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# PSYCHE

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EDITED BY CHARLES T. BRUES

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# PSYCHE

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# PSYCHE

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## HOW ODYNERUS SUSPENDS HER EGG

BY CARL G. HARTMAN

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So far as the writer is aware it was he and his sons, Philip and Paul, amateur entomologists, who first witnessed a Eumenid wasp expel her egg and hang it from the ceiling of her nest — or rather suspend it and then expel the egg, for, as a matter of fact, the thread is made first. Dame Fortune was with us further in that the very first time we witnessed the act we had the movie camera set up, loaded with Kodachrome, and so secured a motion picture of oviposition.

For some forty years, on numerous occasions, I have amused myself and bored tolerant friends by attracting certain solitary bees and wasps ("tube fillers") to my window-sill by setting out tubes of various diameters suitable for their occupancy. Trypoxylon and Odynerus were sure to be there, also small bees as well as the larger Megachile, the leaf cutter. The last mentioned proved especially popular with the amateur naturalist. The method most often employed was that well described and figured by Savin (*Natural History*, 1922). This method consists essentially of screwing together two smooth-faced boards and boring holes of various diameters down the surface of junction. By removing the screws the work of insects could readily be laid bare. Bamboo tubes and even rubber tubing were also set out, but the latter does not favor the survival of the wasp grubs. In vacation time of 1941, however, at Bethlehem, Connecticut, all energies were devoted to watching and photographing the insects as they worked in glass tubes. No better means can be imagined for prying into the insects' domestic activities than by inducing them to live in glass houses! In this the insects proved most coöperative.

It is the object of the present paper to describe the egg-laying of *Odynerus (Rygdium) rugosus* (Sauss) = *foraminatus* (Sauss) as observed and photographed by the glass-tube method.

Bamboo tubes which served as sheaths for the glass tubes so as to afford the requisite darkness of the interior, were tacked on a tree-trunk or the side of the house or other comfortable shady place, and developments awaited. Light for instantaneous photography was secured by reflecting sunlight on the tube by means of a mirror.

The egg is always laid before the prey is captured and the cell stored. Trypoxylon and many others reverse this sequence. The signal for the egg-laying ceremony consists in the wasp's turning around and backing into the tube. Egg laying is the only act for which this orientation is necessary.

After entering the tube the more or less excitable female comes gradually to rest supinely on her wings, with tip of abdomen directed upward close to the mud partition. The rapid breathing movements (air temperature 90° F!) are soon accompanied by another type of movement, a comparatively slow, rhythmic contraction of the abdomen, in which the abdominal segments seem alternately to telescope and evert as the tip of the abdomen is retracted and extended. In the words of the observant young assistants: "She's pumpin' an egg." With each extension of the abdomen the tip comes in contact with the ceiling. Presently a drop of whitish secretion appears and is touched to the ceiling. There it sticks; and as the abdomen is withdrawn a thread is drawn out and instantly hardens, remaining flexible and tough, for subsequent movements of the abdomen do no injury to it.

The abdominal movements continue uninterruptedly until gradually the egg begins to slide out. The motion picture shows the egg free for about one-third of its length when a sudden jump in the film occurs to the point where the egg is two-thirds emerged, the interval marking the time that the camera was being re-wound.

As soon as the egg is free, it is seen to dangle by its thread like a tiny pendulum.

#### *Function of the Thread*

On the adaptive significance of the suspensory thread of the Eumenid egg or its possible phylogenic history, the writer has no contribution to make. Several observations, however, may be cited confirmatory of Ch. Ferton's contention (Collected Works,

1923) that Fabre laid too much stress on the correlation of the well-known liveliness of Eumenid's caterpillars and the alleged delicacy of the Eumenid egg.

It is a matter of common observation that the Eumenid prey is seldom stung to death. On opening a nest of Eumenes or Odynerus practically all of the caterpillars respond to stimulation and many move spontaneously. It is not at all a rare occurrence that a caterpillar begins to crawl as soon as set free. One of the scenes in our motion pictures of Eumenes is that of a merry scramble of four or five surviving caterpillars with two large wasp grubs holding on — for this case concerned an exceptional nest in which two eggs had been laid.

Fabre considered the egg much too delicate to stand the jostling of such vivacious prey entombed alive; he states that he was never able to rear grubs from eggs that were disturbed or removed from their original sites. But not so Ferton, who seldom failed under similar circumstances. Indeed, he once dropped an egg with the lively canker worms into a bottle, carried the specimens some miles on horseback, yet reared a wasp from the egg. We have also reared wasps from eggs that had been carried about in the jug nests of Eumenes or in bamboo tubes stored by Odynerus, although these were not handled with any special reference to the force of gravity.

Ferton points out, furthermore, that the cells are usually so tightly packed with caterpillars that the egg must needs be pressed against the wall and not able to dangle freely at all. This can readily be corroborated by opening almost any fully stored cell. If one split a bamboo tube full of caterpillars, it will be seen that the masses of worms literally swell up as the retaining wall is removed.

To these points we are able to add our direct observation on what happens to the egg as viewed through the wall of the glass tube while the insect is at work.

After the egg has been suspended in the depth of the cell, foraging begins. As the caterpillars are brought in they are stuffed with might and main into a closely fitting firm mass at the bottom of the cell. This happens also in smooth-walled glass tubes in which the worker finds only a precarious footing. The egg is always pushed around and often squeezed against the glass or between caterpillars, which are thus thoroughly immobilized by virtue of mutual pressure.

Ferton is of the opinion that the chief value of the suspensory

thread for racial survival lies in the avoidance of contact by the egg with the wet wall of the cell. All predacious wasps seem particular as to the site of attachment of the egg, usually choosing the upper surface of the prey; or, if the egg is laid on the ground, as in the case of certain fly-catchers that feed the prey from day to day, a pebble is chosen to receive the egg. Of interest in this connection is the "transitional" habit of *Rhaphiglossa zethoides*, a solitary Vespid which attaches its egg, not by a thread, but by an elongated end in such a way that the egg projects away from the wall at an angle of about  $45^{\circ}$ . This wasp is of further phylogenetic interest in the use of both wood fiber, after the manner of the social wasps, and mud, which solitary Sphecina as well as Vespina usually employ.

*Summary.* The act of oviposition of *Odynerus rugosus* is here described and the probable function of the suspensory thread of the Eumenid egg is discussed.



## A NEW FUNGUS GROWING ANT FROM MEXICO

BY WILLIAM F. BUREN

Alexandria, Louisiana

*Trachymyrmex smithi*, n. sp.

## Worker.

Similar to *T. septentrionalis obscurior* but black in color and with several structural differences.

Length about 3.5 to 4.0 mm.

Head, excluding mandibles, a little broader than long, wider behind than in front, with the hind border excised in an obtuse angle, and the sides feebly convex. Head broadest midway between the eyes and posterior corners. Clypeus broadly notched in the middle. Frontal carinæ more mesally placed than in many species of *Trachymyrmex*, produced laterally into subtriangular lobes in front, becoming faint behind and fading out before reaching the hind border of the head. Scapes surpassing posterior corners of head by about one fourth of their length. All funicular joints longer than broad. Antennal scrobes indistinct behind. Genal carinæ curving obliquely mesad past the level of the eyes. No postocular carinæ. Eyes hemispherical. A single short blunt spine behind each posterior corner of the head.

Thorax rather robust. Mesoepinotal impression moderately deep. Inferior pronotal spines small and lappet-shaped. Median superior pronotal spines separate and rather blunt. Lateral pronotal spines blunter than in *obscurior*, projecting laterally and curving slightly ventrad toward the tip. Three pairs of spines on the mesonotum. The first pair not as long as the lateral pronotal pair but blunter and more robust, broader at the base than high. The posterior two pairs of mesonotal spines much smaller and somewhat sharper. Epinotal spines slender and sharp. Rows of tubercles run forward on the epinotum from the epinotal spines to form longitudinal carinæ, and other rows of tubercles form rather feeble oblique carinæ on the pleuræ of the epinotum and mesonotum.

Petiole and postpetiole much as in *obscurior* but the petiole is longer, its anterior dorsal face more sloping. Postpetiole notched

behind as in *obscurior*. The tubercles on petiole and postpetiole larger and more spine-like than in *obscurior*.

Lateral ridges and longitudinal depressions on first segment of gaster indistinct or absent.

Mandibles striate and rather shining. All other regions opaque, densely and finely punctate, giving a granular appearance. Tubercles and hooked hairs moderately numerous, about as in *obscurior*. The thoracic spines are abundantly covered with hairs and tubercles. No tubercles on legs, scapes, pronotum anterior to the spines, most pleural regions of the thorax, and venters of pedicel and gaster, although these parts have numerous hooked hairs. Tubercles larger on occipital lobes than on other parts of head; tubercles on vertex and hind portions of antennal scrobes often prolonged into small longitudinal ridges, or connected by ridges to form small longitudinal carinulæ. No pubescence except on funiculi.

Color entirely black except for the mandibles, tarsi, and articulations of femora and tibiæ, which are brown.

Male and female unknown.

Described from 59 specimens collected November 5 and November 8, 1942, from the same nest in the desert near La Rosa, in the state of Coahuila, Mexico (Elinor Buren, collector). Holotype in the author's collection; paratypes in the author's collection and in the National Museum. The nest was of a simple crater type unlike that of *turrifex* or *septentrionalis*. The ants were extremely slow and sedate in movement even in hot sunlight. They were observed bringing in small green bits which seemed to be pieces of grass. The hard soil prevented excavation.

*T. smithi* seems most closely related to *T. septentrionalis obscurior* Wheeler but the black color, broader, more robust head and thorax, differently shaped thoracic spines, weaker frontal carinæ, etc., seem sufficient distinctive characters.

This species is not closely related to *turrifex* which also occurs in northern Mexico (Vallecillo, Nuevo Leon). *T. turrifex* has shorter antennæ, a different color, narrower head, differently shaped frontal and genal carinæ, tubercles on legs and scapes, etc.

*T. jamaicensis* and its variants often approach or are similar in color to *smithi*, but these forms may be easily distinguished by the three prominent spines or large tubercles on each occipital lobe, the differently shaped head, eyes, thoracic spines, etc.

*T. saussurei*, *arizonensis*, and *desertorum* may all be distin-

guished by their ferruginous color and various differences in shape, spinulation, and tuberculation.

I take great pleasure in dedicating this species to an outstanding American myrmecologist, Dr. M. R. Smith, of the National Museum.

I am indebted to Dr. Smith for his kindness in comparing specimens of *T. smithi* with an undescribed species of *Trachymyrmex* from Lower California in his possession.

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The secretary of the Cambridge Entomological Club regrets to announce the death of Mr. Charles V. Blackburn at Stoneham, Mass., on April 11, 1944, in his 88th year. He was a member of the Club for 41 years, having been elected at the 232nd meeting, December 15, 1903. In 1942 he was elected an honorary member.

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### THREE NEW AFRICAN SPECIES OF MORDELLID BEETLES

BY EUGENE RAY

Chicago, Illinois

The following descriptions were made from a lot of eleven specimens collected in the Sudan region of Africa by A. P. G. Michelson and R. C. M. Darling and sent to the writer by Sir Guy A. K. Marshall, Director of the Imperial Institute of Entomology, British Museum (Natural History). The types of the new species hereinafter described are temporarily placed in the Chicago Natural History Museum, while paratypes remain in the collection of the writer.

#### ***Tomoxia abrupta* new species**

Form short, sides subparallel, derm generally black, with the following exceptions: anterior and intermediate legs and seven distal segments of antennæ fuscocastaneous; four proximal segments of antennæ, palpi, front, and mesal margin of mandibles castaneous. Body densely covered with fine recumbent pubescence, a solid golden on head and pronotum, black on scutellum, an irregular golden area covering basal third of elytra, enclosing an irregular black area on either side of scutellum near base, an irregular, transverse, golden band behind middle, reaching suture but not middle and connected with basal area by a short sutural line, with intervening and subsequent areas blackish-pubescent; ventral surface blackish-pubescent, except for the following whitish areas: meso- and metasternum, 1st and 2nd abdominal segments (except at apical margin), and third segment along basal margin.

(♀). Antennæ 1.4 mm. long, reaching metasternum; segments 1 and 2 equal; 3 distinctly longer than 4, latter broadest at apex; 5 as long as 3, but broader; 6-10 strongly serrate, as broad as long; 11 one-half longer than 10, inner margin and apex rounded, broadest at middle. Terminal segment of maxillary palpi enlarged, with form of a scalene triangle, sides and angles all strongly rounded, mesal margin thickest, divided longitudinally,



with a concave, elongate depression between the edges. Head strongly flattened antero-posteriorly, front, clypeus, and vertex forming a straight line. Eyes reaching occiput.

Pronotum distinctly broader than long ( $2.0 \times 1.8$  mm.), anterior margin and sides rounded, base arcuate, midbasal lobe short, broad, subtruncate. Scutellum subquadrate, sides but slightly angular, apical margin truncate.

Elytra short, but four-tenths longer than broad ( $3.2 \times 2.0$  mm.), sides attenuate to apex, apices individually rounded. Anal style short, thick, truncate at apex, but one-half longer than hypopygium ( $1.5 \times 1.0$  mm.). Posterior tarsal claws with five teeth, two premedian, the first very small, the other distinct; three postmedian, first larger than any other except terminal one, second small, third terminal.

(♂). The males are darker, the castaneous parts of the female being almost piceous in this sex. The elytral markings are more restricted, the posterior band being curved anteriorly at the suture and lateral margins.

Length: to apices of elytra, 3.3–5 mm.; to tip of anal style, 4.3–6.5 mm.

Five specimens: male *type* and two male paratypes, Wady Madu, N. E. Darfur, July 25, 1930, at flowers of *Premna resinosa* (Michelmore); one male paratype, Plain below J. Kabeiya, J. Midob, N. E. Darfur, August 7, 1930, common on leaves and flowers of large succulent grasses (Michelmore); one female paratype, Duani, wilderness of Toganoy, N. E. Darfur, August 12, 1930, on foliage of *Grewia flavescens* (Michelmore).

This species may easily be separated from the only other African member of the genus, *T. robusta* Pic (Rev. zool. bot. afr. 21, 1931, p. 45), by the wholly different pubescent markings, the unicolored abdomen and legs, the bicolored antennæ, and the larger size. Mr. Pic's short diagnosis unfortunately does not permit a more adequate comparison.

#### *Mordellistena sudaniensis* new species

Form elongate, sides subparallel, derm generally black, with the following exceptions: anterior and intermediate legs, front, palpi, and three basal antennal segments flavocastaneous; posterior legs fuscocastaneous. Body densely covered with fine, recumbent, cinereous pubescence and minute, closely-placed tubercles.



Antennæ 0.9 mm. long, reaching metasternum; segments 3-4 equal in length, the latter a little broader; 5-10 each one-third longer than 4 and almost twice as broad as 3, broadest subapically; 11 one-half longer than 10, sides and apex rounded, broadest medially. Terminal segment of maxillary palpi enlarged, slender, three times as long as broad at widest point, ovoid, outer side somewhat less rounded than inner margin, broadest on apical half.

Pronotum as long as broad (0.8 mm.), sides and apex rounded, base arcuate, midbasal lobe short, subtruncate.

Elytra two and three-fourths times as long as broad ( $2.2 \times 0.8$  mm.), sides subparallel to within a fourth of apex, then strongly curved, apices individually rounded. Anterior and intermediate tarsi longer than their tibiæ. Posterior tibiæ with two strong ridges (excluding subapical one), the anterior extending obliquely entirely across outer face; basitarsi with three, second segment with two oblique ridges. Anal style short, subtruncate at apex, but twice length of hypopygium ( $0.7 \times 0.35$  mm.).

Length: to apices of elytra, 3 mm.; to tip of anal style, 3.7 mm.

Four specimens. Type, male, and two female paratypes, El Wuz, September 17, 1931, at light (Darling); a male paratype, Plain below J. Kaboiija, J. Midob, N. E. Darfur, August 7, 1930, common on leaves of large succulent grasses (Michelmore).

This species is allied to *diffinis* Mäklin (Acta Soc. Sci. Fenn. 10, 1875, p. 586), but may easily be separated by the larger size, the much shorter anal style, the lighter appendages, the shorter and broader pronotum and elytra, and the elongate anterior ridge of the posterior tibiæ.

#### **Mordellistena darfurensis new species**

Form elongate, sides subparallel; head, mouth parts, antennæ (outer segments darker), pronotum, and anterior and intermediate legs, flavo- or fuscocastaneous, thorax sometimes with an indefinite dorsal cloud; meso- and metasternum, abdomen, posterior legs, and elytra, black. Body densely covered with fine, recumbent, flavocinereous pubescence.

Antennæ 1 mm. long, reaching metasternum; segments 3-4 equal; 5-10 each one-third longer than 4 and considerably broader, broadest subapically; 11 one-third longer than 4 and considerably broader; 11 one-third longer than 10, sides and apex rounded, broadest medially. Terminal segment of maxil-

lary palpi enlarged, slender, two and one-half times as long as broad, with the form of a scalene triangle, outer edge straight, other margins and angles rounded, broadest at a postmedian point.

Pronotum as long as broad (1 mm.), sides and angles broadly rounded, basal angles obtuse, base arcuate, midbasal lobe short, subtruncate.

Elytra two and seven-tenths times as long as broad ( $2.7 \times 1$  mm.), sides subparallel on basal half, thence distinctly curved to apex, apices individually rounded. Anterior and intermediate tarsi longer than their tibiae. Posterior tibiae with three strong, equal ridges (excluding subapical one); basitarsi with three (one specimen with a rudimentary fourth), second segment with two oblique ridges. Anal style moderately long, attenuate, subtruncate at apex, two and one-third times length of apical ventral segment ( $1.4 \times 0.6$  mm.).

Length: to apices of elytra, 3.7 mm.; to tip of anal style, 5.1 mm.

Two specimens: Type from Plain below J. Kabeiya, J. Midob, N. E. Darfur, August 7, 1930, on leaves and flowers of large succulent grasses; paratype from N. E. Darfur, August 5-13, 1930 (Michelmore).

This species may be separated from its closest ally, *atriventris* Pic (Rev. zool. bot. afr. 21, 1931, p. 47), by the flavocastaneous head, the black elytra, the flavocinereous pubescence, the unicolor legs, the shorter anal style and the larger size. The short description of *atriventris* indicates that the posterior tarsi of his type specimen may be missing. Other differences probably exist, but Pic's short description deals chiefly with color — the antennae and maxillary palpi are not mentioned.

FURTHER STUDIES OF THE TABANIDÆ  
OF TRINIDAD, B. W. I.

BY J. BEQUAERT

Harvard Medical School and School of Public Health,  
Boston, Mass.

The publication of my list of Trinidad Tabanidæ a few years ago (1940, Bull. Ent. Res., 30, pp. 447-453) induced several entomologists to a more intensive study of these flies. Dr. E. McC. Callan submitted for identification two lots, including all specimens in the Department of Entomology of the Imperial College of Tropical Agriculture. More recently Dr. Raymond C. Shannon, of the International Health Division, The Rockefeller Foundation, forwarded to me many specimens obtained by him and his associates in the course of their studies on malaria. The result is most gratifying and has induced me to draw up a revised list of the species known from the island. This was the more necessary because recent careful work on the Panamanian fauna by Dr. G. B. Fairchild has resulted in certain corrected identifications and names. Some of these changes were decided upon in personal discussion with Dr. Fairchild, and most of them have since been published by him. None of the information given in my earlier paper is repeated here, unless it called for correction.

The number of known Trinidad Tabanidæ has risen now from 23 to 31 species, 9 species being added. One of the species of the earlier list (*Tabanus ochrophilus*) was dropped, as the specimen on which the record was based is not now available for study and was no doubt misidentified. The following changes in nomenclature were made. The species formerly listed as *Chrysops auroguttata* is now called *Chrysops pallidifemorata* Kröber. *Stibasoma dyridophorum* becomes a synonym of *S. mallophoroides*. The older name *T. limonus* is applied to the species formerly called *T. viridis*. In accordance with G. B. Fairchild's recent work, *T. ampliifrons* is used for the species I called *T. trilineatus* and *T. vittiger* subsp. *guatemalanus* for

the females formerly called *T. carneus*; while *T. appendiculatus* is considered a synonym of *T. lineola* var. *carneus*.

Two species of *Tabanidæ* are now known from Tobago: *Tabanus amplifrons* and *T. leucaspis*, both common in Trinidad.

In my earlier paper a brief comparison was drawn between the tabanid faunæ of Trinidad, the Antilles, and continental South America. This was somewhat amplified in my monograph of the Tabanidæ of the Antilles (1940, Rev. de Entomologia, 11, p. 271-272). The conclusions reached at the time are merely confirmed by recent additions. The purely South American character of the Trinidad tabanid fauna remains beyond dispute. All nine genera of the revised list are found on the continent. This is true also of the nine subgenera here included in the genus *Tabanus*, some of these groups being given generic rank by recent authors (*Stenotabanus*, *Leucotabanus*, *Chlorotabanus*, etc.). The 31 species likewise all occur on the American mainland, where most of them are widely distributed. On the other hand only four of the nine Trinidad genera are represented in the Antilles (*Chrysops*, *Lepiselaga*, *Dichelacera*, *Tabanus*); while of the nine subgenera of *Tabanus*, five occur in Trinidad as well as in the Antilles (*Chelotabanus*, *Bellardia*, *Chlorotabanus*, *Macrocornus* and *Stenotabanus*). Of the 31 Trinidad species, only five are definitely known from the Antilles: *Chrysops variegata*, *Lepiselaga crassipes*, *Tabanus hookeri*, *T. vittiger* (= *T. truquii* of my Antillean monograph) and *T. lineola*. (*T. ferrifer* has been recorded doubtfully from Barbados). These five species are widely distributed throughout tropical America, *T. lineola* occurring even in the Nearctic Region.

1. *Chrysops variegata* (Degeer).
2. *Chrysops tristis* (Fabricius).
3. *Chrysops fulviceps* Walker (= *C. aurofasciatus* Kröber).
4. *Chrysops pallidefemorata* Kröber (= *C. auroguttatus* var. *pallidefemoratus* Kröber, 1930, Zoolog. Anzeiger, 90, p. 72, figs. 9-10; ♀; Trinidad).

Lezard Swamp, female (R. C. Shannon); Caroni Swamp, female (R. C. Shannon).

These two specimens agree with Kröber's figures of the head, antenna (partly drawn) and wing pattern of var. *pallidefemoratus*, not with those of his typical *auroguttatus* (*Ibid.*, p. 71,



figs. 6 and 8). The second tergite of the abdomen bears a small median apical pale spot.

A renewed study of these specimens and of some other material in our collections has led me to separate *pallidefemorata* as a distinct species. The frons is considerably broader than in *auroguttata*; the second antennal segment is relatively shorter and the first somewhat swollen; the hyaline area in the fourth and fifth posterior cells touches the discal cell; there is no trace of a hyaline spot near the base in the first submarginal cell; and the apical dark streak of the wing is more deeply notched at the base by the hyaline area, so that its apical portion appears widened. The three females from Quintana Roo, Mexico, which I called *C. incisa* in my paper on the Yucatan Tabanidæ (1932, Jl. New York Ent. Soc., 39, for 1931, p. 535) were really *C. pallidefemorata*, so that the species appears to be widely distributed.

The specimens which I listed from Trinidad under *C. auroguttata* in my earlier paper (1940, p. 448) are not now available, so that I am unable to place them under either that species or *C. pallidefemorata*. There is even a possibility that the Trinidad cotype of *auroguttata* was really a *pallidefemorata* and that Kröber's drawings of *auroguttata* were made from the Colombia cotype (both cotypes are at the British Museum). For this reason I omit provisionally the true *auroguttata* from the Trinidad list. The female from Costa Rica (Carillo), which I reported in 1940, was Kröber's true *auroguttata* and this is also true of the Panama records published by Pechuman (1937, Rev. de Entomologia, 7, p. 136) as *C. auroguttata* var. *pallidefemorata*, and by G. B. Fairchild (1942, Proc. Ent. Soc. Washington, 44, p. 4) as *C. incisa*.

Whether *Chrysops incisus* Macquart (1845, Mém. Soc. R. Sci. Agric. Arts Lille, for 1844, p. 172, Pl. IV, figs. 12-12a; ♀; "New Grenada") was *C. auroguttata* Kröber, *C. pallidefemorata* Kröber or some other species (? *melæna* Hine) appears impossible to decide, unless Macquart's type could be found. The description is vague (the yellow stripes on the sides of the mesonotum are not mentioned) and the drawings are too crude to be reliable.

##### 5. *Chrysops bulbicornis* Ad. Lutz.

St. Augustine, 2 females (W. Cook; one of the specimens had



been named *C. læta*, a species not known from Trinidad); St. Augustine, male, allotype (A. M. Adamson); Penal, female (R. C. Shannon); also 3 females from Trinidad, without more definite locality (Stanton Crawford). The species also occurs in Bolivia (Monte S. Pablo).

The markings of body and wings are somewhat as in *C. læta* (Fabricius); but *C. bulbicornis* is readily recognized by the conspicuously swollen first antennal segment and the prominent, conical callosities of the face. In addition, the female has rows of lateral spots on tergites 3 to 6, which tend to fuse into lateral stripes, and the apical black streak of the wing fills the marginal cell completely (the hyaline area not crossing the second longitudinal vein).

*Male* (undescribed). Antennæ as in female, the first segment conspicuously swollen, pear-shaped, both in profile and from above; facial callosities very prominent, cone-shaped; eyes broadly contiguous. Head, including palpi and first two antennal segments, honey-yellow (third segment lacking). Thorax black, covered with black and gray hairs; scutellum and pleura slightly brownish; mesonotum on each side with a prominent yellow stripe. Legs mostly honey-yellow, with black pile; coxæ more brownish. Abdomen brownish-black; dorsum narrowly golden-yellow along extreme sides, with a median row of small, triangular yellow spots on tergites 2 to 5 (more rounded off on tergite 2) and small marginal lateral spots on tergites 3 to 5 (free from the median spot on tergites 3 and 4; narrowly connected on tergite 5). Wing much as in the male of *C. læta* (see Kröber, 1925, Konowia, 4, Pl. III), but apical black streak filling entire marginal cell and anal cell without distinct hyaline streak (though with a slightly paler area). Length, 7 mm.; of wing, 6.5 mm.

6. *Esenbeckia prasiniventris* (Macquart).

St. Augustine, female, the prey of a bembicid wasp, *Rubrica surinamensis* (Degeer) (E. McC. Callan); Maraval, female (Imper. Coll. Trop. Agric.).

7. *Lepiselaga crassipes* (Fabricius).

Pt. Fortia, female (R. C. Shannon).

Widely distributed in the Greater Antilles, Central and South America.

8. *Selasoma tibiale* (Wiedemann).

9. *Stibasoma fulvohirtum* (Wiedemann).

Balandra Bay, female (W. Cook); Brasso, female, biting man (E. McC. Callan); Cumato, female (R. C. Shannon); Point Gourde, female, biting man (E. McC. Callan); Rio Claro, female (R. C. Shannon).

10. *Stibasoma mallophoroides* (Walker) (= *Stibasoma dyridophorum* Knab).

Balandra, female (E. McC. Callan).

Hine, who examined the type of Walker's species at the British Museum, wrote in his manuscript notes: "Type ♀ very much like *S. dyridophorum* Knab; wings almost exactly the same; the discal spot is hyaline in *mallophoroides* and extends into second basal cell, as is the case in Knab's species. It would seem that the variation known to exist in this genus would bring the two together." This synonymy was accepted by me in 1940 (Rev. de Entomologia, 11, p. 272). *S. mallophoroides* was described from the Amazon region, Brazil.

11. *Dichelacera ochracea* Hine.

Valencia, 2 females, biting man (E. McC. Callan).

12. *Tabanus (Chelotabanus) discifer* Walker, 1850 (= *Tabanus albomaculatus* Walker, 1854).

Arima, female (E. McC. Callan); Rio Claro, female (E. McC. Callan); Tamano, female (R. C. Shannon).

The species is known also from Brazil (Pará; San Alberto on the Rio Branco in the State of Amazonas), Dutch Guiana and Venezuela. *T. discifer* was based on the female, *T. albomaculatus* on the male. Kröber (1931, Zool. Anzeig., 96, p. 53) reported it from Trinidad and recognized that *discifer* and *albomaculatus* were the two sexes of one species. I was inclined at one time to regard *Tabanus guttigaster* Kröber (1934) (= *T. guttiventris* Kröber, 1929) as the same species and used that name in my paper on Antillean Tabanidæ (1940, Rev. de Entomologia, 11, p. 272); but this synonymy is uncertain and *T. discifer* is, in any case, the older valid name.

13. *Tabanus (Chelotabanus) ferrifer* Walker.

St. Augustine, many females and males (J. T. Gonzalves; A. C. Salazar; E. McC. Callan; A. M. Adamson; Ruth O'Connor; M. D. French-Mullen; D. K. Kevan); also one female

as prey of the bembecid wasp, *Rubrica surinamensis* (Degeer). El Dorado Village, female (M. V. Beattie; named *T. ferrifer* by the late Major E. E. Austen); Nariva Swamp, female (R. C. Shannon); Mundo Nuevo, female (R. C. Shannon); Tamano, female (R. C. Shannon); Siparia, female (R. C. Shannon).

According to Dr. McC. Callan, this is one of the commonest horseflies at St. Augustine, the males being found in ones and twos sitting in sunny places from about 8 A.M. to 4 P.M.

14. *Tabanus* (*Bellardia*) *xipe* Kröber.

St. Augustine, male, October 22, 1937 (A. M. Adamson); Tamano, female (R. C. Shannon).

*Male* (undescribed). — Differs from the male of *T. ferrifer* in size, extent of the velvety-black spot of the scutellum, markings of abdomen, color of wings, presence of a long appendix at the fork of the third longitudinal vein, and shape of antennæ. In all these characters it agrees with the female of *xipe*. The eyes are entirely bare and divided into an upper zone of enlarged and a lower zone of small facets.

Dr. Shannon sketched the eye of the female as purple with three green cross-bands, the upper one rather broad but short, the lower one very broad and somewhat narrowed outwardly, the middle one much narrower than the others and somewhat wavy.

According to G. B. Fairchild (1942, *Psyche*, 49, p. 8) *Lophotabanus* Szilády (1926) is not subgenerically separable from *Bellardia* Rondani (1863), an opinion with which I concur.

15. *Tabanus* (*Phæotabanus*) *semiflavus* Kröber.

Princes Town, female (R. C. Shannon).

This specimen agrees with two females I have seen from Brazil (Curralinho, State of Pará). The species was first described from Venezuela.

16. *Tabanus* (*Chlorotabanus*) *mexicanus* Linnæus.

Tamano, female (R. C. Shannon).

17. *Tabanus* (*Cryptotylus*) *unicolor* Wiedemann.

Mayaro, female (D. K. Kevan); Tamano, 2 females (R. C. Shannon).

18. *Tabanus* (*Cryptotylus*) *limonus* Townsend (= *Ommallia viridis* Enderlein).

G. B. Fairchild (1940, *Rev. de Entomologia*, 11, pp. 720-

722) established what appears to be the correct synonymy of this species. It is known at present from Mexico, Guatemala, Honduras, Panama, Colombia, Trinidad and northern Brazil.

At one time I referred the Trinidad specimens to *Tabanus luteoflavus* Bellardi (see J. Beqaert, 1940, Rev. de Entomologia, 11, p. 272); but this was erroneous. As for the green male from Paraguay which I mentioned at the close of the discussion of *T. viridis*, it has now been recognized as that of *Tabanus (Cryptotylus) princeps* Brèthes.

19. *Tabanus (Leucotabanus) leucaspis* Wiedemann.

Princes Town, female (R. C. Shannon); Saut d'Eau Bay, female, biting man (E. McC. Callan); St. Augustine, 2 females (Ruth O'Connor); Tacarigua, several females (T. H. Khan); Tamano, female (A. M. Adamson); Maracas Valley, female (M. V. Beattie). Other females merely labeled Trinidad (Stanton Crawford).

A common species in Trinidad. I have also seen one female from Speyside, Tobago (biting man) (E. McC. Callan).

20. *Tabanus (Macrocormus) sorbillans* Wiedemann.

St. Augustine, 4 females (A. M. Adamson; E. McC. Callan) and 2 males (Ruth O'Connor); Tamano, female (R. C. Shannon).

According to a sketch by Dr. Shannon, the eye of the female is purple with 2 rather narrow green cross-bands in life.

21. *Tabanus (Stenotabanus) maculifrons* Hine.

Blanchisseuse, female (R. C. Shannon).

This remarkable little horsefly was originally described from Guatemala (1907, Ohio Naturalist, 8, p. 222; ♀). I have taken a female in Colombia (Caney River near Restrepo, Int. Meta) and G. B. Fairchild found it in Panama. The eye, which I observed in life and which was also sketched by Dr. Shannon, is pale purplish with two moderately broad, unconnected bluish-green cross-bands: one shorter, starting from the frontal callus; the other in the lower third, curved upward at the outer end.

22. *Tabanus (Neotabanus) hookeri* Knab.

St. Augustine, several females (D. J. Billes; E. McC. Callan; D. K. Kevan); also one female as prey of *Rubrica surinamensis* (Degeer) and one male as prey of *Stictia signata* (Linnaeus) (E. McC. Callan); El Dorado Village, female (M. V. Beattie).



23. *Tabanus* (*Neotabanus*) *johannesi* Fairchild (1942, Ann. Ent. Soc. America, 35, p. 164, pl. 1, fig. 6; ♀ ♂).

Nariva Swamp, female (R. C. Shannon).

This specimen was compared with a paratype from Brazil. The species is known also from Paraguay.

24. *Tabanus* (*Neotabanus*) *amplifrons* Kröber (= *Tabanus trilineatus* J. Bequaert, 1940; not of Latreille).

St. Augustine, several females and males, one male taken at light (E. McC. Callan; A. M. Adamson; P. C. Atteck). Tamarano, female (R. C. Shannon); Toco, 2 males (R. C. Shannon); El Dorado Village, 2 males (M. V. Beattie); San Fernando, male (C. B. Williams).

It is the species which I called *T. trilineatus* in my 1940 paper. As shown by G. B. Fairchild (1942, Ann. Ent. Soc. America, 35, p. 178), Latreille's *T. trilineatus* appears to be unrecognizable. *T. amplifrons* is known also from Texas, Guatemala, Panama, Colombia, Venezuela and the Amazon Basin of Brazil. In Trinidad it is one of the most common horseflies. According to Dr. E. McC. Callan, the males are often observed in numbers, sometimes even in hundreds, flying and hovering over roadways from about 6 A.M. to 9 A.M.

25. *Tabanus* (*Neotabanus*) *vittiger* var. *guatemalanus* Hine (= *Tabanus carneus* J. Bequaert, 1940; not of Bellardi).

Moruga, female (R. C. Shannon). The females from Trinidad and Siparia, Trinidad, referred to *T. carneus* in my 1940 paper were *guatemalanus*; but the Trinidad male of *carneus* was that of *T. lineola* var. *carneus*.

The var. *guatemalanus* is widely distributed in Central and northern South America.

In a former paper (1940, Rev. de Entomologia, 11, pp. 272 and 352), I identified *T. vittiger* Thomson (1868) with *Tabanus truquii* Bellardi (1859); but Dr. G. B. Fairchild does not agree with this. He regards Bellardi's species as unrecognizable, although possibly the same as *Tabanus amplifrons* Kröber. He also treats the Antillean specimens of *T. vittiger* as a distinct race, which he calls subsp. *caymanicus* (1942, Ann. Ent. Soc. America, 35, p. 180); but the distinction between *guatemalanus* and *caymanicus* seems to be too finely drawn and based mainly on distributional data, not on reliable characters.



26. *Tabanus (Neotabanus) angustivitta* Kröber.

Nariva Swamp, female (R. C. Shannon).

G. B. Fairchild saw this species from Mexico, Guatemala, Panama, Colombia, Venezuela, British Guiana, Brazil, Ecuador, Peru, Paraguay and northern Argentina.

27. *Tabanus (Neotabanus) fumatipennis* Kröber.

