institute in Formosa, as well as the outstanding entomologists in the region. He also pointed out the similarity between the insect fauna of Japan and that of Europe and North America and the close relationship between that of Formosa and the Himalaya region of North India. In conclusion Mr. Gressitt exhibited various periodicals and entomological books published in Japan and Formosa.—E. G. Linsley, Secretary.

THE FENYES COLLECTION OF COLEOPTERA

The California Academy of Sciences has recently secured the collection of Coleoptera formed by the late Dr. Adelbert Fenyes of Pasadena. It is too early now to make an estimate of the number of species or specimens in this collection but it will bring the total number of mounted insects in the Academy collection to well above one million. The Fenyes collection is strong in the family Staphylinidae of which there are 2700 determined species. In the Aleocharinae, in which subfamily Dr. Fenyes specialized, there are 1800 determined species. His was a world collection but, aside from the North American fauna, it is strongest in that of Europe and Mexico. As the Academy collection is comparatively weak in these faunas this Fenyes material will add a much needed element. We hope to include a biographical sketch of Dr. Fenyes in the next issue of this journal.
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Entered as second class matter, February 10, 1925, at the postoffice at San Francisco, California, under Act of August 24, 1912.
Dr. Adalbert Fenyes
1863 to 1937
On a morning in early spring in the year 1897 there called at my door in Pasadena, California, a gentleman of pleasing personality, who, though speaking English perfectly, spoke it with a slight accent that indicated a foreign nativity. He introduced himself as one interested in entomology, and said he had been directed thither by the city librarian. My visitor became so enthusiastic over what I had to show him that instead of continuing on a world tour with his wife as projected they decided to remain awhile in Pasadena and to that end rented a beautiful home on Orange Grove Ave. for an indefinite residence. This was my first meeting with Dr. Fenyes, the subject of this sketch, and the beginning of a close and cordial intimacy which lasted throughout the twenty remaining years of my residence in Pasadena.

Dr. Adalbert Fenyes was born in Arad, Hungary, Nov. 17th, 1863. His father, Carolus Fenyes, was an attorney and of noble birth. Dr. Fenyes was an honor graduate of the University of Vienna; he was at the Court of Emperor Franz Joseph as an officer in the Army Reserve, being a physician. In 1893 he went to Cairo, Egypt, where he practiced medicine for several years, associating there with the highest potentates of the city. It was here that he met his first wife, a New York lady, whom he married in Florence, and with whom he was making a world tour when his trip was interrupted at Pasadena as I have mentioned above.

Dr. Fenyes was always a great nature lover and in his early years was a devotee of Ornithology, but he had already become a confirmed Entomologist before coming to America.

Once established in Pasadena the Doctor immediately procured the necessary equipment and began systematic collecting in the vicinity. Within a short time he brought me specimens of two rare Melyrids, *Microlipus prolixicornis* Fall and *Listrus*
definitus Fall, previously unknown and so far as I know not since taken by any other collector. His crowning discovery however came several years later when he turned up on Mount Wilson specimens of that large and handsome Eucnemid *Palaeoxenus dohrni* Horn, which, though said to have been found at San Diego, was believed by its describer to have really come from tropical America.

For a good many years Dr. Fenyes made extensive collecting trips to various parts of the country and to Mexico. By this means and by exchange and purchase he rapidly amassed a very large general collection, including much exotic material; also a valuable library, both being housed in a fireproof building erected for the purpose. About 1905 he began a special study of the Staphylinid tribe Aleocharinae. He devoted himself to this work with so much energy and success that in ten years he became recognized as a world authority on this difficult group and was asked to prepare the manuscript thereon for the Wytsman Genera Insectorum. Aside from this monumental task he published about a dozen short papers on his specialty. Moreover at the time he ceased all activity in Entomology, some ten years or more ago, he had completed the manuscript and drawn the plates, containing 766 accurately colored figures, for a monograph of the North American Aleocharinae, a work of such magnitude that no publisher at the time could accept it, and it now passes with his collection into the custody of the California Academy of Sciences.

Dr. Fenyes continued the practice of his profession in Pasadena. He was a pioneer in the use of the X-ray for medical purposes and installed in his office the first X-ray machine to be brought to that city. In recognition of his work in this field he was made an honorary member of the American Medical Society.

After ceasing active work in Entomology he took up gardening as a hobby, specializing in the raising of fine carnations, importing seeds from England and developing specimens that attracted the attention of horticultural experts. He also gave much time in later years to music.

Highly educated, an accomplished linguist, a distinguished physician, a world famed entomologist, an ardent horticulturalist,
a connoisseur in music; truly a remarkably versatile man, and withal a gentleman of the finest type.

Dr. Fenyes died February 22nd, 1937, after a short illness. His second wife, Louise Hiller Fenyes, whom he married May 14, 1930, survives him. He left no children.

Dr. Fenyes’ large collection of Coleoptera, numbering around seventy-five thousand specimens, both native and exotic, as well as his library and all his manuscript have been purchased by the California Academy of Sciences and removed to San Francisco. His specialized collection of Aleocharinae, included in the above, comprises some nineteen hundred species and 19,600 specimens from all quarters of the globe, and is probably unequaled in any other collection in the world. The California Academy is certainly to be congratulated in securing this extremely valuable material.

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**Uber Entomologische Sammlungen**

The third part of this work, under the editorship of Dr. Walter Horn of the Deutsches Entomologisches Institut at Berlin-Dahlem, has just been published, August 1, 1937. This brings the work to completion, making a volume of 536 pages of text and 38 plates. In this most useful publication are given in alphabetical order, the names of all entomologists, present and past, who have assembled collections of insects of any extent, together with the places where these collections are deposited. The plates give reproductions of characteristic labels of all important entomologists. In addition the third part gives some few short biographies, remarks concerning insect collections and discusses the question of the future of systematic entomology.

The work is a splendid one with a great amount of important data concerning the collections of the world which has been painstakingly assembled by Dr. Horn and his assistants, over a period of many years. No student of entomology who wishes to know something of the collections of the world, where they are to be found, or get an idea of the individual manner of labeling or characteristic autography, can afford to be without this most useful publication.—Edwin C. Van Dyke.
BEES FROM SAN MIGUEL ISLAND, CALIFORNIA

BY T. D. A. COCKERELL

The bees recorded below were taken during the last week of July, 1937, on the occasion of the expedition of the Senior Boy Scouts to the Island.

**Bombus californicus** Smith

Rather common on San Miguel, at flowers of *Mesembryanthemum crystallinum*, July 28 and 30. One is a male, with long antennæ and two yellow-haired tergites.

On the mainland, at Santa Barbara (July 16 at flowers of *Leptosperrnum*) Francheschi Park (July 17, at Gaillardia) and at Montecito (July 18, collected by Donal Jones) the similar looking *Bombus* is *B. vosnesenskii* Radoszkowsky. Also on the mainland, at Carpinteria, July 17, at flowers of *Vicia*, I took *B. fervidus* Fabricius.

**Bombus nevadensis miguelensis** Cockerell, new subspecies

Male. Hair of face nearly all black; lower part of pleura with black hair; dorsum of thorax with a very large pure black patch, which does not nearly reach tegulae at sides, though the interval between the patch and the tegulae has black hair intermixed; first two tergites with light yellow hair, third with black hair basally but a broad light yellow fringe; fourth tergite with black hair, apex with red. The genitalia are of the *B. nevadensis*, not *B. crotchii*, type.


**Bombus crotchii semisuffusus** Cockerell, new subspecies

Female. Hair of occiput and vertex all black; yellow band of second tergite much weaker, not broad and sharply defined, its middle portion dusky; the two apical tergites have red hair. The basal nervure goes a little basad of nervulus in this species.

California: San Miguel Island, July 30, at flowers of *Mesembryanthemum crystallinum*. 
Epeolus eastwoodæ Cockerell, new subspecies

Male. Length about 8 mm.; black, including antennæ, but the tarsi entirely red, and the tibiae reddened at apex; tegulae bright chestnut red posteriorly, but black in front; apical plate of abdomen reddish black; eyes very dark greenish. Head broad, orbits converging below; face densely covered with pure white hair, except apex of clypeus which is dull and minutely granular, with the margin shining; mandibles bright red in middle; scape swollen, highly polished; flagellum rather thick; mesothorax and scutellum dull and minutely sculptured; hair of thorax above distinctly tinged with ochreous; anterior middle of mesothorax densely covered with hair, taking the form of two very broad bands separated by the median incised line, each band emarginate posteriorly; anterior corners of mesothorax covered with hair, weakened mesad and just reaching the bands; posterior margins of mesothorax and scutellum (the latter including axillæ) covered with hair, the band on mesothorax broadened at sides; postscutellum with dense pale hair; metathorax hairy at sides, the median and basal bare areas dull seen from above, but moderately shining from another angle; mesopleura mainly densely hairy, but with a transverse bare spot on upper part, and a large bare area (shining between punctures) below; wings a little dusky at apex; recurrent nervures joining second and third cubital cells near middle; hind coxae with a conspicuous band of pure white hair; pale hair of legs otherwise slightly ochreous; spurs pale red; black area of first tergite a broad transverse band, straight in front, obliquely truncate at sides, angulate in middle posteriorly, almost dividing the apical hair-band; hair-band of second tergite rather broadly interrupted in middle, and having a rounded projection at each side in front, the angle formed by the projection and the band beyond a little less than a right angle; hair-bands on tergites 3 to 5 narrowly interrupted, the upper margin of that on third strongly undulate; first two sternites mainly covered with white hair, and third with an apical band, which is slightly interrupted in middle.

California: San Miguel Island, Cuyler’s Cove, near the shore, July 27, 1927 (Cockerell). It was at flowers of Malacothrix implicata Eastwood. In my tables it falls nearest to Epeolus heterurus Cockerell and Sandhouse but it differs in the pattern of the thorax, the partly bare mesopleura, the very short axillary spines, the clearer wings, narrower third cubital cell, straight anterior margin of black area on first tergite, and other characters. The mark on first tergite is much more like that of E. rufomaculatus Cockerell and Sandhouse. Named after Miss Alice Eastwood,
who has advanced our knowledge of the flora of the islands more than any other living botanist.

**Anthidium palliventre vanduzeei** Cockerell, new subspecies

Larger (female about 12.7 mm. male about 14.5 mm.) all the tibiae of male with a yellow stripe; corners of sixth tergite of female prominent.

California: San Miguel Island. First found (one female) by Mr. E. P. Van Duzee, who was the first to collect a bee on San Miguel Island. I took a pair at Cuyler’s Cove, July 30, 1937, hovering over Phacelia scabrella Greene. The male is the holotype.

**Anthophora californica** erysimi Cockerell, new subspecies

Female. Larger and more robust, with broader face, and black instead of green eyes; width of head nearly 5 mm. width of abdomen nearly 6 mm.

California: San Miguel Island, on the top, at flowers of Erysimum insulare Greene, July 20, 1937 (Cockerell).