G. B. Fairchild, who discusses this species at some length (1942, *Ann. Ent. Soc. America*, 35, p. 162), saw specimens from Trinidad, as well as from Costa Rica, Panama, Brazil and British Guiana.

28. *Tabanus (Neotabanus) lineola* var. *carneus* Bellardi (= *Tabanus appendiculatus* Hine).

Yarra River, male (R. C. Shannon); Rio Claro, female, biting mule (E. McC. Callan); St. Augustine, female, prey of *Rubrica surinamensis* (Degeer) (E. McC. Callan); Maracas Bay, female (P. C. Atteck); Mayaro, female (D. K. Kevan). The specimens from Port of Spain and St. Augustine, listed as *T. appendiculatus* in my 1940 paper, were also *T. lineola* var. *carneus*.

The var. *carneus* is a common horsefly in Trinidad. It occurs over most of the Neotropical Region, from Mexico to Paraguay and southern Brazil. No other form of *T. lineola* is known thus far from Trinidad.

*Tabanus ochrophilus* of my 1940 paper is omitted here. It is extremely doubtful that the specimen I saw from Trinidad (not now available for study) was Ad. Lutz's species, which was perhaps only a variant of *T. lineola* var. *carneus*, as suggested by G. B. Fairchild (1942, *Ann. Ent. Soc. America*, 35, p. 175).

The difficult group of trivittate American species, grouped under *Neotabanus*, has recently been revised by G. B. Fairchild and his conclusions are here accepted. The following key of the seven forms definitely known from Trinidad will replace what I wrote in 1940 (*Bull. Ent. Res.*, 30, pp. 452-453).

1. Subcallus bare and shiny in both sexes ..... 2.  
Subcallus pollinose and dull in both sexes ..... 3.
2. Subcallus honey-yellow. Wing hyaline. Mid-dorsal stripe of a series of triangles; lateral stripes broken up into oblique spots. Female: frons about three times as high as wide, slightly narrowed below. Male: upper two-thirds of eye hairy and with the facets much larger than those of lower third. Length, 9 to 12 mm. .... *T. hookeri*.
- Subcallus dark brown to black. Wing slightly smoky. Mid-dorsal stripe of narrow truncate triangles; lateral stripes of a series of short streaks in line.

- Female: frons at least five times as high as greatest width, slightly narrowed below. Length, 9 to 12 mm. (Male unknown) . . . . . *T. fumatipennis*.
3. Female: frons less than three times as high as wide and nearly parallel-sided; frontal callus at least as wide as high and nearly as wide as frons. Lateral stripes decidedly step-like. Wing hyaline . . . . . 4.
- Female: frons at least three times as high as wide (usually much higher); in doubtful cases narrowed below; frontal callus as high as wide or higher and narrower than frons. Lateral stripes usually regular. Fore coxæ and most femora largely pale or yellowish . . . . . 5.
4. Fore coxæ and most femora largely black. Scutellum black. Mid-dorsal stripe a slender even line. Female: frontal callus dark brown to black. Male: upper half of eye hairy, but with the facets only slightly larger than those of lower half (the line of demarkation between the two types not clearly defined). Length, 11 mm. . . . . *T. johannesii*.
- Female: fore coxæ and most femora pale; scutellum reddish; mid-dorsal stripe a series of contiguous triangles; frontal callus yellowish-brown. Length, 11 to 14 mm. (Male unknown) . . . . . *T. angustivitta*.
5. Grayish; abdominal stripes broad and quite even, covered with chalky-white hair. Wing hyaline. Female: frons nearly parallel-sided; frontal callus brownish, only slightly higher than wide. Male: upper half of eye hairy, but with the facets only slightly larger than those of lower half (the two areas not clearly defined). Length, 12 to 15 mm. . . . . *T. amplifrons*.
- Grayish to yellowish-brown; abdominal stripes covered with grayish-white or yellowish hair. Female: frons narrowed below; frontal callus usually decidedly higher than wide . . . . . 6.
6. Wing hyaline. Female: frons somewhat less than four times as high as greatest width; frontal callus large, yellowish-brown. Male: upper two-thirds of eye hairy and with the facets much larger than those of lower third. Length, 12 to 14 mm. . . . . *T. vittiger* var. *guatemalanus*.
- Wing somewhat clouded, at least along the veins. Female: frons at least four times as high as greatest width; frontal callus rather small, dark brown to black. Male: upper two-thirds of eye bare, but with the facets much larger than those of lower third. Length, 12 to 14 mm. . . . . *T. lineola* var. *carneus*.

29. *Diachlorus scutellatus* Macquart.

Trinidad, without more definite locality, female (W. Ulrich). This insect was sent to the U. S. Nat. Mus. and determined by Dr. Alan Stone, who sent it to me for study. The species is known also from French Guiana, British Guiana and Brazil.

30. *Diachlorus curvipes* (Fabricius).

Nariva Swamp, female (R. C. Shannon). The species is known with certainty from Panama, Colombia (Muzo, Dept. Boyaca), British Guiana, French Guiana, Venezuela, and Brazil. Surcouf's citation of "Uruguay" was an error for Paraguay; but the occurrence in Paraguay is doubtful.

31. *Acanthocera marginalis* Walker.

Diego Martin, female (D. J. Billes); Morne Bleu, 2,700 ft. female, biting man (E. McC. Callan); Talparo, female, biting man (E. McC. Callan).

## STUDIES ON SYRPHID FLIES IN THE MUSEUM OF COMPARATIVE ZOÖLOGY<sup>1</sup>

BY FRANK M. HULL  
University of Mississippi

This study presents the descriptions of additional new species of Syrphid flies in the collections of the Museum of Comparative Zoölogy of Harvard University and represents a continuation of earlier studies. Again I wish to thank Professor Nathan Banks for facilities of study extended to me.

### *Syrphus graptus* n. sp.

Male. Length 11.5 mm.; wing 10.6 mm. *Head*: eyes bare, touching for a considerable distance; the middle of the posterior margins are gently excavated, the vertical triangle is brownish-yellow pollinose, the occipital pile wholly golden yellow; the front, face and cheeks are pale yellow, the upper face and remainder of face except the broad round central tubercle are covered with dense, golden pollen, more shining upon the face than upon the front. There is also on the front a large, circular, polished, shining bare area; from this area there runs upward a vertical, slender, brownish streak, not however, reaching to the point of contact with the eyes. Just above each antenna is a conspicuous shining black spot. Antennæ wholly pale orange, the base of the arista concolorous, its rather long, apical three-fifths black. Pile of front long, erect and like that of the face pale and confined to a pollinose area. *Thorax*: dark, shining golden-

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College. Earlier articles in this series, dealing with the Syrphids in the Museum of Comparative Zoölogy, are as follows:

- I. New Species of Exotic Syrphid Flies. *Psyche*, xlv, pp. 12-31; pl. 2 (1937).
- II. Descriptions of Some New Species of Syrphidæ. *Psyche*, xlviii, pp. 149-164, plate x (1941).
- III. Some Flies of the Genus *Volucella*. *Proc. New England Zoöl. Club*, vol. xix, pp. 93-98 (1942).
- IV. Some Flies of the Genus *Mesogramma*. *Proc. New England Zoöl. Club*, vol. xx, pp. 17-24 (1942).
- V. New Species of Syrphidæ from the Neotropical Region. *Psyche*, xlix, pp. 84-107 (1943).

brown with still darker vittæ as follows: a pair of narrowly separated, median vittæ slightly diverging posteriorly, the posterior ends pointed but rounded on the medial surface, running nearly half-way down that part of the mesonotum behind the suture; moreover, rather widely separated from the median pair, is the outlying pair of wider vittæ, narrowly interrupted at the suture; their posterior section of which is wide but which becomes slender before it stops almost at the scutellum. Between each of the vittæ and narrowly enclosing them even at their posterior ends and including the whole of the outer lateral margin of the thorax the area is covered with light yellowish-brown, almost golden pollen; thus a large, broad, posterior semicircle lying in front of the scutellum is left bare. Pile of dorsum of the thorax and of scutellum and of pleuræ quite erect, wholly pale with a shining silky yellow luster; it is especially long just before the mesonotal suture on the mesopleuræ and the scutellum. *Abdomen*: elongate, slenderly oval, widest at the end of the third segment, very little less wide basally or at the end of the fourth segment, its greatest width not quite equal to that of the thorax; second and third segments a little longer than the fourth and fifth; fourth segment as long as its own basal width; the fifth segment is a truncated equilateral triangle. Abdomen shallowly convex, non emarginate with the ground color wholly a light rusty red or orange-brown, largely opaque but more shining on the posterior margins and on the narrow basal margins of at least the posterior segments. There is a conspicuous though not wide, transverse, uniform black band across the posterior margin of the second segment and another one about the same width similarly placed on the third segment. On the fourth segment there is a quite subapical, transverse fascia narrow towards the middle, as it nears the midline turning sharply upward as a sharp-pointed wedge of black that reaches quite to the midpoint; on its outer lateral point it turns down sharply to reach the posterior corners of the segment. On the anterior part of the fourth segment some distance from the base there is a slightly oblique slender fascia, its inner end pointed and directed towards the midline of the base; towards the base the inner ends are separated by three times their width. On the anterior half of the third segment about the same distance from the base, are a similar pair of slightly oblique stripes separated by less than twice their width. *Legs*: almost wholly light yellow, the hind tibiæ and tarsi brownish-yellow due perhaps to



the fact that their pile is dark brown whereas elsewhere, except upon the apical two-fifths of the hind femora, the pile is pale. *Wings*: elongate, nearly hyaline, whole of the stigmal cell light brown, the sinuosity of the third vein very slight, the subapical cross vein long, nearly straight, sharply though slightly bent back a short distance from its apex.

Holotype. No. 23796, one male, Sozan, Formosa, June 30, 1934. L. Grissett collector.

### *Syrphus ochreolinea* n. sp.

Related to *orientalis* H. B. from which it differs in abdominal pattern, etc.

Female. Length 7.5 mm.; wing 7.5 mm. *Head*: shining metallic black over the vertex, the upper third of the occiput black with brassy-brown pubescence, the lower part greyish white pollinose; all of the occipital pile is long and yellowish white. The front is shallowly concave with a broad band of greyish-brown pollen across the middle which is from either side directed a little diagonally downwards. The band is of uniform width on a shining black background. Face shining black with a yellowish-brown, inverted V running from base of antennæ towards the eye margins, ending opposite the tubercle, its margins diffuse. The whole of the face except the prominent tubercle is whitish pubescent; the shining black cheeks are also whitish pubescent. Pile of face almost wholly pale; with a few black hairs along the eye margins on the upper part of the face; the pile of the front and vertex is long, erect and black. Eyes rather thickly long white pilose. Antennæ black, the third joint large, suborbicular with reddish-brown pubescence. *Thorax*: shining greenish-black with long, thick, erect, pale pile. Scutellum greenish-black, somewhat brownish on the posterior half and dark brownish pollinose; the pile on its disc is pale, along its margin is a double row of very slender, long black bristles. Squamæ whitish with yellow fringe, its surface without pile. *Abdomen*: broadly oval, the first and second segments somewhat flattened, the lateral margin of the abdomen slightly curled over but not emarginate. First segment metallic black, the second shining black with a pair of melanic spots obscurely reddish, small, oval and quite widely separated by at least twice their length. Third segment with a pair of sub-basal, light brown transverse spots, each end rounded, set well back from the lateral margin, placed horizontally and separated

by almost the length of one spot. Remainder of the segment shining black. Fourth segment quite similar to the third, the spots barely less wide. The fifth is segment wholly shining black its anterior corners somewhat brownish. Pile of the abdomen long and pale upon the sides of the first and second segment, shorter but pale and erect along sides of the third and fourth segments; the pile of the third and fourth segments is broadly through their middles sparse, flat appressed and chiefly black. Pile of fifth segment long and largely black. *Legs*: all of the femora black, their extreme apices brownish. Anterior tibiae, middle tibiae, and hind tibiae except its extreme base, dark brown; all of the tarsi blackish. Pile of femora chiefly pale. *Wings*: pale brownish, the stigmal cell wholly dark brown; subapical cross vein sinuous.

Holotype: No. 23800, one female, Nikko, Japan, April 22, 1934, L. Grissett, collector.

This fly traces to *orientalis* H. B. in Shiraki's key.

#### ***Syrphus convexigaster* n. sp.**

Related to *orientalis* H. B. from which it differs in abdominal pattern.

Female. Length 9.15 mm.; wing 8.8 mm. *Head*: upper part of occiput and vertex and front shining black, polished, black pilose. A broad, transverse, broadly interrupted fascia of golden-brown pollen lies across the quite concave lower portion of the front; its anterior margin is concave; the pollinose area is drawn out along the eye margins until it is opposite the antennae. Face extensively light brownish-yellow and yellowish pubescent on either side from eye margin to the base of the conspicuous shining black tubercle. The yellow of each side is connected beneath the antennae and at the eye margins about the middle of the face this yellow area leaves the eye margins and drops nearly vertically down the face, almost to the ventral angle of the oral margin; thus a wide, black middle stripe is left upon the face which tapers acutely to a point beneath the antennae and which diverges on either side along the oral margin and connects with the black of the cheeks. Facial pile erect, sparse and black throughout; the oral margin, the extreme posterior part of the face and the cheeks also light pubescent. *Thorax*: black in color, the details obscured by grease; its pile is erect and long, though sparse and wholly pale. Pile of pleurae long and shining yellowish. Scutellum yel-

low, the surface is greasy, with abundant very long fine bristles in several rows on the edge of and before the margin. The sparse ventral fringe is black. Squamæ dark brown, the lower lobe bare; the metasternum pubescent. *Abdomen*: broadly oval, much wider than the thorax, rather convex, the first segment dark shining brown, somewhat metallic on the sides, the remainder of the abdomen shining black, sharply marked with yellow bands as follows: a pair of broad, clear yellow bands on the basal half of the second segment, their inner ends rounded, and separated by a little more than their width and removed from the base of the segment by a little less than their width; their outer ends are diagonally, rounded-truncate and fail by half their width to reach the margin. On the third segment near the midline, narrowly removed from the base, their inner ends rounded, are a pair of spots that, after a short distance, are slightly narrowed and proceed towards the lateral margin which they narrowly fail to reach. Over most of their length except on their medial third they are removed from the base by at least their own width and they are separated in the middle by at least their narrowest width. Their outer ends are subtruncate. On the fourth segment there are a pair of similar bands almost as large and of the same general shape; they are slightly narrower, their inner ends almost touch the base and their later ends again fail to reach the margin. On the fifth segment there are a pair of small, oval, subbasal, yellow spots the medial ends more pointed; the slender, posterior margin of the fourth and fifth segments, except at the sides are yellowish. The sides of the abdomen are quite emarginate. The pile of the abdomen is pale yellow along the margins as far as the end of the third segment, over the yellow spots and to a varying extent beyond it, but the greater part of the pile of the abdomen, especially upon the third and fourth segments is short, subappressed and black; upon the fifth segment it is long and black. *Legs*: femora black except upon the apical fifth and with the hind femora upon the apical sixth. Hind femora unusually long and slender. Anterior tibiæ and middle tibiæ reddish, more brown upon the distal part, the latter pair diffusely yellow on the basal third. Hind tibiæ brown basally and blackish-brown on the distal three-fourths. Fore and hind tarsi and apical joints of the middle tarsi dark brown; the middle basi tarsi are brownish-yellow. *Wings*: tinged with pale brown; the stigmal cell very dark brown.

Holotype: No. 23801, one female, Nikko, Japan, July 15, 1931, L. Grissett collector.



I have carefully compared the present fly with Shiraki's descriptions of Japanese species and I fail to identify it with any of them.

***Epistrophe funeralia* n. sp.**

Much smaller and unrelated by pattern, etc., to the few known species.

Male. Length 9.2 mm.; wing 8 mm. *Head*: eyes touching for a considerable distance, bare, broadly excavated in the middle on the posterior margin; the posterior occiput is grey pollinose and silvery pilose, the pile becoming black towards the vertex. Vertical triangle small, brownish-black, feebly shining, black pilose. Front broadly opaque, brownish-black, feebly shining just before either antennæ; the front is narrowly light brownish-orange along the eye margins, this area expanding opposite the antennæ into the pale broadly yellow sides of the face. The front is extensively bare above the antennæ; it is long, erect, black pilose on the upper half, shorter black pilose in the yellow margins along the eyes. Pile of face black, sparse, submarginal, confined to the anterior half of the yellow stripe. Face produced forward well beyond the base of the antennæ with a strong, convex tubercle deeply concave beneath the antennæ. Face widely shining black in the middle, roughly about one-half of the facial width being black. All of the anterior parts of the cheeks and the posterior part of the occiput below light yellow, obscurely brownish between. Antennæ widely separated, the first joint black, the second joint very dark basally, the third and the outer part of the second joint light orange; the third joint broadly infuscated above. The arista is short, thick, dark in color, the tip black. *Thorax*: dark brown, feebly shining on the anterior part, more polished posteriorly; the humeri, a spot on the sides before the suture and post calli obscurely yellowish-brown. The pleuræ are metallic brassy and anteriorly they are silvery over the metapleuræ, pteropleuræ and hypopleuræ. Scutellum large, evenly rounded, colored like the thorax except that on either side there is an oval, apically separated, large diagonal but quite obscure and diffuse yellowish-brown spot. Pile of thorax erect, chiefly light brown on the dorsum, longer and black upon the disc of the scutellum where it is sparse; the long ventral fringe of the scutellum is golden-brown. *Abdomen*: slender, the sides almost parallel, tapering a little posteriorly, chiefly deep opaque black in ground color, the narrow posterior margins of second, wider ones of third



and fourth wholly shining black, sides of abdomen not emarginate. The sides of first segment with a large, dull yellowish spot; on either side of the second segment and broadly separated in the middle is a large roughly triangular clear opaque yellow, sharply delimited spot, all of the corners of which are rounded, and which does not reach the side margins. On the third segment is a similar spot of the same size, narrowly separated, more oval, rather pointed on its medial ends and pear-shaped. Fourth segment with a pair of spots similar to that of third, almost connected across their somewhat wider medial ends. Fifth segment with a pair of smaller subbasal spots narrowly connected basally. The spots of the third, fourth and fifth segments are more brownish-orange; the pile of the abdomen is pale upon the pale spots of the second and third segments, upon the base and sides of second segment and basal half of third segment; elsewhere it is semi-appressed and black. *Legs*: basal half of anterior, all but the apex of the middle and the whole of the slender hind femora moderately shining black. Apices of the anterior four femora and narrow bases of the four front tibiae light yellowish-brown. Remainder of anterior four tibiae dark brown and the whole of the posterior tibiae black. All of the tarsi dark brown and the whole of the posterior tibiae black. All of the tarsi dark brown. Pile of the legs, except upon the extreme bases of the femora, black. *Wings*: strongly tinged with brown, a little more so along the anterior outer half, but everywhere diffuse; the stigmal cell the darkest of all; no stigmal cross vein present. Subapical cross vein almost straight with no sinuosity, with a slight inward bend just past its base and a slight recurrent turn just before the end; however, it joins the third longitudinal vein rectangularly.

Holotype: No. 23787, one male, New Castle, Jamaica, E. B. Bryant, Feb. 16-20.

#### *Rhysops quadrimaculata* n. sp.

Not closely related to any known species of *Rhysops*; distinguished by the quadrate spots.

Male. Length 6.5 mm.; wing 6 mm. *Head*: large, the eyes touching for a considerable distance, the vertical triangle small, the occiput not protruding beyond the eyes on the upper third. The front is shining bluish-black, grey dusted on the upper half and with a narrow thin line of greyish-white pubescence running down the eye margin which expands anteriorly into a small, tri-

angular spot on the upper part of the face and again on the lower part of the face opposite the tubercle. The face in ground color is brilliantly shining, metallic black, with perhaps a faint bluish luster. On either side of the midline there is a prominent, ventrally connected, violet stripe, its margin golden inside and out. These stripes are rather widely separated over most of their length; their outer margins are lined by a thin stripe of whitish pubescence. Lower half of face sparsely white pubescent and diagonally striate opposite the tubercle; the middle of the face is cut by four shallow grooves, the outer ones less distinct; the profile of face above the low tubercle is perfectly straight. The first and second joints of antennæ are nearly equal in length; light brownish-yellow; third joint missing. The eyes are bare. Pile of face and front light brownish-yellow, of the vertex darker. *Thorax*: very convex, shining metallic black; seen from behind there are a pair of brownish, pollinose, median vittæ which run half-way down the posterior part of the mesonotum. There are suggestions of a fourth pair of such vittæ lying some distance from the others on the lateral part of the mesonotum. There is a low but well developed, rounded bump in the middle of the anterior lateral corners of the thorax lying diagonally from the humeri. Squamæ dark brown with dark brown fringe; halteres pale. Scutellum broadly rounded, brilliantly metallic, with two or three subterminal, transverse, faint, ripple-like depressions. Pile of thorax and scutellum pale, the ventral fringe long. *Abdomen*: long and slender, rather flattened, sides almost parallel, end of the third segment barely wider than base of the abdomen. First segment shining metallic black, second shining on the basal two-fifths with a brassy or golden-brown appearance; opaque, dark sepia-brown on almost all of the remaining segments and quite to their posterior margin. Located near the base upon the sides of the second segment, not reaching the anterior corners and covering about one-half the length of the segment there is a shallow, diffuse, brownish-yellow spot; in some specimens it extends inward for a greater distance. Third segment with a pair of large, square, light brownish-yellow spots occupying the base, the entire anterior corners and the sides for one-half the length of the segment; their medial surfaces are just a little cut-away and diminished on their posterior surfaces; remainder of this segment opaque, dark sepia. Fourth segment with a pair of similar spots, slightly smaller, barely darker, and a very little closer together;

remainder of that segment shining black. The pile upon the abdomen seems to be practically absent on the third and fourth segments, though whether this is due to denudation I cannot ascertain. The sparse lateral pile of the second segment is pale. *Legs*: almost wholly pale brownish-yellow; the narrow apices of the hind tibiæ and the hind femora, a more obscure subbasal hind tibial band and the last two or three tarsal joints of all of the legs dark brown. *Wings*: very lightly tinged with brown; whole stigmal cell brown and the apical margin of the wing to just past the end of the third vein marginate with brown giving the impression of an elongate brown spot.

Holotype: No. 23785, one male. Cuba, Wright, and one paratype.

#### *Baccha cubana* n. sp.

Related distantly to the *lineata* group; distinguished by the anchor-shaped abdominal pattern.

Female. Length 7.5 mm.; wing 7 mm. *Head*: hemispherical, much wider than the thorax, the eyes large, bare, their posterior margins only slightly excavated. The occiput, except at the extreme ventral part, the vertex to just before the ocelli, obscurely shining black; vertical triangle quite narrow, lateral ocellus practically touching eye margin, the ocelli set fairly well forward. Front, long widening to four times its width across ocelli with a conspicuous round black spot just above antennæ; front except for this spot, and the face obscurely shining deep yellow, a little paler on the sides. Face with a low tubercle, almost straight and vertical front tubercle to antennæ, but below the tubercle it retreats rapidly the short distance from the oral margin; there is a shallow concavity between epistoma and tubercle. Cheeks small and wholly yellow. Antennæ short, third joint a little longer than wide, the first joint almost hidden; color of the antennæ light orange, the third joint narrowly brownish above; arista blackish, basally thickened. *Thorax*: mesonotum broadly shining black; the shining yellow of the wide lateral margin of the thorax narrowly follows the suture inwardly on either side for a short distance. Pleuræ and scutellum wholly light brownish-yellow, the latter with a pair of black, short, apical bristles and just a few short black hairs on the disc. I can discern one or two tiny black hairs that may constitute a ventral fringe. Fringe may be absent. Squamæ light yellow halteres yellowish with a brownish knob.



*Abdomen*: elongate, slender, but considerably flattened, the sides posteriorly curved over narrowly along their edges. First segment short, yellow, broadly brownish across the middle; second segment barely longer than the third; third and fourth equal; fifth segment square; the second segment is almost twice as long as wide; the fourth segment just about a half again as long as wide. Second segment brown with a pair of large, oblong, brownish-orange spots well separated from the middle, anterior and posterior ends rounded, reaching the margin and on one side reaching the posterior corner. Third segment brownish-orange except as follows. a prominent median stripe the full length expanded suddenly near the apex into a marginal fascia; this fascia narrowly connects towards the side with a posterior-lateral, acute triangle of brown, produced as far forward as a distance equal two-fifths the length of the segment; the outer margin of this acute triangle is oblique. The fourth segment has a very similar pattern except that posteriorly the middle stripe reaches the apex of the segment; its lateral expansion is more or less obsolescent and the postero-lateral acute brown triangles are well developed, no wider than these of the third segment but reach forward just past the middle of the segment. Fifth segment quite similar to the fourth in every respect except that it is smaller and that the postero-lateral triangles are merely elongated vittæ reaching the same proportion of the segment. *Legs*: the legs seem to be wholly light yellow, basal half of the hind tibiæ barely darker because the pile appears to be darker. The pile is chiefly pale golden but on the hind femora and basal half of its tibiæ it is largely but not entirely brown. *Wings*: pale brownish; diffusely darker brown throughout the subcostal marginal cell and the apex of the submarginal cell; subapical cross vein rather sinuous, joining the third vein at right angles.

Holotype: No. 23784, one female. Soledad, Cuba, Feb. 27th, 1926, George Salt.

#### *Baccha ochreolinea* n. sp.

Related to *cultrata* Austen; it is characterized by the broad abdomen and interrupted yellow fascia of the third abdominal segment, etc.

Female. Length about 8 mm.; wing 7.5 mm. *Head*: hemispherical, deeply excavated in the middle; vertex narrow, dark, obscurely shining brown, continued forward as a wedge of slightly



decreasing width to the middle of the face. There is a tiny black spot above the antennæ, quadrate, connected to the slightly larger, deep lunule of brown above it. Ground color of front, face and cheeks pale yellow, the former slightly brown in the middle, the pile of the occiput on the upper fifth of vertex, front and upper part of face erect and black, a very little pale pile on either side of the tubercle. Occiput except immediately behind the ocelli pale yellowish pollinose. Tubercle small, extending barely beyond the base of the antennæ; profile almost straight above the tubercle, retreating sharply below it; the cheeks small. Antennæ light orange, the third joint broadly dark on the dorsal half and the apex and scarcely longer than wide; pile of the basal joints black; arista black. *Thorax*: dark golden-sepia with a pair of obscure, yellowish-brown pollinose vittæ extending somewhat past the mesonotal suture and between it a narrow line of the same color. Lateral margins of the thorax broadly yellow; pleuræ, except propleuræ, lower sternopleuræ, lower pteropleuræ, hypo and metapleuræ pale yellow, otherwise dark brown. Scutellum wholly light brownish-yellow with several black bristles on the margin and five or six black hairs on its disc; I cannot discern any ventral pile. *Abdomen*: broadly oval, quite flattened, the first segment yellow on the sides with bristly black pile broadly brown across the middle. Second segment almost a third again as wide posteriorly as anteriorly; shining dark brown in color and somewhat lighter along the sides with a conspicuous, transverse fascia across the middle of uniform width, slightly convex, not quite reaching the side margin. Third segment barely wider posteriorly, of similar ground color; it has a slender, basal, yellow fascia not reaching the side margins and a quite broad fascia across the middle; it is broadly interrupted in the middle anteriorly narrowly from its posterior medial corners and on each side in the middle slightly concave. This fascia does not quite reach the lateral margin. Fourth segment with blackish markings on a light yellowish-brown background as follows; the entire narrow lateral margins; on either side from the posterior margin a large triangle is directed towards the base of the segment and reaches two-thirds of its length, its medial surface is more or less straight and its outer surface approximately straight but diagonal. There is a broad, median vitta rounded off anteriorly, a little wider anteriorly and just reaching the base of the segment. The median vitta and the lateral triangles are narrowly connected along the

posterior margin. The anterior corners of the segment are dark brown and connected with the brown lateral margins. Fifth segment marked in an exactly similar way, the lateral triangles more slender but reaching almost to the base of the segment and not connected with the somewhat more slender median stripe which latter is concave on each lateral surface; the antero-lateral corners of brown are absent; sixth segment with three median vittæ of brown. Pile of abdomen wholly flat-appressed and black. Fourth segment about twice as wide as long, the third segment barely longer, the fifth barely shorter, the third barely shorter than the second. *Legs*: anterior and middle pair wholly pale yellow, pale pilose, the middle femora with a posterior row of long dark hair. Posterior femora light brown, apex yellow with a wide, dark brown, subapical annulus; almost the whole of its pile is black. Hind tibiæ except for the very narrow base wholly dark brown, blackish pilose. Hind tarsi wholly yellow. *Wings*: very darkly tinged with brown, rather deep, and elongate oval; the alulæ is small, the subapical cross vein rather sigmoid.

Holotype: No. 23802, one female. Canal Zone, Barro Colorado, July 24, 1924, N. Banks collector.

#### *Salpingogaster panamana* n. sp.

Related to *cothurnatus* Bigot; it differs in the red and yellow pleuræ and yellowish brown tarsi.

Male. Length 12.5 mm.; wing 9 mm. *Head*: vertical triangle shining blackish, the front narrowly yellow upon the sides, broadly brownish-black in the middle, not especially protuberant. Face pale yellow and shining with short, pale yellow shining hair, rather sparse. There is no black or dark facial stripe. Antennæ light brown throughout, without any suggestion of yellow or orange. Occiput black, sparsely pale pilose. *Thorax*: broadly dark brown over the mesonotum which is somewhat greasy and in consequence the arrangement of the pollen or possible vittæ is obscured. Nevertheless the thorax appears to have been broadly greyish pubescence throughout the middle; it was probably vittate. The humeri, a stripe along the sides as far as the suture only, the post calli and the whole of the scutellum except for a brown transverse band, pale yellow. Pleuræ reddish brown with a broad stripe on the posterior half of the mesopleuræ and propleuræ, anterior portion of the pteropleuræ and the greater part of the sternopleuræ pale yellow. There is a second small

wedge-shaped yellow spot or stripe upon the metapleuræ. *Abdomen*: chiefly yellowish, the first segment wholly yellow, second segment light brownish-yellow throughout with a slender but inconspicuous scarcely darker brownish line down the middle. Third segment yellow laterally on the basal two-fifths; in the middle and upon the entire remainder of the segment light reddish-brown. Whole of the fourth segment and the hypopygium reddish-brown. The hypopygium seen from above is bulbous at the base and drawn out into an abrupt point, therefore the hypopygium proper viewed from above looks somewhat like an acutely pointed equilateral triangle. The pile of the abdomen is pale yellowish upon the first and second segments; on the remainder of the segments it is brown but not black. The abdomen is rather slender in shape. *Legs*: anterior legs almost wholly light yellow; last four joints of tarsi pale brown, the middle pair exactly the same; hind femora brownish on the basal fifth and obscurely brownish before the apex. Hind tarsi brown, appearing darker because of the black pile, the apical joint yellow. Hind femora ventrally with sparse black spinules throughout its whole length which near the apex are arranged in a single row on each side. *Wings*: upon the costal, and upon the subcostal and marginal cells, clear yellow as far as the end of the costal cell. The outer or stigmal portion of the subcostal cell and the outer part of the marginal cell sharply dark brown, the color extended narrowly along the apical margin of the submarginal cell. The brown of the subcostal cell is definitely darker than that of the marginal cell. Also the fifth longitudinal vein throughout its posterior section and base is margined with brown. Subapical cross vein strongly sigmoid; loop of third vein deep, rising vertically.

Holotype: No. 23803, one male. Bella Vista, Panama, August 8, 1924, N. Banks collector.

This species is somewhat similar to *cothurnatus* Bigot from which it appears to differ in a number of particulars. It is considerably smaller and the tarsi are pale brown, tending rather to be yellowish instead of black as described by Bigot. Apparently the pleuræ of *cothurnatus* are black whereas here they are reddish, with a single large yellow and a single small yellow stripe. The abdomen in this species is more extensively yellowish, in *cothurnatus* reddish with the posterior borders brown. I have a specimen from Panama quite different from the present specimen



and which more closely agrees in size and black pleuræ with the description of *colhurnatus* and is so close to the present species in type of wing pattern and general coloration and triangularly pointed hypopygium that the general similarity between the two is remarkable. Nevertheless they are abundantly different in many respects. It is worth noting that the description of *colhurnatus* by Sack in the revision of the genus disagrees from Bigot's description in the particulars of the color of the tarsi. Sack describes the hind tarsi as wholly yellow and the anterior tarsi yellowish with the three last tarsal joints black.

#### *Microdon aureus* n. sp.

Related distantly to *beebei* Curran, but characterized by its golden pile.

Female. Length 19.5 mm. which includes the 4 mm. antennæ; wing 11.5 mm. *Head*: vertex and upper occiput dark, shining, metallic green, becoming more or less opaque black on a transverse band in front of the scutellum from eye to eye. Front very shallowly concave, the antennæ situated high upon the head with very short front. Pile along the upper part of the occiput exclusive of post vertex, very short, appressed, brassy yellow. Pile behind vertex longer, upright, black; immediately about the ocelli it is short, appressed, black. Upon the front there is a black pilose area upon an opaque black band; just in front of the opaque black band is a transverse band of pale brassy pile, its anterior border directed forward, its posterior border directed backward and culminating in each eye margin in a fan-like tuft of flat-lying, similarly colored pile that is directed towards the mid-line. Pile of face, except for a black area on the eye margins of the lowest part of the front everywhere pale golden, short, flat-lying and wiry. A tuft of black hairs is directed downward over the middle of the epistoma. There is a vertical band of pale pile on either side of the mid-line of the face, a transverse band from the eye margin to the anterior margin of the epistoma; there is also a rough, rounded area below the antennæ on each side, which is covered by a downward and somewhat obliquely directed area of pile running from the base of antennæ towards the eye margin. Face everywhere shining black except for a mere suggestion of a light colored spot on each side near the middle and near the eye margins. Antennæ elongate, quite slender, the third joint barely longer than the first two, the second joint not quite



half as long as the first. Basal half of first joint dark reddish-brown, remainder of antennæ black. Labellum of face with a pollinia from an orchid attached to it. *Thorax*: dull black with purplish and greenish reflections, a very narrow stripe of pale pile along the margin some distance from the edge of the lateral sutures that forms anteriorly a collar of pile back of the head. A broad equilateral prescutellar triangle and the whole of the scutellum is covered with flat, long, backward-directed, thick, brilliant golden pile. The remainder of the mesonotum is covered with appressed, very dense and extremely short black pile; metanotum greenish. *Abdomen*: elongate, the second segment flattened, barely wider than long, with on its anterior margin a pair of narrowly separated, almost confluent, nearly rectangular, translucent spots; these spots are pale yellowish, unusually hyaline and each spot narrowly reaching the lateral margin in the middle of each side of the segment. Remainder of second segment and of the remaining segments wholly dull black. The abdomen, beyond the second segment, forms a stout, deep, cylindrical, bluntly-pointed, club-shaped body that is everywhere microscopically black and flat-setate. The middle of the first segment has a transverse band of golden appressed pile. *Legs*: everywhere, except narrowly at the base of the hind femora, black in color. The femora have slight greenish reflections the base of hind femur reddish brown. Pile of legs extremely short and pale, dense and appressed. *Wings*: with the usual spur vein, which is however, quite obliquely produced forward. Wing rather pointed, the posterior angles of the first and second posterior cells very much rounded. The entire anterior border of the wing dark brown including the costal, subcostal, marginal, submarginal cells, narrowly the posterior side of the third longitudinal vein, the whole of the first basal cell and both margins of the small cross vein and its connection to the fifth longitudinal vein.

Holotype: No. 23807, one female: Jatun Yacu, Rio Naxo, Watershed, 700 meter, Oriente, Ecuador (Wm. C. MacIntyre).

#### *Mixogaster orpheus* n. sp.

Closely related to *anthermus* Walker but with minor differences in the wing venation.

Female. 12 mm. excluding antennæ; wings 12 mm. *Head*: vertex, except immediately around the ocelli, occiput, except for a diagonal stripe from the corner of the eyes, and front except for

a transverse band across in front of the antennæ including the short antennal prominence and a conspicuous round spot just beneath the antennæ, everywhere light brownish yellow; the exceptions noted are brown. The following areas are also brown: an oval spot or stripe diagonal from the corner of the eyes to the back of the occiput in which there is an impressed line, the area immediately around the ocelli, a conspicuous round spot beneath the antennæ all brown. There is a large, transverse spot above the antennæ, including the short but black antennal prominence which is reddish brown and is widely separated from the eye margins. Antennæ light brown; second joint half as long as first, third joint missing; antennal pile dark brown; extreme base of first joint with a black annulus. Face rather conspicuously concave just above the middle with very sparse pale pile. Eyes bare. *Thorax*: chiefly light brownish-yellow, with a short pair of submedian, slender, brown stripes that are almost fused with a much wider pair of stripes that lie on either side of the thorax and run throughout its length and slightly converge posteriorly and whose anterior lateral ends fill out the entire corners of the thorax behind the humeri, leaving, however, a large yellow spot before the suture. Pleuræ wholly pale, shining yellow, almost bare with a single diagonal reddish stripe from base of wing down to hind coxæ and a brown stripe behind the metapleuræ. Scutellum broadly brown across the disc, the base and the posterior margin yellow; somewhat triangular in shape with rounded apex. Metanotum yellow; humeri yellow; squamæ yellow with a brown margin and fringe; halteres brownish yellow. *Abdomen*: elongate, quite petiolate; the first and second segments are subcylindrical, fused, narrowest in the middle and not quite as long as the remaining three segments. There is a reddish stripe running from the base of the second segment diagonally down the long second segment to meet the opposite stripe in the middle a short way from the end of the segment; elsewhere the first two segments are shining yellow. The remainder of abdomen is light brown, the posterior third of the third segment uniformly light yellow; pile of abdomen everywhere pale. *Legs*: wholly light yellow, the apical two-thirds of the hind femora a little darker; pile of legs wholly yellow. *Wings*: large and long, longer than abdomen, faintly brownish-yellow along the anterior half with stigmal cross vein, very short anterior cross vein and with a practically straight subapical cross vein that joins the third vein approximately at a

right angle; posterior corners of the first and second posterior cells with well developed spurs.

Holotype: No. 23794, one female. Bartica, British Guiana, August 19, 1901, collection C. W. Johnson.

This fly, which is a true *Mixogaster* because of the fact that it lacks any spur or vein from the third longitudinal vein into the first posterior cell as well as by its petiolate form, is characterized by its light brownish yellow color and large wings. It was compared at the British Museum by myself with the type of *anthermus* Walk. and found to be very close to that species differing, however, in particulars of the wing venation. It is also close to *anthermus* from the Amazon region in other respects, differing in the less developed occiput, the less retreating face and in the presence of the lateral yellow spot anterior to the suture of the thorax, in the absence of a much reduced brown square upon the metanotum and in the isolated brown spot around the ocellus. There are probably other differences but the general pattern coloration in the dried specimens leaves the markings obscure.

#### *Planes proxima* n. sp.

Related to *vagans* Wied., the anterior tibiae are extensively dark brown, the lower part of the face is reddish brown and the abdominal pattern is different.

Female. Length 9.15 mm.; wing 6.8 mm. *Head*: eyes bare, vertex in front shining bluish-black, the latter with a broad silvery pubescent band from eye to eye which is indented above and below in the midline; almost the whole of the face is covered with pale greyish-white pubescence, worn off a little on either side below the sharp facial carina; ground color of the face metallic black, except that it is obscurely reddish on either side above the oral margin; the face is retreating and in profile very shallowly concave on the lower part. Antennae elongate, the first and second joints dark brown, the third reddish basally and on the ventral third but otherwise dark greyish-brown; arista long, slender, reddish. *Thorax*: obscurely shining black, chiefly short pale pilose, with some black pile along the middle behind the suture and more extensive black on the sides behind the suture but beginning to vanish as it reaches the posterior calli. The pile, then before the scutellum is broadly pale, somewhat appressed and more or less directed forward and towards the sides. Seen from behind there are a pair of widely separated, broad, median



vittæ of pale shining yellow pile which is directed more or less forward. Pile and pubescence of the mesopleuræ whitish; scutellum with a strong brassy cast, faintly impressed rim, its pile about half and half black and pale. *Abdomen*: elongate, narrowest at the end of the third segment where it is but little less wide than the base of the third segment. Ground color anteriorly very dark brown, almost blackish, becoming more brassy on the fourth segment. First segment shining dark reddish-brown with a strong brassy cast that is quite absent upon the next two segments. On either side of the second segment, widely separated, is a pair of large yellow spots opaque, rectangular, with corners rounded, the anterior lateral corner slightly attenuated, the posterior corners vaguely attenuated, widely separated from the lateral margins. On the third segment there is a pair of similar, smaller, more diffuse and more obscure spots. Pile of fourth segment wholly semiappressed, pale yellow and quite abundant. There are not over three or four black hairs in the middle of this segment. Pile of fifth segment erect and wholly pale. *Legs*: all of the femora very dark brown almost black with narrow reddish apices; the hind pair with the usual rather extensive thickness; its pile is pale but its ventral spines black, quite long and sharp and beginning quite in the middle of the ventral surface of the femora. Anterior tibiæ blackish-brown upon the apical half dorsally; and ventrally upon the apical two-thirds brown quite to the apex. Middle tibiæ almost wholly yellowish, pale whitish on the basal half, faintly brownish apically, the spines black. Posterior tibiæ quite arcuate, the basal third pale yellow, the remainder dark brown, the apical spur triangular but quite sharp and rather long; the pile is wholly pale except along the whole of the ventral margin there is a narrow dense band of erect black pile. Basal three joints of anterior and middle tarsi wholly pale yellow, their apical and hind tarsi light brown. *Wings*: lightly tinged with brown, stigmal cell wholly dark brown; there is no spur from the posterior corners of the first and second posterior cell.

Holotype: No. 23791, one female, labelled '*proxima*' beneath which is the label — "variety of *ejuncida*" Loew coll. There is no locality. It is presumably from the West Indies.



*Crepidomyia darlingtoni* n. sp.

Related to *tricrepis* Shannon but very distinct in the smoky wing apex.

Male. Length 14 mm.; wing 10.8 mm. *Head*: rather short and therefore wide and flat; the eyes are large, conspicuous, bare, the anterior facets slightly enlarged above, touching only a short distance. Vertical triangle obscurely shining black and long, erect black pilose. Upper third of occiput black and black pilose. The whole of the flat front totally obscured by thick, microscopic, brilliant, golden pubescence. Face strongly carinate with a lateral ridge or keel reaching from eye margins of epistoma slightly concave anteriorly along the lateral keels and this broad shallow concave area is covered by pale brassy pubescence forming a broad stripe from the lateral facial strips to the oral margin; remainder of face shining black; facial strips pale pubescent; cheeks shining black. Antennæ black, the third joint with brownish pubescence, about half again as long as the third joint, gradually thickened towards the base, blackish on the basal sixth, remainder white. *Thorax*: dull black with a brownish tinge due to four very obscure barely discernible vittæ; the inner pair are shorter, more closely separated, but diverging posteriorly, the outer pair reaching to the scutellum. On the extreme anterior edge of the mesonotum lying inside the humerus there is an almost equilateral triangle of pale shining yellow pubescence. Along the dorsal suture, stopping someways from the midline there is a long, slender, marginal stripe of yellowish-brown pubescence; upon its medial ends and anterior side it curves sharply backwards for a little distance. Pile of thorax wholly suberect, black. Scutellum shining black with faintly impressed rim, its discal pile black, its ventral pile thick, long and pale. *Abdomen*: moderately long but compact, not so wide as thorax, widest at the basal third segment, but scarcely less wide either at base or end of fourth segment; wholly shining black, the first two segments somewhat flattened, the pile everywhere flat-appressed and black except as follows: sides of first segment and broadly over the anterior corners of the second nearly to the end of the segment of erect pale pile; a small, marginal, lateral, subbasal patch of white pile on the third segment and a medio-apical patch on the last segment. *Legs*: chiefly shining black, the anterior tibiæ distally, greater distal part of the middle tibiæ dark brownish-black. Anterior basal tarsi dark

brown; two basal, mid-tarsal joints and the hind basal tarsal joints light brown. Hind tibiae with a short, inconspicuous, ventral apical spur; hind femora considerably thickened in the middle, more slender on the posterior half than on the basal half and all of the thickening confined to the dorsal side of the femora. Hind trochanters with a long spur. Metasternum pubescent; without spur. *Wings*: strongly tinged with brown on the anterior-apical half, becoming diffuse posteriorly; the color more sharply delimited about the stigma, the point of fusion of the subcosta and at the separation of the first and second longitudinal vein.

Holotype: No. 23789, one male. Mounts north of Imias, Eastern Oriente, Extreme eastern province of Cuba, July 25-28, 1936, 3-4,000 ft. Darlington collector.

I take pleasure in naming this handsome species for Dr. Darlington, who has brought so much interesting material out of the West Indies.

#### **Temnostoma japonicum n. sp.**

Related to *bombylans* Fabr., but differing in the dark pattern of the wing, the basally black femora, etc.

Male. Length 14 mm.; wing 11 mm. *Head*: eyes bare, almost touching in the middle. The vertical triangle is obscurely shining black, but only as far as the corner of the eye; the entire occiput is dull, brownish-golden pollinose, narrowly divided in the midline and extending just a little further posteriorward along the eye margin. The lower part of the front golden pubescent except for a prominent, acute, shining black triangle above the antennae, its apex continued as a narrow line to the narrow black area between the eyes. There is a smaller, impressed black triangle within the larger one. Face shallowly concave below the antennae, broadly shining black, finely striate in the midline, the midfacial stripe expanding to a large triangular area below the antennae; elsewhere the face is broadly golden-yellow pubescent, and with only very short, sparse, pale pile upon the lower part of the face in front of the cheeks. Antennae light orange, the third joint oval after an oblique fashion, its margin rounded. Arista light orange, the cheeks shining black. Front without pile, that of the vertex shining yellowish. *Thorax*: dull black, scutellum of the same color, the mesonotum with a pair of obscure greyish vittae set close together that run half of the distance from the suture to the scutellum. There is a conspicuous, laterally widened,

medially tapered, golden, pollinose stripe lying in front of the transverse suture, broadly interrupted in the middle, but continued over most of the posterior part of the mesopleuræ. There is no trace of pale pollen anterior to the posterior calli, but there is a quite obscure, reddish pollinose spot lying upon the mesonotum at the base of the scutellum. Pile of the anterior half of the thorax short and shining reddish; of the posterior half short reddish with considerable black hair around the middle. Pile of scutellum wholly reddish, of mesopleuræ whitish. *Abdomen*: elongate, with almost parallel sides, the third segment barely wider than at the end of the second segment and at the end of this segment about as wide as the thorax. Ground color of abdomen black, dull in color, obscurely shining upon the fourth and last half of the third segment and posterior corners of second. Second segment with slightly oblique, much elongated, narrowly connected yellow spots; their lateral ends are rounded and they lie on the basal third of the second segment. Viewed from behind, these spots appear to be completely interrupted. On the third segment there are a pair of similar golden-yellow pollinose spots which are more slender, reach no closer to the lateral margin, but are slightly more pointed laterally and which are narrowly connected in the middle of the medial ends. On the fourth segment there is a transverse, somewhat broader, narrowly sub-basal, similar, golden pollinose band shallowly indented in the middle near its lateral ends, turning slightly downward in oblique fashion; its lateral, somewhat pointed ends do not reach the side margins. The spots of the third segment are more transverse than either of the other two. The pile of the whole posterior two-fifths of the third segment except narrowly on the sides is appressed and black; the pile of the third segment is wholly appressed with considerable black pile confined to a central area on the posterior half, elsewhere it is shining reddish. The whole of the pile of the fourth segment is flat appressed and shining reddish. Pollen of the second and third fascia more brownish; that of the second segment pale yellow. *Legs*: all of femora except their apical third or less black with sparse greyish pollen and wholly pale pile; apices of these light reddish brown. Anterior tibiæ reddish-brown, dark brown upon the antero-medial surface of the apical half; middle tibiæ wholly light reddish-brown; hind tibiæ similar in color, a little darker upon the medial posterior margin on the apical half. Anterior tarsi wholly black, the last



joint reddish brown pollinose, middle and hind tarsi wholly pale reddish-brown; pile of hind tibiae and tarsi and a middle tibiae and tarsi wholly pale, of the anterior tibiae and tarsi wholly black except upon the ventral medial margin of the former and ventrally upon the basi tarsi. *Wings*: broadly reddish-brown upon the anterior half, as far as the posterior margin of the first basal and upon the first posterior cell as far as the posterior margin of the first basal and upon the first posterior cell as far as the end of the vena spuria. Anterior margin of first posterior cell broadly brownish, almost to the apex of the cell. Apical margin of submarginal cell paler. The costal and second basal cell light brownish-yellow. Vena spuria especially dark brown.

Holotype: No. 23798, one male. Nikko, Japan, L. Grissett collector, July 19, 1931.

This specimen I had tentatively determined as *T. bombylans* Fabr. I now believe that it presents specific differences from that species. It is characterized by the extensively basally black hind femora and the definitely indented and almost interrupted cross band of the abdomen and the strongly reddish pile of the thorax and abdomen.

#### *Temnostoma fumosum* n. sp.

Distinct from *bombylans* Fabr., in the concentration of the dark wing color near the middle of the wing.

Female. Length 14 mm.; wing 12 mm. *Head*: occiput tumid, together with the vertex bare upon the upper part and shining black; front shining black, especially polished upon the lower half with a short linear stripe of brownish-white pubescence along the eye margin that begins a short distance below the ocelli. There is a trace of a similar spot in the middle of the front; it may be that the front was originally broadly light brownish pubescent. Face shining black, strongly concave on the lower portion, the bottom of the concavity lying at the tip of the antennæ; in this specimen it so happens by accident that the antennæ are folded down and just fit into the concavity. Face covered with a very sparse scattered, whitish pubescence and still more sparse, pale pile. Cheeks shining black. Antennæ large, the first two joints shining, brownish-black; the third is much wider than long with evenly rounded margins, reddish-brown, silvery pubescent. Arista very long and slender, reddish in color. *Thorax*: moderately shining black, rather convex with appressed pile which is



chiefly black but is broadly reddish down the midline and again just before the scutellum. There is a narrow obscure line of pale pubescence along the outer portions of the mesonotal suture. Humeri convex, shining black, pale pilose. Scutellum obscurely shining black with some long pale pile and shorter, black, tuberculate, setaceous pile. *Abdomen*: quite convex, elongate, somewhat oval, widest in the middle of the third segment, the base of the abdomen but little wider than the apex, the abdomen somewhat wider than the thorax at its widest point. Color of abdomen chiefly black, moderately shining. On the second segment there is a pair of linear, very obscure, reddish, almost obsolescent spots; they are widely separated in the middle and do not reach the sides; they are slightly oblique and placed a little before the middle of the segment. If the abdomen is viewed from the front the spots become more evident because they are clothed with thick, pale yellow pubescence. Pile of the posterior three-fourths of the segment appressed and black. On the base and sides of the segment the pile is quite long, erect and whitish. The third segment has a pair of similar, slightly oblique, larger and more evident linear bands which almost reach the side margins and which occupy a natural depression in the abdomen; they are narrowly separated in the mid-line, are reddish in color and are outlined from in front chiefly by thin golden pile and very little pubescence. The fourth segment has a conspicuous, complete, sub-basal band running almost to the lateral margin and diverging a little from the basal margin towards the sides. This band is light reddish-brown pollinose but there is some evidence that it may have been golden pollinose originally. It is sparse, golden pilose; elsewhere the third, fourth and fifth segments are shining black and semi-appressed black setate. *Legs*: femora almost wholly black; only the very narrow apices brown. Hind femora quite slender; fore tibiae wholly black, its very narrow base excluded; middle and hind tibiae chiefly black, narrowly brownish apically. Anterior tarsi wholly black. Middle and hind tarsi light reddish-brown on the basal three joints; others dark brown. *Wings*: with a strong brown spot on the anterior border just past the middle, occupying the region from the costa to the vena spuria and all of the basal part of the marginal cell and the area below this to the vena spuria, extending moreover along the posterior margin of the fourth longitudinal vein for a short distance on the apical side of the small cross vein, extending off on both sides of the

third longitudinal vein but growing fainter apically, extending broadly along both sides of the second longitudinal vein all the way to the costa and filling the stigmal cell.

Holotype: No. 23799, one female. Nikko, Japan, July 10, 1931. L. Grissett, collector.

SOME AFRICAN BEES OF THE GENUS *NOMIA*

BY T. D. A. COCKERELL

The bees recorded in this paper belong to the British Museum, but will be retained by me until after the war.

*Nomia semlikiana* Cockerell

Uganda; Entebbe, April 12, 1914. ♀ (C. C. Gowdey)

*Nomia matha* (Cameron)

Natal; Van Reenen, Drakensberg, Dec., Jan. (R. E. Turner); Cape Province; Worcester, Jan. (Turner); Milverton, Cape Town, Jan. 1926. (Turner).

*Nomia heterodoxa*, sp. n.

♂. Length about 11.5 mm., anterior wing 10.8; black, with the scape red at base, flagellum obscurely reddened beneath, and the legs bright ferruginous; face very narrow, with pale cinereous hair, the lower part of clypeus swollen and exposed; vertex shining; pronotum with a narrow pale fringe; mesonotum and scutellum dull, not hairy, the mesonotum with linear notauli and a slender median line shining; scutellum elevated, with a pair of large bosses, shining at end; base of metathorax dull, with a shining median groove; tegulae rather large (but not of the large type) with a light brown boss and subhyaline margins; wings very long, with a large dark brown stigma and brown nervures, the basal nervure, curved at lower end, meeting nervulus, the second submarginal cell small and very narrow; the wings are hyaline at base, but the apex is occupied by a very large black cloud, which includes the apical half of the marginal cell; legs slender and simple, the hind basitarsi very long, anterior basitarsi with very long hairs; abdomen with the basal tergite highly polished, the others mainly dull, without hairbands, the apical margins of second and third tergites reddened; fifth sternite with a black elevation on basal middle. Uganda; Mabra Forest, Chagwe, 3500-3800 ft., July 1911 (S. A. Neave). Related to

*N. ruwenzorica biconica* Ckll., but easily distinguished by the tegulæ and the peculiar pattern of the wings.

#### *Nomia heterura* Cockerell

Gold Coast; Yapi, Dec. 1916 (J. J. Simpson). A typical female, with red tegulæ. The following females have dark tegulæ, but seem to belong to the same species: Gold Coast; Yapi, Dec. 1916 (J. J. Simpson), Yapi, Sept. 1916 (Simpson). S. Nigeria; Ibadan, July 27, 1920. N. Rhodesia; Buyamungoma Boma, Jan. 14, 1911 (Silverlock).

#### *Nomia platycephala* Cockerell

Pondoland; Port St. John, March, 1924, ♂ (Turner). On close comparisons, I conclude that this is probably a form of *N. matha* (Cameron), although the wings are paler than is normal for *N. matha*. The legs are black, and it is certainly not the same species as *N. breviceps* Ckll., described from the male in 1939 as a sub-species of *N. matha*. The sexes of *N. platycephala* are tabulated in Annals Durban Museum, Aug. 1920. In Ann. Mag. Nat. Hist., March 1935. *N. matha* and the apparent synonym *N. rugicollis* Friese are discussed, and it is left uncertain whether we should recognize one or more races or closely allied species.

#### *Nomia laticincta* Friese

Lonely Mine, S. Rhodesia, six females, Dec. 1913, Jan., March and April 1914 (H. Swale). The tegulæ vary in color, being in some specimens dark. As I suggested in 1939, this is probably to be regarded as a race of *N. murinella* Ckll.

#### *Nomia tricoloripes* Cockerell

British E. Africa: Masai Reserve, April 26, 1913 (T. J. Anderson). ♀. The female, not before known, resembles the male in most respects, but the legs are black, except the ends of the tarsi, and the front and middle knees. The hair on scutellum and post-scutellum is distinctly reddish, contrasting with the pale grey of the mesonotum. This suggests *N. murinella*, from which it is easily known by the dense fulvous abdominal bands, very broad on tergites 3 to 5. The tegulæ are translucent pale reddish, and the short flagellum is dusky red beneath. The tegulæ distinguish it from *N. tricineta* Friese, the tegulæ of which have a black boss and a hyaline margin.



**Nomia victoriella** Cockerell

Uganda; between Seziwe River and Kampala, 3500–3750 ft., Aug. 27–31, 1911 (S. A. Neave). A male differs from the type by having a large red spot at each side of first tergite, as sometimes occurs in *N. stanleyi* Ckll. A typical male *N. victoriella* is labelled Uganda Prot., Entebbe (Forest), 3800 ft., July 5–11, 1911 (S. A. Neave).

**Nomia serratula** Smith

Pondoland; Port St. John, male (R. E. Turner).

**Nomia polytricha** sp. n.

♂. Length 8 mm.; anterior wing 6.8; black, rather slender; mandibles black; antennæ black, with the long flagellum very faintly brownish beneath; head and thorax with abundant grayish-white hair, not dense enough on mesonotum to hide the surface; face (but not front) densely covered with coarse grayish-white hair; vertex dull; mesonotum dull, a little shining on disc; scutellum shining, small, prominent, unarmed; upper sides of metathorax polished; tegulæ enlarged, with a very large black boss, and a broad posterior lobe, which is pallid but inconspicuous; wings long, dusky hyaline, the apical area brownish; stigma large, reddish brown, nervures pallid; lower section of basal nervure nearly straight, except that it is abruptly bent at lower end, meeting nervulus; second submarginal cell large and square, receiving recurrent nervure near the middle; legs slender and simple, with much pale hair, small joints of tarsi more or less reddened; abdomen with first and second tergites shining, the punctures very small; tergites with dull white hair-bands, on first confined to sides, on second broadly interrupted; no red hair at apex; fourth sternite with a large patch of pale reddish hair.

British East Africa; Kabeta, 6000 ft., April 11, 1918 (T. J. Anderson).

In my table this falls near *N. kampalana* Ckll., but the abdomen is narrower at base being subclaviform, and the dark tarsi and abdominal characters are distinctive. In Strand's table it runs out near *N. parca* Kohl. *N. kampalana* is also considerably smaller.

*Nomia elgonica* sp. n.

♂. Length nearly 10 mm., anterior wing nearly 9; black, rather slender, antennæ black, hind tibiæ chestnut red, front and middle tibiæ reddened at end, tarsi pallid reddish; head circular seen from in front; face covered with slightly fulvescent hair, in one specimen partly denuded on clypeus; front and vertex dull; thorax with dull white hair, scanty above; mesonotum dull; scutellum hairy, dull, unarmed; area of metathorax a rather wide channel, broadly angulate in middle, with cross plicæ; sides of metathorax posteriorly dull; tegulæ rather elongated, posteriorly with a dark boss, but anteriorly broadly thin and hyaline; wings long, conspicuously reddened, but without a dark apex; stigma very pale red, nervures darker; basal nervure with lower section straight except at lower end, where it is abruptly bent and meets nervulus; second submarginal cell large, varying in width, receiving recurrent nervure beyond the middle; hind femora moderately stout, with a strong tooth beneath; hind tibiæ very broad apically; abdomen dull, without a red spot; fourth and fifth sternites shining, not tomentose.

Uganda; Mt. Kojanjero, S. W. of Elgon, 6400 ft., Aug. 7-9, 1911 (S. A. Neave). Two specimens.

In a series of similar species it is known by the red hind tibiæ, ordinary head, and entirely dull mesonotum, without punctures evident under a lens. It is to be compared with *N. langi* Ckll., which comes from Stanleyville in the Belgian Congo, and agrees in the toothed hind femora and red hind tibiæ; the wing is 7.4 mm. long, and the mesonotum is different. There is evident affinity with the South African *N. phenacopoda* Ckll., which is smaller, and has a broad short head, and a red spot at end of abdomen. Compared with *N. dominarum* Ckll., the stigma is very much paler, and the marginal cell is shorter. *N. snelli* Ckll., from Zanzibar, is also related, but the hair on thorax above is quite different.

## WASPS FEEDING ON COMB-HONEY

BY PHIL RAU

Kirkwood, Missouri

When a plate of honey is placed out-of-doors to attract honey-bees, it is interesting to see how quickly wasps are also attracted to it. Honey in a tin plate is certainly different in its setting and in its quality from the weak nectar in the flowers which wasps are accustomed to patronizing.

But if wasps and honey-bees are attracted to honey, it is strange indeed that solitary bees are not likewise attracted to it. In the clay bank in my garden, not far from the honey dish, many *Anthophora abrupta*, *Osmia cordata*, *O. lignaria* were nesting but none of these ever came to the honey. In the wooden frame above the clay bank many *Xylocopa virginica* were also nesting and even though I have often fed them honey from a glass rod while they were trying to extract nectar from the flowers, I have never seen *Xylocopa* go to the honey-plate.

Many bumble-bees, *Bombus americanorum*, visit the flowers nearby, but none of them are attracted to the honey in the dish. Do wasps and honey-bees learn more quickly than wild bees that honey is a richer food than nectar, and that honey in a dish is more accessible than nectar in the flowers?

The following wasps have often been seen feeding from a dish of honey:

*Monobia quadridens* L., both sexes.

*Eumenes fraternus* Say.

*Sceliphron cæmentarium* Drury.

*Polistes pallipes* Lepel.

*Polistes variatus* Cress.

*Vespula maculifrons* Buyss., workers.

*Arachnophroctonus ferrugineus* Say.

Honey-bees, as already stated, were easily attracted to a dish of honey in the grass, but what is surprising is that the dipterous, heavy-bodied mimic of the honey-bee, *Eristalis tenax* L. [C. T. Greene] was also often attracted to it and ate heavily of the honey.

THREE SPECIES OF COLEOSOMA FROM FLORIDA  
(ARANEÆ; THERIDIIDÆ) <sup>1</sup>

BY ELIZABETH B. BRYANT

Among material recently sent the Museum of Comparative Zoology by Mr. George Nelson from Sebastian, Florida, were specimens of *Coleosoma flavipes* O.P.-Cambridge, described from males, and known only from the type localities in Mexico and Guatemala. Impressed by this discovery, I wrote to Dr. William M. Barrows, who has collected in Florida, and was gratified to receive in response *Coleosoma* collected by him at various times.

Among this material, I have identified not only *Coleosoma floridanum* Banks, the only species of the genus previously known from the state, but also both males and females of Cambridge's *C. flavipes* together with a male and females of an undescribed species, *C. normale* spec. nov. Of this material, *C. flavipes* Camb. and *C. normale* were taken in Florida in early summer. Cambridge does not mention dates in his descriptions. *C. floridanum* Banks proves to have a wide seasonal distribution, having been taken in mid-summer at Soledad, Cuba, and in November at Floreana in the Galapagos.

The female of *C. flavipes* is very unlike the male, as the abdomen extends in a prolongation above the spinnerets. In this respect it suggests Keyserling's figures of *Achæa* in his "Theridiidæ, 1884, 1, pl. 5."

The genus *Coleosoma* was based by O.P.-Cambridge in 1882 on the species *blandum* Camb. from Ceylon, also known only from the type, a male. Simon synonymized the genus with *Theridion*, a fact which has been the cause of some confusion. In 1884, Keyserling described and figured males, as *Coleosoma blandum* from the Marx Coll. taken at Enterprise, Florida. Mr. Banks noted the difference of his Florida specimens from the original description and in 1900, named the former *floridanum*. And in 1897, Simon reported as *Theridion blandum*, the

<sup>1</sup>Published with the aid of a grant from the Museum of Comparative Zoology, at Harvard College.



Ceylon species, from St. Vincent, and casually stated that it was found in the tropics around the world. It is not improbable, that the species found on St. Vincent is either new, or one of the species found in Florida.

I wish to express here, my thanks to Mr. George Nelson for collecting at Sebastian; to Dr. William M. Barrows for generously allowing me to examine his collections from Fort Myers and to Mr. N. Banks for his encouragement and help.

Genus *Coleosoma* O.P.-Cambridge  
Proc. Zool. Soc. London, 1882, p. 426.

*Cephalothorax* longer than broad, moderately convex, sloping gradually from eye area to posterior margin, thoracic groove punctiform; *eyes* rather small, anterior row recurved, eyes subequal and equidistant, posterior row procurved, lateral eyes touching; *clypeus* very high, convex; *mandibles* vertical, small and weak; *labium* wider than long; *maxillæ* narrow, inclined over labium; *abdomen* in male, long, usually constricted about middle, with a thin, bilobed, chitinized plate at anterior end that extends onto cephalothorax and continues on venter to about the middle of the abdomen; in female, the abdomen may be cylindrical, or produced in a tubercle above the spinnerets, the chitinized plate found in male, missing; *legs* in male, first pair very long.

Genotype; *Coleosoma blandum* Cambridge, male, Ceylon.

*Coleosoma* is separated from *Lithyphantes* by the higher, convex clypeus, slender mandibles, and the abdominal plate longer both on dorsum and venter. At present the genus consists of the genotype from Ceylon, and the three species described in this paper.

*Coleosoma flavipes* O.P.-Cambridge  
Figures, 1, 4, 7, 9

Biol. Centr. Amer., 1895, 1:154, pl. 19, fig. 12. "♂ Teapa, in Tabasco, Mexico; Guatemala."

Male. Length, 2.1 mm., ceph. 0.6 mm., abd. 1.5 mm. long, 0.4 mm. wide.

*Cephalothorax* grayish-brown, more than two-thirds as wide as long, (4.0:5.5), posterior margin about one half that of

anterior, sides evenly rounded, slopes gradually from eye area to posterior margin, thoracic groove punctiform, posterior margin indented with a chitinized hump on each lateral lobe, probably on which the abdomen rubs; *eyes* cover two-thirds of head, seen from above, anterior row recurved, eyes small, subequal and equidistant, posterior row slightly procurved, so that lateral eyes touch, eyes subequal and equidistant; *quadrangle* narrower in front and as high as width behind; *clypeus* strongly convex, more than twice as high as eye area, with no groove below anterior eye row; *mandibles* small, weak, vertical; *labium* wider than long; *maxillæ* more than twice as long as labium, inclined, tips almost touching; *sternum* brown, more than two-thirds as wide as long, convex, triangular, widest between I coxæ; *abdomen* cylindrical, black, constricted posterior to middle with constriction marked by a narrow white band, anterior portion larger, at base a thin, chitinized plate or sheath that extends in two blunt points over cephalothorax, and is continued on venter to fold, which is posterior to middle, dorsum with a few long colorless hairs, venter black, spinnerets at tip; legs, 1-4-2-3, long and very slender, I pair more than twice as long as entire spider, yellow with a black line on femora, tip of IV tibia and base of metatarsus dark, no spines but lines of colorless hairs; *palpus* longer than cephalothorax, dark, terminal joint very broad, embolus starts from lateral margin above in distal half, and almost completes a circle, tip with an abrupt turn, at end, a wide dark piece with an uneven tip.

Female. Length, 1.7 mm., ceph. 0.7 mm., abd. 1.0 mm.

*Cephalothorax* not as wide as in male, a dull brown, with a narrow black marginal line; *eyes* same as in male; *abdomen* a dull gray, with a median dark stripe from pedicel to tip, sides a dull gray, abdomen prolonged in a slender conical projection, so that height above spinnerets equals length on venter from pedicel to spinnerets, venter dull gray from pedicel to spinnerets, fold much nearer pedicel than in male; *legs*, long, slender, pale; *epigynum*, area not quite as long as wide, two dark tubes beneath the skin, close together at anterior end, but separating near fold where a short median dark tube can be seen.

Allotype ♀ Florida; Fort Myers, 25 June 1941, M. C. Z. Coll.

2 ♂ Florida; Sebastian, March 1944, (Nelson)

♂ s ♀ s Florida; Fort Myers, 25 June 1941, Barrows Coll.

The specimens collected by Dr. Barrows at Fort Myers, show great variation in color among the males. Some have the cephalothorax pale yellow and the abdomen almost white with parallel stripes of gray; these have the legs about the same color as the cephalothorax, and either no dark stripe on the femora, or the stripes very indistinct. Other males are very dark, with the abdomen black as described by Cambridge, and the legs with dark lateral lines on the femora. All however, have the abdomen constricted just beyond the middle and a very broad palpus with the same corresponding parts. The females vary as much as the males. In some the abdominal tubercle above the spinnerets is reduced to a slight hump, while in others the tubercle is long, slender and pointed. All have the median dark line on the abdomen and the epigynum is the same. The coloring also varies. Some are quite dark with a darker median line on the abdomen; others are pale with the dark median line. The legs are usually white.

A lateral view of the abdomen of the female suggests some of the figures of *Achæa* given by Keyserling in the *Theridiidæ*, 1884, vol. 1, pl. 5.

#### *Coleosoma floridanum* Banks

Figures, 3, 6

Can. Ent., 1900, 32: 98. "2 ♂ Florida; Punta Gorda."

*Theridion interruptum* Banks, Can. Ent., 1908, 40: 205, fig. 9. "♀ Miami; Florida." (immature)

Male. Length, 2.0 mm., ceph. 0.6 mm., abd. 1.6 mm.

*Cephalothorax* brown, about two-thirds as wide as long, anterior and posterior margins about equal in width, sides evenly rounded, rather flat, slopes gradually from eye area to posterior margin, two small dark lobes near posterior margin, thoracic groove punctiform; *eyes* about cover anterior margin, anterior row slightly recurved, eyes equidistant, a.m.e. smallest of the eight, posterior row straight, eyes equidistant, lateral eyes touching on a low tubercle; *quadrangle* narrower in front, and as high as wide behind; *clypeus* vertical, slightly convex, with a groove below anterior eye row, about twice as high as eye area; *mandibles* vertical, small, weak; *labium* wider than long, fused to sternum; *maxillæ* fully twice as long as labium, inclined but tips not touching; *sternum* as wide as long, convex, dark about

margins; *abdomen* more than twice as long as wide, constricted posterior to middle, but constriction not as deep as in *C. flavipes* and divisions not as globose, anterior portion largest, pale brown, with lateral dark stripes which end before the constriction, a pair of irregular cream-color blotches on posterior slopes, constriction pale, posterior portion black with no markings, at the base, a thin, chitinized plate or sheath that extends in two blunt points over cephalothorax and extends on venter to fold which is posterior to middle, venter pale; *legs* much broken, 1-4-2-3, pale, a dark line on posterior femora, tip of IV tibia and base of IV metatarsus dark, I pair about one and a half times length of spider, no spines, but lines of long hairs; *palpus* not as long as cephalothorax, pale, embolus much shorter than in *C. flavipes*, embolus starts from near base and completes about half a circle, the dark piece at tip quite narrow, extends beyond the cavity, below a larger pale piece also extends beyond the cavity.

Female. Length, 1.8 mm.

*Cephalothorax* and *eyes* same as in male; *abdomen* cylindrical, three-quarters as wide as long, overlapping cephalothorax, but with no chitinized plate as in male, two widely separated, parallel dark stripes broken about middle, with paired white flecks in area between, pale flecks on sides; *legs*, 1-2-4-3, pale, with a dark ring at distal end of tibiae and distal end of IV femur, rows of bristles on all joints and a long dorsal bristle on tibiae; *epigynum*, a broad median septum with large openings each side.

Holotype 2 ♂ Florida; Punta Gorda, (Mrs. Slosson), Banks Coll.

Allotype ♀ pullus, Florida; Miami, February-March 1903, (Comstock), Banks Coll.

3 ♂ s 1 ♀ Florida; Fort Myers, February 1930, Barrows Coll.

♂ s ♀ s Cuba; Havana, Banks Coll.; Soledad, July-August, 1931, (Banks and Worley)

1 ♂ ♀ s Galapagos Islands; Floreana, 12-14 November, (Norge Exped.)

The male of *Coleosoma floridanum* is easily separated from the other two species of the genus, as the embolus completes about half a circle instead of almost a complete circle. The



female can be separated from the other two, by the much simpler epigynum. The parts of the epigynum are very lightly chitinized in all the specimens seen but apparently are the same in all specimens from Cuba or from the Galapagos Islands. The specimen figured is from Fort Myers, Florida.

*Coleosoma normale* spec. nov.

Figures, 2, 5, 8, 10

Male. Length, 1.5 mm., ceph. 0.5 mm., abd. 1.1 mm.