At Santa Barbara, August 2, my wife took A. urbana Cresson at flowers of Lantana. This species has a representative or subspecies (A. catalinae Cockerell, 1901) on Santa Catalina Island.

**Agapostemon californicus** psammobius Cockerell, new subspecies

Male (type). Scapae all black; hind tibiae marked with black; hind femora usually with a continuous broad black band, bent in middle, on inner face (in one specimen this band is interrupted); venter with less yellow; genitalia with the squama intermediate in type between that of A. texanus and A. angelicus as figured by Sandhouse (Jl. Wash. Acad. Sci., 26, 1926, p. 81); the slender curved lower lobe is essentially as in A. texanus, but the upper one is produced, slender, like the end of a finger, the sinus between the lobes is elongate-oval; rounded below.

Female. Metathorax above less sculptured, the rugae indistinct; tegulae very dark brown, or a little green in front, with a yellow spot.

The male differs from Crawford’s description of A. californicus thus; wings not clouded apically; front and middle femora broadly black above; hind femora as described above; venter with yellow only on basal part.
California: San Miguel Island, end of July, mostly at flowers of *Mesembryanthemum crystallinum* on the top of the island, but one female near the shore, Cuyler's Cove, at *Malacothrix implicata*. On Princess Islet a fragmentary male, remarkable for having the yellow band on first tergite rather broadly interrupted, was found in a web of *Metepeira gosoya* Chamberlin and Ivie (det. Gertsch), in a clump of prickly pear, *Opuntia littoralis* (Engelmann). In this specimen the mesothorax is of a splendid purple-blue.

I collected *A. californicus* Crawford at Santa Barbara, July 11-17, at flowers of *Mesembryanthemum, Scabiosa* and a boraginaceous plant. The female has the metathorax above strongly sculptured, the rugæ strong and regular; tegulae fulvotestaceous, with a yellow spot. The male has or lacks a yellow stripe on scapa.

**Halictus pavonotus** Cockerell

This very distinct species has been known from the sand hills at Pacific Grove and San Francisco. Sixteen males were taken on San Miguel, but no females. One male bee has the head unusually broad (diam. pr. 2.5 mm.) but is only an individual variation. All were taken at Cuyler's Cove, visiting flowers of *Malacothrix implicata*.

**Halictus (Seladonia) meliloti catalinensis** (Cockerell) was taken in some numbers at Santa Barbara, females at flowers of *Ceanothus* and fennel. This bee was described from Catalina Island, but has long been known to be common on the mainland. No *Seladonia* occurred on San Miguel. The only other metallic-colored *Halictus* which I took at Santa Barbara was *H. helianthi* Cockerell, females common on fennel, but also taken on *Ceanothus* and marguerite daisy. This was not found on San Miguel.

**Halictus (Chloralictus) grinnelli**, Cockerell

One female was taken, at flowers of *Eschscholtzia* near the ranch house, on the top of the Island. I cannot separate it from *H. grinnelli* described from the Coronado Islands.

**Halictus (Chloralictus) nevadensis** Crawford

San Miguel, one female on top of Island, near ranch house, at flowers of *Eschscholtzia*, July 31. This has the general ap-
pearance, yellowish wings and reddened tarsi, of *H. nevadensis*, but compared with a paratype, differs by the longer area of meta-
thorax and depressed line down middle of scutellum. The latter character is evident in a specimen of *H. nevadensis* I collected on the Coronado Islands. My series of specimens, attributed to *H. nevadensis*, is variable, and it is possible that closer study, with more material, will prove the existence of more than one species.

**Halictus (Chloralictus) megastictus** Cockerell, new species

Female (type). Length about 6 mm., anterior wing 4; head and thorax rather dark green, with long outstanding entirely white pubescence; head broad, with projecting clypeus; antennæ black, mandibles dark red at extreme apex; apex of clypeus thickened, black; supraclypeal area large, brassy; mesothorax dullish, finely punctured, the median groove strong; scutellum shining on disc; area of metathorax broadly truncate behind, with thickened margin, the surface dull, the sculpture not distinctly seen under a lens; metathorax dark bluish; tegulae large, black, very strongly punctured, rounded behind; wings clear hyaline, not reddish, the stigma and nervures very pale; legs black with abundant white hair, the hind basitarsi with a red apical brush; hind spur with four spines, the first two very long; abdomen shining black, the first tergite a little greenish; basal corners of second tergite, and the following ones entirely covered with white tomentum, which under the micro-
scope has the appearance of small scales, though there are also long hairs; the fourth tergite is distinctly green under the hair.

Male. Similar, with the same large, black, punctured tegulae; no light markings in region of mouth; clypeus with two shining elevations; face covered with white hair; flagellum long, pale red beneath; mesothorax highly polished on disc; scutellum with a median sulcus; plīce at sides of area of metathorax very distinct; no light color on legs; abdomen shining black, the first three ter-
gites with basal corners covered with pale hair, the others hairy all over, some of the hairs long, the others short and plumose.

San Miguel Island, end of July (Cockerell). The female at flowers of *Malacothrix implicata*, at Cuyler’s Cove. This is super-
ficially similar to *H. grinnelli*, and I had confused the two until I observed the tegulae. Being a comparatively large species with punctured tegulae it suggests *H. nymphaearum* Robertson, but that is considerably larger, with the area of metathorax very coarsely sculptured; in the male the scutellum is strongly bigibbous, and the face more narrowed below.
Halictus (Chloralictus) perichlarus Cockerell, new species

Female (type). Length about or nearly 7 mm., anterior wing 5; olive green, including the shining abdomen, the upper part of clypeus and the supraclypeal area cupreous, margin of clypeus broadly black; pubescence long and outstanding, entirely white; antennae and mandibles black, the latter very faintly reddish at tip; head broad, cheeks ordinary; mesothorax strongly punctured, dullish, shining on posterior disc; scutellum shining, well punctured, with no median sulcus; area of metathorax coarsely plicate, with a thick shining rim; tegulae very dark brown or black, without distinct punctures; wings grayish hyaline, a little yellowish at base, stigma and nervures pale; legs black with white hair; hind spur with four stout spines; abdomen shining olive green, the hind margins of the tergites reddish; the abdomen has long hair at sides, and tomentum at lateral bases of second and third tergites (under the microscope this appears as minute, scale-like hairs) and the apical tergites have in addition much long hair. One specimen, which I at first thought might be distinct, has the last three tergites closely hairy all over, while the second tergite has the basal corners very broadly hairy.

Male. Smaller and slender, with parallel-sided abdomen; no light marks in region of mouth or on legs; flagellum long, dusky red beneath; mesothorax shining; abdomen with little pale hair.

San Miguel Island, end of July, eleven females and one male (Cockerell). The male was at Eschscholtzia, near the ranch house, July 31; three females were taken at the same time on these flowers, but all the rest were at flowers of Mesembryanthemum crystallinum. The following key separates it from several which are more or less related:

1. Females ................................................................. 2
   ... Males .................................................................. 5
2. Mesothorax strongly shining; abdomen dark green, the margins of tergites dark brown................................. 3
   ... Mesothorax dull or dullish.............................................. 4
3. Larger and more robust; clypeus and supraclypeal area shining green; area of metathorax dull, with fine parallel plicae .................................................................disparilis Cresson
   ... Smaller; clypeus hardly at all green; area of metathorax shining, basally plicate........................................cattellae Ellis
4. Head oblong; mesothorax entirely dull; tegulae pale or red ........................................................................pilosus Smith
   ... Head broad; mesothorax shining on disc; tegulae dark ........................................................................perichlarus Ckll
5. Abdomen obscurely greenish; mesothorax highly polished; tarsi clear red................................................disparilis Cresson
   ... Abdomen strongly green................................................. 6
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6. Head very broad; tegulae and tarsi dark......perichlarus C&K

... Head suboval, tegulae pale; tarsi pale reddish......pilosus Smith

The female may also be compared with H. diversopunctatus Ellis, which is a rather large species, with extremely hairy thorax, yellowish wings, plicae of area of metathorax very strong, abdomen green.

Halictus (Chloralictus) punctiferellus Cockerell, new species

Female. A small species similar to H. tegularis Robertson and H. tegulariformis Crawford, with strongly punctured tegulae and pectinate hind spur. In the Sandhouse table it runs straight to H. tegulariformis, except that the tegulae are rounded posteriorly, but this character seems rather elusive depending on the angle of vision. Comparing Crawford’s description of H. tegulariformis, it agrees in having the parapsidal grooves not apparent, and the punctures along the median groove of mesothorax not finer than the rest; but on comparing a specimen of H. tegularis received from Robertson, these characters do not seem very distinctive. The first tergite is very distinctly transversely lineolate, which it is not in H. tegulariformis, as described by Crawford. H. tegulariformis was described from Nevada, but according to specimens before me, it ranges from Colorado and New Mexico to Baja California. On comparing a New Mexico one with one from Baja California, the former has the area of metathorax tessellate, with few strongly divergent plicae, while the latter has many irregular but more or less parallel plicae.

I strongly suspect that the species, as we have understood it, is composite. It seems, however, to be distinctly different from the Illinois H. tegularis.

Length about 4.6 mm., anterior wing nearly 4; head and thorax dark blue-green; pubescence rather dull white; mandibles and antennae black, the flagellum very faintly brownish beneath; clypeus and supracypeal area shining, clypeus rather golden-green above, a little coppery in middle, black apically; supracypeal area colored like the shining band along orbits, the front being otherwise dull; mesothorax anteriorly with the median groove very deep, and the region on each side of it shining, though well punctured; posteriorly the mesothorax is dull; scutellum with a median depression, on each side of which is a sparsely punctured shining area; area of metathorax rather large, dull dark blue, seeming without plice, but the microscope shows very delicate well separated irregular radiating plice; tegulae black; wings clear with very pale stigma and nervures, the stigma with no dark margin (the character of the stigma shows that this cannot be the female

1 Michener (1937) has separated a species of this group from Albuquerque, New Mexico, as H. albuquerqueensis n. sp.
of *H. gaudialis* Sandhouse); legs black with white hair, a copper-red brush at end of hind basitarsi; abdomen rather broad, highly polished, black with the hind margins of the tergites brown or pallid; first two tergites with pale hair at basal corners, the others hairy but not densely so.

California: San Miguel Island, end of July (Cockerell).

**Halictus** (Chloralictus) *pilosicaudus* Cockerell, new species

Female. Length about 5 mm.; wings short, the anterior wings about 3 mm.; head and thorax olive green, the metathorax darker and bluer; but not strongly contrasting; pubescence dull white, covering the last three tergites with dense tomentum; head broadly oval; clypeus short, its lower part black, its upper part and the supraclypeal area copper red, the supraclypeal area very brightly colored with almost a rose tint; middle of mandibles broadly red; flagellum short, dull red beneath; mesothorax dullish, the microscope showing very dense, uniform, strong punctures, often running in rows; scutellum shining anteriorly; area of metathorax large, triangular, with dense vermiform plicæ (the intervals shining) on somewhat more than basal half, the apical part very minutely rugose; posterior truncation small, shining; tegulae pale, not punctured; wings clear, faintly yellowish, the stigma and nervures very pale, the stigma with no dark margin; legs black, with reddish tarsi, the basitarsi distinctly red; hind spur with three stout teeth; abdomen black, with a faint greenish or brassy lustre, in one specimen with a purple band across first tergite; margins of tergites pallid, more or less reddish; first two tergites showing the shining surface, though the basal corners are hairy, the others densely covered with hair.