*Cephalothorax* pale, with a narrow dark marginal line and shaded with gray posterior to eyes, rather low and flat, three-quarters as wide as long, anterior margin much narrowed; *eyes* about cover anterior margin, anterior row recurved, eyes subequal, a.m.e. diurnal, separated by less than a diameter, little nearer to a.l.e., posterior row about straight, eyes equidistant, p.m.e. largest separated by more than a diameter, lateral eyes touching; *clypeus* vertical, only slightly convex, less than twice the eye area; *mandibles* pale, vertical, weak; *labium* pale, wider than long; *maxillae* inclined; *sternum* triangular, dark about margins; *abdomen* pale, with two parallel dark stripes from base to spinnerets, stripes quite narrow about middle and heavier at ends, cylindrical, about half as wide as long, no indication of a constriction, chitinized basal plate narrow but divided at base into two blunt points and extends on venter to about the middle, venter pale yellow, margined with black, black about spinnerets; *legs*, broken, pale, with no indications of dark stripes or rings, no spines; *palpus* about as long as cephalothorax, pale, terminal joint very large, broad, embolus starts from side near tip, follows contour to tip, forming almost a complete circle, a pale club-shaped piece opposite bulb rests against the large black conspicuous piece at tip of bulb.

Female. Length, 1.6 mm., ceph. 0.5 mm., abd. 1.3 mm.

*Cephalothorax* and *legs* same as in male; *abdomen* cylindrical, with no indication of the chitinous plate found in male, pale, with two widely separated parallel dark stripes from base to spinnerets as in male, venter with median dark gray spot that reaches spinnerets; *epigynum* large for the size of the spider, a convex chitinized plate, beneath which can be seen the convolute tubes that almost touch at anterior end and are widely separated at posterior.

Holotype ♂ Florida; Fort Myers, 25 June 1941, M. C. Z. Coll.

Allotype ♀ Florida; Fort Myers, 25 June 1941, M. C. Z. Coll.

Paratype ♀ Florida; Fort Myers, 25 June 1941, Barrows Coll.

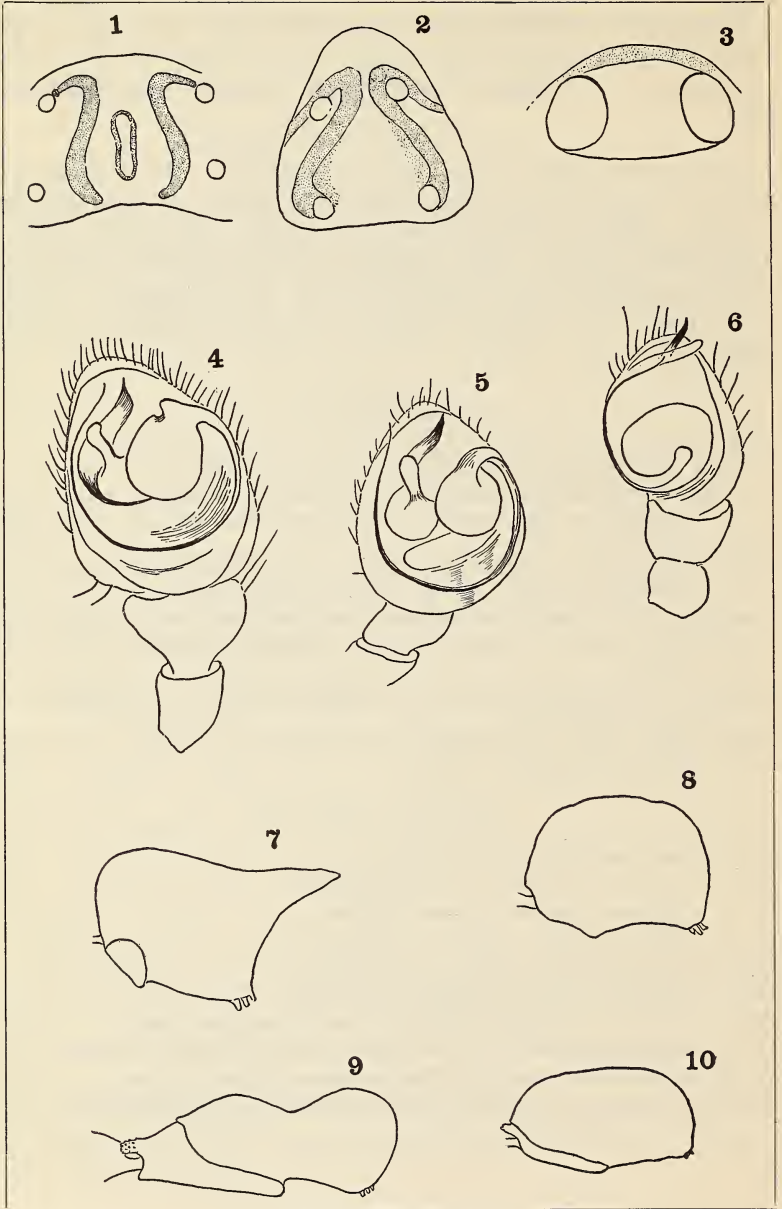
The male of this species has no constriction of the abdomen and the thin chitinous plate at the anterior end of the abdomen is much shorter in proportion than in the other two species. The female has the same markings on the abdomen and lacks the chitinized plate at the anterior end. The epigynum is similar to that of *C. flavipes* Camb. but the openings are widely separated.

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#### EXPLANATION OF PLATE I

- Fig. 1. *Coleosoma flavipes* Camb., epigynum.  
 Fig. 2. *Coleosoma normale* spec. nov., epigynum.  
 Fig. 3. *Coleosoma floridanum* Banks, epigynum.  
 Fig. 4. *Coleosoma flavipes* Camb., left palpus.  
 Fig. 5. *Coleosoma normale* spec. nov., left palpus.  
 Fig. 6. *Coleosoma floridanum* Banks, left palpus.  
 Fig. 7. *Coleosoma flavipes* Camb., lateral view of abdomen, female.  
 Fig. 8. *Coleosoma normale* spec. nov., lateral view of abdomen, female.  
 Fig. 9. *Coleosoma flavipes* Camb., lateral view of abdomen, male.  
 Fig. 10. *Coleosoma normale* spec. nov., lateral view of abdomen, male.



Bryant — *Coleosoma*

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## SYSTEMATIC NOTES ON THE GENUS PSEUDOMYRMA<sup>1</sup>

BY E. V. ENZMANN<sup>2</sup>  
The Haskins Laboratory

The genus *Pseudomyrma* is one of the most difficult of the genera of the family Formicidæ and few systematists have attempted to explore the intricacies of its classification.

The genus was created by Latreille, 1831; up to the middle of the past century only a few forms were known of which Fabricius described two and Guérin and Spinola each contributed two more. The genus began to suffer from a sort of abnormal growth due to the writings of F. Smith who added some forty new forms, most of them badly characterized. In one case Smith illustrated the description of a *Pseudomyrma* with the drawing of an *Eciton*. The resultant chaos discouraged many later writers, a fact which can be readily seen by a perusal of the small list of later contributors. Thus, Mayr described 7 forms, Roger 4, Emery 15, Forel 78, Wheeler 6 and Santschi 16. In addition, Buckley, Norton, Wasmann and Aquayo each described one; Mann and Sitz described two each, and Wheeler in collaboration with Mann added four more.

Through the kindness of Professor Banks, Curator of the Entomological Collections of the Museum of Comparative Zoölogy, Harvard University, we are in the fortunate position of having access to the large collection, which is mainly built around Wheeler's material; many of the types and identified specimens are available here.

The Haskins Collection contains an additional number of

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

<sup>2</sup> Mailing address: The Biological Laboratories, Harvard University.



types and identified specimens. The two collections between them contain specimens of nearly half of all the described species and varieties.

Following Forel's example we have disregarded a number of inadequately described forms, mostly those of F. Smith. Forel's viewpoint on Smith's work is given in the following quotation:

"F. Smith hat eine grosse Anzahl Arten dieser Gattung (*Pseudomyrma*) moeglichst oberflaechlich, fast ausschliesslich nach der bei den verschiedenen Individuen ungemein variierenden Farbe beschrieben. Es folgt daraus, dass die Mehrzahl seiner Arten unentwirrbar ist. Was bis jetzt entraetselt werden konnte ist von Mayr, Emery und mir klargestellt worden. Den Rest muss man ignorieren, oder man muss auf die Beschreibung und Neubenennung von *Pseudomyrma*arten verzichten. Ich will nun das erstere tun."

Emery, 1895-1897, *Zool. Jb. Syst.*, expresses similar views.

Forel however can not be absolved from adding to the difficulties of the systematics of *Pseudomyrma*. He described a very large number of new forms, mostly subspecies and varieties, based on minute differences, but failed to arrange his and the previously described forms and integrate them into a system. He was able to do this only because of his remarkable knowledge, which prevented him from making mistakes and duplications.

Emery in his catalogue (*Gen. Ins.* 1921-23) made some attempt to arrange the known forms of *Pseudomyrma* which at his time of writing numbered nearly two hundred. He split the genus into three groups: *gracilis*, *tenuis* and divers, only one of which — *gracilis* — was characterized by him.

In the present account we have divided *Pseudomyrma* into five branches and each of the branches into numerous groups wherever possible. The terms "branch" and "group" were chosen deliberately and are employed in the same sense in which Emery used the term group, to denote a classificatory category which can not be sharply characterized, *i.e.*, where there are too many intergrades to permit the use of such terms as genus or subgenus.

This paper contains the descriptions of a number of new *Pseudomyrma* which the late W. M. Wheeler had named and labelled as types and cotypes, but whose descriptions have not been published. Professor Brues and Professor Banks have

advised us to include these descriptions in this paper.

Other undescribed forms were found in the unidentified material of the collection of the Museum of Comparative Zoölogy; the remainder of the newly described forms are material collected by us and for us in Central and South America.

### Genus *Pseudomyrma* (Latreille).

*Pseudomyrma* is the only American genus of Forel's Promyrmicinæ (Promyrmicini of some writers), which includes the following tribes and genera:

- I. Tribe Metaponini Forel
  1. Genus *Metapone* Forel
- II. Tribe *Pseudomyrmini* Forel
  1. Genus *Sima* Roger
  2. Genus *Pseudomyrma* Latreille

#### *Branches.*<sup>3</sup>

Branch *Ornatinoda*. Pl. II, fig. 1, 2; Pl. III, fig. 1, 2, 3.

Characters: The petiole with angular or rounded projections above and behind; or deeply excavated above; or with longitudinal or transverse impressions. This branch corresponds roughly to Emery's group *tenuis*.

Type: *Pseudomyrma tenuis* (Fabricius).

Groups: *excavata*, *tenuis*, *picta-schuppi*.

Branch *Clavanoda*. Pl. II, fig. 3, 4, 5; Pl. III, fig. 15;

Pl. IV, fig. 26-35.

Characters: The petiole is clubshaped, with a long thin peduncle in front, and is not or only weakly margined at the sides. This branch corresponds to Emery's group *gracilis*.

Type: *Pseudomyrma gracilis* (Fabricius).

Groups: *lævigata*, *solisi*, *mutica*, *gracilis*.

Branch *Triangulinoda*. Pl. II, fig. 6-12.

Characters: The pedicel from above has approximately the shape of a triangle, usually with rounded corners and convex sides; the peduncle is much shorter than in the preceding branch. The node is margined or submargined in some of the forms.

Type: *Pseudomyrma spinicola* Emery.

Groups: *dolichopsis*, *sabanica*, *championi*, *spinicola*, *elegans*.

<sup>3</sup> An explanation of this term has been given on p. 60.

Branch *Apedunculata*. Pl. II, fig. 13-15.

Characters: The petiole rises from the articulation with the epinotum in a straight line or in a convex line, *i.e.*, the node extends clear to the articulation and the peduncle is not differentiated; the node is usually strongly margined and sometimes the lower face of the petiole in profile is concave.

Type: *Pseudomyrma sericea* Mayr.

Groups: *subtillissima*, *sericea*, *acanthobia*, *elongata*, *filiiformis*, *fiebrigi-brunnea*.

Branch *Latinoda*. Pl. II, fig. 17-22.

Characters: The peduncle is very short and notably broadened; the node is short and broad, sometimes broader than long; it is usually not margined at the sides.

Type: *Pseudomyrma latinoda* Mayr.

Groups: *triplaridis-maligna*, *arboris-sanctæ*, *damnosa-latinoda*, *canescens*.

KEY FOR THE IDENTIFICATION OF THE WORKERS  
OF PSEUDOMYRMA<sup>4</sup>

*Branches of Pseudomyrma*

1. The pedicel is ornamented with spines or cones or carinæ on the posterior face, or with longitudinal impression or suture.....*Ornatinoda*, Pl. II, fig. 1, 2, 3; Pl. III, fig. 1  
The petiole is not ornamented.....2
2. Petiole usually very long, club shaped, not marginate or submarginate.....*Clavanoda*, Pl. II, fig. 4, 5  
Petiole not distinctly club shaped.....3
3. Petiole from above triangular in outline; marginate or not marginate; usually with a peduncle. The species which have the petiole triangular but the peduncle very short and broad (*canescens*, Pl. II, fig. 18), have been included in *Latinoda*.....*Triangulinoda*, Pl. II, fig. 6-13  
Petiole from above not triangular.....4
4. Petiole from above convex at the sides, usually broadest in the posterior third; sometimes subtriangular, but always lacking a differentiated peduncle, *i.e.*, the anterior face

<sup>4</sup>This key can not be used generally for the identification of the females and males, although it is often possible to place the former by means of it. No attempt was made at completeness, because the main purpose of the key is to indicate clearly the position of the newly described forms.

- of the petiole in profile is straight or even convex.....  
 .....*Apedunculata*, Pl. II, fig. 13-15
- Pedicle of different shape; with the node transversely oval,  
 or trapezoidal, or globular, or triangular, but always  
 with a very broad and short peduncle.....  
 .....*Latinoda*, Pl. II, fig. 17-22

*Detailed keys to the groups and species*

BRANCH ORNATINODA

1. Pedicle in profile long and low, with the upper border al-  
 most horizontal. Pl. III, fig. 3..... *tenuissima* Emery  
 Petiole in profile higher..... 2
2. Pedicle in profile with a high rounded node. Pl. III, fig. 1  
 ..... group *excavata*  
 Petiole in profile with a sharp or blunt superior-posterior  
 corner. Pl. III, fig. 2.  
 A. — Posterior face of the node straight. Pl. II, fig. 2....  
 ..... group *tenuis*  
 B. — Posterior face of the node convex.....  
 ..... group *picta-schuppi*

The group *picta-schuppi* is transitional to the branch  
*Latinoda* and some of its forms are listed there. We include  
 under *Ornatinoda* the following additional forms:

1. *gebelli* — which has a transverse suture on the  
 petiolar node.
2. *excissa* — the node with a strong semilunar excava-  
 tion.
3. *schuppi* var. *geraënsis* — which has the node exca-  
 vated on top.

The remaining forms of *schuppi* we have placed near  
*belti*, following Forel.

Group *tenuis*

1. *tenuis*, typical. Length 5 mm. Entirely yellow-ochrous;  
 sides of the head very convex; basal face of the epinotum  
 with a longitudinal impression; node from above long and  
 narrow; prothorax strongly marginate. Maranhão, Brazil.
2. var. *parænsis*. Length 5 mm. Yellowish; mesonotum  
 broader than long (as long as broad in the type); node with  
 rounded angles instead of sharp corners; posterior face of  
 node a little convex. Para, Brazil.



3. var. *pittieri*. Length 6 mm. Reddish brown; abdomen brownish. Costa Rica.
4. subsp. *nigripes*. Color ferruginous red; head black. Brazil, Peru.
5. var. *andina* var. nov. Length 5 mm. Reddish yellow; sides of the pronotum coarsely sculptured (finely punctate in the type). Peru.
6. var. *guatemalensis* var. nov. Length 6 mm. Reddish yellow; head brown; prothorax and mesothoracic disc both broader than long; petiolar node without horns or cones, but sharply raised brown margins. Guatemala.
7. var. *rufa* (re-described as *P. rufa* by Mann, 1916). Length 6 mm. Color ferruginous; meso- and epinotum infuscated. Pará, Brazil.

## BRANCH CLAVANODA

1. Monocolored forms.....2  
Bicolored forms.....3
2. Yellow colored.....group *laevigata-solisii* (see below)  
Color brown to black.  
A. *unicolor* (syn of the type and monochroa); black.  
B. *alfari*. Brownish yellow; length 4.1–4.8 mm.; peduncle short.  
C. *duckei*. Length 3.5–4 mm.; peduncle short and indistinct; this form is transitional to *Apedunculata*.  
D. *nigropilosa*. Length 6 mm.; testaceous yellow with black hairs.
3. Larger forms; 11 mm. or larger:  
A. *gracilis* var. *major*. Yellowish red; head and abdomen black.  
B. *mutilloides*. Black, except the peduncle which is red.  
Smaller forms; usually under 9 mm.....4
4. Thorax not impressed at the mesepinotal suture, which is very faint; length 5.6–6.3 mm.; head black, rest of the body reddish brown. The color is however variable.....  
..... *salvini*  
Thorax not impressed.....5
5. Peduncle very short; length 6.5 mm. Pedicel and gaster brown, rest of the body black.....*godmani*  
Peduncle longer.....6

- Gaster light brown with dark brown spots, like freckles.....  
 ..... *santschii*, sp. nov.  
 Gaster not spotted with brown..... *gracilis* group,  
 (remaining forms).

Group *gracilis*

Pl. IV, fig. 26-35

1. Petiolar node in profile with a very steep anterior face. Pl. II, fig. 32; length 9-10 mm.; dark brown .....  
 ..... subsp. *squamifera*  
 Petiolar node of different shape..... 2
  2. Pronotum broader than long; length 8.5 mm.; color variable..... subsp. *agilis*  
 Pronotum as long as broad or longer than broad ..... 3
  3. Head and thorax smooth and shiny; length 6.4-6.8 mm.; epinotum with a semilunar impression; gaster without pubescence..... var. *glabiventris*  
 Not with these characters..... 4
  4. Peduncle relatively short:
    - A. subsp. *maculata*. Peduncle shorter than in the type; pilosity more abundant. Pl. III, fig. 34.
    - B. *gracilis* type. Color extremely variable; most of the named forms fall in fact under the definition of the type.
    - C. subsp. *mexicana*. More robust than the type; black with the prothorax red. Pl. IV, fig. 29, 33.
    - D. subsp. *carapuna*. Smaller than *agilis* and more pilose than the type. Pl. IV, fig. 27.
- Peduncle relatively long, usually with a secondary dilatation at the level of the stigmata:
- E. subsp. *sericata*. Thorax vividly red, head and gaster black. Pl. IV, fig. 26.
  - F. var. *peruviana*. Peduncle very long; mesepinotal disc very elongated. Pl. IV, fig. 31.
  - G. var. *longinoda* var. nov. Peduncle very long as in the preceding form; shoulders very overhanging.
- (The species *alternans* and *faber* are probably nothing more than color varieties of the species *gracilis*; we have not seen the types.)

Group *lævigata-solisii*

1. *lævigata* type. Length 8.5 mm.; with fine punctation, body very shiny; color testaceous yellow.
2. subsp. *kitscheli*. Length 9 mm.; head less convex than in the type; epinotum not narrowed behind.
3. subsp. *osura*. Length 7.2 mm.; head longer than in the type, longer than broad; base of the epinotum more convex than in the type and in *kitscheli*; color reddish yellow.
4. subsp. *insularis* subsp. nov. Smaller than the type and with abundant golden hairs (the pilosity in the type is sparser and black).
5. *P. solisii*. This species is intermediate between *Clavanoda* and *Triangulinoda*. We have put it into the latter, because of its short peduncle. It may be considered the extreme border case of this group (*lævigata*).
6. *flavidula*. Pl. III, fig. 15. Entirely smooth and shiny; yellow colored; head broader than in *pallida*; abdomen with a brown spot of variable size. Texas to Brazil.
7. *flavidula* var. *pallida* (formerly *pallida*); very close to the preceding, but the abdomen is not spotted. Florida to Mexico.
8. *flavidula* var. *jaumei*. Length 4 mm.; close to the variety *pazosi*, but with the head shorter and less convex; gaster shiny and black; rest of the body dark red. Cuba.
9. subsp. *levivertex*. Color reddish yellow; first petiolar node more sharply bordered than in the type; abdomen banded brown. Argentina.
10. subsp. *lizeri*. Length 6 mm.; abdomen spotted, thorax tinted brown; clypeus not toothed (toothed in *levivertex*).

## BRANCH TRIANGULINODA

## Pl. III, fig. 6-10

1. Pedicel in profile less than twice as long as high; peduncle barely indicated by a concave anterior border of the node. Pl. III, fig. 4. ....2  
 Pedicel in profile more than twice as long as high; peduncle well developed and long. Pl. III, fig. 7. ....4
2. Thorax without impressed mesepinotal suture; length 6.5 mm.; pronotum margined; epinotum and first node reddish, postpetiole and abdomen brown or black.

Guatemala. (Differs from the related form *antiguana* by the shorter peduncle.)..... *stolli*  
 Mesepinotal suture impressed.....3

3. With a small antero-ventral tooth on the petiole. Pl. III, fig. 8.....group *dolichopsis*

A. Larger forms, 4.3–5 mm.:

- I. *dolichopsis*. The node in the typical form is very broad and convex on the sides. Colombia.  
 II. var. *curacænsis*. Length 4.3–5 mm.; color testaceous; brown in the type. Curaçao.  
 III. var. *implicata*. Length 4.3 mm.; head narrower than in the type; erect hairs absent on the femora. Amazonas.

B. Smaller forms: Length 3.6–3.9 mm.; scapes longer than in *dolichopsis*; reddish yellow or brownish. Guatemala. .... *peperi*

With larger antero ventral tooth and with a postero ventral tooth; the two teeth connected by a lamina. Pl. III, fig. 4. ....group *championi-denticollis*

A. *denticollis*, type and varieties; length 5–7 mm.; unicolorous or not.

- I. *denticollis* type. Length 6–7 mm.; reddish; Paraguay. Pl. III, fig. 5.  
 II. var. *infuscata*. Length 5–6.2 mm.; head brown, gaster testaceous, sometimes the whole body brown. São Paulo, Brazil.

B. *gældii*. Length 3.2–3.5 mm.; pronotum red, rest black. São Paulo.

C. *rochai*. Length 4–4.7 mm.; head bright red, rest of the body black.

D. *championi* and subspecies. Pl. III, fig. 4. Length 4.5–5.5 mm.; antero ventral tooth strong and curved backward.

- I. *championi* type. Thorax and petiole red, rest blackish brown; length 4.7 mm.  
 II. var. *haytiana*. Same color as the type, but the antennæ are bright yellow; postpetiole and gaster with reddish spots.  
 III. subsp. *haytiana* var. *affinis*. Head black, epinotum with a black streak in the center; pedicel and gaster brown.



- IV. subsp. *haytiana* var. *torquata*. Head to post-petiole black, except the pronotum, which is bright red.
- V. subsp. *haytiana* var. *paulina*. Transitional to subsp. *incurrens*.
- VI. subsp. *incurrens*. Length 4.6–5.3 mm.; brown as in *torquata* but the node is three times as long as broad.
4. Unicolored forms. Pl. II, fig. 6.....group *sabanica-pallens*
- A. *depressa*. Length 4.3 mm.; thorax strongly compressed; color brownish black; head as long as broad, with convex sides; smooth and shiny. Colombia.
- B. *kuenckeli*. Pl. II, fig. 10. The node from above forms a short triangle.
- I. *kuenckeli* type. Color reddish testaceous, gaster brownish. Costa Rica.
- II. var. *bierigi*. Length 5 mm.; darker than the type, nearly black; head ferruginous. Panama.
- III. var. *dichroa*. Larger than the type and more robust; head yellowish red, thorax yellow in front, rest of the body brown. Colombia.
- IV. var. *honduriana*. Head reddish brown, thorax dark reddish, gaster brown. Honduras.
- (The varieties of *P. kuenckeli* are separated mainly by their color patterns; we have not enough material on hand to determine how real these differences are.)
- C. *sabanica* type. Color dark brown (Pl. II, fig. 6) and the variety *saffordi* length 3.4–4 mm.; color uniformly brown, lighter than in the type.
- D. *pallens* type. Length 5–6 mm.; color testaceous; pilosity sparse; pubescence moderate. Colombia.
- I. var. *gibbinoda*. Mesonotum very convex (in the type it is straight and forms an acute angle with the base); São Paulo.
- II. var. *landoldti*. Length 6 mm.; reddish yellow; first node much broader than in the type. Colombia.
- Bicolored forms.....5
5. Thorax without mesepinotal constriction.....  
.....*antiguana* sp. nov.

- I. *antiguana* type. Length 5 mm.; reddish brown, head and gaster slightly darker. Guatemala.
- II. var. *brunneipes* var. nov. Length 6 mm.; sides of the thorax and petiole bright yellow contrasting sharply with the dark brown legs. Guatemala.

Thorax with a pronounced mesepinotal constriction.....6

- 6. Smaller forms. Pl. III, fig. 7. .... group *spinicola*
  - A. *edvardi* type. Color black and the variety *cæciliæ*. Black as the type; length 2.9–3 mm. Differs from the type by the straight posterior edge of the head (concave in the type).
  - B. *ejecta* type. Length 1½ lines. Color rufo-testaceous, gaster black, and the variety *peruviana*. Same size as the type; head to mesothorax testaceous, rest of the body rich castaneous.
  - C. *distincta* type. Close to *ejecta* but with the head black, and the variety *pulchella*. This variety is listed under the larger forms below.
  - D. *mutica*. Length 5.2–6.2 mm.; rusty red, head and gaster brown; peduncle nearly obsolete. This form is transitional to *Apedunculata*. It is distinguished by having the posterior face of the first node vertical as in *denticollis*.
  - E. *kurokii*. Length 4.6 mm.; reddish brown, gaster brown, and the variety *rufiventris*. Length 6.1 mm. (only the female known).
  - F. *solisii* type. Length 4 mm. Near *mutica* but with the head more convex; petiolar node evenly rounded and the variety *belgranoi*. Length 5 mm.; differs from the type in the shape of the petiole.

The species *mutica* and *solisii* are transitional to *Clavonoda* and are listed again under that branch.

- G. *spinicola*. Node rounded, without antero-ventral tooth. Pl. III, fig. 7.
  - I. *spinicola* type. Length 4–5.5 mm.; testaceous, gaster darker.
  - II. var. *convarians*. Length 3.6 mm.; head shorter than in the type.
  - III. var. *gaugei*. Length 4.5–5.2 mm.; color vividly red.

- IV. var. *atrox*. Length 4–4.7 mm.; head almost as broad as long.
- V. var. *infernalis*. Differs from the type by lack of margination, from *convarians* by larger size, from *gaigei* by the narrow postpetiole and from *atrox* by the nonenotched clypeal lobe.
- VI. var. *scelerosa*. Very near to *infernalis* but with the mesonotal disc more elevated (low in *infernalis*).

Larger forms. Pl. II, fig. 7.....group *elegans*

- A. *auripes*. Length 8 mm.; color blackish brown with yellow legs, contrasting sharply.
- B. *distincta* var. *pulchella* (see also under *spinicola*). Head and abdomen black, thorax and pedicel ferruginous red; length 8 mm.
- C. *elegans* type. Head and abdomen black, thorax and pedicel ferruginous red. Length three lines (about 8 mm.), and the variety *breviceps*. Head shorter than in the type; petiole narrower with less margination; petiole and thorax deep red with brown spots. (The differences given in Forel's description warrant raising the variety to the rank of a species. We have not seen the type of the variety.)

#### BRANCH APEDUNCULATA

1. Petiole in profile less than twice as long as high. Pl. III, fig. 10.....2
- Petiole in profile more than twice as long as high. Pl. III, fig. 18.
2. Very slender forms with long and narrow head:
  - A. *subtillissima* type. Length 3–3.5 mm.; color testaceous. Costa Rica. (The variety *tenuissima* has been raised to species rank and listed under *Ornatinoda*.)
  - B. *voytowskii*. Length 2.2 mm.; occiput transparent; prothorax yellow, rest of the body brown, Peru, and the variety *costariensis*. Length 4.2 mm.; head reddish brown; opaque (shiny in the type). Costa Rica.
- More robust forms.....3
3. Petiole with backwardly directed antero-ventral tooth. Pl. III, fig. 10.
  - A. *wessoni*. Length 3.5–4 mm.; uniformly yellow; pedi-

cel and gaster shiny, rest of the body opaque. Peru. Pl. III, fig. 10. The variety *tuberculata*. Epinotum with small tubercles at the junction of the base and the declivity. Pl. III, fig. 12. The type lacks the tubercles.

B. *allidora*. Length 3–3.5 mm.; intermediate between *sericea* and *acanthobia* in the shape of the petiole; differs from the former by its brown color, from the latter by the absence of erect hairs. Panama.

C. *weberi*. Length 3.8–4 mm.; head reddish brown, weakly bicolored on the rest of the body; this species is easily recognized by the peculiar shape of its petiole in profile. Pl. III, fig. 16. It is transitional to *decipiens*.

Petiole with a triangular lamella in place of the antero-ventral tooth. (Some forms have a tooth, i.e., *sericea fortis*.) Pl. III, fig. 17.....4

4. With an antero-ventral and a posterior tooth, the two teeth connected by a serrated lamina. Pl. III, fig. 19.....5

Without a posterior tooth, but the lamella is present. Pl. III, fig. 20. Color brown.....6

5. All forms belonging here are black or very dark brown and all have a silky shine.

A. *sericea* type. Length 4.5–5.5 mm.; Colombia. Pl. III, fig. 11.

B. var. *altinoda*. Length 4 mm.; petiole higher than in the type, two-thirds as high as the thorax; differs from the type in color. Brazil.

C. var. *cordiæ*. Smaller than the type; clypeal lobe triangular. Peru.

D. var. *fortis*. Length 6 mm.; base of the epinotum longer than the declivity. Mexico.

E. var. *huberi*. Length 4.5 mm.; abdomen grayish, otherwise as in *rubiginosa*.

F. var. *ita*. Length 4.5 mm.; the first node has a very convex anterior face, the second node is smaller than in the type. Costa Rica.

G. var. *longior*. Length 5.5–6 mm.; clypeal lobe triangular; color as in *fortis*. Brazil.

H. *rubiginosa*. Head black, front of pronotum deep



brown, first node banded with brown, abdomen black, rest of the body rusty red. Brazil.

- I. var. *vineni*. As in cordiæ, but with larger eyes; base of the epinotum very convex; length 3.5–4.5 mm. Brazil.
  - K. var. *acaciorum*. Length 3.5–3.8 mm.; chocolate brown; clypeal lobe rounded; coloration distinctive. Panama.
  - L. var. *lisa*. Near *acaciorum*, but with the sides of the thorax smooth (punctate in *acaciorum*); color scheme more vivid.
6. Light brown forms; *acanthobia* and varieties.
- A. *acanthobia* type. Reddish yellow with brown spots on the abdomen; pronotum not marginate. Paraguay. Pl. III, fig. 13.
  - B. var. *capperi*. Differs from the type by having the first node margined. Jamaica.
  - C. var. *cocæ*. Smaller than the type; length 5.5–6 mm.; sculpture coarser. Argentina.
  - D. var. *fuscata*. Darker colored than the type. Paraguay.
  - E. var. *panamensis*. Length 4 mm.; petiole shorter than in the type.
  - F. var. *virgo* Sant. Length 3.5 mm.; yellowish, gaster not spotted. Brazil.
  - G. subsp. *deliculata*. Length 3–3.5 mm.; pedicel very narrow compared with the width of the thorax; brownish yellow with brown spots on the abdomen. Jamaica. Pl. III, fig. 13.
  - H. subsp. *deliculata* var. *vittata*. Length 3.4–4 mm.; with brown bands on the second and third gastric segments. Brazil.
  - I. subsp. *deliculata* var. *limai* var. nov. Length 2–3 mm.; very shiny; occiput transparent; abdominal spots very small. Peru.
- Dark brown to black forms:
- A. *elongata* type. Length 3–4.5 mm.; head narrowed behind; color dark brown to black. Colombia. Pl. III, fig. 12.
  - B. var. *tandem*. Head shorter than in the type; petiole thinner. Costa Rica.

- C. var. *subatra*. Length 4–4.5 mm.; head shorter than in the type; epinotal base shorter; sculpture coarser than in the other varieties. Haiti.
7. Color dark, brown to black.....group *fiebrigi-brunnea*.
- A. *fiebrigi*. Length 3.7–4 mm.; blackish brown to black; pronotum bluntly margined. Paraguay.
- B. *culmicola*. Length 3 mm.; reddish brown, abdomen brown; close to the type but with thicker antennae and a smaller petiole. Trinidad.
- C. *holmgreni*. Length 4.2 mm.; testaceous brownish yellow, gaster brown. Peru.
- D. *euryblemma*. Length 5 mm.; pronotum not margined; reddish brown. Costa Rica.
- E. *peltata*. Length 6.8 mm.; ferruginous red; peduncle long. This form is transitional to *Clavanoda*.
- F. *brunnea*. Length 2.5–3 mm.; head with nearly parallel sides; color dark brown, gaster blackish.
- G. *brunnea* var. *nigrita* var. nov. Head opaque (shiny in the type); black with white mandibles.
- H. *colei* sp. nov. Length 4.5 mm.; nearly naked; head and prothorax reddish brown, gaster black. Peru.
- I. *colei* var. *vistana* var. nov. Head bright reddish, occiput dark brown, petiole and gaster dark brown. Peru.
- Color lighter, light brown or yellow.....8
8. Petiole in profile very long.....*filiformis* and varieties
- A. *filiformis* type. Length 4–5.5 mm.; head yellowish red, gaster brown. Guatemala. Pl. III, fig. 18.
- B. var. *longiceps*. Larger than the type; head much longer. Colombia.
- Petiole in profile shorter.....9
9. Petiole in profile with a small antero ventral tooth.....*decipiens*
- A. *decipiens* type. Length 5–7 mm.; node transitional to *salvini* and *gracilis*; reddish yellow; base of the abdomen banded brown.
- B. var. *longior*. Length 6.4–6.7 mm.; head longer than in the type; first node higher.
- Petiole without a tooth below. Pl. III, fig. 14....*nigrocincta*
- A. *nigrocincta* type. Length 4–4.5 mm.; yellow, with fuscous spots on the abdomen. Costa Rica.

- B. var. *bicincta*. Head rectangular (narrowed behind in the type); base of the petiole and gaster brown.

BRANCH LATINODA

1. Color bright yellow, last gastric segment brownish; petiole stout with a short peduncle and a round node, rising sharply from it. Trinidad. Length 6 mm. .... *icterica*  
Color darker ..... 2
2. Petiole below without or with a very small antero ventral tooth. Pl. III, fig. 23 ..... 3  
Petiole with a large tooth and usually with a broad lamella except in *maligna-cholerica*, which lacks the tooth. Pl. III, fig. 20 ..... 7
3. Head oval, not longer than broad. Pl. III, fig. 23 ..... *belti*  
A. *belti* type. Length 5–6 mm.; petiole with a small tooth; thorax narrowly margined. Costa Rica.  
B. var. *obnubila*. Length 6–6.8 mm.; black; more robust than the type; peduncle longer and broader. Costa Rica.  
C. subsp. *fulvescens*. Color reddish testaceous; gaster brown; thorax flatter than in the type.  
D. subsp. *venifica*. Length 4–4.5 mm.; deep brown; petiole and gaster sometimes lighter; very hairy. Mexico.  
E. subsp. *bequaerti*. Length 5–6 mm.; head a little longer with convex sides; prothorax not marginate; differs from the other varieties by its uniformly brown color.  
Head a little longer than broad ..... 4
4. Head narrowed behind; color uniformly dark brown; node almost as long as broad; petiole without a ventral tooth; very hairy ..... *caroli*  
Head not narrowed behind ..... 5
5. Clypeus in front with two blunt teeth, as in the genus *Sima*; length 6.5 mm.; petiole as broad behind as long; color brownish yellow. Amazonas ..... *simoides*  
Clypeus not with blunt teeth ..... 6
6. Group *canescens*. Pl. III, fig. 22.  
A. *canescens*. Length 5.5–6.5 mm.; head longer than broad, with nearly parallel sides; antennæ surpassing the head. Mexico.  
B. *bradleyi*. Length 5.5 mm.; uniformly light brown;

prothorax not marginated; node subglobular; petiole with a small tooth. Peru.

7. Petiole with a vertical posterior face and a lamina below, ending in front in a triangular tooth. Pl. III, fig. 21.

A. *picta* type. Length 5.5 mm.; pronotum marginate; node from above trapezoidal and marginate, the margins ending behind in blunt teeth (transitional to *Ornatinoda*). Ground color red with a complicated black pattern superimposed. Brazil.

B. var. *humboldi*. Without postero superior teeth on the first node.

Petiole shaped differently.....8

8. Petiole with a relatively long peduncle and a strong tooth, sometimes continued backward in a crenulated lamellæ.

Pl. III, fig. 19.....group *triplaridis-maligna*

Petiole without peduncle, lamella not crenulated. Pl. III, fig. 20. ....group *arboris-sanctæ*

#### GROUP TRIPLARIDIS-MALIGNA

- A. *ulei*. Length 4–5 mm.; mandibles angular near the base; head rectangular with nearly parallel sides; color as in *caroli*. Amazonas.

- B. *maligna*.

I. *maligna* type. Length 4–4.6 mm.; thorax submarginate; petiole from above globular; petiolar node abrupt behind; color deep castaneous. British Guiana.

II. var. *cholericæ*. Length 3–3.5 mm.; lighter colored than the type and weakly bicolored; without a ventral tooth on the petiole. British Guiana.

III. var. *crucians*. Length 3–3.5 mm.; very dark brown, sometimes black. British Guiana.

- C. *triplaridis*. Head long and narrow; mandibles not lighter than the rest of the body as is almost invariably the case in *Pseudomyrma*.

I. *triplaridis* type. Length 4.5–4.8 mm.; petiolar node from above subhexagonal. Amazonas.

II. subsp. *biolleyi*. Length 4.8–5.2 mm.; eyes smaller than in the type; node from above globular; head reddish brown, gaster brown, first gastric segment and rest of the body reddish. British Guiana.



- III. subsp. *boxi*. Length 4 mm.; mandibles not darker than the head, color brownish yellow; sculpture stronger than in the other forms. British Guiana.
- IV. subsp. *trigona*. Length 4–4.8 mm.; mesonotal disc angular as in the type; epinotum ovoid and convex. Color uniformly red. British Guiana.

## GROUP ARBORIS-SANCTÆ

- A. *schuppi* and var. Antennæ beaded; frontal carinæ indistinct; close to *belti* in the shape of the head; length 4.5–5 mm. (the variety *geranensis* has the first node excavated above and is therefore transitional to *Ornatinoda*, where we have listed it).
- B. *oki*. Length 3.5 mm.; like a small *belti fulvescens*; the clypeus without lobe; pronotum marginate; node as in *belti* but without a peduncle.
- C. *latinoda*. Pl. III, fig. 19.
- I. *latinoda* type. Length 4 mm.; rufo testaceous; petiole very short. Brazil.
  - II. var. *endophyta*. Length 4.1–5.3 mm.; more robust than the type; color reddish yellow. Brazil.
  - III. var. *nigrescens*. Length 4.4–4.8 mm.; petiole and thorax black, rest of the body reddish yellow; darker than the type. Brazil.
  - IV. var. *opacior*. Length 4.3 mm.; pronotum gently sloping, not abrupt as in *nigrescens*; color uniformly brownish yellow. Cuba.
  - V. subsp. *tachigaliæ*. Head longer than in the type, with parallel sides, clypeus with a rectangular lobe. Brazil.
  - VI. var. *coronata*. Length 5.5–6 mm.; head testaceous with a brown spot on the occiput; rest of the body dark brown. British Guiana.
- D. *dendroica*. Close to *arboris-sanctæ*.
- I. *dendroica* type. Length 6.5 mm.; robust; pronotum marginate; color deep brown. Brazil.
  - II. var. *emarginata*. Head broader than in the type. Brazil.
- E. *arboris-sanctæ*. Pl. III, fig. 20.
- I. *arboris-sanctæ* type. Length 5.6 mm.; testaceous, head darker; first node very transverse. Bolivia.

- II. var. *cordobensis*. Length 6–6.5 mm.; head not concave behind as in the type; color reddish yellow. Argentina.
- III. subsp. *symbiotica*. Length 4.4–4.7 mm.; color reddish yellow, middle of the gaster brown.
- IV. subsp. *symbiotica* var. *læwensohni*. Length 5.5–5.7 mm.; color reddish brown. Panama.
- V. var. *ecuadoriana* var. nov. Length 5.5 mm.; with a brown occipital spot; postpetiole more transverse than in the type; color reddish brown, first three abdominal segments banded brown. Ecuador.

*Pseudomyrma acanthobia*, subsp. *deliculata* var. *limai* var. nov.  
Pl. IV, fig. 24.

Worker.

Length 2–3 mm. Close to the subspecies *deliculata* from which it differs by the following characters. The whole body, except the pedicel, very shiny (the subspecies is sublucid). Smaller and slenderer. The whole occiput is transparent showing the outlines of the brain (the type is a little transparent on the occiput). The scapes are shorter and fail to reach the middle of the eyes. The petiole is even more slender than in *deliculata* and is finely punctate and subopaque. The abdominal spots are barely visible, or absent in some specimens, while in *deliculata* they are dark brown and large. Described from several workers taken from an unspecified tree.

Type locality: Lima, Peru.

Holotype No. 75, Haskins Collection, located in the Biological Laboratories, Harvard University, Cambridge, Massachusetts.

*Pseudomyrma allidora* sp. nov.

Worker.

Length 3–3.5 mm. The new species is intermediate between *P. acanthobia* and *P. sericea* in the shape of the pedicel. It differs from *P. sericea* by its lighter color and from *P. acanthobia* by the presence of erect hairs, a much longer head, coarser sculpturing on head and thorax, absence of brown spots on the abdomen, etc.

Head, without mandibles, about  $1\frac{1}{2}$  times as long as broad with nearly straight sides and weakly concave posterior border.

The eyes are flat and large, occupying more than half the sides of the head. The mandibles are yellow, with two large apical and three small basal teeth, all black; heavily striated. The clypeal lobe is rectangular and not excised. The scapes fail to reach the middle of the head. The head is evenly and densely punctate, opaque, devoid of erect hairs, but with fine white pubescence on the vertex. The prothorax is longer than broad, and distinctly margined on the sides; the mesonotal disc has an acute angle in front, behind it is semicircular. The epinotal base is longer than broad, broadest in front, narrowed behind, where it meets the epinotal declivity. The petiole is subtriangular from above, with convex sides and rounded posterior edge; the postpetiole is as long as broad and nodiform. The thorax in profile is slightly convex above with a strong depression at the mesepinotal suture. The base and the declivity of the epinotum meet at a rather sharp angle. The node in profile is shaped as in *P. sericea*; but has a pronouncedly backward curved antero-ventral tooth (the tooth is triangular in *P. sericea*).

The pilosity is sparse on the thorax, pedicel and abdomen, absent elsewhere. The pubescence is also sparse, except on the postpetiole and gaster, where it is relatively abundant, white and silky. The color is brownish-yellow, with the prothorax and petiole a little lighter; the head sometimes a little blackish. Mandibles and tarsi clear yellow.

Habitat: Ancon, Canal Zone (Type locality). On *Cordia allidora*. Miraflores, Canal Zone. On *Triplaris cumingiana*. The specimens from Miraflores have the gaster subopaque (shiny in the specimens from the type locality).

Cotype 20533, Harvard Collection, Mus. Comp. Zoölogy (21 specimens).

*Pseudomyrma antiguana* sp. nov.

Worker.

Length 5 mm. The whole body reddish brown, with the head and gaster dark reddish brown. Head and thorax densely and coarsely punctate, the rest of the body finely punctate and opaque throughout. The new form belongs to the branch Triangulinoda and is close to the bicolored species *spinicola*, which has a long peduncle with the faintest indication of an antero-ventral tooth, placed very close to the articulation with the epinotum.

The new form is sufficiently different from *spinicola* to be listed as a separate species. The structure of the thorax of the new species is in marked contrast to that of *P. spinicola*; it is evenly convex in profile, without any depression at the mesepinotal suture. From above this suture is very faint, nearly obsolete. The mandibles are almost as dark as the rest of the head, a feature which distinguishes *P. triplaridis*, which however belongs to another branch. The mandibles are curiously flattened, as if they had been artificially crushed, and strongly rugose, each ruga leading to a tooth. The frontal carinæ are very close together.

Type locality: Antigua, Guatemala (Wheeler coll.).

Holotype No. 84, Haskins Collection; two paratypes.

*Pseudomyrma antiguana* var. *brunnipes* var. nov.

Worker.

Length 6 mm. With the general features of the type, that is the flattened mandibles and the very faint mesepinotal suture. It differs from the type by its shorter and more robust petiole. It differs from the type by its shorter and more robust petiole, which has a shorter peduncle. The frontal carinæ are longer and farther apart than in the type. The color pattern is very striking. The whole body, including the mandibles and legs, dark reddish brown and contrasting very sharply with the thorax and petiole, both of which are bright yellow on the sides and brownish yellow dorsally. The petiolar node is almost as dark as the postpetiole and gaster. The second abdominal segment has the anterior half golden yellow, the posterior half dark brown.

Type locality: San Lucas, Toliman, Guatemala (Wheeler coll.).

Holotype No. 85, Haskins Collection.

*Pseudomyrma arboris-sanctæ* var. *ecuadoriana*, var. nov.

Worker.

Described from numerous workers collected for us in Ecuador. Length 5.5 mm. Head  $1\frac{1}{4}$  longer than broad, with very convex sides and straight posterior border. Mandibles very strongly striate, with two large apical and several small blunt basal teeth. The clypeal lobe is very short and rectangular. The scapes are much thickened apically and reach the middle of the eyes. Head densely foveolate, not punctate; on the occiput



with a brown spot around the ocelli. Prothorax as long as broad, not margined at the sides. Mesothorax with an almost circular disc which is a little elevated, separated from the base of the epinotum by a wide depression; the latter is longer than broad, broadest at the level of the stigmata, and very convex transversely. The petiole is shaped as in the type; the postpetiole is more transverse. The posterior edge of the first, second and third segments are brown, the tip of the gaster and the gaster below are brown. The rest of the body is reddish brown, except for the brown spot on the occiput.

Type locality: Ecuador.

The new form differs from the type *arboris-sanctæ* in coloration. The type has the anterior edge of the head and the prothorax light yellow, the mesonotal disc dark brown, and the occipital spot very small. The pilosity and pubescence is much more developed in the new variety, the eyes are larger and more convex. From the other forms of *arboris-sanctæ* the new variety differs by the characters given in the key.

Described from 5 workers in the Collection of the Museum of Comparative Zoölogy, labelled Cotypte 26809.

*Pseudomyrma belti* subsp. *bequærti* subsp. nov.

Worker.

Length 5–6 mm. Head a little longer than broad with very convex sides and straight posterior edge. Mandibles very shiny; clypeus with a short broad rectangular lobe in front; scapes reaching beyond the middle of the eyes. Eyes very large and convex, occupying more than half the sides of the head. Head coarsely and evenly punctate, with very sparse erect hairs.

Prothorax longer than broad, not margined on the sides. Mesothoracic disc triangular with well rounded angles. Epinotum about twice as long as broad. In profile the prothorax is slightly convex above, the epinotal base nearly flat; the base rounds into the declivity without an angle.

Petiole from above  $1\frac{1}{2}$  times as long as broad, the node broader behind than in front, the posterior edge rounded. Postpetiole about as broad as long, twice as broad as the petiole. In profile the petiole is  $1\frac{1}{2}$  times as long as high, with a very short peduncle; the node evenly rounded with the posterior face a little more abrupt.

Erect hairs sparse on thorax, pedicel and abdomen. Pubes-

cence long and adpressed, on the tibiæ short and fine. Head to pedicel opaque, gaster subopaque. Color uniformly brownish yellow.

Type locality: Puerto Castillio, Honduras (Bequaert). In *Acacia*.

The new subspecies is easily distinguished from the type as well as from the other varieties and subspecies by its color. It is closest to the subspecies *fulvescens* Emery, which is reddish-testaceous with a darker abdomen. The pedicel from above in *fulvescens* is nearly triangular, with convex sides and blunt margin.

Cotype 23139, Harvard Collection, 8 specimens.

*Pseudomyrma belti* subsp. *venifica* subsp. nov.

Worker.

Length 4–4.5 mm. Head shaped as in the type. Mandibles faintly striated. Clypeus with a much narrower but rectangular lobe; front and clypeus with abundant pilosity. Prothorax about as long as broad, not marginate at the sides. Mesonotal disc transversely oval; epinotum nearly twice as long as broad, broadest at the level of the stigmata. The node from above shaped as in *P. decipiens* (Pl. II, fig. 13), not marginate at the sides. Postpetiole broader than long, more than twice as broad as the petiole. Abdomen very slender. Thorax strongly constricted between the meso- and epinotum, seen in profile. The epinotum is very convex, the base evenly rounded into the declivity, not forming an angle. The petiole in profile as in *P. belti bequaerti*.

Color deep brown, the prothorax and petiole and sometimes the gaster lighter brown.

Type locality: Manzanillo, Colima, Mexico. (Townsend).

Female.

Length 5 mm. The female is very distinctly bicolored with a reddish brown ground color; the prothorax, mesothorax (except the disc) and petiole very light brown to yellow.

This form is easily recognized by its extraordinarily long pubescence, especially on the pedicel, gaster and legs, which gives this ant a shaggy appearance. It is a transition form but nearer to *belti* than to *P. decipiens*.

Described from 20 specimens, labelled Cotype 20538, in the Collection of the Museum of Comparative Zoölogy.

*Pseudomyrma bradleyi* sp. nov.

Worker.

Length 4.5–5 mm. Color uniformly light brown, or yellow brown except the mandibles, front of the head, tarsi and articulations of the legs, which are yellow. Differs from *P. latinoda* var. *coronata* by having the sides of the head nearly straight, so that the head seen from above is nearly a perfect rectangle; the antennæ are brownish, not clear yellow as in *coronata*. The prothorax is much narrower than long in the median line; the epinotum is almost flat transversely, broadest just behind the mesepinotal impression. The prothorax is not marginated. The node of the petiole is subglobular, a little narrower in front. The postpetiole is shaped as in *coronata*. In profile the pro- and meso-notum together form a convex line, which is interrupted by the promesonotal suture. The base of the epinotum is straight and forms a blunt angle with the declivity. The petiole in profile has a very short peduncle, almost "apedunculate," with convex anterior and posterior faces, the latter more abrupt. There is no trace of margin on the node.

Pilosity practically absent on the vertex, thorax and petiole, sparse on the postpetiole, gaster and legs. The pubescence is moderately abundant, adpressed, fine and white. The whole body with very fine punctation, coarser on the head, and subopaque.

This form is close to *latinoda* but differs from it in several major characters, which justifies listing it as a separate species.

Type locality: Perene, Peru. (Bradley).

Cotype 22864, Harvard Collection, 6 specimens.

*Pseudomyrma brunnea* var. *nigrita* var. nov.

Worker.

Similar to the type in size and structure and with the epinotal declivity much longer than the base (as in the type). It differs from *P. brunnea* by the much coarser sculpturing on the head and thorax, which renders it opaque (shiny in the type); the stouter body; the coloration which is black in the new variety, except for the mandibles, which are white and contrast strikingly with the rest of the head (mandibles yellow in the type). The head is long and narrow in the type while in the variety it is almost as broad as long.

Type locality: Mirador, Mexico.

Described from 3 workers, labelled Cotype 26810, in the Collection of the Museum of Comparative Zoölogy. The Haskins Collection has 6 workers from Camaron, Mexico.

*Pseudomyrma colei* sp. nov.

Worker.

Length 4.5 mm. Head  $1\frac{1}{4}$  times as long as broad, broader in front, with very round occipital corners and straight posterior edge. Mandibles strongly striated, with two apical, but no basal teeth. The clypeus with a very short and narrow anterior lobe which is weakly excised in the middle. The eyes are about half as large as the sides of the head and are flat. The scapes reach the middle of the head. The head is finely punctate and shiny. Prothorax broader than its length in the midline, not margined, finely punctate. The mesothoracic disc is transverse. The base of the epinotum is twice as long as broad, broadest at the level of the stigmata, a little narrower at the junction with the epinotal declivity. The petiole from above is shaped as in *P. decipiens*. The postpetiole is  $1\frac{1}{2}$  times as broad as the petiole, broader than long, and nodiform. The thorax in profile is slender, a little convex above, strongly impressed at the mesepinotal suture. The base and declivity of the epinotum form a blunt angle. The petiole in profile is distinctive and separates this form from all other related species. It is twice as long as high and has four distinct faces; the slightly concave anterior face rises from a short peduncle; the superior face is convex and higher behind than in front; the posterior face is convex and abrupt and ends in a sort of posterior peduncle. Below, the petiole has a small blunt tooth, shaped as in *P. elongata*.

The new species is nearly naked: the pilosity is restricted to the mouth, and the extremely fine pubescence to the funiculi and the tarsi. Color: tibiæ antennæ, tarsi and tip of the gaster yellow. Head and prothorax reddish brown, the rest of the body almost black.

Type locality: Bella Vista, Peru (800 m. sea level). Taken from an unknown tree.

Holotype No. 71, Haskins Collection.



*Pseudomyrma colei* var. *vistana* var. nov.

## Worker.

Described from a large number of workers, taken from the leaves of an unknown tree. The new form is almost identical with the type in structure, but differs markedly from it in coloration. The mandibles are very pale yellow, with black teeth. The head and antennæ are bright reddish-yellow, but all of the occiput, behind the eyes, is dark brown. The prothorax is yellow with a large brown spot in the middle; the mesonotum and epinotum are black; the pedicel and abdomen dark brown. The middle and hind coxæ and the middle swollen parts of the femora are reddish brown, the rest of the legs is yellow. The ventral part of the epinotum, pedicel and gaster are reddish yellow. The gaster is very smooth and shiny.

Type locality: Bella Vista, Peru.

Described from 6 workers labelled Cotype No. 72, Haskins Collection. One pin has been deposited in the Museum of Comparative Zoölogy, and was labelled Cotype 26811.

*Pseudomyrma crenulata* sp. nov.

## Worker.

Described from specimens labelled erroneously *P. kuenckeli* in the Harvard Collection.

Length 5-5.5 mm. Head as broad as long, markedly narrowed in front, with convex sides, well rounded posterior corners and straight occipital edge. The eyes are less than half the length of the sides of the head and very convex. Mandibles powerful and coarsely rugose; clypeal lobe very short, broad and rectangular. Antennal scapes reaching beyond the middle of the eyes but do not attain the occipital border. The whole head finely shagreened-punctate and shiny. Prothorax as broad as long in the midline, sharply bordered with the border crenulate (this is the first *Pseudomyrma* we have seen which has this character). Mesothoracic disc semicircular in front, concave behind; weakly elevated. Epinotal declivity broadest behind; petiole node trapezoidal, twice as broad as long. Postpetiole broader than long, with blunt corners at the sides. Thorax in profile weakly convex above, the epinotal declivity almost vertical. Petiole in profile similar to that of *P. maligna*, but shorter, with a nearly vertical posterior face and weakly crenulated lamina. Gaster very stout.

The color is uniformly testaceous yellow, infuscated at the vertex and middle femora. The pilosity is abundant, long and erect. The pubescence is long and untidy giving the ant an unkempt appearance.

Type locality: Guernavaca, Mexico.

Holotype No. 76, Haskins Collection; 3 paratypes.

The new species is related to the triplaridis-maligna group but differs from the related species by a series of unusual characters such as the broad node, the head narrowed in front, the crenulated epinotal margin.

#### GROUP *gracilis*.

Of all the descriptions of forms which undoubtedly belong to the *gracilis* group 15 are good enough to permit the student to recognize the form, although even here some descriptions are not adequate to decide between two or more. The *gracilis* group shows in miniature the weaknesses of the whole genus *Pseudomyrma*, namely a planless accumulation of bad descriptions. Nobody really knows how many forms of *gracilis* have actually been described, because many of F. Smith's undecipherable descriptions may refer to *gracilis*.

The confusion arose because an entirely useless character (as far as this species is concerned) has been chosen as the chief diagnostic character, that is the color pattern. A casual collector, who picks up a specimen here and there and does not pay much attention to the structural features, will come to the conclusion that *gracilis* is a large group containing many dozens of good species; the color patterns are very striking indeed. They are however practically worthless, because even individuals from the same nest show marked differences. Several of the forms which are now recognized as subspecies or varieties in good standing exhibit the larger part of the variation range of the type series. This is shown in the diagram (Pl. IV, Fig. 26-30).

All forms of *gracilis* have at least part of the body black or dark brown; on the other hand there is no form which is completely black. The original type *gracilis* (Fabr.) has only the mandibles and the petiolar peduncle light colored; the other extreme is found in some specimens from the Amazon Valley, which have only the head black and the rest of the body yellow.

The fallacy of basing species, subspecies or varieties of *gra-*

*cilis* on color alone, has been recognized early. Emery (1890) after studying a large series came to the conclusion that *P. gracilis* (Fabr.), *P. bicolor* (Guérin), and the variety *dimidiata* Roger were identical. Emery proposed *P. bicolor* as the type of the species. Forel later made *P. termitaria* Sm. a synonym of the type. It differs from the type by its smaller stature, but falls without question into the size range of the type series.

But even if other characters had been chosen to separate the forms of *gracilis*, its classification would still be very difficult. We have attempted to do this in our key, but have not been very successful. For instance *P. maculata* Smith (now subsp. *maculata*) is said to differ from the type by its shorter peduncle. We have studied a large series of specimens covering the whole area from Texas to Southern Brazil and Peru; all we can say is that the South American forms usually have longer and more slender pedicels, but even the type series includes forms with long and short peduncles, and intermediate forms are very common.

Every other character which might be chosen to effect a separation shows similar gradations. The elevation of the mesonotal disc, used by some writers shows all grades of development not only in the type series but in the series of *mexicana*, *agilis* and *sericea* as well.

The only reason we retain most of the names and even add to them is that the names sometimes are associated with the extreme development of some given character, and that certain color and structure patterns are characteristic of given regions.

*Pseudomyrma gracilis* var. *peruviana* var. nov.

Worker.

Length 8.5–9 mm. Identical with the variety *longinoda* from the same general locality. It differs from the latter by coloration, having the mandibles, clypeus, pedicel and gaster pale yellow; funiculi, coxæ and femora reddish brown to brownish yellow; rest of the legs and the scapes testaceous; head and thorax black. We have seen a similar color pattern in some specimens of the subsp. *agilis*, from which the new variety differs by the very pronounced shoulders. From the variety *longinoda*, its closest relative, it differs by its very abundant, long erect hairs on the occiput and thorax, and the opaque gaster (shiny in *longinoda*).

Type locality: Lima, Peru.

It is not unlikely that further collections in Peru will unearth numerous intergrades between the two new varieties.

Holotype No. 89, Haskins Collection.

*Pseudomyrma gracilis* var. *longinoda* var. nov.

Worker.

Length 8–8.5 mm. Color black, except for the mandibles, clypeus, peduncle of the petiole, which are yellow or reddish yellow, antennæ, tibiæ and tarsi brownish red. The coloration conforms to the description of the type *P. gracilis* (Faber, not Emery). Head opaque, rest of the body subopaque (as in *P. bicolor*). Postpetiole much longer than broad, piriform, as in *dimitiata* (more nodiform in *bicolor*, *sericata mexicana*). The peduncle is very long and has a secondary swelling at the location of the spiracles (this feature is much less developed in all other forms). Pronotum powerfully marginate with large overhanging shoulders, much more pronounced than in *agilis*. The clypeal lobe is very broad and nearly rectangular, as in some forms of the type series.

Type locality: Bella Vista, Peru. From fallen leaves.

We name this new form because it shows two characters in extreme development: the length of the petiolar peduncle and the margination of the thorax. It is nearest to *agilis*, from which it differs by a very much higher mesonotal disc, as well as by accentuation of some of the distinctive characters of *agilis*.

Cotype No. 90, Haskins Collection; one pin has been deposited in the Museum of Comparative Zoölogy, where it has been labelled Cotype 26812.

*Pseudomyrma kuenckeli* var. *hondurana* var. nov.

Worker.

Differing from the type in color pattern. Head reddish brown, darker than in the type; thorax dark reddish; gaster brown; front of the head and mandibles yellow.

The varieties of the species *kuenckeli* are separated mainly by their color pattern. We have not enough material on hand to make any positive statements as to whether color differences can be regarded as a good character for the separation of named varieties.

Type locality: Honduras (Bates coll.). Other specimens of this variety in the Haskins Collection are from Guatemala.



Described from 6 workers in the Museum of Comparative Zoölogy, labelled Cotype 26814.

*Pseudomyrma lævigata* subsp. *insularis* subsp. nov.

Worker.

Length 6.5–7 mm. Differs from the type by smaller size (type 8.5 mm.); character of the pilosity (long and black in the type, more sparse, shorter, and of golden color in the new subspecies); the shape of the prothorax (broad and flat above in the type, narrow and slightly curved in *insularis*); the coloration (bright yellow in the type, reddish yellow in the subspecies). The differences between the new subspecies and the remaining forms of *P. lævigata* are given in the key.

Type locality: Barro Colorado Island, Panama.

Holotype No. 81, Haskins Collection.

*Pseudomyrma latinoda* var. *coronata* var. nov.

Worker.

Length 5.5–6 mm. Cotype 20542, Harvard Collection, 19 specimens. Tarsi and head testaceous-yellow. On the vertex a brown spot of variable shape and size; rest of the body dark brown. Head a little longer than broad, with very convex sides and slightly concave posterior border. The eyes are in the middle, very flat, and occupy less than half the sides of the head.

Mandibles heavily striated, with two large apical and three smaller teeth. Clypeus with a short, broad, straight lobe. Funiculi reach the middle of the head. Head very shiny, with abundant small foveoli. Prothorax broader than its length in the midline, submarginate on the sides. Mesothorax broader than long, with blunt angle on the sides. Epinotum longer than broad, very convex transversely. Petiole with a trapezoidal node, which is broader behind than long. Postpetiole bell shaped, much broader than long. In profile the pro- and meso-thorax form a convex line above, which is separated by a deep depression from the very convex epinotum. The node in profile longer than high, subtriangular, with rounded summit.

The whole body shiny; thorax and petiole finely punctate, postpetiole and gaster smooth; with relatively abundant erect hairs especially on the pedicel and moderately abundant pubescence, more dense on the thorax and gaster. The coxæ and femora are infuscated.

Type locality: Mouth of Jerume, British Guiana.

*Pseudomyrma sabanica* var. *saffordi* var. nov.

## Worker.

Length 3.4–4 mm. Head slightly longer than broad, with convex sides and excavated posterior edge. The mandibles are microscopically punctate and shiny; clypeal lobe as in *P. belti*. The eyes are flatter than in the latter and the head is much denser punctate. The prothorax is sharply marginate on the sides. The mesonotal disc is longer than broad, with a straight posterior border. The epinotum is length-oval, broadest at the level of the stigmata. The petiole from above is fully twice as long as broad, and somewhat triangular, with a rather long and broad peduncle. The thorax is evenly convex in profile, but with a saddle shaped impression between meso- and epinotum. The petiole is shaped as in *belti bequaerti* in profile, but longer.

Erect hairs very sparse on the body, but the pubescence is more abundant, very fine, white and adpressed. The whole body, except the head lucid. Color brown and uniform, not bicolored.

Type locality: Yerba Santa, Chiapas (N. C. Collins).

The new subspecies is close to *P. sabanica* from which it differs by its lighter brown color and other points.

Cotype 20437, Harvard Collection, 20 specimens.

*Pseudomyrma santschii* sp. nov.

## Worker.

Head almost as broad as long, narrowed behind, with slightly convex sides, almost completely taken up by the very large eyes; slightly excised behind. Mandibles with two large apical and several smaller teeth, all black; heavily striated. Clypeal lobe rectangular with straight anterior border. Head above with very fine punctation and fine pubescence, opaque; yellow with a dark brown spot around the ocelli. Thorax sharply marginate, deeply impressed between meso- and epinotum. With very fine long hairs and abundant and very fine pubescence. Pedicel from above similar to that of *P. gracilis*. Postpetiole and gaster slender with abundant pubescence. Thorax and legs brown except for yellow patches especially on the sutures and articulations of the legs; pedicel and gaster yellow. The dorsal part of the gaster is covered with many small sharply circumscribed brown spots, having the appearance of freckles. This is a very characteristic feature and distinguishes this ant from all other known *Pseudomyrma*. Size 8–9 mm.

Type locality: Lima, Peru.

The new species is closely related to *P. gracilis* with which it has many features in common. All members of the *gracilis* group however have at least a part of the body black or very dark brown, while in the new form the dominant color is reddish brown. The freckled abdomen sets the new species aside from the numerous other forms related to *P. gracilis*.

Holotype No. 80, Haskins Collection; 3 Paratypes.

*Pseudomyrma sericea* var. *acaciorum* var. nov.

Worker.

Length 3.5–3.8 mm. Smaller than the other described form of *sericea* except the variety *vineni* Forel. Color chocolate brown, with the anterior part of the head, scapes and tarsi yellow; the funiculi, tibiae and sides of the prothorax brownish yellow. The clypeal lobe is rounded-triangular as in the variety *cordiae*. The base of the epinotum forms a square with rounded corners, and is shorter than the declivity. The fine hairs on the pronotal angle, and on the nodal angle (one on each side) are as in the other *sericea* and seem to be characteristic of the species.

Type locality: Tumba Muerto Road, Canal Zone. Living in *Acacia spadicigera*.

The new variety differs from all others by its color pattern, structure of the epinotum and pedicel in profile.

Described from a specimen labelled cotype 22865, in the Harvard Collection, 21 specimens.

*Pseudomyrma sericea* var. *lisa* var. nov.

Worker.

The new variety agrees very closely in stature and even in coloration with *P. sericea* var. *acaciorum* which lives on *Acacia spadicigera*.

It differs from the latter by its slightly smaller size and color pattern. *P. lisa* has a beautiful color, deep lustrous brown and golden yellow. The yellow portions are: mandibles, clypeus, cheeks, antennae, pronotum, legs and pedicel; the pronotum has two small dorsal spots; other light brown spots or areas are on the sides of the prothorax, upper coxae, central part of the femora and a small triangle on the petiole, between the characteristic backward directed spines. The deep brown areas are bordered with yellow on the mesonotum and on the declivity of the epinotum.

*P. sericea* var. *lisa* is probably only a local variety of *acaciorum*. The sides of the thorax are smooth in *lisa* (punctate in *acaciorum*).

Type locality: Peru.

Holotype No. 78, Haskins Collection.

*Pseudomyrma spinolæ* var. *infernalis* var. nov.

Worker.

Length 4.5 mm. Larger than the var. *convarians*. Color brownish yellow, with the gaster a little darker, barely missing being bicolored. The type is more reddish, as is the var. *gaigei*. Mandibles pale yellow with five strong teeth. Head finely punctate and opaque. Prothorax evenly rounded, not marginate, as broad as long in the midline. The node from above is subtriangular, approaching trapezoidal shape.

Female.

Length 5–5.5 mm. Head and pedicel very much longer than in the worker. The thorax, except prothorax, brown, as the gaster. The latter opaque (shiny in the worker).

Male.

Length 5 mm. Much darker than the other castes, with a very long and slender pedicel.

Type locality: Red Tank, Canal Zone. Taken from an *Acacia spadicigera*. Other specimens were taken by Prof. Banks at Cambia, Canal Zone. The latter are more slender, with more reddish color and they approach the type in the weaker margination of the prothorax.

The new variety differs from the type by lack of margination on the prothorax; from *convarians* by larger size; from *gaigei* by the narrower postpetiole and from *atrox* by the non-notched clypeal lobe.

Gynotype No. 100, Haskins Collection. Androtype No. 100A, Haskins Collection.

Described from cotype 20547, Harvard Collection, many workers.

*Pseudomyrma spinolæ* var. *scelerosa* var. nov.

Worker.

Length 4 mm. Differs from all other forms of the *spinolæ* group by lacking all traces of bicoloration. The body is uniformly bright reddish yellow with the mandibles barely lighter colored. The whole body is opaque. The clypeal lobe is straight



as in the variety *infernalis*. The prothorax lacks all traces of margination. The mesonotal disc is conspicuously elevated.

Type locality: Granada, Nicaragua. (Baker Coll.).

The new variety is closest to the variety *infernalis* from which it differs by the coloration, elevated mesonotal disc and the more pronounced sculpture.

Cotype No. 101, 3 workers in the Haskins Collection.

Described from specimens marked cotype 23145, in the Harvard Collection.

*Pseudomyrma tenuis* var. *andina* var. nov.

Worker.

Length 5 mm. Identical with the type except for the coloration, which is reddish yellow as in the variety *paranensis*. The node is spined as in the type but the margins are sharper and the spines longer. The sculpture on the thorax is much coarser than in the type and consists of coarse punctures (fine punctation in the type). The head is a little broader in the new variety.

Type locality: Lima, Peru. From an unnamed tree.

Cotype No. 69, Haskins Collection; one pin has been deposited in the Museum of Comparative Zoölogy and is labelled Cotype 26814.

*Pseudomyrma tenuis* var. *guatemalensis* var. nov.

Worker.

Length 6 mm. Color reddish yellow with the head brownish yellow. More robust than the type; both the pro- and mesothorax broader than long; node without either angles or spines behind, which distinguishes this variety from all others; the margin of the node is sharply raised and is brownish, contrasting sharply with the bright yellow color of the sunken portion of the node from above.

Type locality: Esquintla, Guatemala.

Cotype No. 70, Haskins Collection.

*Pseudomyrma triplaridis* Forel.

1904, Zool. Jb. Syst., 20, 684, all castes.

Worker.

Redescribed for the purpose of illustrating characters which can be used in separating the newly described subspecies. Length 4.5–4.8 mm. Head  $1\frac{1}{3}$  times as long as broad, with

nearly straight sides and weakly concave posterior border. The eyes are more than  $1/3$  but less than  $1/2$  the length of the sides of the head. The mandibles are striate and not lighter colored than the rest of the head. Clypeal lobe straight in front. The scapes are short and thick and fail to reach the middle of the eyes. Antennal joints 3-7 very transverse. Head strongly punctate and opaque. The prothorax is considerably longer than broad and submarginate. The disc not semicircular in front but with a rounded angle; it is semicircular behind and separated from the epinotal base by a wide margin. The latter is suboblong of the same width most of its length, concave in front. The petiolar node is subhexagonal with rounded corners. The postpetiole is broader than long and nodiform. The gaster is slender, with subparallel sides. In profile the thorax is weakly concave above with a strong depression at the mesepinotal suture. The convex epinotal base is rounded into the short declivity.

Head opaque, rest of the body subopaque. The pilosity is abundant, erect and of golden color. The pubescence is short and untidy; longer and more regular on the gaster, giving the latter a silky appearance.

Habitat: The specimens from which the description was made were collected by N. A. Weber in Venezuela, at the mouth of the Orinoco. The identification was made by Weber. The type locality is Amazonas.

*Pseudomyrma triplaridis* subsp. *biolleyi* subsp. nov.

Worker.

Length 4.8-5.2 mm. Head barely longer than broad, with convex sides, well rounded occipital corners and concave occipital edge. The eyes are smaller than in the type, about  $1/3$  the size of the head, and flat. The mandibles are not paler than the head. (As in the type). The clypeal lobe is longer, and a little convex in front. The antennæ are similar to those of the type. Head finely punctate and very shiny. Prothorax broader than its length in the midline, evenly convex and very smooth. Disc semicircular in front (angular in the type). The epinotal base is longer than broad, broadest at the level of the stigmata, the part in front of that level is subtrapezoidal; the part behind that level gradually narrows towards the junction with the base. The petiolar node is globular above (as in some *arboris-sanctæ*

forms) and the pedicel is as broad as in *latinoda*. Postpetiole and gaster similar to the type. In profile the thorax is strongly impressed at the mesepinotal suture; the base and declivity are of the same length and form a blunt angle. The petiole has a strong antro-ventral tooth and a lamella. Pilosity and pubescence much less than in the type. The new variety is distinctly bicolored. The head is dark reddish brown, the gaster brown, except for the first segment which is reddish or reddish yellow, as is the rest of the body. The mesonotal disc is brownish.