California: San Miguel Island, end of July (Cockerell). It visits *Malacothrix implicata*. Nearest, apparently to *H. brunneiventris* Crawford, differing by the dense pilosity of apical half of abdomen, and the sculpture of metathorax. In the Sandhouse table it goes to *H. nevadensis*, which (paratype compared) is a very different species, with a round head. In my table it falls near *H. sparsus* Robertson, which is really quite different.

**Halictus** (Chloralictus) *cabrilli* Cockerell, new species

Male. Length about 4.7 mm., anterior wing about 4.2; rather slender, with large broad head, approximately circular, seen from in front; head and thorax bluish green, the mesothorax highly polished, with very distinct but well separated punctures; metathorax bluer, the basal area dark blue; mandibles and region of mouth all black; flagellum long, pale red beneath; legs black, the
hind tarsi red at extreme tip; abdomen shining black, with sparse outstanding hair, conspicuous at sides; pubescence dull white, long on head and thorax; tegulae very dark brown, without distinct punctures; wings clear hyaline; nervures and stigma very pale, but stigma with a dusky margin. Orbits converging below; clypeus shining; sides of face with much white hair; scutellum highly polished on disc, appearing rather yellowish green, strongly contrasting with the dull dark blue base of metathorax; area of metathorax short, densely rugosoplicate, the intervals shining as seen under microscope; mesopleura and sides of metathorax densely punctured; margins of third and following tergites somewhat brownish; suture between first and second tergites impressed.

California: San Miguel Island, end of July, four (Cockerell). It visits flowers of Malacothrix implicata. It is named after the famous explorer, who died on San Miguel. In the Sandhouse table it could be sought for near H. lactineus Sandhouse, from which it is easily known by the dark legs, or H. disparilis Cresson, which is entirely different. There is some resemblance to H. foveolatus Robertson, from Illinois, and among the west coast species H. daggetti Cockerell is rather near, but is larger, with bluish head and thorax and milky wings. H. gaudialis Sandhouse, from La Jolla, has strongly punctured tegulae.

**Halictus miguelensis** Cockerell, new species

**Male.** Length about 9 mm., anterior wing 7; rather slender, black with apical band on clypeus (with a small median extension above), labrum, spots on knees, and basitarsi, all very light yellow; pubescence white; mandibles black, red at tip; antennæ entirely black; flagellum very long, reaching base of abdomen; clypeus projecting; orbits strongly converging below; front and upper part of face with much white hair; a shining line along inner orbits to the top; mesothorax and scutellum shining, with numerous fine punctures; in lateral view, the sides of mesothorax appear dull, contrasting with the highly polished sides of scutellum; area of metathorax large, dull, densely covered with parallel plice, the microscope shows a complex system of rugæ, forming a sort of network, and also shows that the large postscutellum is coarsely sculptured; tubercles black; tegulae not punctured, shining brown, with a light yellow spot in front; wings perfectly clear, not yellowish, iridescent, the large stigma clear rufous, the nervures light brown; outer nervures paler but hardly weaker; front tibiae with a narrow pale stripe its whole length posteriorly, and anteriorly pale reddish; middle and hind tibiae with a pale yellow mark at base, and a little reddish at apex; basitarsi very pale yellow, the following joints pale reddish, except the last, which is dark; abdo-
men highly polished, thinly hairy, margins of tergites inconspicuously pallid; second to fourth tergites with conspicuous light hair at sides of base, the microscope shows that this hair is strongly plumose.

California: San Miguel Island, July 30 (Cockerell). Related to *H. nigricalis* Vachal, but more robust, with more shining disc of mesothorax, and entirely black antennae. On account of the clear, quite colorless wings, it cannot be associated with *H. pacificus* Cockerell or *H. truncatus* Robertson. It is not *H. cooleyi* Crawford (which I took in Santa Barbara) which has much yellow on the mandibles. *H. arctous* Vachal has a yellow spot on tubercles; *H. kincaidii* Cockerell has the clypeus all black; *H. pullilabris* Vachal has the labrum black.

The holotypes of the new species will be placed in the collection of the California Academy of Sciences at San Francisco.

THE EFFECT OF STYLOPIZATION ON ANDRENA PORTERAE COCKERELL

(Hymenoptera)

BY E. GORTON LINSLEY

University of California

Few andrenid bees are more strongly sexually dimorphic than *Andrena porterae* Cockerell. The sexes are so unlike that they were originally described as distinct species and remained unassociated until field observations suggested their identity. In addition to differences in general form and structure of mandibles, antennae, legs, and abdomen, the females have the integument and pubescence entirely black. The male (first described as *Andrena leptanthi* Vier. and Ckll.) is brown, with the clypeus bright yellow, the pubescence pale brownish. Whatever doubt may have remained with regard to the identity of the sexes of *porterae* may now be dispelled by the capture of a stylopized female exhibiting a partial reversal of secondary sexual characters. In color, structure of posterior pair of legs, and proportions of the antennal segments the example is more or less

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intermediate between the normal male and the normal female. The individual may be described as follows:

Size and form of typical female; integument dark brown; pubescence of head dark brownish, that of thorax and abdomen brown, of posterior metatarsi and tibial scopæ pale brownish; clypeus with a large, irregular, bright yellow, median spot; first segment of flagellum shorter than the three following together (in the normal female it is as long as or slightly longer than the three following, in the normal male it is but little longer than the two following together); tibial scopæ thinner than usual, the hairs of the dorsal margin mostly shorter than the width of the tibia (rather than distinctly longer than the width of the tibia).

Described from an example taken at West Walker River, Inyo County, Calif., elevation 6,000 feet, on May 16, 1937, at flowers of Ribes, by Mr. Charles D. Michener, who very kindly presented it to the writer. The specimen has been parasitized by a male Stylops. A second female, captured at the same time and bearing a female parasite, exhibits no reversal of sexual characters. Apparently neither specimen was making any attempt to collect pollen since the scopæ of both females were devoid of pollen grains.

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**Note on the Dispersion of Pseudoscorpions**

Recently while collecting moths at an electric light, I observed that an occasional moth had what seemed to be a particle of dirt attached to its tibia. In removing one it seemed to be attached by a stalk. When removed and examined with a glass, to my surprise I found it to be a pseudoscorpion. The specimen has been preserved and is now in the collection of the California Academy of Sciences.—F. E. Blaisdell, Sr.

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SYNOPSIS OF THE GRYLLOBLATTIDAE WITH THE DESCRIPTION OF A NEW SPECIES FROM OREGON (ORTHOPTERA)

BY ASHLEY BUELL GURNEY

INTRODUCTION

Since Walker (1914) established the family Grylloblattidae, some twenty-five papers have been published concerning the group. In the present study a revisionary synopsis and an evaluation of taxonomic characters are offered for the first time. Two genera and five species are included, of which one species is here described as new and one genus re-established as valid. The genus Galloisiana Caudell is composed of two subgenera, and Grylloblatta campodeiformis Walker consists of two subspecies.

The present study was prompted by difficulties experienced in identifying material collected in Oregon by Prof. H. A. Scullen of the Oregon State Agricultural College. Professor Scullen kindly placed at the disposal of the writer the entire series of specimens collected by him, together with full collecting notes. Through the kindness of Dr. R. H. Beamer of the University of Kansas it has been possible to examine the entire series of Grylloblatta campodeiformis occidentalis Silvestri collected by him on Mt. Baker, Wash., in 1931. Dr. Harlow B. Mills of the Montana State College has provided examples of G. c. campodeiformis Walker collected in Gallatin Canyon, Montana, in 1936. Dr. E. M. Walker of the University of Toronto has kindly loaned for study two pairs of the typical race of campodeiformis from the Canadian Rocky Mountains. The writer would express his appreciation to the above-named gentlemen, also to his colleague, Mr. Herbert S. Barber, for detailed information regarding the conditions under which Grylloblatta barberi Caudell was originally collected and their relation to the problem of natural barriers in the distribution of species. During this study specimens of all known forms, except Galloisiana notabilis (Silvestri), described from a single nymph collected in Japan, have been examined.

In the following key the more important character is men-
tioned first in each couplet containing two or more characters. The word nymph refers to large, nearly mature specimens.

KEY TO THE GENERA AND SPECIES OF GRYLLOBLATTIDAE

1. Posterior-lateral angles of pronotum broadly rounded in adult (fig. 4); third segment of antenna more than twice the length of second segment (fig. 2); compound eyes somewhat reduced (fig. 2) or absent; cercus of adult composed of nine segments (fig. 3); front and hind femora shaped as in figs. 5 and 6, (Japan) . . . Genus Galloisiana Caudell.................................2

... Posterior-lateral angles of pronotum narrowly rounded in adult (fig. 7); third segment of antenna not more than one and one-half times the length of second segment (fig. 9); compound eyes present and well-defined, general shape as in fig. 9; cercus of adult composed of eight segments (fig. 1 and 8); front and hind femora shaped as in figs. 10 and 11, (North America) . . . Genus Grylloblatta Walker.................................3 (Genotype, Grylloblatta campodeiformis campodeiformis Walker, by monotypy.)

2. Compound eyes present . . . Galloisiana, subgenus Galloisiana Caudell (Type and only species, Galloisia nipponensis C. & K., 1924).

... Compound eyes absent . . . Galloisiana, subgenus Ishiana Silvestri (Type and only species, Grylloblatta (Ishiana) notabilis Silv., 1927).

3. Dorsal valve of ovipositor clearly reaching to middle of cercus, usually to the sixth segment (fig. 1); antenna of adult composed of 36 segments or less, of nymph\(^2\) not over 30; cercus normally not exceeding 1.8 times the length of pronotum, (Alberta, Montana, Washington) .......................................4

... Dorsal valve of ovipositor not reaching to middle of cercus, seldom beyond the fourth segment (fig. 8) (adult of barberi unknown); antenna of adult frequently composed of 39 or more segments, of nymph often of more than 30; cercus longer than above, normally 2 times or more the length of pronotum, (Northern California, Oregon) .......................................5

4. Antenna of adult composed of 27-30 segments, of nymph seldom more than 26, (Alberta and Montana) .........................campodeiformis campodeiformis Walker (1914) .......................................campodeiformis occidentalis Silvestri (1931)

... Antenna of adult composed of more than 30 segments, of nymph usually more than 26, (Washington) ..............................campodeiformis occidentalis Silvestri (1931)

5. Antenna of nymph composed of 36-40 segments; compound eye prominent, proportion of greatest length of eye to width of eye to width of head about as 1:4:4; color of body grayish brown, (Northern California) ...........................barberi Caudell (1924)

\(^2\) Reference is here made to large, nearly mature specimens.
Antenna of nymph normally containing 31-32 segments; compound eye distinctly smaller than above, proportion of greatest length of eye to width of head about as 1:5.8; color of body light amber, paler than in barberi, (Oregon)..................