Type locality: Kartabo, British Guiana (Wheeler Coll.).

Cotypes: No. 20648, Museum Comp. Zool.

*Pseudomyrma triplaridis* subsp. *boxi* subsp. nov.

Worker.

Length 4 mm. Head  $1\frac{1}{4}$  times as long as broad, with convex sides, well rounded posterior corners and concave occipital edge. The mandibles are not darker than the rest of the head, which is characteristic of all forms of *P. triplaridis*. The clypeal lobe is long, narrow and straight in front. Head strongly punctate and opaque. The scapes reach the middle of the eyes, which are slightly larger than  $\frac{1}{3}$  the sides of the head. Prothorax as long as broad, well rounded, not marginate, strongly foveolate. The anterior rim of the mesonotal disc is semicircular. Epinotum longer than broad, broader at the level of the stigmata, strongly sculptured. Petiolar node shaped as in the subspecies *biolleyi*, with a very broad peduncle. Postpetiole and gaster stout, more convex and more robust than in the type.

Pilosity and pubescence abundant, but less than in the type. Color brownish yellow, antennæ, gaster and tibiæ a shade lighter.

Type locality: Blairmont, Berbice, British Guiana (H. E. Box coll.).

The new subspecies differs from the type and the *ss biolleyi* by its strong sculpture, different color and other characters.

Described from cotype 23146, Harvard University Collection, many workers.

*Pseudomyrma triplaridis* subsp. *trigona* subsp. nov.

Worker.

Length 4–4.8 mm. Head subrectangular.  $1\frac{1}{3}$  times as long as broad, with weakly convex sides and relatively sharp occipi-

tal corners. The clypeal lobe is short and narrow and has a convex anterior border. Scapes short, not attaining the middle of the eyes, which are a little more than  $1/3$  the sides of the head and long and flat. Head densely punctate and subopaque. Prothorax longer than broad, distinctly margined at the sides; mesonotal disc angular in front as in the type. Epinotum ovoid and convex. Petiolar node subhexagonal. Postpetiole broader than long. The gaster is shaped as in the type. Petiole in profile with a strong antero-ventral tooth; the lamina below not crenulated.

Pilosity and pubescence considerably less than in the type. The color is uniformly red; in the immature specimens reddish yellow.

Type locality: Blairmont, Berdice, British Guiana (Box Coll.).

The differences between the new subspecies and the others are given in the key.

Described from type 23147, Harvard University Collection.

*Pseudomyrma voytowskii* sp. nov.

Worker.

Head longer than broad, with parallel sides, the eyes occupying more than half the length of the sides. Mandibles white, smooth, with two larger apical teeth and some smaller ones. Scapes slender and short, not quite reaching the middle of the eyes. The whole head smooth, shiny and yellow except for a region on the occiput, which appears brownish; this is caused by the fact that the integument is transparent like a window, revealing the insides of the head. Prothorax not marginate, smooth and yellow. The mesonotal disc is a rounded triangle. Mesothorax and epinotum dark reddish brown, smooth, shiny on top, with heavy punctation on the sides. Pelicel in profile shaped as in *tenuissima*, with the anterior and posterior faces of equal slope; heavily punctate and devoid of ventral carina and ventral tooth. Postpetiole nodular in profile, with less coarse sculpture. Gaster stubby, smooth and very shiny. Petiole from above shaped as in *subtillissima*, subtriangular and very shiny.

Color. Distinctly bicolored, with the anterior part of the head and the prothorax yellow. The rest of the body dark brown, appendages lighter brown. Pilosity nearly absent, hav-



ing but three to four long hairs on the gaster, and with the pubescence so short and sparse that only careful observation reveals its presence in a few spots. Size 2.2 mm., including the mandibles.

Type locality: Lima, Peru.

The new species is related to *P. subtilissima*. It differs from *tenuissima* by the broader head and thorax, from the type by the almost complete absence of hairs, and from the var. *andina* by sculpture and other characters.

Holotype No. 77, Haskins Collection.

*Pseudomyrma voytowskii* var. *costaricensis* var. nov.

Worker.

Larger than the type; length 4.2 mm. Of the same general appearance as *P. voytowskii* and with a similar color pattern. The head is very dark reddish brown, with the mandibles, clypeus and antennæ yellow. The scapes are browned in the middle. The head is subopaque (shiny in the type). The pilosity is more abundant in the type.

Type locality: San Jose, Costa Rica (Wheeler Coll.).

Holotype No. 87, Haskins Collection.

*Pseudomyrma weberi* sp. nov.

Worker.

Described from specimens in the Harvard Collection, erroneously labelled "subsp. of *P. caroli*."

The new species belongs to the branch *Apedunculata* which has a short petiole; it is near *P. allidora* and *P. acanthobia*. Length 3.8-4 mm. Weakly bicolored. Head dark reddish brown; mandibles, clypeus and antennæ yellow brown. Head subrectangular,  $1 \frac{1}{3}$  times as long as broad, with slightly convex sides and convex posterior border. Eyes occupying less than half the sides of the head. Clypeal lobe narrow, relatively long and concave in front. Scapes reaching the middle of the head. Head finely punctate and a little shiny (*P. acanthobia* has the head very concave behind and shiny; *P. allidora* has the head much longer, concave behind and very opaque). Prothorax longer than broad and not marginate (broader than long in *acanthobia*). The mesonotal disc is angulate in front (rounded in *acanthobia*, angulate in *allidora*). The epinotum is shaped as in *allidora* and is narrower behind; the anterior edge is straight (angulate in *acanthobia*, semicircular in *allidora*).

The new species is readily separated from the more closely related species by the shape of the petiole in profile; *weberi* is the only species that has the posterior face of the peduncle concave; the antero-ventral tooth is very small and bears a single long hair.

Type locality: Esquintla, Guatemala.

Cotype 26815, Museum Comp. Zoöl., No. 88, Haskins Collection.

*Pseudomyrma wessoni* sp. nov.

Worker.

Length 3.5–4 mm. Head  $1\frac{1}{4}$  longer than broad with weakly convex sides and straight posterior border. The eyes occupy more than  $\frac{2}{3}$  the sides of the head. Mandibles pale yellow, longitudinally striated and opaque. Clypeal lobe with convex anterior border. Antennal scapes reach the middle of the eyes. Antennæ pale yellow, head darker yellow, very heavily punctate and opaque. Prothorax much longer than broad; margined and convex above. Mesothoracic disc convex. Epinotal base longer than broad, broadest at the level of the stigmata. Petiole from above triangular, with convex posterior edge, sharply margined. Postpetiole broader than long. Thorax in profile with very deep and broad mesepinotal depression; epinotal base much higher than the prothorax, convex, with a sharp angle at the declivity. Petiole in profile subtriangular, differing from all other species of the subgenus *Apedunculata* by its vertical posterior face. *P. allidora* has a similar petiole but the antero ventral tooth is blunt in the latter species, not sharp as in *wessoni*.

Color almost uniformly reddish yellow, with the tibiæ lighter. Pilosity short and sparse; pubescence relatively abundant, fine, silky and adpressed. Pedicel and gaster shiny, the rest opaque.

Type locality: Lima, Peru.

The new species is related to *P. subtilissima*, *sericea*, *allidora*, *acanthobia* and *colei*. It differs from each of these by the shape of the pedicel in profile, which is very short, with a vertical posterior face and a sharply recurved antero ventral tooth.

Female.

The female is of nearly the same size as the worker and with the same characters, except for the cast differences. There is a tendency to darker coloration; more brownish red, with an indication of bicoloration (the prothorax lighter brown than the rest of the thorax).

Cotype No. 26816, Museum Comp. Zoöl., Gynotype No. 74, Haskins Collection.

*Pseudomyrma wessoni* var. *tuberculata* var. nov.

Worker.

Head about as broad as long with very large eyes, occupying more than half of the convex sides. Mandibles with two large apical teeth and several smaller ones, all brown; heavily striated; the clypeus with a sinusoid anterior border. Head and antennal scapes densely punctate and opaque. Prothorax marginate, deeply impressed mesepinotal suture and the epinotum with a faint indication of epinotal spines on the junction of the epinotal base and declivity. (This is a very unusual feature in workers of *Pseudomyrma*). Petiole in profile similar to that of *wessoni*, but shorter. Postpetiole very short and much broader than long. Abdomen stubby.

Coloration uniformly dark yellow or light brown. The pilosity consists of sparse long hairs. The pubescence is very fine and somewhat more abundant on the head and gaster.

Type locality: Lima, Peru.

The new variety is related to *P. wessoni* from which it differs by the structure of the pedicel, the small epinotal tubercles and the darker coloration. The sculpture is much as in the type.

Holotype No. 82, Haskins Collection.

*Pseudomyrma wheeleri* sp. nov.

Female.

Head almost twice as long as broad, with straight sides and the eyes occupying a little more than the middle third of the sides. Mandibles with two large apical teeth, a diastemma and two small basal teeth; heavily rugose, with stiff erect hairs. Clypeus with a rounded lobe. Scapes thickened, reaching a little beyond the anterior edges of the eyes. Whole head opaque, with dense punctation. Borders of clypeus and mandibles black. Thorax with fine punctation, opaque, with sparse long hair and medium dense pubescence. Petiole in profile about twice as long as high, without a peduncle, but with a short central carina which ends in a blunt tooth anteriorly; from above clavate in outline, with long stiff hairs. Heavily punctate and opaque. Wings sooty and with dense fine hairs. Gaster long and slender, with very fine punctation, a little shiny, with a few erect hairs

and somewhat more abundant pubescence. Head, sides of the pronotum and all articulations, yellow. Rest of the body reddish brown. Length 8 mm.

Type locality: Peru.

Male.

Head very short; eyes occupying the whole sides of the head. Mandibles short, finely striated, with a large apical and a few small basal teeth; with sparse and very long hairs. Clypeus with a projecting, circular lobe, prolonged backward between the antennal insertions. Frontal carinæ absent. Scapes so short that they form but elongate beads. Funiculi ten-jointed, with all joints of equal length and thickness. Occiput slightly sinusoid. Whole head densely punctate and opaque, bright yellow from the mandibles to the level of the antennal insertions, dark brown further back. Thorax of the usual shape; Mayrian furrow distinct, wings yellow and very hairy; very finely sculptured leaving the integument shiny; light brown, with all sutures yellow, petiole and postpetiole extraordinarily slender, the petiole thinned to a very slender stalk, with a slight swelling in the posterior third; with sparse long hairs and dense, coarse pubescence. Gaster very slender with dense pubescence. The petiole is unarmed below.

Bicolored, with part of the head dark brown, thorax lighter brown, the color gradually becoming lighter backward, gaster dark yellow.

Gynotype No. 79A, Androtype No. 79B, both in the Haskins Collection.



## EXPLANATION OF PLATES

## PLATE II

Showing the petioles from above of a representative series of *Pseudomyrma*.

- |  |                           |
|--|---------------------------|
| 1. <i>excavata</i>                     | 13. <i>decipiens</i>      |
| 2. <i>tenuis</i>                       | 14. <i>filiformis</i>     |
| 3. <i>nigropilosa</i>                  | 15. <i>oculata</i>        |
| 4. <i>gracilis</i>                     | 16. <i>sericea</i>        |
| 5. <i>denticollis</i>                  | 17. <i>belti bequærti</i> |
| 6. <i>sabanica</i>                     | 18. <i>canescens</i>      |
| 7. <i>elegans</i>                      | 19. <i>arboris-sanctæ</i> |
| 8. <i>championi</i>                    | 20. <i>bradleyi</i>       |
| 9. <i>dolichopsis</i>                  | 21. <i>caroli</i>         |
| 10. <i>kuenckeli</i>                   | 22. <i>crenulata</i>      |
| 11. <i>acanthobia</i>                  |                           |
| 12. <i>brunnea</i> var. <i>nigrita</i> |                           |

## PLATE III

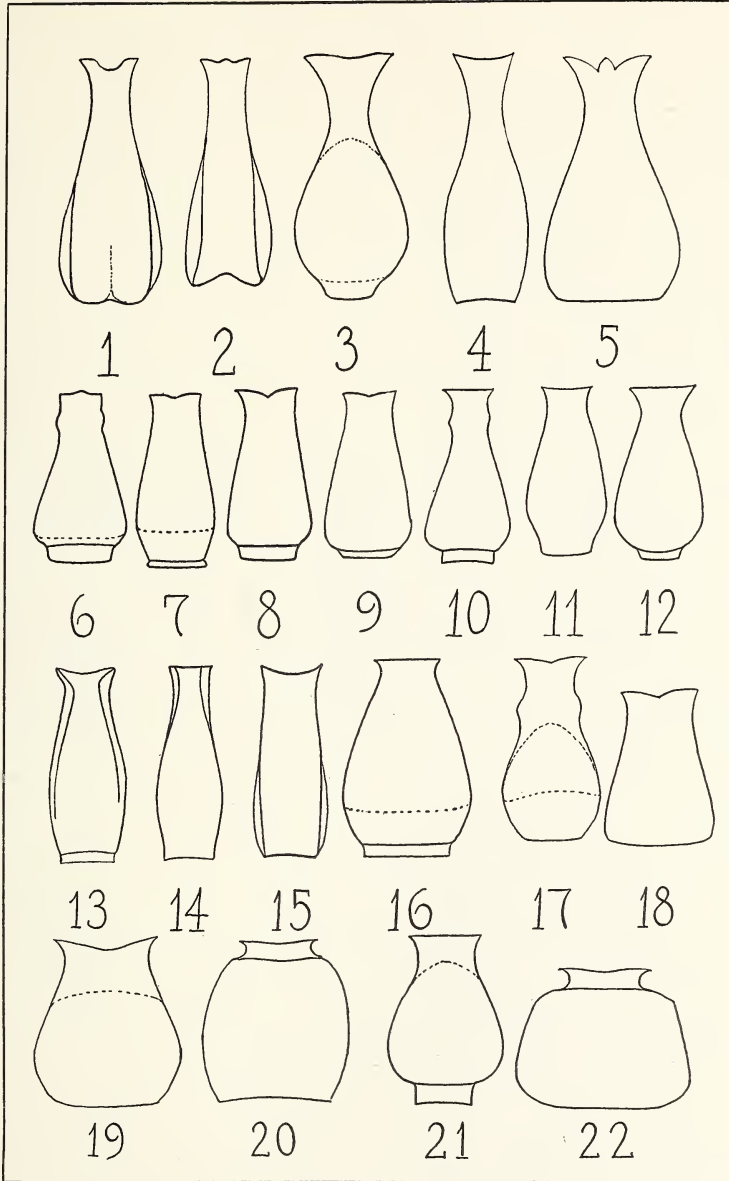
Petioles in profile of a representative series of forms of *Pseudomyrma*.

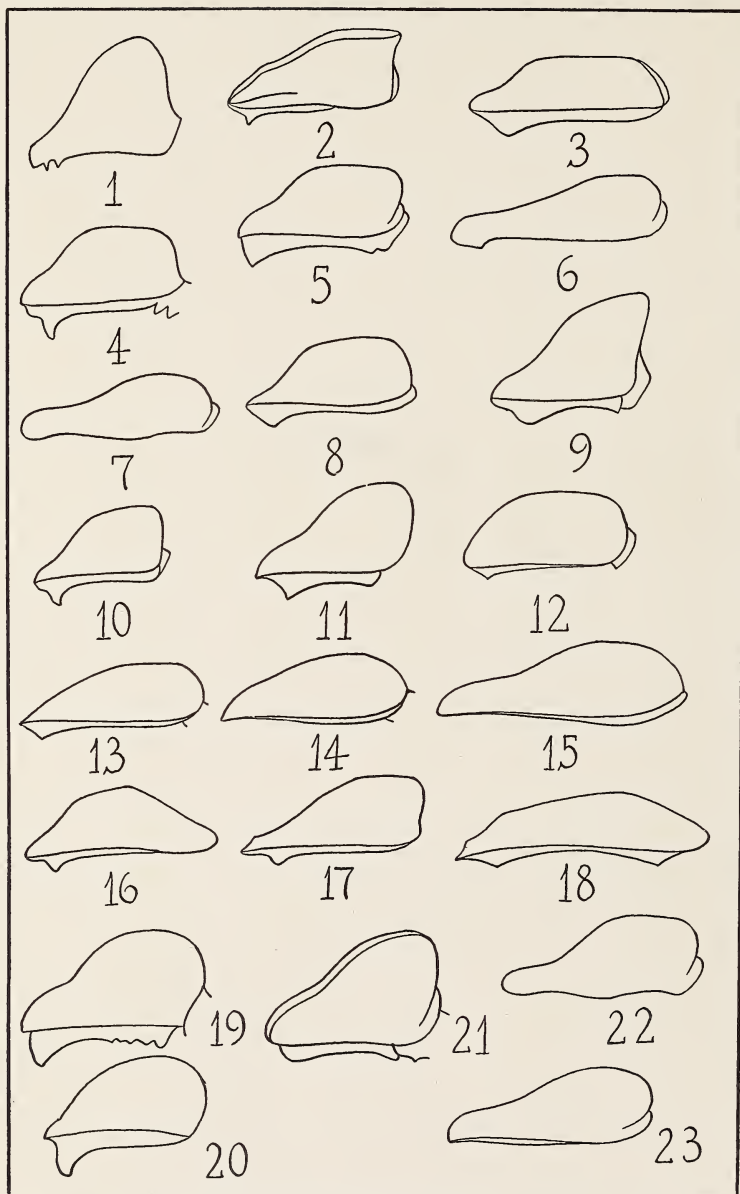
- |                             |                                  |
|-----------------------------|----------------------------------|
| 1. <i>excavata</i>          | 13. <i>acanthobia deliculata</i> |
| 2. <i>tenuis</i>            | 14. <i>nigrocincta</i>           |
| 3. <i>tenuissima</i>        | 15. <i>flavidula</i>             |
| 4. <i>championi</i>         | 16. <i>weberi</i>                |
| 5. <i>denticollis</i>       | 17. <i>colei</i>                 |
| 6. <i>sabanica</i>          | 18. <i>filiformis</i>            |
| 7. <i>spinicola</i>         | 19. <i>latinoda</i>              |
| 8. <i>dolichopsis</i>       | 20. <i>arboris-sanctæ</i>        |
| 9. <i>sericea acaciorum</i> | 21. <i>picta humboldi</i>        |
| 10. <i>wessoni</i>          | 22. <i>canescens</i>             |
| 11. <i>sericea</i> type     | 23. <i>belti</i>                 |
| 12. <i>elongata</i>         |                                  |

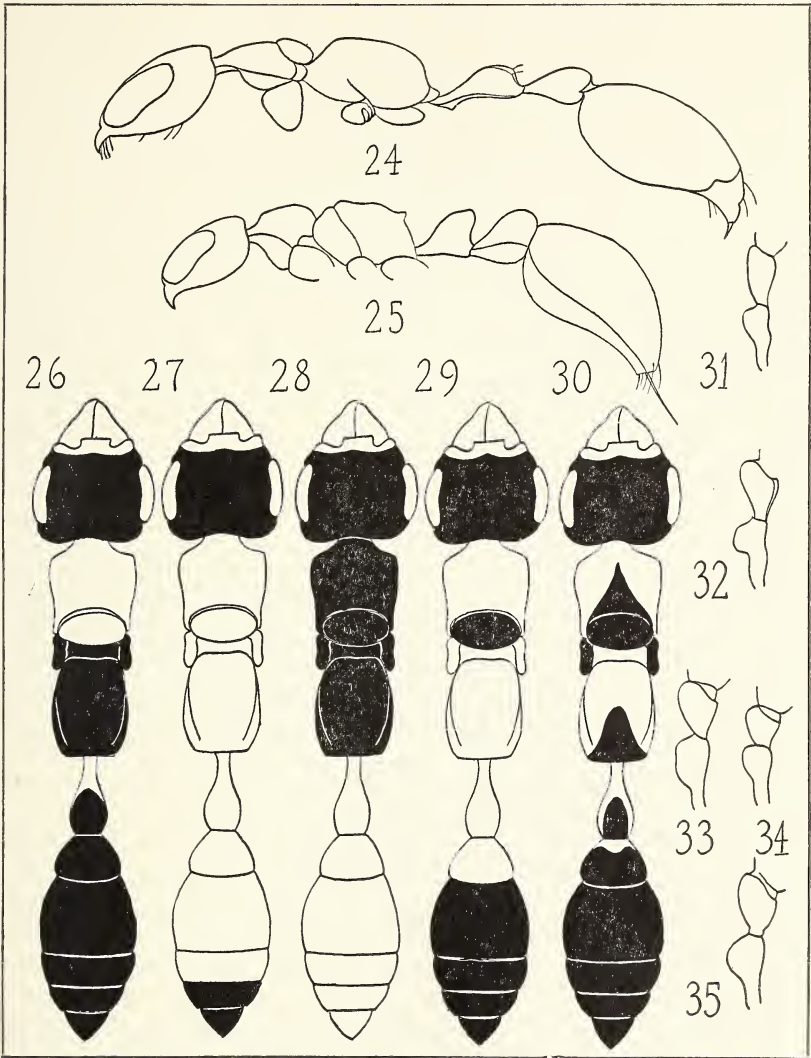
## PLATE IV

Color patterns in *Pseudomyrma gracilis* (figs. 26-30); pedicels in profile (figs. 31-35); outline drawings of two newly described forms (figs. 24, 25).

24. *acanthobia deliculata* var. *limai*
25. *wessoni* var. *tuberculata*
26. *gracilis* subsp. *sericata*
27. *gracilis* subsp. *carapuna*
28. *gracilis* var. *peruviana*
29. *gracilis* subsp. *mexicana*
30. *gracilis* var. *dimitiata*
31. *gracilis* var. *peruviana*
32. *gracilis* var. *squamifera*
33. *gracilis* var. *mexicana*
34. *gracilis* var. *maculata*
35. *gracilis* type









NOTES ON THE MORPHOLOGY OF THE  
GENUS LYCÆIDES

(LYCÆNIDÆ, LEPIDOPTERA)<sup>1</sup>

BY V. NABOKOV

Out of the hundred or so holarctic Lycænids distributed among at least sixteen genera of the subfamily *Plebejinæ* (definitely fixed by Stempffer, 1937, Bull. soc. ent. France 42 :211, etc.; *not* covering the superficial concept of "Blues" for which no systematic term or division can exist), only fourteen species or so, two of which are obvious invaders from the Tropics, occur in the nearctic region (north of the 30th parallel). These belong to seven genera, four of which (the first four in the list given below) are holarctic and contain together six species of which one half is common to both regions. All three exclusively American genera have the free portion of the ædeagus elongated; all the exclusively palearctic genera, except *Aricia* R. L. (and the, mainly tropical, *Chilades* Moore<sup>2</sup> and *Freyeria* Courvoisier) have stubby or proximally "bulbous" free portions. Of the four genera common to both regions one half belongs to the first type and one half to the second.

The only *Plebejinæ*, so far known to exist in the nearctic region, are: 1. *Agriades* Hübner: *glandon* Prunner (holartic); 2. *Vacciniina* Tutt: *optilete* Knoch (holartic); 3. *Lycæides* Hübner: *argyrognomon* Bergsträsser (holartic), *scudderi* Edwards, *melissa* Edwards; 4. *Plebejus* Kluk: *sæpiolus* Boisduval; 5. *Plebulina*, n.g. (remarkably amalgamating the *Plebejus* or *Lycæides* ædeagus with the valval *processus superior* and uncus + falces of *Albulina* Tutt): *emigdionis* Grinnell (genotype); 6. *Icaricia*, n.g. (allied to *Aricia* R.L. in ædeagus; somewhat to *Polyommatus* Latreille in general type of uncus as seen ventrally; close to both in *processus superior* of valve; distinguishable by the underdeveloped, *i.e.* devoid distally of any

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

<sup>2</sup> Unexpectedly represented by *speciosa* Staudinger in the Andes.

semblance of hook, triangular, laminate, proximally very broad falx, its very gradually tapering apex hardly exceeding in height the level of its strongly humped humerulus): *icarioides* Boisduval (genotype) with its various subspecies (clamoring for a reviser) and four other species, viz.: *acmon* Doubleday-Hewitson, *sp. indeterminata*. (? *chlorina* Skinner), *neurona* Skinner and *shasta* Edwards; these four structurally smaller than the genotype (with an unculus lobe distally somewhat grooved in lateral view but not actually revealing Stempffer's process as it occurs in *Aricia anteros* Freyer), and 7. *Hemiargus* Hübner: a curiously aberrant genus (somewhat allied to *Chilades* Moore) which is represented by *hanno* Stoll and in which I very provisionally retain *isola* Reakirt. An unexpected *fultura superior* is present in the former and is monstrously developed in the latter.

For some time I have been especially concerned with the genus *Lycæides*. In a preliminary paper (Nabokov, 1943 [March, 1944], *Psyche* 50 :87 etc.) an attempt was made to clear up several taxonomic points mainly in regard to the nearctic section; <sup>3</sup> the palæarctic one is still badly confused taxonomically, especially because the type specimens of a number of races have never been examined structurally (German authors, for instance, blindly relying upon the haphazard commercial identifications of the Staudinger firm). These matters I shall discuss elsewhere, but it is necessary to make a few comments regarding the genotype.

This is the "*argus* Linn." of Hübner ([1823], *Verz. bekannt. Schmett.* 5 :69), *nec* Linn., which was selected as the type by Scudder (1872, 4th Ann. Rep. Peabody Acad. Sci. 1871:54; 1875, Proc. Amer. Acad. Arts Sci., Boston 10:208), and since Hübner's *argus* is the "*Argus*" of Reverdin (1917, *in* Oberthur, *Et. lép. comp.* 14:22, fig. 3, unculus) it follows that it is also the "*argyrognomon* Bergsträsser" of Tutt [and Chapman] (1909, *Brit. Butt.* 3:205-208, pl. 50, fig. 2, unculus) and thus not the "*Ligurica*" of Reverdin (1917, *op. cit.*:22, fig. 4, unculus) which is the "*ismenias* Meigen" of Heydemann (1931, *Int. ent. Zft.* 25:129) and the "*argyrognomon* Bergsträsser" of Forster (1938,

<sup>3</sup> With an incidental suggestion (*l.c.* : 88, *nota*) that *cleobis* Bremer falls to *subsolanus* Eversmann. I now find that Hemming (1938, Proc. R. Ent. Soc. London, 7 (1), B : 5-7, fig., male, type) had already come to the same conclusion.

Mitt. Munchner ent. ges. 28:11), wrongly, and belatedly, selected by the latter author as "type" with the suggestion that readers look up for themselves Hübner's plate. They do, and find (Hübner, Samml. europ. Schmett. pl. 64 [1800]) that fig. 316, to which Scudder referred when selecting the type, can be easily matched by German males of the "*Argus*" of Reverdin and of the "*argyrognomon* Bergstr." of Tutt and, consequently, of Hemming (1934, Gen. names hol. butt. 1:108), who definitely fixed it (thus excluding the other species of *Lycæides* which he knew well) as the type of the genus, and this clinches the matter, whatever the two species be called. The publication of Beuret's important paper (1935, Lambillonea 35:162, etc.) has led to attempts to transfer the name *argyrognomon* Bergsträsser (1779, Nomenclatur, 2:76-77, pl. 46, fig. 1,2) from the short-falx species (the genotype) to which it was applied by Tutt (1909) and which we shall term for the moment species X, to the long-falx species, *ismenias* Meigen, 1830 (Heydemann,<sup>4</sup> 1931) which we shall term species Y. These attempts have been prompted by the fact that female specimens apparently belonging to Y (Beuret, l.c., does not give the reasons for his determination), casually collected in the type locality of *argyrognomon* Bergstr., proved to be closer to Bergsträsser's equivocal figures than sympatric females of X. One cannot deny that the figures apply better to the general run of Y females than to the general run of X females; but pending further investigation, or some formal decision on the part of a special commission, I am compelled to use in this paper the name *argyrognomon* Bergstr. for X because of the following considerations: 1. As noted and illustrated by Beuret himself (1934, Lambillonea 34:119) at a time when he still called X by the name *argyrognomon*, absolute similarity to Bergsträsser's figures is exhibited by what he (inconsequently) named *argyrognomon rauraca* Beuret (l.c. pl. 5, 5a, fig. 9, 10. See also Beuret, 1928, Soc. Ent. 43, fig. 5, 10, uncus, *argyrognomon*, "Augst"). This, now extinct, colony was discovered on a plot of ground, a thousand feet long and 1/6 of this broad, near Augst in the Aargau, N. Switzerland, i.e., some 200 miles south from the type locality (Bruchköbel Forest, in the Hesse-Nassau district, Central Germany) of *argyrognomon* Bergstr.; but mor-

<sup>4</sup> Whose clumsy fixation I reluctantly adopt.

phologically, *i.e.*, apart from current geographic obsessions and notwithstanding the inconvenience of the thing not flying where it ought to fly, *rauraca* Beuret was when discovered, and in my opinion remains so now, an absolute synonym of *argyrognomon argyrognomon* Bergstr., since in genitalia it corresponds to Tutt's *argyrognomon* Bergstr. and in the appearance of the female to Bergsträsser's figures; 2. There is no guarantee that the next German, or British, collector in the Hesse-Nassau district will not come across chance specimens or a little colony of X, different from the race of X (*lycidasoides* Beuret, 1934), assigned to the general region, and similar to Beuret's Aargau series — in which case the whole question would have to be brought up again (Tutt remaining the first reviser<sup>5</sup>); and 3. It is not at all clear what name should be used for X if "*argyrognomon*" is switched to Y. The name *acreon* Fabricius (1787 Mantissa 2:76), on the basis of a worn specimen of *argus* auct (which combined at least X and Y) in the Banksian collection was assigned to the latter omnibus species by Butler (1869, Cat. Diurn. Lep., descr. by Fabricius, in coll. B.M.: 171) which leaves us none the wiser, even if Butler did see "the type female in Copenhagen" as stated by Heydemann (1931, Int. ent. Zft. 25:150) who anyway had not seen it himself and thus was perfectly unjustified in using the name (l.c. pl. 1, fig. 4, 12) for a race of X. The name *calliopsis* Boisduval ([1832] Ic. hist. lép. Europe 1:58, fig. 4,5) suggested by Hemming (1938, Proc. R. Ent. Soc. London 7,B:4) also cannot be used for X, until the female type (from Grenoble, France) and the Uriage male assigned to *calliopsis* by Oberthur (1896, Et. ent. 20, pl. 5, fig. 64) are critically investigated in the B.M. collection. In view of the fantastic misadventures which names have undergone in this genus, pedantic care must be taken, so as to avoid some new nomenclatorial trouble in the future.

The genus *Lycæides*, of which *argyrognomon* Bergstr.-Tutt is the type, is characterized by an uncus (including the falces) exceedingly different from the corresponding structure found in other subdivisions of the *Plebejinæ*, and as I think it advisable to base specific unities upon the intrageneric variation of that character which intergenerically is responsible for the greatest

<sup>5</sup> In the sense that by figuring the male genitalia he first applied the name *argyrognomon* Bergstr. (which previously to 1909 had covered at least two *Lycæides* species and a form of *Plebejus argus* Linn.) to a definite species.



hiatus, it is the uncus that I have selected (partly in development of Reverdin's, Chapman's, and Stempffer's views) for differentiating species in the *Lycæides*.

The male armature consists of a dorsal (in regard to the body) portion (the uncus) and of a ventral one (the valves — which have a constant fishlike shape in the *Plebejinæ*). The two are hinged to each other somewhat in the way of the lids of a shell and appear "closed" when viewed *in situ*. When teased out of the tissues and viewed ventrally, *i.e.*, when the whole organ is forced open oysterwise so that its symmetrically extended valves continue to point down, whereas the uncus lobes point distad from the observer, the most conspicuous thing about the upper portion is the presence of a pair of formidable semi-translucent hooks (the subunci or falces — of a peculiar shape not found in allied genera), produced from the opposite side of the distally twinned uncus and facing each other in the manner of the stolidly raised fists of two pugilists (of the old school) with the uncus hoods lending a Ku-Klux Klan touch to the picture. The flame-shaped distal part of the candle-shaped ædeagus reaches a point between their elbows, while its proximal part is propped by the *fultura inferior* (furca) at the root of the valves.

In the paper already referred to, I introduced the following terms: F. for the length of the upright portion, or *forearm*, of the falx measured from its distal point to the apex of its elbow; H. for the length of the *humerulus* of the falx, from the apex of its elbow to the apex of its shoulder; and U. for the length of the *uncus lobe* from its distal point to the apex of the shoulder of the falx. In the majority of some 500 preparations, regardless of whether the elbow of the falx happened to be raised (in the follow-through of an "uppercut," to pursue the pugilistic image) as it is for instance in fig. ARG.A. of pl. 1, or whether it remained in its normal position (*i.e.* with the forearm parallel to the axis of the uncus lobe), a rather curious fact was noticed, namely that the distance between the tip of the falx and the apex of the shoulder exactly equalled U. This suggested the tracing of a triangle, FHU, its lines joining three points: apex of forearm, apex of elbow, and apex of shoulder. A glance at fig. 1 will show that, according to the dimensions of forearm, humerulus and uncus lobe, this triangle assumes a different size (showing the gradual generic development) and a different shape (showing the specific relative dimensions of parts).

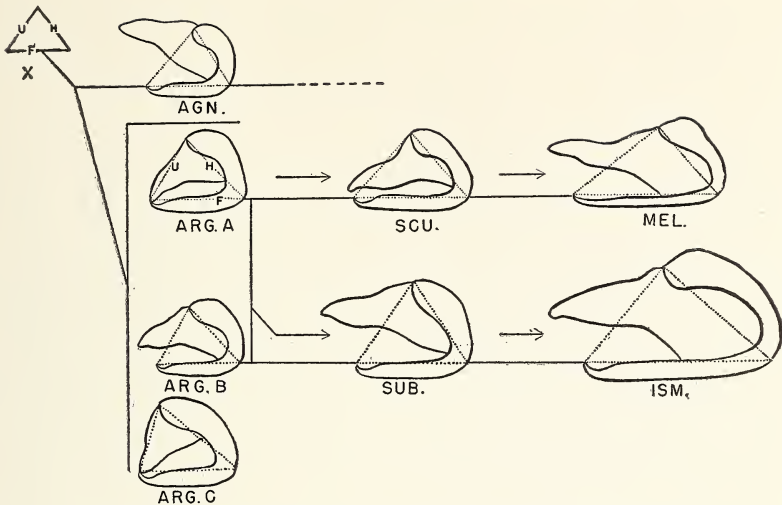


FIG. 1. EVOLUTION AND SPECIATION OF UNCUS IN LYCÆIDES  
(All the figures are  $\times 33$ )

F — length of forearm of falx.

H — length of humerulus of falx.

U — length of uncus lobe, equal to distance between apex of falx and apex of shoulder.

FHU — triangle for measuring relative dimensions of parts.

X — hypothetical ancestor;  $FHU = 0.25 + 0.22 + 0.22 = 0.69$  mm.

AGN — *agnata agnata* Staudinger, prep. 193, "Maralbaschi [Maralbashi, W. Sinkiang, Central Asia]" *ex coll.* Weeks, M.C.Z.;  $FHU = 0.33 + 0.26 + 0.30 = 0.89$  mm.

ARG.A — *argyrognomon* Bergstrasser ssp. (*ssp. anna* Edw. *prox.*), prep. 348, "Brewster, Washington [N. America], 18–VII–1940" coll. Stallings-Turner;  $FHU = 0.36 + 0.33 + 0.27 = 0.96$  mm.

ARG.B — *argyrognomon bellieri* Oberthuz, prep. 189, "Corsica [S. Europe]" *ex coll.* Weeks, M.C.Z.;  $FHU = 0.33 + 0.30 + 0.25 = 0.88$  mm.