The Genus Galloisiana Caudell


Grylloblatta (Ishiana) Silvestri, Ib., p. 113.

The genus Galloisia was proposed by Caudell and King for the species nipponensis, represented by one adult male and two nymphs collected by the junior writer in Japan. The original authors, in giving the generic diagnosis, emphasized the presence of lateral flange-like pads at the apices of the basal four segments of each tarsus. Other characters mentioned as being of probable generic importance were nine-segmented cerci, and a third antennal segment about three times the length of the second. Cerci of adult Grylloblatta are eight-segmented and, according to Caudell and King, the tarsi are cylindrical and lack pulvilli and lateral pads.

Crampton (1927) enumerated the above generic characters given by Caudell and King and accepted the Japanese species as probably belonging to a genus distinct from Grylloblatta. He also attributed generic significance to several characters taken from the specific description of nipponensis. He reported, however, that distinct tarsal pads, though smaller than in Galloisiana, are present in Grylloblatta.

Later in the same year, and being acquainted with Crampton’s paper, Silvestri (1927) discussed the immature stages of two species collected in Japan. After comparing these with nymphs of Grylloblatta campodeiformis Walker (apparently adults of Galloisiana were not available for study) he placed Galloisiana as a synonym of Grylloblatta. The nymphs reported by Silvestri included three male specimens collected at the type locality of
nipponensis and identified as that species, and a single male nymph taken near Nagasaki (about 600 miles from Nikko, near where nipponensis was taken). This nymph was described as Grylloblatta notabilis, a new species and type of a new subgenus, Ishiana. Ishiana was particularly characterized by the absence of eyes.

In the present paper Galloisiana, with Ishiana as a subgenus, is reëstablished as a valid genus on the following grounds:

1. One of the two most important characters, in the writer's opinion, is the shape of the pronotum as shown in figs. 4 and 7. Nymphs of the two genera do not exhibit such differences in the outline of the posterior-lateral angles; but the adult Galloisiana nipponensis is very distinct from Grylloblatta adults in this respect, and, if the shape of the pronotum in this group is nearly as significant as in Dermaptera and Blattidæ, it is certainly of generic value.

2. The blind condition described for Silvestri's notabilis is not difficult to visualize after one examines the type material of nipponensis. The compound eye is elongate, as shown in fig. 2, and the outlines of the eye and its facets are obscure, in contrast to the differently-shaped conspicuous eye of Grylloblatta (fig. 9). It seems evident that there is a strong tendency toward the reduction of eyes in the known Japanese members of Grylloblattidæ. That they form a complex distinct from the Nearctic species is fairly clear. On the basis of the single reported nymph of notabilis, no change is justified other than to ally it with Galloisiana rather than Grylloblatta, because of its blindness. Ishiana, accordingly, is here considered a subgenus of Galloisiana. The discovery of the adult may indicate whether the species is blind in all stages and further show the proper placement of the species.

3. The different proportions of the third antennal segment in comparison with the second segment in the two genera are shown in figs. 2 and 9. The constancy of the character is demonstrated by the four American forms. The third antennal segment of notabilis, as figured by Silvestri (1927), is longer than in the corresponding stages of Grylloblatta. Since the two complexes indicate the stability of this character it is reasonable to consider proportional lengths of antennal segments of generic importance as they are in certain Dermaptera.
4. All records of adult Grylloblattidae indicate the number of nine segments in the cercus of Galloisiana and eight in Grylloblatta to be constant, although, as noted by Caudell and King, the basal two segments are very closely united in Galloisiana (fig. 3). In Plecoptera the number of segments of the cerci is frequently of family significance and it seems advisable to consider even the relatively slight difference observed in the Grylloblattidae, with respect to this character, as probably of generic value.

5: The spurs and spinelike setae appear somewhat heavier in Galloisiana, and the legs (figs. 5 and 6) seem to be definitely stouter, than in Grylloblatta (figs. 10 and 11). These features will probably prove to be constant.

6. As stated by Crampton in 1927, adults of Grylloblatta preserved in alcohol show unmistakable lateral pads on the tarsus. Each pair of pads may represent a pulvillus which has become divided in the process of evolution. Although these pads are considerably smaller than those of Galloisiana, this character appears to be of minor value as compared to the shape of the pronotum and the reduction of the eyes. Unfortunately, the figures of tarsi shown by Caudell and King are somewhat misleading, since comparison is made between short, flattened segments of an adult Galloisiana (then called Galloisia) and elongate, cylindrical segments of a nymphal Grylloblatta. The tarsi of adults of Grylloblatta approach in form those of Galloisiana. The hind tarsi of Grylloblatta, particularly the basitarsi, appear more distinct from those of Galloisiana than the front and middle tarsi, which are very similar in the two genera. The incorrect statement that the tarsi of Grylloblatta lack pulvilli apparently originated with Walker's (1914) accidental use of the term "pulvilli," when he obviously meant "arolia," in the original description. Arolia between the claws are absent, and pulvilli are present on at least the fifth segment of front and middle tarsi, in both genera.

7. Since the elongate projection of the male supra-anal plate of Galloisiana is not present in Grylloblatta, it may be a valuable character. Until more information is available, however, the writer hesitates to consider specialization of genitalia as generic.
The Genus 

*Grylloblatta* Walker 


*Grylloblatta sculleni* Gurney, new species

(Figs. 7-11)

Female: General form elongate, slender; body with fine pube-scence. Head with parietal sutures well defined; lateral area with two spine-like setae about mid-way along parietal suture, a slightly oblique row of four similar setae mid-way between suture and lateral margin of head, about six setae along margin of head at the occiput. Coronal suture and frontal sutures indistinct; two well-spaced setae borne in each frontal suture. Postclypeus and anteclypeus plainly differentiated, their anterior margins slightly and evenly rounded. Labrum covered with fine setae. Compound eye sharply defined, distinctly smaller than antennal socket (fig. 9). Basal segments of antenna as illustrated (fig. 9), right antenna composed of 39 and left of 32? segments, respectively.

Pronotum as illustrated (fig. 7); the posterior-lateral angles narrowly rounded. Ventral-anterior margin of front femur with closely set row of about 16 stout spine-like setae; the ventral-posterior margin with about 6 weak, scattered setae (fig. 10). Hind femur as illustrated (fig. 11). Tarsus of front leg with segments shorter than those of middle leg, segments of rear tarsi longest. Lateral flange-like tarsal pads at apices of first four tarsal segments (small but distinct); pulvillus well developed on apical segments of front and middle tarsi, lacking on hind tarsus.

Abdomen and appendages typical of the genus; gland on basal sternite well developed. Dorsal valves of ovipositor reaching about to base of fifth segment of cercus. Ovipositor and cerci as illustrated (fig. 8).

Coloration: General coloration light amber, ventral surface of body of a lighter shade than above. Setae of body and appendages, tips of tibial spurs and tips of tarsal claws brown. Compound eyes black.

Measurements: Length of body, 23.0 mm.; of antenna, 17.0; of eye, 0.53; of pronotum, 3.15; of rear femur, 5.0; of dorsal valve of ovipositor, 3.45; of cercus, 7.2; width of head, 3.22; of pronotum, 2.63; of rear femur, 0.9.

In addition to the holotype described above, two adult females and eight nymphs, including a male 12 mm. in length, are considered paratypes. The apical antennal segments are broken from several specimens, the maximum number being 35 in the adults and 32 in the nymphs. The maximum head width is 3.15 mm. and 3.16 respectively in the two adult paratypes. The eye
length is 0.45 mm. and 0.58 in the two adult specimens. In other respects they agree essentially with the holotype.

_Type locality._ Scott Camp (6,600 feet, altitude), Three Sisters, Cascade Mountain, Oregon.

_Type._ No. 52017, U. S. National Museum.

The holotype female, one adult female paratype, and six small nymphal paratypes collected July 12, 1936, by H. A. Scullen and Robert Rider. One adult female paratype and two large nymphal paratypes collected at the type locality August 6, 1935, by H. A. Scullen and George Ferguson. Two adult and three immature paratypes are returned to Professor Scullen.

Professor Scullen, for whom this species is named, has furnished the following notes:

"On the day in question (August 6, 1935), the car was left at the C. C. C. camp located at what has for a long time been called Frog Camp, on the west side of the McKenzie Pass. From Frog Camp the skyline trail was followed to White Branch Meadow and from there to the snow line near Obsidian camp, at an elevation of about 6,600 feet. Within less than half an hour one immature specimen of _Grylloblatta_ was found among the crushed rock at the border of the melting snow. Further searching brought to light an additional immature specimen. In both cases they were taken among the small particles of rock wet with the water from the dripping lower border of the snow. No additional specimens were taken in the neighborhood of this snow patch. Search was then made along the border of a more extended snow area, with the result that a mature female was taken among the broken pieces of rock close to the snow. No additional specimens of this group were taken during the two hours of collecting.

"There is no doubt that this insect is common if one can succeed in reaching its normal habitat. The difficulty, however, is in being able to dig under the shale rock for the specimens. I saw several adult specimens which I was unable to collect, because just at the instant I was ready to capture them a landslide of shale rock came down in my direction and I was compelled to give way."

Elsea (1937) has recently reported the collecting of two females of _Grylloblatta campodeiformis_ near Crater Lake, Ore-
gon, on November 27, 1936. Although his specimens have not been examined, it seems probable that a form of *Grylloblatta* other than the typical race of *campodeiformis* is represented, perhaps *sculleni*.

**Taxonomy and Bionomics of the Group**

The accompanying key presents the distinguishing characters of the four known forms of *Grylloblatta*. The number of antennal segments has formerly been considered the most important specific character. In *c. campodeiformis* the number has not been reported previously in excess of 29, and since *c. occidentalis* exhibits 32-36 segments as now known, the latter form would seem to be valid. Among ten specimens of *c. campodeiformis* from Montana which have been examined by the writer are three with antennal counts of 29-30, 29-30, and 28-30 respectively; the others do not exceed 27 and some have broken antennae. Although the naming of species in primitive orthoptera merely on the basis of a slight difference in number of antennal segments would seem to be a questionable practice, at present it seems best to recognize the two as distinct subspecies on the difference in the number of antennal segments.

The new species, *sculleni*, is clearly distinct from either form of *campodeiformis* on the basis of the ovipositor and cerci, as well as by the other differences given in the key. Although adults of *barberi* are not known, the maximum number of 40 antennal segments and the large dimensions of the cerci and femora in the nearly mature nymphs indicate its distinctness from *campodeiformis*, and its probable relation to *sculleni*. From the latter species *barberi* may be separated by the characters given in the key. The nymphal eye of *barberi* is larger than that of the adult *sculleni*. When adults of *barberi* are known other differences may become apparent. Until then, it seems best to describe *sculleni* as a distinct species; subspecific rank may later be advisable.

As mentioned by Crampton (1927), the right coxite of the male of *Grylloblatta c. campodeiformis* bears a dorsal process, illustrated by Walker (1919, fig. 8; 1922, fig. 69), which is not present in *Galloisiana*. Adult males of *c. occidentalis* agree with those of *c. campodeiformis* in this respect and no other genitalic differences have been found. Neither do the ovipositors of the
two forms show any appreciable differences.

Our knowledge of the biology of *Grylloblatta* is derived mainly from the following papers: Caudell (1923), Ford (1926, 1937), Silvestri (1931), Beamer (1933) and Mills and Pepper (1937). Specimens have usually been collected from beneath stones, pieces of wood, or other objects in cold surroundings, but snow has not always been present. Most collections have been made at altitudes of 5,000 feet or higher. The type locality of *barberi* is at an elevation of slightly more than 2,000 feet in the valley of the Feather River, at the base of Lassen Peak, Calif. Cold air from this mountain, which is over 10,000 feet in height, doubtless chills the nearby valley and provides suitable conditions for *Grylloblatta*. Mills and Pepper have suggested that the rock-strewn, talus slopes where *Grylloblatta* is most frequently found provide a means for the insects to select favorable living conditions by retreating back under the debris or advancing to the open air, to suit their own tastes. Available data suggest that the food may include some plant material and that in certain favorable stations insects that have been killed by the cold may be an important item of diet. Miss Ford (1937, p. 282) reports that under suitable laboratory conditions individuals “have lived for three and four years, slowly reaching maturity and depositing eggs.” Mills and Pepper, as well as Miss Ford, have found *Grylloblatta* sensitive to temperature changes and prostrated by a degree of warmth in which most insects thrive. Buckle (1925) states that a specimen of *c. campodeiformis* showed signs of distress and soon died when placed in direct sunlight. It seems clear that, like the adults of the mecopteran *Boreus* and the tipulid *Chionea*, *Grylloblatta* is adapted to live normally in locations which are always near freezing. The Japanese *Galloisiana nipponensis* was taken in and beneath decaying logs and under conditions of cold, although snow was not present. Silvestri (1927) found that the alimentary canal of *nipponensis* contained arthropod remains.

The distributional data regarding *Grylloblatta* are still very fragmentary, but the evidence points to the presence of many widely separated, more or less isolated, units of population which may eventually be found to extend southward as far as New Mexico in the East and the San Bernardino Mountains of California in the West. The three forms in the Pacific Coast States are
distinct and the natural barriers rather clear. The Oregon species, *scullenii*, is separated from *G. c. occidentalis*, occurring on Mt. Baker, Wash., by the Columbia River Valley. *G. barberi* occurs in the Sierra Nevada Mountains in Plumas County, California, and is separated from its nearest Cascade relative by valleys in the watershed of the Klamath River. The known centers of distribution for *G. c. campodeiformis*, Banff, Alberta, and Gallatin Canyon, Mont. (reported by Strand, 1937, p. 38, fig. 7), are separated by about 500 miles, but in the same mountain range. Specimens from Emerald Lake and Mt. Edith Cavell, Alberta, agree with Montana individuals.

Since *Grylloblatta* is restricted to definite favorable habitats and has no means of rapid dissemination, it follows that the species are likely of ancient distribution. In this connection it may be observed that the two subspecies of *campodeiformis* are within or very near the limits of the main areas of glaciation during Pleistocene time, while the localities of *scullenii* and *barberi* were each characterized by separate and individual local glaciations. This fact gives added evidence for the distinctness of the Pacific Coast species.

Regarding the ordinal position of the Grylloblattidae, it is purely a question as to how much the currently accepted orders are to be divided, which determines whether the order Notoptera (Crampton, 1915) should be accepted, whether it should be considered a suborder (Crampton, 1933, p. 102) of Orthoptera, or whether the group should be treated as a family of Orthoptera. Future morphological studies by Walker and others may give added weight to one belief; for the present the writer prefers to follow Hebard (1930) in treating the Grylloblattidae as a family of Orthoptera. A number of ordinal names, in addition to Notoptera, have been proposed, chief among which are Grylloblattoidae (Brues and Melander, 1915) which was later changed to Grylloblattodea (Brues and Melander, 1932), and Grylloblattaria (Bruner, 1915, p. 2). A full discussion of the phylogenetic relationships of the Grylloblattidae is furnished by Crampton (1933).

**Partial Bibliography**

For additional references the reader may consult the bibliography given by Gurney (1936).


Bruner, Lawrence, 1915. Preliminary catalogue of the orthopteroid insects of the Philippine Islands. Univ. Studies, Lincoln, Neb., Vol. 15, No. 2, pp. 1-87. (Grylloblattidae not recorded from P. I., merely mentioned in key under ordinal name.)


**EXPLANATION OF PLATE**

Fig. 1. *Grylloblatta campodeiformis occidentalis* Silvestri, lateral view of apex of female abdomen; Fig. 2. *Galloisiana nipponensis* (Caudell and King), lateral view of head; Fig. 3. Same, lateral view of apex of male abdomen; Fig. 4. Same, dorsal view of pronotum; Fig. 5. Same, lateral view of posterior surface of right front femur with associated trochanter and base of tibia; Fig. 6. Same, lateral view of anterior surface of left hind femur with associated trochanter and base of tibia; Fig. 7. *Grylloblatta seuallenii*, new species, dorsal view of pronotum; Fig. 8. Same, lateral view of apex of female abdomen; Fig. 9. Same, lateral view of head; Fig. 10. Same, lateral view of posterior surface of right front femur with associated trochanter and base of tibia; Fig 11. Same, lateral view of anterior surface of left hind femur with associated trochanter and base of tibia.

**EUDIACOGUS PULCHER** Fahr.

This attractive and well known weevil, which has previously been reported only from Florida, Texas and Jalapa, Mexico (Höge), has been taken in limited numbers at trap lights at Calexico, Imperial Valley, California, August 23, 1937, by J. K. Ellsworth. This extends its known distribution clear across our southern border. It feeds on senna (*Cassia occidentalis*) in Texas, according to Dwight Pierce.—Edwin C. Van Dyke.

**CHANGE OF NAME**

*Nodocion* solaster, nom. nov. This name is proposed to replace *Nodocion zelotoides* Chamberlin (American Museum Novitates, 1936, No. 853, p. 6) which is preoccupied by *Nodocion zelotoides* Worley (Ann. Ent. Soc. Am., 1928, vol. 21, p. 621).—Ralph V. Chamberlin.
AN ANNOTATED LIST OF THE INSECTS, MOSTLY COLEOPTERA, ASSOCIATED WITH JEFFREY PINE IN LASSEN NATIONAL FOREST, CALIFORNIA

BY W. HARRY LANGE, JR.
University of California, Berkeley

A complete study of the insect fauna of Jeffrey pine is a very desirable goal as it would not only add considerably to our knowledge of the life histories of these insects, but would also aid in insect control work in those localities of California where it is to be maintained for its valuable lumber or its æsthetic value.

It is the purpose of this paper to present additional observations on insects associated with Jeffrey pine. The data was recorded during the month of June 1935 near Camp No. 10, Lassen National Forest, California, at altitudes between 5,500-6,500 feet. A salvage operation in this area made the study possible.

In the following list the insects are arranged in groups according to the part of the tree attacked; the Coleoptera follow the systematic arrangement of Leng's Catalogue.

I wish to express my appreciation to Dr. Edwin C. Van Dyke for many suggestions during the preparation of this paper, and for checking the determinations of the Coleoptera. Dr. F. E. Blaisdell, Sr. kindly determined the species of Corticeus, and Professor E. O. Essig the Aphididae.

PRIMARY INSECTS UNDER BARK OF MAIN TRUNK OR BRANCHES

Melanophila gentilis Lec. Main trunk, usually near base; maximum number of pupæ June 13; adults June 10-21; single generation a year, overwintering in pre-pupal state, pupating in spring; numerous; a "fill-in" species in this locality.

Melanophila californica Van Dyke. Upper trunk and larger branches; pre-pupal larvae and pupæ June 12; adults June 13-21; life cycle as in M. gentilis; with Ips oregoni (Eich.) causing top killing.

Dendroctonus jeffreyi Hopk. Throughout main bole; in association usually with other bark-beetles, especially Ips emarginatus (Lec.); full-grown larvae June 6; pupæ June 15; considerable overlapping of broods; numerous.

Dendroctonus valens Lec. Base of bole; full-grown larvae and pupæ June 12; fairly abundant as a "fill-in" species.
Ips emarginatus (Lec.) Throughout main bole; maximum number of larvae June 15 (1935 attack); very numerous; usually found associated with other bark-beetles, but “pure” attacks occur.

Ips oregoni (Eich.) Upper bole and larger branches; parent adults, eggs, and small larvae June 15; pupae June 20; very abundant and serious as a top killer in association with Melanophila californica Van Dyke.

SECONDARY INSECTS UNDER BARK OF MAIN TRUNK OR BRANCHES

Chrysobothris caurina Horn. Adults from reproduction; June 18; few.

Chrysobothris purpurifrons Mots. Adults from reproduction or attracted to slash; June 14; common.

Chrysobothris dentipes (Germ.) Main limbs and logs at landings; adults June 10-27; June 13, pupae and new adults found in large limb; very numerous.

Stephanopachys pacificus Csy. Bark of dying trees; adults June 5; few.

Rhagium lineatum Oliv. Under bark, main trunk; adults June 10-17; common.

Callidium cicatricosum Mann. Main bole; adults June 4-19; rare.

Pissodes yosemite Hopk. Adults from reproduction; June 14; few.

Gelus californicus (Lec.) Under bark; adults June 6-14; very common.

Hylurgops subcostulatus Mann. Bases of recently killed trees; June 17, eggs found laid in masses in egg grooves arising from the sides of the longitudinal burrow; adults June 17-19; fairly common.

Hylastes macer Lec. Under bark, main trunk; adults June 12; few.

Ips latidens Lec. Smaller limbs, with Ips oregoni (Eich.); adults June 8-14; fairly common.

Orthotomicus ornatus Sw. Smaller limbs, usually associated with other engraving beetles; adults June 4; few.

IN WOOD OF TRUNK OR BRANCHES

Chrysophana placida (Lec.) Main bole; adult June 12; one specimen.

Chalephora angulicollis (Lec.) Dying or dead trees; adults attracted to logs at landings; June 5-21; very common.

Dicera sexualis Cr. Adults attracted to logs at landings; June 8-14; numerous.

Dicera tenebrosa Lec. Adults attracted to logs at landings; June 10; few.