ARG.C — *argyrognomon* Bengstr. ssp. (*ssp. opulenta* Verity *prox.*), prep. 211, "Alto Adigo [N. Italy] 3–VII–1930," *ex coll.* Weeks, M.C.Z.;  $FHU = 0.39 + 0.40 + 0.27 = 1.06$  mm.

SCU — *scuderi scuderi* Edwards, prep. 168, neotype, "Saskatchewan [N. America] [leg.] Kennicott," M.C.Z.;  $FHU = 0.45 + 0.34 + 0.34 = 1.13$  mm.

SUB — *subsolanus* Bremer *ssp.*, prep. 242, "Korea [E. Asia], 27–VII–1933, *leg. Suk.*" M.C.Z.;  $FHU = 0.44 + 0.39 + 0.39 = 1.22$  mm.

MEL — *melissa samuelis* Nabokov, prep. 338, holotype, "[Albany, New York] Orig. Pl. 6, fig. 6, Butt. N. Engl. Cab. S.H. Scudder," M.C.Z.;  $FHU = 0.57 + 0.35 + 0.44 = 1.36$  mm.

ISM — *ismenias calabricola* Verity, prep. 152, "San Fili (Cosenza), Calabria [Italy] 17–VI–1920 [leg. fam.] Querci," *ex coll.* Weeks, M.C.Z.;  $FHU = 0.74 + 0.56 + 0.49 = 1.79$  mm.

I view evolution in *Lycæides* as a twofold process of growth: 1. as a generic growth — involving the whole of the male genitalic structure, so that the absolute size of the uncus (independently from the size of the wings) in its general graduation from the most primitive structures ( $F + H + U =$  about 0.9 mm.) to the most specialized ones ( $F + H + U =$  about 1.8 mm.) is doubled at the maximum limit of development; and 2. as a specific growth — a process acting upon the relation of parts F, H, and U, attacking one part more strongly than the other, whereupon the latter tends to catch up with the former, producing at a certain stage stabilization and equilibrium, which eventually are again broken by unequal growth.<sup>6</sup> Details cannot be discussed here, but it may be noted that the generic growth produces more robust structures in the palearctic section than it does in the nearctic one; that there is also a difference in the rhythm of the specific growth (H being the part conspicuously affected in the palearctic branch, while it is the relation U/H which grows in the nearctic branch where H is more cramped and sluggish); and that throughout the general process stunted by-products occur (holarctically), reduction in absolute size of structure synchronizing here with reduction in size of wings.

I have separated the extremely numerous subspecies of which some 120, most of them badly chosen and poorly described, have names (with up to four synonyms in some cases) into six specific groups. In each there is a considerable range of racial fluctuation in the general size of the structure, and in F/U and a more limited individual fluctuation in H/U, but there is a convenient constance in the structural proportions (and in other structural details not mentioned here) of forms clustering around the main peaks of speciation. These peaks are:

*agnata*<sup>6</sup> Staudinger: small structure, with H smaller than F and slightly smaller than U;

*argyrognomon* Bergsträsser: small to average, with H subequal to F and greater than U;

*subsolanus* Eversmann: average, with H smaller than F and equal to U;

*scudderi* Edwards: small to average, with H still smaller than F and equal to U;

<sup>6</sup> It is not improbable that *agnata* produces in Turkestan a form paralleling *scudderi* (see Nabokov, l.c. : 95, *nota*).

- melissa* Edwards: average to large, with H much smaller than F and smaller than U;  
*ismenias* Meigen: fairly large to very large, with H much smaller than F and greater than U.

From the arrangement on fig. 1 where selected examples of proportions are given, it will be seen that *argyrognomon*, coming from an ancestral structure from which *agnata* was also derived (and which on the basis of certain data provided by other genera I am tempted, being human, to furnish with certain characters, namely with H and U both equal to 0.2 and slightly smaller than the small F), produces two branches, which run parallel to each other in the general growth of parts. A complete sequence of intergrades (more complete than I originally thought) exists between *argyrognomon* and *scudderi* in the palearctic branch and between *argyrognomon* and *subsolanus* in the nearctic one; and I would not hesitate a moment to assign to *subsolanus* and *scudderi* a subspecific position within the polytypic *argyrognomon* had they not been centers radiating as it were their own forms and, on the other hand, had they been separated from *melissa* and *ismenias* respectively by a definite hiatus, which is not so, since racial intergrades (with a corresponding combination of pattern and structure) exist here too.

It may be added that the genus is distributed from the polar regions to just below latitude 40° in Europe and eastern North America, and to at least 30° in western North America and Asia. Its cradle is a lost country of plenty beyond the Arctic circle of today; its nurseries are the mountains of central Asia, the Alps, and the Rockies. Seldom more than two and never more than three species are known to occur in a given geographical region, and so far as records go, not more than two species have ever been seen frequenting the same puddle or the same flowery bank.

When about to draw up detailed comparative descriptions of the numerous forms, some of them new, involved in my examination of this genus, I was confronted by the fact that the pattern of the Lycænidæ had never been adequately analyzed by systematists. On the other hand, none of the works especially devoted to schemes of stripes or lines deal with that family nor can I adapt anything they contain to my needs, since pattern development and correspondence in design values are discussed



by authors (Eimer, Kusnezov, Schwanwitsch, and others) from a point of view with which I entirely disagree.<sup>7</sup> Thus I have been forced to devise a scheme of my own.

Before passing on to this scheme, certain methodological points must be explained. An extremely exact and simple method of mapping the wing characters has been suggested by the fact that the wing is crossed by a set of concentric scale lines of equal breadth (very constantly about 0.06 mm.; sinking to 0.05 only in dwarfs and rising to 0.07 only in giants). Although a few of these lines may fork<sup>8</sup> here and there, their curved course is, on the whole, remarkably regular, and easily followed from costa to dorsum. By stating the meridian of the scale line and the parallel of the vein, the position of any point on the wing can be given, and by counting the scale lines occupied by a marking, the extension of the latter can be adequately measured both in its absolute size and in relation to the whole expanse of the wing. At the root of the wing the scale lines are badly blurred, since the scales here are coarse and irregular. I have thus taken for 0 the scale line crossing the wing through the base of Cu, which is especially convenient as then the axis of the forewing discoidal macule (*i.e.* the two discals or cross veins) coincides more or less with the course of the hundredth scale line (from about the 95th in average sized specimens). Out of a great number of specimens examined and measured, an average looking *Lycæides* was selected the discoidal macule of which lay exactly upon the hundredth scale line (see pl. V, the model of which was a Colorado male of *melissa melissa* Edwards, to which macules R<sup>2</sup> and R<sup>3</sup> have been added from other individuals).

When prolonged beyond the wing, the scale lines are seen to form concentric circles (the curvature of the central and distal lines, forewing, and that of the distal ones, hindwing, showing almost geometrical regularity). These, however, are not concentric with the termen (especially in the forewing)<sup>9</sup> and thus

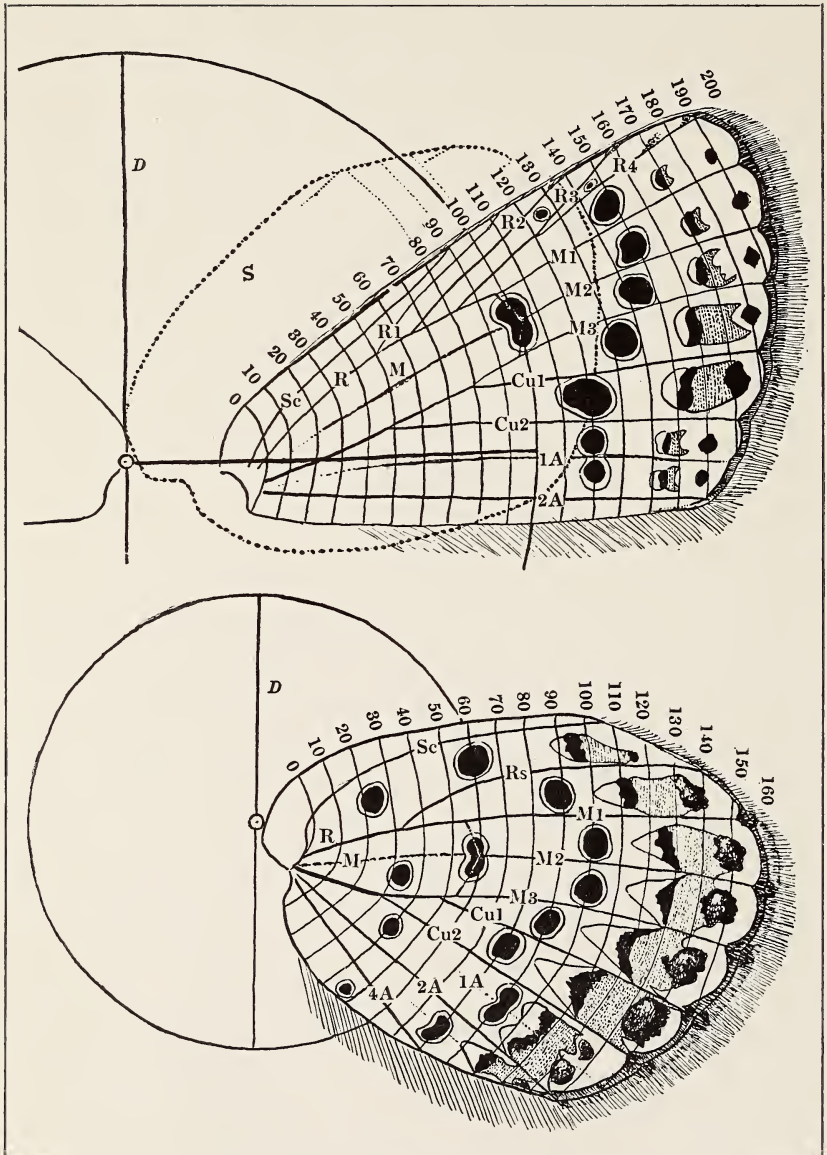
<sup>7</sup> While deeply enjoying the profusion of fascinating figures provided by those authors; and of course Kusnezov's masterpiece (1915, *Insectes lépidoptères* (Nasekomye cheshuekrylye) I (1), *in* Faune de la Russie) is unsurpassed by any other general survey of the morphology of Lepidoptera.

<sup>8</sup> This seems to be a more frequent occurrence in large races than in small ones, and takes place more often distally than basally but I have not yet come to any conclusion regarding the morphological value of this character.

<sup>9</sup> They are concentric to the termen in representatives of other subfamilies, *e.g.* in *Thecla* Fabricius (*s.s.*).

the outline of the latter seems as it were carved out (as if somebody had taken a sheet of paper that happened to be neatly ruled and had cut out a butterfly, ignoring the lines), after which the transversal disposition of the markings was more or less adapted to the new shape (especially in the case of the more distal markings) in consequence of which they ceased to follow the curvature of the scale lines. Its center in regard to the forewing lies outside the root of the latter at a point corresponding to the root of the forewing on the opposite side of the thorax, *i.e.*, at a distance from the base of the wing equal to the breadth of the body at that point; the hindwing center, however, is situated at the very root of the wing (base of costa), so that in order to make the two curvatures coincide, the right hindwing must be placed upon the right forewing in such a way as to have its hub coincide with the root of the left forewing (see plate V). My ignorance of mathematical and mechanical matters is prodigious, and thus I am quite incapable of following up certain lines of thought which these curious facts suggest.

Four veins have been lost in the course of the development of the *Lycænidæ* or of their ancestors. The first to go was an additional radial nervule between ScR and Rs. The next to go was 3A of hindwing. Its more recent disappearance is suggested by the rather constant rheniform shape of macule 2A and by a slight halving of the cretule (*q.v.*) due to the occurrence of a line of weak scales (or a very slight scar) following the old 3A course upon a slightly darker ground. The last two veins to go were 1A and M, probably more or less simultaneously, their remnants being very similar. These remnants are: the still quite definite separation of first macule (*q.v.*) in 1A from that in  $Cu_2$  (the oldest set), the somewhat less definite (in hindwing especially so) separation of the second macule (*q.v.*) in 1A from that in  $Cu_2$  (a more recently evolved set) and the distinct scar of vein 1A. I have treated it as an existing vein in my classification of macules. A similar scar is visible in cell RM, the intracellular macule of the hindwing being placed *under* that scar (in other genera there is also an upper macule), and consequently I call it M. The discoidal double macule (RM) placed upon two very weak and often partly obsolescent discales, is very like macules  $Cu_2 + 1A$  (the + denoting their frequent fusion). It seems likely that the third macules in Sc and  $Cu_2$  of the hindwing travelled to their present positions distad after



ΝΑΒΟΚΟΝ-ΛΥCÆΙΔΕS (X 5)

the disappearance of the veins that had once halved their cells. In the forewing the last radial is numbered  $R_4$  since I have not come to any conclusion as to which of the initial five veins disappeared. The stalking of  $R_3$  and  $R_4$  seems to have occurred after the (rare and weak) first and second macules in  $R_3$  reached their present position from a point adjacent to cell RM; their weak condition seems due to the subsequent segregation in the prison of the shortened and narrowed interspace.

An examination of all known genera of Lycænidæ, clues provided by aberrational individuals and certain ontogenetic data suggest that the maculation of a given interspace develops phylogenetically in result of a series of recurrent waves or rays of pigment, each shorter than its predecessor. An initial wedge-like or gusset-like infuscation, in the proximal corner (against cell RM) of a neutrally colored interspace, grows distad, extending along the interneural fold. This ray broadens distally; the limit (and transverse breadth) it attains varies, and this variability is responsible for the variable position and interneural breadth (filled completely in "striped" forms) of the subsequent macule. The latter is formed by a gradual deepening and concentration of the fuscous pigment at its maximal distal limit, which in the case of the *first macule* to be evolved, is subterminal. The rest of the fuscous extension is weakened, owing to this local concentration, and finally degenerates and disappears, leaving only the residue of its distal limit and the initial wedge-shaped store of fuscous in the proximal corner, whereupon the whole process is repeated (in the majority of the Lycænidæ). It is repeated with a little less vigour but with more variety in the limit of the fuscous extension and hence in the position and size of the *second macule* which is formed discally in the same way as the first was formed subterminally. In some interspaces the number of which varies in the Lycænidæ, a proximal wedge still remains, even after the termination of the second process. At this point it may not have sufficient strength to extend again but a certain concentration of fuscous does occur, with the formation of a half halo distally, (see *halo*), this gusset-like macule appearing to the eye as a sessile *third macule* ready to emerge completely and creep in the wake of the second one. However, in certain interspaces a third wave of fuscous may extend as freely as it had done in the second process and a third macule is formed more or less dis-



EXPLANATION OF PLATE V  
Disposition of pigmented wing-markings in average *Lycæides*  
FOREWING

From base of interspace	Macule (second)	Stretch (II-I)	Semimacule (inner first)	Interval I with aurora	Præterminal mark (outer first)	Terminal space	Terminal line	Termination of vein
83-142	R <sub>4</sub> 142-152	152-168	R <sub>4</sub> 168-170	170-186 (170-172)	R <sub>4</sub> 186-190	190-198	R <sub>4</sub> 198-200	R <sub>4</sub> at 190
100-144	M <sub>1</sub> 144-153	153-170	M <sub>1</sub> 170-172	172-187 (172-175)	M <sub>1</sub> 187-193	193-198	M <sub>1</sub> 198-200	M <sub>1</sub> at 200
100-138	M <sub>2</sub> 138-149	149-166	M <sub>2</sub> 166-168	168-183 (168-174)	M <sub>2</sub> 183-189	189-193	M <sub>2</sub> 193-195	M <sub>2</sub> at 197
80-128	M <sub>3</sub> 128-139	139-158	M <sub>3</sub> 158-161	161-176 (161-173)	M <sub>3</sub> 176-184	184-188	M <sub>3</sub> 188-190	M <sub>3</sub> at 191
48-111	Cu <sub>1</sub> 111-126	126-151	Cu <sub>1</sub> 151-154	154-168 (154-168)	Cu <sub>1</sub> 168-176	176-181	Cu <sub>1</sub> 181-183	Cu <sub>1</sub> at 185
0-116	Cu <sub>2</sub> 116-123	123-144	Cu <sub>2</sub> 144-146	146-157 (146-151)	Cu <sub>2</sub> 157-163	163-173	Cu <sub>2</sub> 173-175	Cu <sub>2</sub> at 175
0-116	1A 116-123	123-143	1A 143-145	145-156 (145-148)	1A 156-160	160-166	1A 166-168	1A at 170

Other macules: First discoidal RM (= 10 scale lines, on 100); Lateral macule R<sub>2</sub> (= 5 scale lines, on 125); Second macule R<sub>3</sub> (= 4 scale lines, on 145); First macule R<sub>3</sub> (evanescent).

## HINDWING

0-55	Sc 55-65	65-92	Sc 92-97	97-112	Sc 112-117	117-129	Sc 129-130	Sc at 105
31-84	Rs 84-93	93-110	Rs 110-115	115-131	Rs 131-141	141-148	Rs 148-150	Rs at 140
57-97	M <sub>1</sub> 97-105	105-122	M <sub>1</sub> 122-127	127-145	M <sub>1</sub> 145-155	155-160	M <sub>1</sub> 160-162	M <sub>1</sub> at 155
57-96	M <sub>5</sub> 96-104	104-124	M <sub>5</sub> 124-130	130-141	M <sub>5</sub> 141-154	154-160	M <sub>5</sub> 160-163	M <sub>5</sub> at 163
48-86	M <sub>3</sub> 86-93	93-115	M <sub>3</sub> 115-120	120-133	M <sub>3</sub> 133-147	147-155	M <sub>3</sub> 155-157	M <sub>3</sub> at 158
30-76	Cu <sub>1</sub> 76-84	84-105	Cu <sub>1</sub> 105-112	112-130	Cu <sub>1</sub> 130-143	143-147	Cu <sub>1</sub> 147-150	Cu <sub>1</sub> at 151
0-87	Cu <sub>2</sub> 87-93	93-104	Cu <sub>2</sub> 104-109	109-120	Cu <sub>2</sub> 120-129	129-139	Cu <sub>2</sub> 140-143	Cu <sub>2</sub> at 145
0-88	1A 88-93	93-102	1A 102-107	107-118	1A 118-127	127-133	1A 133-136	1A at 140
0-77	2A 77-82	82-98	2A 98-103	103-112	2A 112-120	120-124	2A 124-125	2A at 130

Other macules: Third in Sc (19-27); Third in Cu<sub>2</sub> (37-43); One in 4A (43-46); First RM (= 5 scale lines, on 57); Second (R) M (= 6 scale lines, on 32).



EXPLANATION OF PLATE V  
Disposition of pigmented wing-markings in average *Lycæides*  
FOREWING

From base of interspace	Macule (second)	Stretch (II-I)	Seminacule (inner first)	Interval I with aurora	Præterminal mark (outer first)	Terminal space	Terminal line	Termination of vein
83-142	R <sub>1</sub> 142-152	152-168	R <sub>1</sub> 168-170	170-186 (170-172)	R <sub>1</sub> 186-190	190-198	R <sub>1</sub> 198-200	R <sub>1</sub> at 190
100-144	M <sub>1</sub> 144-153	153-170	M <sub>1</sub> 170-172	172-187 (172-175)	M <sub>1</sub> 187-193	193-198	M <sub>1</sub> 198-200	M <sub>1</sub> at 200
100-138	M <sub>2</sub> 138-149	149-166	M <sub>2</sub> 166-168	168-183 (168-174)	M <sub>2</sub> 183-189	189-193	M <sub>2</sub> 193-195	M <sub>2</sub> at 197
80-128	M <sub>3</sub> 128-139	139-158	M <sub>3</sub> 158-164	161-176 (161-173)	M <sub>3</sub> 176-184	184-188	M <sub>3</sub> 188-190	M <sub>3</sub> at 191
48-111	Cu <sub>1</sub> 111-126	126-151	Cu <sub>1</sub> 151-154	154-168 (154-168)	Cu <sub>1</sub> 168-176	176-181	Cu <sub>1</sub> 181-183	Cu <sub>1</sub> at 185
0-116	Cu <sub>2</sub> 116-123	123-144	Cu <sub>2</sub> 144-146	146-157 (146-151)	Cu <sub>2</sub> 157-163	163-173	Cu <sub>2</sub> 173-175	Cu <sub>2</sub> at 175
0-116	1A 116-123	123-143	1A 143-145	145-156 (145-148)	1A 156-160	160-166	1A 166-168	1A at 170

Other macules: First discoidal RM (= 10 scale lines, on 100); Lateral macule R<sub>2</sub> (= 5 scale lines, on 125); Second macule R<sub>3</sub> (= 4 scale lines, on 145); First macule R<sub>4</sub> (evanescent).

HINDWING

0-55	Sc 55-65	65-92	Sc 92-97	97-112	Sc 112-117	117-129	Sc 129-130	Sc at 105
31-84	R <sub>5</sub> 84-93	93-110	R <sub>5</sub> 110-115	115-131	R <sub>5</sub> 131-141	141-148	R <sub>5</sub> 148-150	R <sub>5</sub> at 140
57-97	M <sub>1</sub> 97-105	105-122	M <sub>1</sub> 122-127	127-145	M <sub>1</sub> 145-155	155-160	M <sub>1</sub> 160-162	M <sub>1</sub> at 155
57-96	M <sub>2</sub> 96-104	104-124	M <sub>2</sub> 124-130	130-141	M <sub>2</sub> 141-154	154-160	M <sub>2</sub> 160-163	M <sub>2</sub> at 163
48-86	M <sub>3</sub> 86-93	93-115	M <sub>3</sub> 115-120	120-133	M <sub>3</sub> 133-147	147-155	M <sub>3</sub> 155-157	M <sub>3</sub> at 158
30-76	Cu <sub>1</sub> 76-84	84-105	Cu <sub>1</sub> 105-112	112-130	Cu <sub>1</sub> 130-143	143-147	Cu <sub>1</sub> 147-150	Cu <sub>1</sub> at 151
0-87	Cu <sub>2</sub> 87-93	93-104	Cu <sub>2</sub> 104-109	109-120	Cu <sub>2</sub> 120-129	129-139	Cu <sub>2</sub> 140-143	Cu <sub>2</sub> at 145
0-88	1A 88-93	93-102	1A 102-107	107-118	1A 118-127	127-133	1A 133-136	1A at 140
0-77	2A 77-82	82-98	2A 98-103	103-112	2A 112-120	120-124	2A 124-125	2A at 130

Other macules: Third in Sc (19-27); Third in Cu<sub>2</sub> (37-43); One in 4A (43-46); First RM (= 5 scale lines, on 57); Second (R) M (= 6 scale lines, on 32).



cally. The occurrence of yet a fourth process has been noted only in a limited number of forms (*e.g.* in the Lycænidae like patterns of certain Riodinidae).

Having retained a certain vitality even after it has been formed (or owing to an extension of the wing membrane in the termen) the first macule splits, *i.e.*, the distal part stretches and snaps off and then a fissure is formed, within which very often the neutral ground undergoes an auroral and/or structural differentiation. In certain species where the general process started very early (*e.g.* in *Tomares*) a splitting occurs too in the second macule of the interspace (and the resulting fissure is also differentiated aurorally from the ground, or, *e.g.* in *Cosmolyce boeticus* Linn. (*Catochrysoptinæ*) is filled with white structural scales).

Thus the difference we see in the position of the same macule when comparing two specimens is really a matter of different limits attained by the sequence of initial rays. In comparing specimens, however, the eye sees those differences as the result of the actual "movement" of this or that macule distad and this is a true impression, inasmuch as a macule is formed at different limits of the distally progressing infuscations. On the other hand, the white cretule capping a semimacule proximally (and produced not only by a gradual draining of the ground on the part of the first macule but also by the force of the stretch attending the splitting of the latter), is not at all "growing basad" as one is tempted to see it in some forms: in direction of growth and in shape it adheres to the general standard, for it should be noted that the essential shape of a macule and its halo, of a semimacule and its cretule, of an interval and its aurora, of a præterminal mark and its scintilla, is obovate, sagittate, cordate, arcuate, with the wider part directed distad; this outline repeats that of a sessile macule which in its turn conforms to the shape of the apex of the cell; or in other words, the shape of any of these markings renders macrocosmically the shape of each distally broadening scale and microcosmically the general fan-wise expansion of the wing and its cells, and is influenced in details of outline and direction by the apical and/or cubito-anal development of the termen (alone the ciliary markings, lying as they do beyond the membrane of the wing, point distad). I see no trace or possibility of the basally directed development of

markings postulated by authors to explain certain phenomena of pattern.

Pseudo-linear arrangements of markings, insofar as they occur in the Lycænidæ, must be also briefly noted. The terminal line is the only sequence of interspatial markings for which I employ the word "line" at all, as it is the simplest term. Although it may be the remaining maximal limit of an infuscation preceding the formation of the first macule, its connection with ciliary elements places it in a separate class (submarkings) from the macules. It would not have mattered much had I called it "limbal" with Herrich Schäffer or "extreme" with Schröder, or "marginal" with the British authors. But if I called it "Line I" with Eimer (who has eleven of them numbered basad) or "XII" with Verity (who has twelve of them, numbered distad), or "22d" with Kusnezov (who has twenty-two) or "external I" with Schwanwitsch (who has three such external ones) or "Randbinde I" with Süffert (who has two such "Randbinden"), then I would be instantly involved in a wild confusion of man-made patterns. I fail to perceive in the Lycænid wing any suggestion whatsoever of initial transverse lines or stripes forming, or having formed, an integral part of the pattern and lending themselves to classification and "homologisation." In Lepidoptera generally, the limit of a lost ancestral infuscation in any place within a given cell, may produce, in combination with a similar limit occurring at more or less the same point in an adjacent cell, what may be loosely termed a line. When this occurs in several interspaces without a special macular differentiation in any, and is followed by various adjustments and adaptations to the distal outline of the wing in the course of more or less synchronized stages of posterior and anterior development of the termen, then the line may seem very perfect to the eye, but it is the *result* of those processes and not a "primitive" line which Mother Nature automatically traced with her brush on one butterfly after another as soon as she had stuck on the wings.

It is never the line as such that "breaks" into ocelloid macules. Such macules are formed by the initial spread of fuscous, or not at all; and sometimes when the latter had been strong enough interneurally to span that space, the resulting macule may be broad enough to "connect" with any other macule (not

necessarily of its "own," *i.e.*, synchronous series) formed in an adjacent cell; or, more seldom, during the process of concentration + draining + isolation the macule may steal additional pigment from the ground of a neighboring unoccupied interspace and form therein part of its halo.

Even in the most zebroid species of *Catochrysoptinæ* or *Theclinæ*, the macules peep through their linear disguise. If on the basis of some synthetic "prototype" we tried to classify these lines (say Lx, Ly, Lz), we would be continuously mistaking proximal and distal parts of split macules for components of different linear sets, or, in other cases, would come to the nonsensical conclusion that the same macules (*e.g.*, the second macules of the posterior interspaces) form the lower part of Lx in one species, the lower part of Lz in another, and an intermediate Ly in a third. The illusion of a stripe in the subfamilies mentioned is due to several variously combined factors. The macules in two or more adjacent cells may be bar-like, with halos formed only laterally. Sessile third macules (half haloed, *i.e.*, only distally) wedged proximally in their interspaces, *e.g.*, in  $R_4$  (just above the outer part of a split discoidal macule) and in  $M_3$  (just between the discoidal outer portion and the second macule in  $Cu_1$ ), combined with a posterior sequence of second macules in  $Cu_1$ ,  $Cu_2$ , and A1 may complete the illusion of a stripe crossing the wing radially. Moreover, when these macules are comparatively weakly pigmented, the eye tends to confuse them with portions of ground color; or a complete transverse section of brown ground between "white lines" (formed by the inversely in regard to each other directed half halos of two different macular series) may be mistaken for a "stripe." Remarkable cryptic phenomena in some genera produce yet other illusory patterns, and a "white line" that the eye follows across two cells may really consist of a proximal half-halo in one and a distal one in the other. Finally, it should be kept in mind that among the second macules *any* three may be *always* seen in line provided that two of them (such as  $A_1$  and  $Cu_2$  or  $M_1$  and  $M_2$ ) are those which, throughout the family, are more or less linked together in their movement distad. Although quite possibly my judgment may be affected by the fact that the genus which I have especially studied and to which we must now turn is most honestly "spotted" — and also by the fact that I am interested more in what happens within a given interspace than in the

wing pattern as a whole, still I am quite sure that it would be a waste of time to try and twist this or that illusion created by a transverse combination of Lycænid macules into this or that "prototypical line."

#### THE WING-CHARACTERS OF THE GENUS LYCÆIDES

The categories to be discussed are: I. Size and shape. II. Ground. III. Cyanic overlay. IV. Vadosal elements. V. Scintillant elements. VI. Hairscales. VII. Terminal submarkings. VIII. Maculation. (Number of specimens of *Lycæides* forms examined: 959).

##### I. Size and Shape.

Length of forewing (from base of Cu to end of  $M_1$ ) in smallest individual measured: 7.5 mm., with length of hindwing (from base of Cu to end of  $M_2$ ): 6.5 mm.; in largest individual measured these lengths are: 18.5 and 15 mm. respectively, thus giving a range of 11 mm. and 8.5 mm. Number of scale lines ranging from 140 in forewing and 115 in hindwing to 260 and 210 respectively. In average sized forms the number of scale lines varies from 190 to 210 in the forewing and from 160 to 170 in the hindwing. The hindwing varies less than the forewing in the number of scale lines but more in shape. The most distal point of the termen of the hindwing lies either rather anteriorly (*high angled shape*), namely between  $M_1$  and  $M_2$ , or more posteriorly (*low angled shape*), between  $M_2$  and  $M_3$ , or rather exactly at the end of  $M_2$  (*average shape*); or the termen is evenly rounded, *i.e.*, runs almost concentrically to the scale lines in the stretch from  $M_1$  to  $Cu_1$  this however only occurring in stunted individuals. In especially high-angle individuals the scale line which in the hindwing coincides with the tip of  $Cu_1$  (further on termed s.l. $Cu_1$ ) abuts anteriorly at the tip of Rs and cuts off a terminal segment of about 20 scale lines at the point of its greatest expanse (in interspace  $M_2$ ); but another individual with the same number of scale lines in  $M_2$  will seem less conspicuously angled if s.l. $Cu_1$  reaches anteriorly a more distal point (say, between Rs and  $M_1$ ) since the segment cut off by the line will occupy a lesser number of scale lines. In low-angled forms s.l. $Cu_1$  may abut at  $M_1$ , thus cutting off the terminal parts of only two interspaces instead of four. Finally the segment itself may be either of a fuller or more apical



shape, and when this difference exists the wing of one individual may look rounded and that of another angular though actually both are high-angled (the tips of  $Cu_1$  and  $R_s$  being connected by the same scale line in both). In the *circular* shapes, found in stunted specimens, sc.l. $Cu_1$  abuts at  $M_2$ , practically coinciding with the termen and thus cutting off no segment at all. In the forewing the variations are less conspicuous but there is generally some correspondence between the wings since in high-angled forms the forewing is apt to be "pointed," *i.e.*, with the scale line which connects the tips of  $M_3$  and  $R_4$  cutting off a larger segment (about ten scale lines in a "rounded" forewing and about twenty in a "pointed" one). *Short* forewings (where the proportion between breadth and length is less than five to four) and *long* forewings (when more than five to four) may have, together with difference in shape, a certain significance in subspecific values. It may be added that there is a certain connection between shape (*i.e.* vigor of growth in termen) and color (vigor of pigmentation). A low-angled shape is generally associated with weakly pigmented undersides, and these are generally strongly pigmented in races with high-angled hindwings.

## II. Ground.

Upperside, both sexes: ranging from neutral fuscous or weak brown to blackish. Costa in hindwing above  $Sc$  of a scaly neutral fuscous still weakened by the addition of colorless or very faintly iridescent scales. In a few female forms, with greatly developed upperside auroræ (see VIII 4), the fuscous ground may be intermixed with sparse auroral scales (the beginning of a brightening of the ground which in both sexes of *Plebulina* is well on the way to complete predominance, as occurring in *Lycæninæ*).

Underside, both sexes: ranging from fawn to brownish; or from white (colorless scales completely covering some, or all, neutral ground areas) to whitish fawn; or producing a greyish or bluish effect due to the even admixture of colorless or faintly iridescent scales with a more or less developed ground pigmentation. Occasionally the veins and the vein scars appear marked in a lighter shade. The forewing is generally of a slightly more diluted and smoother tone than the hindwing, and in one and same race the ground of the female is generally slightly richer than that of the male.

### III. Cyanic overlay.

Upperside, both sexes: structural scales invading the ground from the base with more or less vivid violet blue; partly (a) or almost completely (b); (a) clothing or dusting only certain areas (*i.e.*, absent discally, or only empurpling the cretules (*q. v.*) in the female) or reduced to a few scales at the base; (b) overlaying the ground evenly or more or less sparsely (*i.e.*, leaving out minute bald patches and the vadosal elements, *q. v.*) but always keeping clear of the costa in both wings, of most of the subcostal area in the hindwing (see further, V, 1 and IV, 5, 6) and reaching distad a maximum limit situated at a distance of about three scale-lines from the termen (see IV, 4) and less sharply defined in the female than in the corresponding male; the intensity and tint of the violet blue depending upon the density of the scaling producing it, as well as upon the fundamental pigmentation of the wings.<sup>10</sup> Reduced or absent in the female considerably more often than in the male, where its complete absence occurs only in a few races.

### IV. Vadosal elements.

Racially more or less characteristic portions of fuscous upper-side ground inasmuch as they are isolated, defined, and strongly pigmented in forms (mainly male) with dense cyanic overlay which in its spread distad leaves "dry" or fails to reach always three (fourth, fifth, and most of sixth), but often all of the following ten ground elements: the (1) *vadosa* proper: a longitudinal stretch of ground thickly or finely sheathing a vein throughout its course (or only terminally: (2) *terminal vadosa*), often broadening towards its tip (on veins  $R_4/Rs$ / down to 1A) to form there the basally tapering (3) *vadosal triangle* (in shape and position a more or less exaggerated silhouette of the corresponding inner triangle *q. v.* of the underside) which may occur independently and which in its turn fuses with (and rep-

<sup>10</sup> Culling at random definitions of these shades from original descriptions of *Lycæides* forms, I find: dull violet, shiny blue, glossy violet blue, silky lilac blue, deep purple, hyssop violet, lavender blue, pruinose blue, pinky lilac, violet with a pink tinge, and at least two authors have found in their races a greenish cast. All these, more or less subjective, color impressions are worthless as racial characters unless the combination of the two factors producing the color effect (in fresh specimens) be carefully analyzed in comparison with fresh specimens of other races (of the same and of different species).

resents the neural thickening of) the (4) *vadum*.<sup>11</sup> a linear or more extensive marginal space of pigmented ground, from apex to tornus, between the limbal limit of the overlay and the termen, at its narrowest reproducing the terminal line of the underside, apically turning into the delicate (5) *costal vadum* of the forewing, merging with the distally fuscous Sc area ((6) *subcostal vadum*) of the hindwing, distally connected with the vadosal fringe *q.v.*, and with the outer triangles *q.v.* and proximally (in the hindwing) often joined more or less thickly by means of an (7) *interneural vadosa* with the (8) *insula* proper (as differing from (9) *insula Rs II* and (10) *insula RM*) which is a frequently occurring, more or less isolated, roundish blotch or point of conspicuous fuscous repeating in all or some interspaces the corresponding præterminal mark *q.v.* of the underside (also, but usually faintly, macule *Rs II*, and in some cases, mainly in females with strong overlay and mainly in forewing, macule *RM*), and sometimes appearing as a blacker spot within the vadum when the latter is extensive enough to surround it, but not sufficiently dark to merge with its pigmentation.

#### V. *Scintillant elements.*

1. The *scintillant pulvis*: structural scales more or less extensively dusting with metallic greenish blue (in strongly pigmented forms) or turquoise (in weakly pigmented or white forms) the ground at the base and in the anal interspaces of the underside; mainly in hindwing; sometimes quite absent or reduced to a few scales next to the body. Upperside: confined to the dorsum and to the proximal and posterior part of the subcostal interspace of the hindwing and intergrading there with the main overlay; in a few female forms, occurring also on the upperside of the forewing where it clothes the costa and lines the veins discally (*i.e.*, more or less corresponding to the distribution of short white hairscales in the male); consisting there of rather coarse scales of a dull turquoise tone suggesting "dead" parts of the cyanic overlay.