Chrysobothris californica Lec. One adult female taken attracted to felled log at landing; June 27.
Asemum atrum Esch. Adults resting on trunk; June 17; few.
Liaseum mokelumne Csy. Adults on bark of main trunk; June 8-21; commonest cerambycid on both ponderosa and Jeffrey pines.

Monochamus maculosus Hald. Adults resting on trunk; pupae and first adults June 15; common.
Cossonus ponderosae Van Dyke. Under bark, at base of dead tree; adults June 11; few.
Rhyncolus oregonensis Horn. Under bark, base of bole, dead tree; adults June 11; few.

Gnathotrichus retusus (Lee.) Sap-heartwood at base of bole, dying trees; adults in burrows June 6; common.

Xyleborus scopulorum Hopk. Base of dead trees; adults June 6; fairly common.

ATTACKING SMALLER LIMBS OR TWIGS

Ernobius sp. Adults beaten from staminate catkins; June 14; few.
Callidium hirtellum Lec. Dead limbs; June 10-14; common.
Pogonocherus propinquus Fall. Limbs; adults June 3; few.
Magdalis cuneiformis Horn. Foliage; adults June 14; common.
Magnaldis lecontei Horn. Beaten from foliage; adults June 8-14; very common.

Cinara schwarzii (Wilson). Aphis infesting small lateral branches of reproduction; June 13 few winged forms, mostly apterous; June 19 many winged forms; another Cinara sp. found on ponderosa pine; common on cut-over areas.

DEFOLIATORS

Dichelonyx erotchi Horn. Foliage; adults June 12; common.
Dichelonyx vicina (Fall). Foliage; adults June 12-14; common.
Glyptoscelis sequoiae Blais. Foliage; adults June 14; few.

Scythropus californicus Horn. Foliage; adults June 10-14; very common.

Diprion sp. Larvae of this sawfly very commonly collected on needles of reproduction; larvae during June.

FEEDING ON STAMINATE CATKINS

The following species were taken June 14 by beating the foliage and staminate catkins. They are not necessarily connected with this host, as some were attracted by the source of food.

Listrus sp. Common.
Asclera excavata Lec. Few.
Adelocera rorulenta Lec. One specimen.
Limonius nitidulus Horn. Very common.
Ludius triundulus tigrinus Fall. Very common.
Ludius seneipennis (Kby.). Common.
Ludius inflatus (Say.) Common.
Elater phasicopterus Germ. Common.
Elater bimaculatus Van Dyke. Few.
Eronyza pilosulus (Cr.) Common.
Scymnus ardelio Horn. Few.
Hippodamia apicalis Csy. One specimen.
Adalia frigida (Schn.) One specimen.
Cleis picta (Rand.) Common.
Stenochedus cyanescens carbonarius Schfr. One specimen.
Platydema oregonense Lec. One specimen.
Anoplodera chrysocoma (Kby.) Common.
Leptacmeops basalts (Lec.) Very common.
Rhinonaccer comptus Lec. Common.

ASSOCIATED WITH POLYPORUS VOLVATUS

_Epuresa monogama_ Cr. Adults of this nitidulid collected within the sporophores; several found together; common.

**PREDACIOUS INSECTS**

_Nudobius pugetanus_ Csy. Burrows of bark-beetles; adults June 6-12; common.

_Phloeonotus pusillus_ Grav. Burrows of bark-beetles; adults June 6-12; common.

_Platysoma punctigerum_ Lec. Under bark, usually associated with bark-beetle galleries; adults June 4; fairly common.

_Plegaderus nitidus_ Horn. Under bark; adults June 4; common.

_Enoclerus sphegeus_ (Fab.) Adults on bark; June 4-11; common.

_Thanasimus lecontei_ (Wolc.) Adults on bark; June 11; not as common as on ponderosa pine.

_Othnius lugubris_ Horn. Adults active on bark; June 6-8; common.

_Temnochila virescens chlorodia_ (Mann.) Adults in crevices of bark; larvae among frass of wood boring Coleoptera; larvae and adults June 4; fairly common.

_Tenebrioides_ sp. Under bark, dead trees; adults June 4; fairly common.

_Ostoma oregonensis_ Schaef. Under bark, dead trees; June 10; few.

_Lasconotus bitomoides_ Kraus. Burrows of _Ips oregoni_ (Eich.); adults June 12; few.

_Aulonium longum_ Lec. Burrows of _Dendroctonus_ and _Ips_ sp.; adults during June; common.

_Deretaphrus oregonensis_ Horn. Crevices of bark or under bark, base of bole; June 11-12; fairly common.

_Corticeus_ (Hypophlemaeus) _substriatus_ (Lec.) Burrows of bark-beetles and other wood boring Coleoptera; dying or dead trees; adults June 4-5; numerous.

_Bius estriatus_ Lec. Under bark; adults June 4; few.
GENERIC CHARACTERISTICS OF AONIDIELLA BERLESE AND LEONARDI, AND A DESCRIPTION OF A NEW SPECIES FROM AUSTRALIA (HOMOPTERA-DIASPIDIDÆ)

BY HOWARD L MCKENZIE

University of California Citrus Experiment Station

Aonidiella has for many years been accepted by the Italian coccidologists as a valid genus. In 1921 MacGillivary (3) apparently concurred, although it was not until 1933 that Nel (5) stressed this point to the extent that the name was at least partially accepted by American entomologists. The genus is important because the California red scale, Aonidiella aurantii (Mask.) is the type species. As early as 1899 Cockerell (2) placed Aonidiella as a sub-genus of Chrysomphalus, although he gave no reason for this change. Since then economic workers have consistently placed aurantii in the genus Chrysomphalus.

Although there has been much argument about the genus Aonidiella, apparently no attempt has been made to define it. In the original description of this genus in 1895 by Berlese and Leonardi (1), mention was made of the kidney-shaped body. The almost circular enlargement and sclerotization of the body of the adult female at maturity does seem to be fairly characteristic. This character alone would tend to separate it from Chrysomphalus where the pygidium is never so strongly retracted into the body. The paraphyses of the Aonidiella species are, in all cases examined, very short, slender, and small as compared with the more pronounced type of paraphyses in Chrysomphalus. The absence of the perivulvar pores was considered of importance for many years, and, as a matter of fact, if the species lacked these structures, they were usually assigned to Aonidiella, regardless of any other character. However, in view of the fact that Aonidiella comperei McKenzie and the new species described in this report, as well as Aonidiella orientalis (Newstead), all possess perivulvar pores, very little importance can be given this structure as a generic character. The epiphysis or outgrowth upon the margin of the pygidium just beyond the

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1 Paper No. 371, University of California Graduate School of Tropical Agriculture and Citrus Experiment Station, Riverside, California.
2 Numbers in parentheses indicate references at end of article.
third pair of lobes is usually very well developed. The presence of the fenestrations (window-like structures) on the body just above the pygidium (as is recognized in comperei, the new species described in this report, and occasionally present in a few individuals of taxus) may be of some importance in distinguishing species, but apparently is not of generic significance. The tubular ducts are long, slender, and usually very broad, especially those feeding the gland openings situated near the median lobes. In every species of Aonidiella examined, with the exception of orientalis, the body of the mature female is intimately associated with the scale covering.

Aonidiella eremocitri McKenzie, n. sp.

This species was collected by S. E. Flanders of this Station, while he was exploring for parasites of the citricola scale, Coccus pseudomagnolarium (Kuwana), in Australia, in 1931. The description was made from 12 stained specimens mounted on one slide and three scales glued to the side of the coverglass. This represented the only specimens of this species. No male scales were present. The stained specimens were removed and placed two on each slide.

Type. From Eremocitrus glauca, Marmor, Queensland, Australia.

Habitat. Occurring on the leaves, twigs, and larger branches.

Scale of female smooth, circular, flat, yellow, hard, and brittle, 1½ to 1¾ mm. in diameter. Male scale not identified. Apparently all species of Aonidiella thus far known, however, do have male scales of the typical elongate type.

Morphological characteristics: Adult female, when mounted, about 1 mm. in diameter and of the typical reniform shape. Body heavily sclerotized. Pygidium (fig. 1) not heavily sclerotized. Three pair of lobes (trullæ) present, the median pair only slightly larger than the second and third pairs. The second and third pair of lobes approximately the same size. Paraphyses small, short, slender, arranged as follows: One at the inner basal angle of median pair of lobes; one almost directly above the first plate beyond the median lobes; one at each basal angle of the second pair of lobes, the inner longer; one directly above the first plate beyond the second pair of lobes; and one at each basal angle at the third pair of lobes, the inner the longer. There are two serrate plates between the median lobes; two between the median and second lobes, both of which are cleft; two between the sec-
ond and third lobes, the inner plate of which is deeply cleft; and
three beyond the third lobe, all of which are deeply cleft and
quite sharply dentate. Epiphysis beyond the last three plates
well developed and conspicuous. Spines on pygidal fringe situated
as shown in figure 1. Dorsal wax gland openings large and ar-
ranged in three rather definite rows on each side of the pygidium.
Tubular ducts broad and conspicuous. Anal opening large, slightly
cephalad, of the median paraphyses. Ventral side with a few
small ducts situated close to the margin of the pygidium. Vaginal
opening near the center of the pygidium. Perivulvar pores pres-
ent in four groups, of apparently not more than three pores, usu-
ally two, to each group. Spines on the venter situated as
shown in figure 1. Six square fenestrations situated dorsally on
the body just above the pygidium, usually conspicuous (see fig.
1, E).

Of the species known to me this most closely resembles the
false yellow scale, Aonidiella comperei McKenzie, from which
it differs chiefly by the presence of four groups of perivulvar
pores on the pygidium instead of only two groups. Aonidiella
eremocitri n. sp. may be separated from comperei, citrina, and
orientalis, as well as from taxus, and aurantii, by the following
key:

**KEY TO THE SIX SPECIES OF AONIDIELLA**

1. Perivulvar pores present, .........................................................2
   ... Perivulvar pores absent, .................................................3
2. Perivulvar pores in two groups, ..................comperei McKenzie
   ... Perivulvar pores in four groups, ..................eremocitri n. sp.
   ... Perivulvar pores in five groups, ..............orientalis (Newst.)
3. Sclerotized structures A\(^3\) on ventral part of pygidium present
   .................................................................4
   Sclerotized structures A absent..........................taxus Leon.
4. Sclerotized structures B on ventral part of pygidium present;
   structure A globular, fourth lobe-like process usually incon-
   spicuous, ........................................................aurantii (Mask.)
   ... Sclerotized structures B absent, an irregular fold present,
   structure A usually narrow and elongate; fourth lobe-like
   process usually prominent, ........................................citrina (Coq.)

The type specimen and paratypes of this species are deposited
in the U. S. National Museum, at Washington, D. C.; the re-
mainder of the paratypes are in the Stanford University collec-
tion and the Citrus Experiment Station collection at Riverside,
California.

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\(^3\) The reader is referred to item four in the bibliography where these struc-
tures are clearly illustrated and described.
Aonidiella eremocitri n. sp.

A, antenna of first stage; B, spiracle of adult female; C, scale of female; D, antenna of adult female; E, enlargement of fenestration on body; F, general features of adult female; G, pygidium of adult female; H, dorsal aspect of detail of pygidial margin of adult female; I, ventral aspect of same.
A NEW NOTONECTA FROM MEXICO

(Hemiptera-Notonectidae)*

BY H. B. HUNGERFORD

Lawrence, Kansas

Among the insects collected by Mr. Henry Thomas in Mexico during the season of 1936 there is a new species of the genus Notonecota which I describe below and name in honor of the collector.

Notonecota thomasi Hungerford, n. sp.

Size: Length 12 mm. to 13 mm.; width of pronotum, 3.9 mm. to 4.2 mm.

Color: Grayish and black, the lighter portion of the hemelytra ranging from pale smoke-gray in most of the males to light pinkish cinnamon in four of the five female in the series before me. No doubt, the gray color of the hemelytra may be orange in some specimens of the species, as is the case with Notonecota hoffmanni Hungerford and various other species of the subgenus Erythro-necta, to which this new species belongs. The hemelytra of the males are more or less infuscated along the hemelytral suture, the clavo-corial union and the lateral half of the corium; the brownish black marginal area of the corium is broadened behind and joins the black membrane which is pale at the apex. The hemelytra of the females are infuscated only along the costal margin. Head, pronotum, and legs grayish. Scutellum black.

*Contribution from the Department of Entomology, University of Kansas.
Membrane of hemelytra from dusky to black. All trochanters and femora streaked beneath with black.

Structural characteristics: More slender than any other of the known species of the subgenus Erythronecta. Head not conspicuously enlarged; vertex plainly longer than its anterior width; anterior margin of vertex less convex than the frontal margin of the eye; anterior breadth of vertex: synthlisis :: 3.4:1. Length of head: length of pronotum :: 1:1.35. Lateral margin of pronotum nearly straight, slightly divergent, explanate on anterior half, anterior lateral angles right-angulate as seen from above; lateral ledge with ends depressed, anterior end abruptly so. Anterior lobe of membrane of hemelytra larger and longer than posterior lobe. Anterior trochanter of male without hook. Meso-trochanters rounded. Carina of fourth abdominal sternite bare; penultimate abdominal sternite of female shaped more like that of N. undulata Say than like that of other species of the subgenus Erythronecta, but shallowly notched at tip. The last abdominal sternite of female and the male genital capsule are as shown in text figures below.

Location of types: Holotype, allotype and paratypes in the Francis Huntington Snow Entomological Museum of the University of Kansas. Described from seven males and five females labeled as follows: "Cuernavaca, Morelos, Mexico. Oct. 17, 1934. H. D. Thomas."

Comparative notes: More slender than any other species of the subgenus Erythronecta known at present. The species is like N. Hoffmanni Hungerford in having the lateral margins of
pronotum straight but they are less divergent. In the new species the anterior end of the lateral margin of the pronotum is turned down. This is not true of *N. hoffmanni*. The male claspers are very different and the penultimate ventral abdominal segment of the female is relatively broad and therefore very different from *N. hoffmanni*.

STUDIES AMONG THE COCCINELLIDÆ, No. 8 (COLEOPTERA)

BY F. W. NUNENMACHER

*Piedmont, California*

I have received two shipments of Coccinellidæ from Dr. A. Ogloblin of Argentina, South America. Among this material I find three new species, as follows:

**Stethorus ogloblini** Nunenmacher, n. sp.

Form oval, subdepressed. Color black, shining; mouth parts, tibiae and tarsi testaceous, femora black.

Head with a few scattered punctures. Pronotum densely and rather coarsely punctured; punctures of the elytra coarser; pubescence short and cinereous. Metacoxal plates short, not extending to the middle of the segment. Length 1 mm.; width 0.75 mm.

Type, female, in my collection. Type locality: Loreto Misione, Argentina, South America. Collected in 1936. A paratype in the collection of Dr. A. Ogloblin.

**Scymnus convexus** Nunenmacher, n. sp.

Form oval, convex. Pronotal and elytral outline continuous.

Male: Color of head and pronotum light yellow, elytra fusco-piceous, legs and ventral segments testaceous, mesosternum and metasternum dark. Female: Head, pronotum and elytra fusco-testaceous; pronotal front and sides a little lighter; the elytra with a narrow dark margin; legs and ventral surface testaceous throughout.

Head, pronotum and elytra densely, minutely punctured and invested with a short, fine whitish pubescence. Ventral surface minutely punctate. Length 1 mm.; width 0.75 mm. or slightly more.
Holotype, male and allotype, female, in my collection. Type locality: Est. Exp. Loreto, Argentina, taken March 6, 1936, by Dr. A. Ogloblin, who has a paratype.

Convexus belongs to Group C, of Dr. Horn's table of species which have the metacoxal line curving but not making a full arc.

**DELPHASTUS ARGENTINICUS** Nunenmacher, n. sp.

Form broadly oblong-oval, moderately convex. Color deep black, highly polished and subglabrous.

Male: Head and anterior angles of the pronotum, legs and last four ventral segments rufescent; epipleuræ black. Female: Head and pronotum black, with only the mouth-parts rufescent.

Head and pronotum with minute sparse punctures, those of the elytra still more widely spaced. Length 1.3 mm.; width 1 mm.


Type, male, in my collection. Two paratypes in the collection of Dr. A. Ogloblin.

Argentinicus comes close to sonoricus Casey, but the black epipleuræ will separate it from the latter species, in which the epipleuræ are rufescent.

Scymnus quercus described by me in the Pan-Pacific Entomologist, vol. X, p. 18, will have to be given a new name, as I overlooked Scymnus quercus Muls. (Securipalpes, p. 982, 1850. I now give my species the name maderi nom. nov.

If your subscription expires with this issue you will find enclosed a notice of this fact printed on a self-addressed envelope. To subscribers who make use of this simple device without waiting to receive the conventional bill, the Publication Committee extends its special thanks, as the saving in postage, stationery, etc., is a vital item at this time when every economy is necessary.
CONCERNING THE PLEBEJUS ICARIIOIDES RASSENKREIS
(Lepidoptera: Lycaenidae)

BY WILLIAM HOVANITZ
University of California, Berkeley

The western part of North America, due to its diverse topography and climatic conditions, is a region of many barriers to animal migration. Because of this a species (Rassenkreis) may develop several races geographically close together. This necessitates, in working out a scheme of geographical variation, a knowledge of the exact type locality of each "species" or race previously described. As is well known, this was an insignificant part of early-day writings due to a different concept of the species, in consequence of which there is still some doubt as to the correct interpretation of names proposed. The names must be applied to those races which best fulfill the author's description and type locality, and, if the type specimen can be positively identified, must agree with the type. However, when a description can apply to specimens of more than one race, when the type (if such ever existed) is lost, and when no exact locality is given, the only course possible is to place that name as a synonym of the original name applied to the Rassenkreis without regard to race.

The Rassenkreis, Plebejus icarioides (Bdv.), occupies the entire continent of North America west of the Central Great Plains region. In this area it has developed numerous divergent races, some more differentiated than others. Some variation, no doubt, is directly caused by climatic conditions under which the butterflies live. Most races follow rather closely the life-zone areas on the western exposures of the mountain ranges whilst in arid regions, races seem to have little to do with altitude. However, before real distributional work can be done much more information must be gained and collections with better data made.

Plebejus icarioides icarioides (Bdv.)


Boisduval (1869) states that Lorquin collected his Californian material somewhere between San Francisco and the moun-

1 Authors consistently use this as a basis for genetic differentiation, as if differing climatic conditions by its direct effect genetically changes the heredity of an organism. The inheritance of acquired characters is, of course, not accepted.
tains to the east and in northern California. He mentions the placer mining areas in the "Juba" mountains which are the foothills of the central Sierra Nevada. In the description of this particular species he states that the specimens are from the mountains. At the time Lorquin was in California the only areas open in the mountains were these "Juba" mining areas and the Truckee and Placerville roads to Lake Tahoe and Nevada. Specimens collected today between 2000 and 4000 feet elevation (between Transition and Upper Sonoran life-zones) along either of these roads or in the "Juba" mountains agree with the report given of the type by McDunnough (1914) as well as a report he has communicated to me. Specimens from higher elevations show the tendency toward the orange margins on the upper side of the wings mentioned by McDunnough as being present on several specimens (females) examined. Other specimens mentioned by him as having the black spots on the under side nearly obsolete are more typical of those which fly at higher elevations and approach the Nevada race ardea Edws. Although unfortunately I have been unable to refer to the figure of the type (more exactly a cotype) shown by Oberthür nor to the types said to be in the U. S. National Museum, because of the convincing information of the type locality and the agreement of the description with specimens taken at that locality, I place the type locality of the race icarioides (Bdv.) as : 2000-4000 feet El Dorado and Nevada counties, California. It is to be noted that Lorquin might very well have collected specimens of the race ardea (Edws.) (those in which the spots are nearly obsolete); all of which Boisduval classed as his types.

PLEBEJUS ICARIOIDES PARDA LIS (Behr)


The description of this race being in Latin is rather short but to the point. The male is blue and the female entirely brown. It is figured in Holland (1931) and Comstock (1927) as mario-
copa Reakirt. The types were destroyed in the San Francisco fire of 1906 and no figures of them exist. The type locality, however, makes its identity undoubted. Behr (1867) writes, "The only habitat of this species yet known to me is in the Contra Costa Coast Range, in the vicinity of San Antonio, where it frequents steep, grassy hillsides". The Contra Costa Coast Range
is a name used in the early days of California for the Berkeley and Oakland hills facing San Francisco on the west (Contra Costa means "on the other side", that is, on the other side of the bay from San Francisco). San Antonio is the name of a very early settlement situated just to the south of San Antonio Creek (now Lawe Merritt) in the center of the present city of Oakland. The hills to the east are those referred to, now covered by the city. Typical specimens may still be obtained a few miles to the south in the Redwood Peak region or to the north in the Berkeley hills. Barnes and McDunnough's (1916) figure of a specimen from Sonoma County seems typical but is north of the type locality. For the interpretation of Behr's geographical locations I am indebted to Prof. Edwin C. Van Dyke of the University of California.

PLEBEJUS MARICOPA (Reakirt)


Reakirt's description is very important. The first paragraph follows: "Male. Upper side brown, glossed with violet blue, a narrow terminal line along the outer margins; a black discal bar on the primaries, sometimes wanting, and some obsolete rounded spots on the hind margin of the secondaries. Fringe ash colored." Also part of the second paragraph: ". . . three transverse maculate bands; the first composed of eight large rounded black spots, . . . ". From this I deduce the following:

1. The description is of a female as none of the Plebejinae are known with males brown on the upper side.

2. " . . . a black discal bar on the primaries, sometimes wanting" could only mean that he had more than one specimen to draw his description from and possibly more than one race. Also in the last sentence of the second paragraph of his description he says, " . . . and the seventh spot of the first and second rows are sometimes confluent." Obviously he was describing a variable series of specimens.

3. The "type" specimen in the Strecker collection does not have any blue or violet-blue gloss or suffusion on its upper surface (Barnes and McDunnough 1916) and therefore, although it may have been in Reakirt's series of specimens, because of its
disagreement with the description and for other reasons as stated by Barnes and McDunnough it cannot be designated the type.

4. The type locality “California” is of little value except that a study of Reakirt’s travels in the state might enlighten the subject. He is supposed to have collected from the vicinity of Los Angeles through the Sierra Nevada foothills (at that time busy with mining activities) to Sacramento (Essig 1931). However, there is some doubt as to whether he collected in the state at all. In the Tehachapi (Comstock 1927) he might have obtained the specimen now in the Strecker collection. Here also he might have gotten the name maricopa from the town by that name in Kern County.

5. Therefore, as no valid type exists, as no type locality is known, and as the description is too poor to adequately place the name other than as some form of icarioides with large spots (of which several exist), the name maricopa Reakirt must be considered a synonym of icarioides Bdv. and pardalis Behr must be removed from the synonymy of maricopa.2

Plebejus icarioides missionensis Hovanitz, new race

Size identical with P. pHERES (Bdv.).3 Upper surface of wings: Male, identical with pHERES; blue with black border and white fringes; anal angle and body clothed with white hair. Female, identical with pHERES except for the slightly greater restriction of the blue towards the base of the wings; marginal row of black or slightly blue spots at lower end of outer margin of secondaries. Under side: Male and female almost identical; ground color of a darker shade than in pHERES; two rows of black spots on both primaries and secondaries, those on primaries much the same as in pHERES but outer row darker; secondaries differing from pHERES in having inner row of spots round, black and encircled with white; outer row smaller and not encircled with white.

Missionensis differs from pHERES (Bdv.) in having black instead of white spots on the under side secondaries, from pardalis

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2 In weighing evidence for the correct interpretation of names, I place of greatest importance locality and secondly description. Evidence of a type specimen I give due consideration. The reasons for this I believe are obvious: Type specimens may be mislabelled or mixed, etc., descriptions are not always accurate and may have been drawn from a few atypical specimens of the race.

3 This combination, I believe, is new in print. Plebejus icarioides pHERES (Bdv.).
(Behr) in having smaller black spots and with a blue suffusion in the female, from *icarioides* (Bdv.) in having greater hairiness of the body and wings, in the different shade of blue and in its smaller average size, and from *moroensis* Sternitzky in having larger black spots on the under side of secondaries. No genitalic study has yet been made of these races.


We have found that the type locality of *P. icarioides* (Bdv.) is the central Sierra Nevada foothills of approximately 3000-4000 feet elevation. This, therefore, restricts the above name to that certain montane race of the Rassenkreis. The same author named another butterfly *pheres*, which differed by having white spots on the secondaries instead of black, and which was taken in San Francisco. Also in San Francisco is found a race differing from both of these and which apparently does not have a name. This I have described above as *Plebejus icarioides missionensis* Hovanitz.

*P. i. pheres* (Bdv.) is found on the sand-dunes of western San Francisco on, or in relation with, the larval food-plant, *Lupinus chamissonis* Esch. No other locality is known. *P. i. missionensis* Hovanitz flies in a different but contiguous area to the east, being abundant on the Twin Peaks and Mission District hills of the city, in areas where *Lupinus varicolor* Steud. is found. It thus occupies a region between *pheres* and *pardalis* but cannot be considered a transition or intergrade. All these races agree with Jordan’s Law in that they occur in different but adjacent areas; and, it is also of interest to note that the larval food plant, and climatic conditions of each are different. The writer realizes that because of lack of definite knowledge of intergradation, some authors might wish these to remain as separate species; however, whether one wishes to call them species or subspecies, they are at least different races and for matter of convenience the trinomial had better be used. Because of the differing current usage of the terms species and subspecies, the author be-
lieves the following two old terms deserve greater use in designating these concepts: 1. Race to be used for the only taxonomic category recognizable in nature; this is identical with what has been called the subspecies. 2. Rassenkreis to designate the connected series of races which by some is called the species. Both of these are old terms whose meanings have not become warped. The former is known to all. The latter is finding much greater use in America of late although it has been used in Europe (Germany) for some time. The species-subspecies terminology implies that the species is a definite category from which various geographical variants (subspecies) have arisen and which by isolation in space and time will become species. Any subspecies must intergrade with some other subspecies or it is elevated to specific rank. The Rassenkreis (racial circle) terminology does not imply any origin of a species for this still seems to be a debatable question. It is merely a connected series of related races, many of which may be isolated so that intergradation cannot take place and does not imply that races are incipient species (Rassenkreis). However, some writers go so far as to say that the Rassenkreis is definite in nature and that racial variation occurs only within this unit. Two other terms have sometimes been used, complex and exerge; the former referring to a closely related group of races and, in many cases, obviously meaning a Rassenkreis, and the latter referring to a geographical branch of a racial circle produced by straight-line migration. Use of the former should be avoided as it has no definite meaning but the latter (exerge) is a good term to use in describing geographical distribution.

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A NEW SPECIES OF VALGUS AND A NEW GENERIC RECORD FOR MEXICO (Coleoptera-Scarbaeidae)

BY MONT A. CAZIER
University of California

Valgus mexicanus Cazier, new species

Small, robust, flattened, black, sparsely squamose. Head narrow, shallowly excavated between the eyes, sparsely clothed with small erect squamae, each squama arising from a small elevated pore which is surrounded by a shallow circular or lunate groove; clypeus feebly notched in center of anterior margin; antennæ nine-segmented, club longer than funicle. Pronotum longer than broad, gradually deflexed from apical third, widest at base, gradually narrowing to front, lateral margins bluntly serrate, posterior margin evenly rounded, middle carinae prominent, not acute, impression at basal third shallow; apical two-thirds sparsely covered with circular or lunate grooves, basal grooves forming striations that rotate outward from mid base of disc; sparsely clothed with narrow, black squamae on carinae, raised portions of disc and lateral edges; outer angles and posterior and anterior margins with small groups of large, flattened, white squamae. Elytra short, flattened, basal margin concave, humeral umbone prominent, connected to the prominent apical umbone by a ridge, middle of disc with several smooth, narrow bands, striations irregular, formed by series of connected lunate grooves, lateral grooves both lunate and circular, separated; large, flat, white squamae confined to center of disc forming an irregular line down sutural third from base to apical umbone; narrow, erect, black squamae sparsely scattered over entire surface. First visible abdominal segment with a prominent tubercle on posterior edge at lateral extremity; entire surface moderately clothed with narrow, erect, black squamae and large, white, flattened squamae, each pore surrounded by a circular groove; pygidium evenly rounded at sides, with small flattened, slightly concave section at extreme apical tip, clothed with scales and sculptured as in first visible segment except that the margins are lined with narrow, white squamae which are rather dense at apical extremity. Beneath, body and legs, moderately clothed with white, broad and slender squamae, separated from each other by their own lengths; anterior half of gena densely clothed with large, flat, white squamae, posterior portion bare or with a few scattered scales, sculptured as on dorsal surface; legs short, side margin of anterior tibia with two large teeth separated by a smaller one; anterior tarsi with first segment one-half as long as second, two, three and four equal, five slightly longer than four; middle tarsi with first four segments
equal, five slightly longer; hind tarsi with first four segments equal in length but with first more robust, second, third and fourth becoming gradually smaller (not shorter), fifth slightly longer than fourth; claws simple. Length 4-5 mm.

Type locality, Orizaba Mexico, June, 1929, collected by G. Trussel. Holotype male and three paratypes in the author's collection, one paratype in the collection of Hugh B. Leach, one in the collection of L. W. Saylor and one in the collection of the California Academy of Sciences.

This is the first record of this genus from Mexico or from south of the United States and, although the species is distinct in most of its characters including tarsi, thorax and pygidium, from our four species, I do not think that it will be of any value to erect a new genus or subgenus on the basis of these differences as has been done in Europe. I have not recognized the subgenera *Homovalgus* and *Acanthurus* because they also are of little value.

In the seven specimens before me there is little variation except in the number of squamae present. The type specimen has the maximum number in the series whereas some of the other specimens are nearly devoid of all squamae on the dorsal surface. In one specimen there are two tufts of scales in the center of the first visible abdominal segment. This species is most closely related to *V. canaliculatus* and *V. seticollis* of the United States, being nearest to *canaliculatus*. It differs from *canaliculatus* by having the body very sparsely covered with squamae, the posterior margin of prothorax evenly rounded, the presence of the prominent tubercles on the first visible abdominal segment, the flattened tip of the pygidium, the tarsal character as given in the key, and the black color. The only other black species described from North America is *V. californicus* which is much larger and differs by having the prothorax nearly square, by the absence of the striae on prothorax, and by the characters given in key.

**Key to the North American species of Valgus**

1. First segment of posterior tarsi slightly longer than second, equal in length to fifth, ........................................... *mexicanus*

   ... First segment of posterior tarsi as long as two and three combined and from one and one-half to two times longer than fifth, .................................................................2
2. Sparsely clothed with narrow squamae, prothorax as broad as long, ..................................................3
   ... Moderately to densely clothed with large flat squamae, prothorax longer than broad, .................................................................4
3. Head deeply excavated between the eyes, black, ......*californicus*
   ... Head flat between the eyes, brown, ................................**minutus**
4. Ventral surface of abdominal segments covered with a dense pad of squamae in center in male; disc of elytra elevated; female with corneous process on pygidium, ............*canaliculatus*
   ... Ventral surface of abdominal segments sparsely clothed with squamae in male; center of disc of elytra with elevated area; female without corneous process on pygidium; lateral margins of abdominal segments, first visible abdominal segment and pygidium densely clothed with flat squamae, ...............*seticollis*

I want to express my thanks to Dr. E. C. Van Dyke for his assistance and to G. E. Bohart for testing the key.

A NEW ENTOMOLOGICAL GLOSSARY


While cited as a completely revised and rewritten edition of "Smith's Explanation of Terms Used in Entomology" this is in fact a new work. It shows a great amount of patient research that few would have the time or patience to bestow. A rough estimate gives about 8,000 words that have been defined in a brief but concise manner. The author's treatment of the question of "types" should do much to standardize that somewhat involved subject. Much of the type terminology has developed since my earlier work. Then all specimens used in founding a species were types; later one was selected as the type and all others were co-types. Such now are called paratypes and the selected type is the holotype. Mr. Bueno's explanation of the terms subspecies, race and form should do much to stabilize the nomenclature of some of our beginners of the younger generation who have not given this matter proper consideration.

One could go on indefinitely pointing out the importance of a work such as this. Suffice it to say it is indespensible to our younger students and scarcely less so to those more experienced. The two appendices giving Latin definitions and arbitrary symbols will be found very useful, as will also the nine plates for which there are full explanations.—E. P. Van Duzee.
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