2. The *scintilla*:<sup>12</sup> a variable number of scintillant scales more or less thickly and evenly grouped, overlaying the pigment

<sup>11</sup> "fuscous border," "bordure noire," "Distal Rand," "terminal border," "kraievaya polosa," "marginal streak," etc., of authors.

<sup>12</sup> Possibly remnants of a dense scintillant pulvis which had covered the whole of the hindwing, completely swamping all its markings, at some period in the evolution of the Lycænidæ, as it still does in certain Asiatic species of *Albulina*,

of each præterminal mark of hindwing underside; tending to be gradually reduced from  $M_3$  or  $M_2$  costad, and often lacking in the anterior interspaces, but seldom missing in the posterior ones; very poorly developed in some forms but only individually quite absent; in most cases placed rather proximally upon the mark, *i.e.*, not reaching its distal limit, so that the latter spreads out beardlike from underneath the scintillant incrustation, if viewed from the termen; (the following more individual than racial variations in position are to be noted since any one of them can be stabilized specifically in other genera) sometimes coming in complete contact with the aurora (*q.v.*), but often well separated from it by a tendency to occupy a median, or even distal, position within the mark; sometimes absent from a more or less conspicuous point in the center (upon the inter-neural fold) which thus forms a blackish pupil; in some cases agglomerating band-like across the mark; or distributed unevenly, with patches and dots of black showing at different points; but in a few cases overlaying the mark completely (with or without a pupil), or, as it were, overlapping or replacing it in cases when the pigment of the mark tends to obsolescence or is quite gone; in shade varying (racially, inasmuch as the pigmentation varies racially) to the naked eye from turquoise (in poorly pigmented forms) through peacock blue (at an average or reduced development in well-pigmented forms) to golden green (when completely overlaying a strongly pigmented mark), but hardly distinguishable from the scintillant pulvis under lens (both sets of scales being turquoise), the aforesaid variations in color depending on the angle of light, the compactness of scales, the pigmental basis and frame — and a subjective approach on the part of the observer.

#### VI. *Hairscales (and androconial scales)*

1. *Hairscales* of forewing, in male: very short, white, bluish, or pale violet blue (according to light); of a bristly appearance under lens; projecting distad (apically and tornad when paired on a radial vein, on each of which they may form a sequence of basally pointed arrowheads) and sparsely to rather densely distributed (more or less distally) within cell RM and throughout the circumcellular area distad, lacking at the base of its posterior

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*Glaucopsyche*, *Lycæna*, and *Tomares*, and which subsequently had disappeared, leaving the scintillæ as seapools are left by the sea at low tide.



part, stopping or diminishing in number at or beyond limit II (*i.e.* the limit corresponding to the emplacement of second macules, *q.v.*, of the underside) but sometimes just reaching in hindwing (where however they are somewhat less conspicuous throughout than in the forewing) limit I (*i.e.*, the limit corresponding to the emplacement of the semimacules *q.v.* of the underside). Above RM in forewing mainly along veins Sc, R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub>, agglomerating on their slopes (giving the vein a pinnate appearance) when the overlay is dense enough to eliminate the vadosæ in the costal area which then seems, especially in freshly emerged specimens, rather densely powdered with white (*costal pulvis*).

2. *Male androconial scales*: a microscopical character: minute battledore-shaped scales, in outline, size, length of pedicule and number and density of "knots" varying in individuals of some forms, racially more or less constant in others (especially in stunted or overdeveloped forms), and often duplicated by specifically different races (and thus lacking the specific importance assigned them by Courvoisier, 1917, on the strength of scanty, and more or less misidentified, European material).

3. *Costal fringe*: short hairscales (allied to the male hairscales) in both sexes rimming the costa with white and very conspicuous in specimens with a strongly pigmented costal vadum (IV, 5).

4. *Basal cilia*: long and very long silvery white, bluish or drab hairscales clothing basally the upperside of the hindwing (reduced in forewing), sweeping in a distal and then downward direction across the proximal part of cell RM, extending rather far into interspace Cu<sub>1</sub> where they just reach limit II, still further in Cu<sub>2</sub> + 1A (almost to limit I), and spreading from base into 2A and 4A, where they stipple the scintillant pulvis of the dorsum.

5. *Dorsal cilia*: white, or producing on the upperside a light blue effect as if daintily dyed. Springing from a very faintly fuscous *dorsal margin* and sometimes slightly infuscated themselves. Equal to about 10 s.l., somewhat shorter in forewing.

6. *Terminal cilia* as seen from the underside: long hairscales (equal to about 10 s.l. in forewing and to 12 s.l. in hindwing) attached to the termen, proximally denser than distally; silvery white or with slight bluish or mother-of-pearl reflections in certain lights; sometimes, especially in females, more or less

infuscated, ranging in shade from drab or pale fawn to brownish; completely pigmented or in part, *i.e.*, only proximally or only distally and then either from tornus to apex throughout, or only along a limited section of that range.

7. *Vadosal fringe*: consisting of rather short pigmented hairscales rooted in the vadum, upperside, and thus doubling basally the terminal cilia of the underside; usually equal to 4 s.l.; tending towards the fuscous of the vadum from which sometimes it may be almost indistinguishable to the naked eye.

Viewed in cross-section the short dark vadosal fringe (rooted in the still darker vadum) is seen to overlay the long white underside cilia (rooted in the distal edge of the terminal line) to about  $2/5$  of their length. The very slight jutting of the dark hairscales of the terminal line just beyond the rim of the membrane forms a kind of prop for the base of the ciliary hairs which thus are encased between it and the vadosal fringe. If the cilia are viewed from the under surface by the naked eye, an illusory more or less dark ciliary line seems to run along the middle of their transverse stretch: this is due, first, to the cilia abruptly losing their quilted appearance at  $2/5$  of their length where the edge of the upperside vadosal fringe stops, and second, to minute portions of this edge being discernible in between the white ciliary hairs, as they become less dense distally. If, moreover, the distal part of the cilia on the underside happens to be infuscated and if this infuscation begins at just over  $2/5$  of the length distad, then on the upperside too there is a similar illusion of a ciliary line (but of a light one this time), due to a narrow stretch of unpigmented cilia showing between the distal infuscation and the edge of the dark vadosal fringe which shuts off most of the white basal part of the underside cilia. My abundant material has not proved the occurrence of a true ciliary line in *Lycæides*, *i.e.*, of an actual infuscation of each ciliary hair only at its middle, or of shorter hairs (among the longer ones) infuscated only at the very tips.

#### VII. *Terminal submarkings of underside.*

1. The *terminal line*: edging the termen proximally with more or less dense fuscous from about the middle of i.Sc. in secondaries, and from the tip of  $R_4$  in primaries, to the tornus; consisting of very short distally directed hairscales (which very slightly jut beyond the termen), and in its interspatial aspect

resembling a garland more or less raised and thickened at both ends. Very thin and faint in weakly pigmented form.

2. The *inner triangle*: a fuscous triangular basally tapering mark formed upon the termination of each vein (mainly from  $M_1$  to  $Cu_2$ ) by the meeting of the thickened præneural ends of two adjacent sections of the terminal line. Not necessarily absent in weakly pigmented forms. See also IV, 3.

3. The *outer triangle*: a fuscous subtriangular distally tapering mark formed upon the proximal part of the terminal cilia (and also occurring sometimes upon the vadosal fringe of the upper side) independently from the general pigmentation, if any, of the latter and placed directly opposite (base to base) the inner (or the vadosal) triangle, which it repeats in reverse, except that its base is usually narrower and its point more or less truncated. Mainly in hindwing. Seldom leading to any conspicuous scuttellation in the forewing.

#### VIII. Maculation of underside.

Counting from termen basad a *first macule* (split into inner and outer part) and a *second macule* are both represented in  $Sc.$ ,  $Rs$ , and  $2A$  of hindwing, in  $R_3$  (where, however, they occur seldom and are always much reduced) and  $R_4$  of forewing, and in  $M_1$ ,  $M_2$ ,  $M_3$ ,  $Cu_1$ ,  $Cu_2$ , and  $1A$  (small in the two last) of both wings. A *third macule* supplements the set in  $Sc$  and  $Cu_2$  of hindwing. Moreover, there is a small *lateral macule* in  $4A$  of hindwing caught in the blind alley of the dorsum and sometimes a small lateral macule is somewhat similarly trapped in  $R_2$  of forewing (where the eye sees it as "belonging" to the transverse series of second macules). In both wings the discoidal cell (a double interspace  $R$  and  $M$ ) has its own *first* (double) *discoidal macule*,<sup>13</sup> the rheniform  $RM$ , traversed by the discals (the outer segment of its  $R$  part and the outer segment of its  $M$  part form in relation to the second macules  $M_1$  and  $M_2$  a pair of sessile third macules — an important point in the case of certain other genera). In the hindwing there is a *second* (single) *discoidal macule* within the cell under the scar of vein  $M$ . All the macules are of a more or less deep fuscous and are rimmed with structural scales, *i.e.*, *halos* (produced by the macule having drained during its period of formation and concentration the initial pig-

<sup>13</sup> Among the names employed by authors for this double macule are "discal streak," "bar," and "disco-cellular lunule."

ment in its immediate neighborhood). The halves of the halo which has split together with each first macule are termed *cretules* but only the proximal one is represented in full. The inner part of each first macule is the *semimacule* (capped or rimmed proximally by the *cretule*) and the outer part is the *præterminal mark* (adorned in hindwing with the *scintilla*). The fissure between the two parts is the *interval* (extending in average size races from about 5 to 20 scale lines in  $Cu_1$  of forewing, always correspondingly more in hindwing) which may be, and generally is, more or less completely filled by the *auroral element* — an agglomeration of brightly colored scales differentiated from the ground, and associated with the splitting of macules. In the female the semimacules and præterminal marks may appear in darker pigment within the fuscous ground of the upperside, and the series of *auroræ* is often repeated, completely or in part; but in the males with average overlay only the præterminal marks appear (as *insulæ*) although in very rare aberrations the posterior *auroræ* of hindwing may be repeated (as happens more often in forms of *Plebejus argus* L., becomes fairly normal in its allies and is characteristic of the smaller *Icaricia* where the auroral development resembles that found in certain *Glaucopsychinæ*). All parts of the first macule are less developed in the forewing than in the hindwing, where again those in  $M_3$  and especially  $Cu_1$  (there extremely developed in "tailed" genera) are stronger than in the rest of the interspaces.

#### VIIIa. Elements of First Macule.

1. *Semimacule*:<sup>14</sup> generally crescentic, sagittate, or deltoid (pointing basad upon the interneural fold) in hindwing (from  $i.Sc$  to  $A_2$  incl.); when well developed, spanning almost the whole breadth of the interspace, except in  $Sc$ ,  $Rs$ , and  $M_1$ , where it is shorter and often reduced to an uneven bar-like shape; often tending to the latter shape in all interspaces of forewing (from  $i.R_4$  to  $i.1A$  incl.) where each is shorter than the corresponding one of the hindwing and may seem blurred to the naked eye owing to a weaker pigmentation. Variable in longitudinal extension; quite absent only in extreme individuals of very weakly pigmented races.

<sup>14</sup>The "rather narrow bent lunule" of Scudder and the "crescent," "flat crescent," "arrowhead," and "chevron" of Chapman; those two authors have left by far the best descriptions of the *Lycæides* pattern.



2. *Cretule*: capping proximally each semimacule in both wings; more or less conspicuously white or whitish (almost invisible on the powdery white ground of some forms) or, very rarely, retaining some diffuse pigment; crescentic or sagittate or squarish, *i.e.*, more or less in keeping with the shape and size of the corresponding semimacule, but usually somewhat more pointed and larger; sometimes so greatly developed as to seem to fuse with the halo of the corresponding second macule (actually it is the halo which intrudes), and then appearing raylike if the whole system of macule I is transversally reduced; at other times, however, especially in hindwing where the semimacules are better developed, and more often in females, occupying the whole breadth of the interspace for a certain distance basad from semimacule before "terminating" crescentically or tapering to a point (phylogenetically, however, expanding distad from that point), so that the sequence of *cretules* (especially if they fuse with the halos of series II) has been described by observers as a "white band"; in some well pigmented forms very small or quite absent, especially in forewing. Appearing on the upperside in some females, in whitish or bluish (or violet as portions of the overlay).

3. The *præterminal mark*: tending to be heart-shaped (expanding distad) in hindwing where it is generally strongly fuscous and contains the *scintilla*; roughly rhomboidal or (when reduced) bar-like in forewing where its pigmentation is weaker; situated in the same interspaces as the semimacule distally to the latter, and varying in size accordingly; tending to complete obsolescence in some weakly pigmented forms, although the *scintilla* may be retained (see V,2).

4. (The remnants of an) *outer cretule*: colorless (white) scales diffused in the ground of the crescentic terminal space with which, when the latter lacks pigment altogether, it is practically synonymous; usually more conspicuously white in hindwing but sometimes very much so in  $Cu_2$  of forewing in otherwise well pigmented forms. Appearing on the upperside in some females with the same variations as 2.

5. The *aurora*: racially varying in extension (together with that of the interval) and in transversal development, (together with that of the semimacule); on the underside in both sexes (but somewhat better developed in the female); ranging there from light yellowish to deep reddish orange; of

a more velvety appearance on the upperside of the female where it may be under or overdeveloped in comparison to the underside in the same specimen and where its color ranges from a bleached neutral shade to a rich fulvous (the slight discrepancy in tone between the two surfaces being due to a difference in the degree of the ground pigmentation as well as to the sparser spread of colored scales forming the average upperside aurora); at its full development on the underside snugly fitting into the interval between the semimacule which caps it and the corresponding præterminal mark which it caps in its turn; often represented in all intervals; tending, however, to be ill-formed, underdeveloped, or absent in the primaries, especially in  $R_4$ ,  $M_1$ ,  $M_2$ ,  $Cu_2$ , and  $A_1$  (termed the *weak interspaces*) of the male underside and of the female upperside; in a few female forms, however, hypertrophied on the upperside and especially conspicuously so in the forewing, the sequence reaching there from costa to dorsum and swamping a stretch corresponding to that occupied on the underside by the inner cretule + semimacule + aurora, thus forming a broad "band" with a more or less diffuse proximal edge (see also II); when underdeveloped the aurora edges the interval always proximally, *i.e.*, does not reach the præterminal mark in its growth distad from "beneath" the semimacule (the remaining gap being either concolorous with the ground or colorless). It is the first to develop, or the last to go, in  $Cu_1$  (with its neighbor in  $M_3$  following closely). Completely absent only in extreme individuals of weakly pigmented forms.

5a. *Cusps*: when fully developed and especially in  $Cu_1$  and  $M_3$  of the hindwing underside, the crescent of the aurora is prolonged distad by two (inner and outer) pairs of cusps and occupies the whole breadth of the interspace; the inner cusp clasps the præterminal mark laterally, the outer one runs next to the vein and fuses upon the vein with the outer cusp of the adjacent aurora to finally penetrate and bisect the inner triangle of the terminal line; in the forewing and in the anterior interspaces of the hindwing the outer cusp tends to be absent, so that the auroræ (and their semimacules) do not touch the veins and are separate from each other.

5b. *Lacrimæ*: in some richly pigmented and strongly developed forms there are on the underside two or four streamlets of blurred auroral pigment coming as it were from beneath the

præterminal mark, and "trickling" distad across the terminal space (one, or a pair, on each side of the interneural fold).

*VIIIb. Second, Third, Discoidal, and Lateral Macules.*

*Second macules:* if a *Lycæides* forewing is placed with its base towards the observer and its discal constellation is viewed from an imaginary horizontal line joining the opposite ends of the discals, the *second macules*, ( $R_3$ ),  $R_4$ ,  $M_1$ ,  $M_2$ ,  $M_3$ , and  $Cu_1$ <sup>15</sup> all of which have radiated from positions adjacent to cell RM, are seen to form a fairly regular rather weak arc, sloping somewhat sideways in relation to the rheniform macule RM, as if tipped by a slight apical pull (process 3). The twin macules  $Cu_2$  and 1A lie outside the lower end of the arc, *i.e.*, lead an independent existence, having reached their present position (phylogenetically, from an enormously remote starting point in comparison to the starting points of the other macules) in result of a (process 2) cubito-anal stretch of the membrane (so conspicuously retained in some genera) that had occurred at some period in the evolution of the narrow and ovoid ancestral forewing (with a similarly shaped hindwing) prior to the comparatively recent generic and tribal apical development (process 3) which in a way has tended to repeat the initial growth and elongation of the ancestral wing (process 1). These stages of unequal growth and of subsequent compensatory readjustment may be compared to the already discussed evolutionary phenomena in the case of the uncus.

It would be necessary to analyze a great number of generic patterns (in the *Plebejinæ* alone striking variations on a P-shaped basis occur in *Agriades*, and a remarkable apicoid angle is formed by the macular constellation in *Albulina*) in order to bring out certain features of the position of second macules in *Lycæides*, but this would transcend the scope of this paper. In selecting the three positions (1 proximal, 2 central, and 3 distal) given for this genus, stress has been laid on the progress of macule  $Cu_1$ , but actually this may be combined, at these and intermediate stages, with shiftings on the part of the anterior series which may be removed from RM further than it is shown here. Fig. 2a shows the generic starting point of  $R_4$  whose initial rather distal position (in regard to even such

<sup>15</sup> When no Roman number is appended to the symbol of the macule, the reference is to the second macule (e.g.  $Cu_1 = Cu_1$  II).

genera in *Plebejinæ* where the constellation is of the same type) coupled with the also rather distal position of  $R_2$  or  $R_3$ , when occurring (not shown in the figures), is instrumental in weakening the curvature of the arc and producing its "sideways" position already discussed. The same figure also shows the most proximal position of macule  $Cu_1$  which is at this stage in an oblique line (the *radial slant*, reoccurring throughout the family) with RM and  $Cu_2 + 1A$ . Under RM this imaginary line diverges distad from the latter's scale line to finally cross the scale-line of macule  $Cu_2$ . Fig. 2b shows a middle position which is most frequently found in this genus. Fig. 2c shows the most distal position of  $Cu_1$  (except that the whole series can move still further if the semimacules are further removed than they are in average forms) when the series is roughly adapted to the sequence of the first macules which in its turn is sub-parallel to the outline of the termen. The tendency to assume one of the two extreme positions (a, b) is sometimes a racial character.

In forewings of average extension (about 200 s.l. in  $M_1$  and 185 in  $Cu_1$ ) and with semimacule  $Cu_1$  having reached s.l. 150 or thereabouts, the range of movement of the center of macule  $Cu_1$  (and it is this center which is referred to throughout), is from s.l. 105, at which initial point in *Lycæides* it is about 50 s.l. removed from the apex of its cell (which thus is less than macule  $R_4$  has travelled from the apex of cell  $R_4$  but *more* than the distance covered by the other anterior macules in regard to their respective cells — although curiously enough all describers, being obsessed by the notion that macules must form "lines," speak of  $Cu_1$  in this position as "advanced basally") to s.l. 135, at which point it has 50 scale lines to go if it wishes to reach the termen, which of course it cannot, since the split first macule occupies the remaining space. Thus its range of activity is 30 s.l. which is somewhat less than 1/4 of the length of its interspace and about 2/5 of the distance from the proximal position of  $Cu_1$  to the termen (this range varies racially). The width of the interval between semimacule (inner I) and præ-terminal mark (outer I) (see fig. 2d, e, f) is mainly dependent on the position which the former had reached when the macule I split (the outer part wandering distad). The breadth of the fissure (interval I) ranges from 4 s.l. to at least 20 (average sized males). The space available for the progress of macule  $Cu_1$



depends on the position reached by the center of the corresponding semimacule (this is about s.l. 145, proximal limit, about 155, average, and about 165, distal). Thus when the latter reaches its distal limit (resulting in a narrow interval I, since the præterminal mark cannot wander away beyond a certain limit), the increase in the II-I stretch allows macule  $Cu_1$  a

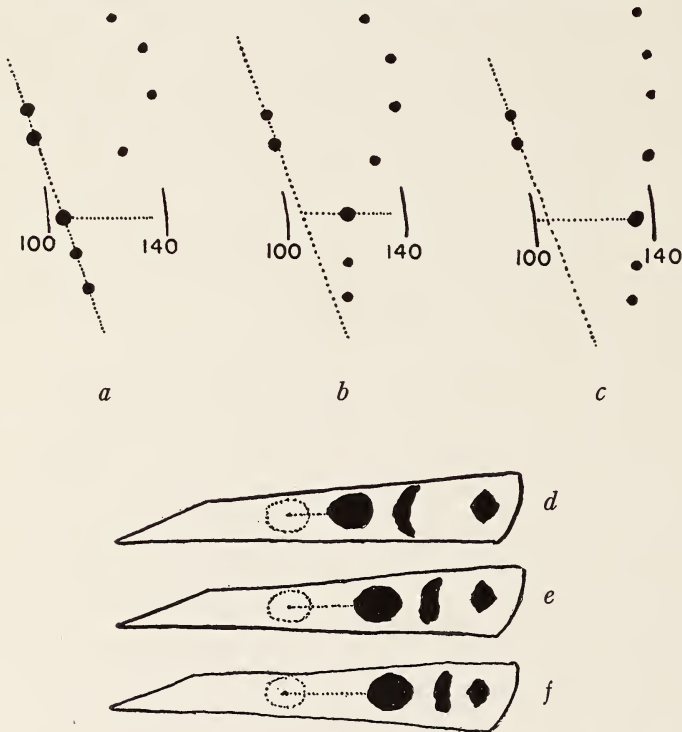


FIG. 2. a, b, c, Forewing discal constellation in *Lycaïdes*, showing proximal, central and distal position of second macule  $Cu_1$ . d, e, f, Cell  $Cu_1$  of forewing, showing relation in position between semimacule (inner part of first macule) and second macule.

greater range (at least 40 s.l.). A terminal extension of the wing even to only 195 in  $Cu_1$  may produce a veritable wilderness for  $Cu_1$  to traverse. These phenomena have great racial importance.

In the hindwing the position of macule  $Cu_1$  varies less con-

spicuously. The same discal arc as in forewing is readily perceived, but the eye sees  $R_s$  in a more proximal position in relation to  $M_1$  than  $R_4$  appears in relation to  $M_1$  in the forewing (actually, both  $R_s$  and  $R_4$  — especially the latter — have progressed further *distad* from their apices than the corresponding macules  $M_1$  have progressed in their cells). Macules ScIII and ScII at one end and  $Cu_2$  II at the other prolong the discal arc ( $R_s$ ,  $M_1$ ,  $M_2$ ,  $M_3$ ,  $Cu_1$ ) in such a way as to form a horseshoe arrangement around cell RM: this *circumcellular arc* becomes practically a circle in some genera, where the second macule in cell RM (or a third one) is placed basally enough to act as a link. Posteriorly to this, macules  $Cu_2 + 1A$ ,  $2A$  and  $4A$  form a short weak additional arc or *parenthesis* (also a special feature in certain other genera) with its concavity toward the proximal stretch of vein Cu. The radial slant connects macules ScIII, RM,  $Cu_1$  (when lagging) the colon (its  $1A$  part, however, generally “diverges basad”) and the semimacule in  $2A$  by a regular but perfectly imaginary line, traversing the wing and very conspicuous and perfect in butterflies where the anal part of the termen has been stretched tailwise.

When examining *Lycænidæ* patterns for systematic purposes, loose impressionistic descriptions will inevitably result (and I have erred myself in this respect) if the describer does not take into account the actual distances of the macules from the apices of their cells and from the termen, the actual and comparative positions of the split first macules, the extension of the split in comparison to the whole wing, the development of the terminal space, and the relation between the size of the macules and the entire number of scale-lines. I shall limit myself here to a few words regarding the dimensions of macules in this genus.

Divided by three, the sum of scale lines occupied by the three median macules II in a specimen gives pretty exactly the mean size of the whole discal maculation in that specimen. When the relation of this number to the alar expanse in scale-lines (see category I) is around  $1/20$  for each wing, the maculation in the specimen or in the race may be said to be of “average” development in both wings. Below this, it is “reduced”; above, it is “enlarged.” In the forewing macule  $M_1$  is often equal to  $M_2$  but their elongation and direction may be different.  $R_4$  is smaller than  $M_1$  and both tend to be ovoids slanted towards the wing apex, these

two being especially sensitive to the apical pull.  $M_2$  when ovoid, tends to be slanted towards the stem of veins  $R_3$  and  $R_4$  just above the discoidal.  $M_3$  when ovoid and tending towards a proximally pointed cordate shape has its axis directed anteriorly towards the discoidal and posteriorly tornad. The same is true of  $Cu_1$  which is usually the largest in the series and is often very conspicuously elongated (in all these cases, of course, the actual extension and expansion is essentially in a distal direction). Macules  $Cu_2$  and 1A which are often well separate and smaller than  $R_4$  (except when the latter is very much reduced) form together a *colon*, the axis of which is directed either towards the discoidal, and appears more or less in line with the latter's axis, or towards the apex of interspace  $R_3$  and then follows its scale-line (which is most frequently the one traversing the point of forking of veins  $R_3$  and  $R_4$ ), as the discoidal does its own, in which case, since both lie on different sections of their respective scale-lines, discoidal and colon do not appear parallel to each other, the former slanting tornad and the colon remaining "straight," *i.e.*, at right angles to the dorsum. The rare  $R_2$  is smaller than  $Cu_2$  (or 1A) while the slightly more frequent  $R_3$  is scarcely perceptible to the naked eye. In a general way and disregarding the difference in elongation, the dimensional sequence of macules runs as follows:  $R_3$ ,  $R_2$ ,  $A_1$ ,  $Cu_2$ ,  $R_4$ ,  $M_1$ ,  $M_2$ ,  $M_3$ ,  $Cu_1$ , with the rheniform RM ( $R + M$ ) slightly broader than colon ( $Cu_2 + 1A$ ).

In the hindwing the macules forming the circumcellular arc are generally subequal, with  $Cu_2$ III and  $M_3$  often tending to be smaller than the rest, while  $R_s$  tends to be slightly enlarged and ScII is still more so (sometimes vaguely suggesting a very ancient fusion of two spots in adjacent interspaces where the partition has been lost). Thus there is a gradual reduction in size from ScII to  $M_3$  with  $Cu_1$  subequal to  $M_1$  and  $M_2$ .  $Cu_2$  and 1A are the smallest in series II (and even slightly smaller than  $Cu_2$ III) and are apt to be fused forming an hour glass-shaped or rheniform (distally convex) spot not unlike the discoidal ( $R + M$ ) and of approximately the same size but having a different curvature of axis since they lie upon different sections of their respective scale-lines. The extension of 2A is almost that of  $M_2$  but (transversally to the veins) it is longer and forms a roughly rheniform blotch suggesting a more complete fusion of adjacent macules in 2A and 3A (an extinct vein) than that

of the macules in  $Cu_2II$  and  $1AII$  and often slightly diverted anteriorly and outwardly from the scale-line of its axis. Macule M in the discoidal cell is intermediate in size between ScIII and  $Cu_2III$  while the latter is intermediate between M and 4A which is the smallest of all. In a general way, and taking account of their tendencies, the sequence in size of the macules is as follows: 4A,  $Cu_2III$ , M,  $M_3$ , ScIII,  $M_1$ ,  $M_2$ ,  $Cu_1$ , Rs, ScII. The sequence for the rheniform macules (length) is: 2A,  $Cu_2 + 1A$ , RM. These sequences are important as they give the order in which macules in both wings tend to disappear in some races. Their reduction (racial) in one wing, however, is not necessarily accompanied by reduction in the macules of the other, nor do the rest of the markings and the general pigmentation always follow suit.

In conclusion a few words may be said concerning the specific repetition, rhythm, scope, and expression of the generic characters supplied by the eight categories discussed. "Repetition" when affecting a conspicuous character or a great number of characters, produces striking resemblances between certain forms (which may be widely allopatric and associated with totally different surroundings) belonging to two or more different species of *Lycæides*, and this kind of resemblance I term *homopsis* since I cannot use "isomorphism," (the mimetic implications of which would be quite irrelevant in the case of this genus), or "parallelism" (which I restrict to resemblances in structural characters), or "analogy" (which is a minor form of homopsis affecting allopatric races of the same species); *inter-specific homopsis* to be precise — for remarkable homoptic forms may be also supplied by *generically* and *tribally* different Lycæinids. "Rhythm" depends on the following: if B, L, P, T represent in one species of *Lycæides* certain combinations of characters as revealed by definite subspecies, and if in another species the combination L fails to be represented at all, while on the other hand P is not represented by a single definite subspecies, but is spread over several, these omissions, gaps, fusions, and syncopatic jerks will produce in one species a variational rhythm different from that of another. "Scope" refers to range of variation in a species in comparison to that of another species and in its approach towards the generic range. A species may set a unique record in one character or category, while lagging



behind in the others, or it may attain a good average in most characters. Finally, "expression" means the slight differences by which even the most strikingly homoptic forms (*i.e.*, belonging to different species) may be distinguished without an examination of the genitalic structure.

*A priori*, I had assumed that in the course of the combination and segregation of generic characters in various racial forms (and this is incidentally the meaning I attach to the term "form") each of the six structurally different groups (*i.e.*, species) of *Lycæides* would be seen to repeat certain stages of the same general (*i.e.*, generic) variation, but would reveal differences in rhythm, scope, and expression, the total of which would produce the synthetic character of one species as differing from the synthetic character of another. This has proved correct insofar as the species are known at present, although certain aspects of rhythm are exaggerated or, inversely, blurred by erratic taxonomy and by the tendency to create a new form not because of its marking some important combinational stage in the morphologic development of the species, but because of its coming from some new locality. New localities, however, are most welcome in themselves, for it should not be forgotten that immense areas, practically all of European and Asiatic Russia, as well as China, and numerous more limited areas in the pale-arctic and nearctic regions are more or less *terra incognita* in regard to these butterflies (although no doubt much precious material from there lies unsorted or misidentified in museums), so that one can still hope to obtain an *agnata* with white underside, a *subsolanus* as blue as *melissa*, and a *melissa* with a heavy vadium.

In delineating in this manner the principles I intend to follow in my subsequent discussion of racial variation in *Lycæides* species, I am guided among other things by the belief that the systematist may fare better when keeping to the all important morphological moment, than when giving comprehensive geographic names (the whole of China, the whole of the Moon) to hypothetical "populations" (a dreadfully misused term — and a hideous word, anyway) on the basis of half a dozen specimens taken by somebody between climb and cloud on some mountain thousands of miles away from the describer's desk.

## SEVERAL NEW SPECIES OF ENDOMYCHIDS (COLEOPTERA) FROM ASIA, AFRICA AND AUSTRALIA

BY H. F. STROHECKER  
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In the summer of 1939 I received from Dr. Hans Sachtleben of Deutsches Entomologisches Institut a small lot of endomychids with the request that I furnish identifications and describe any new species which might be represented in the material. After the invasion of Poland, I was asked to hold the specimens "until after the war."

Representatives of four new species of endomychids were included in the lot sent by Sachtleben, all four species of more than ordinary interest in that they extend considerably the known ranges of the genera to which they belong. Since the specimens were sent to me unconditionally, I feel free to describe the new species, together with two others from the collection already in my possession. The types of all the species described below are in the author's collection.

*Trycherus vittatus* new name.

In 1939 (p. 120)<sup>1</sup> I gave the name *Trycherus maculatus* to an unusual species from Nigeria. Erno Csiki of the Hungarian Museum called my attention to M. Pic's (1922 p. 9)<sup>2</sup> prior use of the name. From Pic's description it appears certain that two species are involved and I propose *T. vittatus* to replace *T. maculatus* Strohecker (not of Pic).

*Indalmus hirsutus* n. sp.

Type, male. Java.

This *Indalmus* has the general aspect of a species of *Pedanus* (Gerstæcker) but the character of its mandibles demands the generic placement given it here.

Head deep red, coarsely and sparsely punctured, with a broad and shallow longitudinal impression along the base of antenna.

<sup>1</sup>Strohecker, H. F. 1939. New Species of Old World Endomychidæ. Proc. Royal Ent. Soc. London Series B, 8: 118-120.

<sup>2</sup>Pic, M. 1922. Mélanges Exotico-Entomologiques 35:32 pp.

Eyes large and coarsely faceted. Antennæ with joint 1 stout, equal in length to joint 3, which is about equal to joints 2 and 4 together; joints 4-6 gradually diminishing in length, joints 6, 7 and 8 of about equal length. Joints 9-11 form a narrow, not much flattened club, which is only a little longer than the preceding three joints together. The mandibles are worn but distinctly prolonged at their tips. The outer lobe of the maxilla is moderately broad and very long, extending beyond the palp and acutely pointed, the inner lobe not more than half the length of the outer and very slender. Prosternal process narrow, not surpassing the front coxæ, which are globose and prominent. Pronotum slightly broader than its middle length, its front angles produced to the eyes and rounded. From the front angles the sides of the pronotum widen very slightly to their middle, then are constricted and run straight back to the slightly acute but not produced hind angles. Side margins narrow. Lateral sulci deeply impressed, a little divergent, ending behind the middle of pronotal disc. Transverse sulcus deep, almost straight. Surface of pronotum black, the edges reddish, clothed with a fine, recumbent, gray pubescence. Scutellum transverse, rounded behind. Elytra at shoulders a little broader than the pronotum, widening posteriorly. Sutural stria fine. Each elytron bears two transverse, reddish-yellow marks; the first just behind the shoulder, beginning at the side, then a little constricted in the longitude of the umbo, thence expanding rapidly posteriorly so that the spot is roughly foot-shaped. The posterior spot is equally removed from sutural and lateral margins. It is produced anteriorly into two broad, blunt processes and posteriorly into two equally broad but longer processes of which the inner is the longer and more pointed. The elytra, like the pronotum, are clothed with a fine, sparse, gray pubescence. The under surface is red except for the mesosternum, which is black. Legs black.

The single specimen available is a male as revealed by dissection of the genitalia. The only external feature which seems to be of accessory sexual nature is a small curvature of the middle tibiæ in their distal third. The last ventral segment is lightly rounded and shows no special characters. The last dorsal segment is also rounded and entire. Length 6 mm.

*Meilichius æneoniger* n. sp.

Type (sex undetermined). Nilgiri Hills, India.

A small, highly convex, glabrous and shining insect. Antennæ reddish-brown with joints 9 and 10 and the base of 11 infusate. Each of the first seven joints is about twice as long

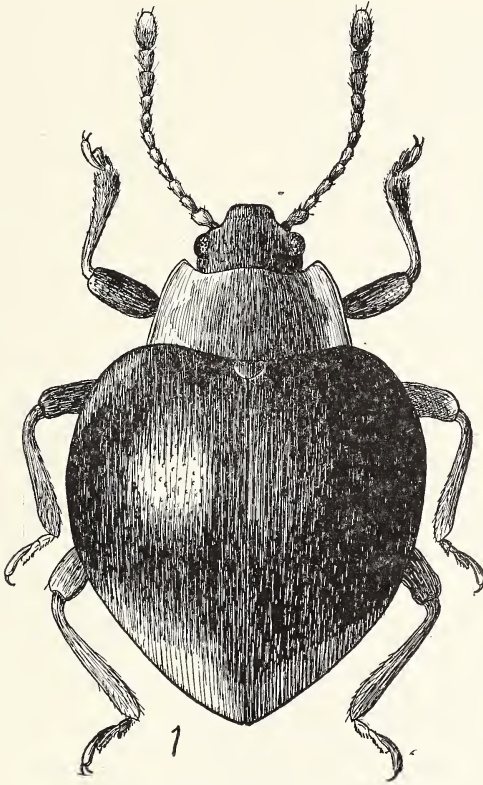


Fig. 1. *Meilichius æneoniger* n. sp., type.

as wide, joint 8 only a little longer than broad. Joint 11 almost equal to 9 and 10 together. Pronotum more than twice as broad as long, lightly convex, black with bronze luster, the margins pale. The pale area along the margin is expanded a little at the front angles and more decidedly at the hind angles. Surface of pronotum finely and sparsely punctured at middle, no punctures evident at the sides. Head bronze-black, clypeus, labrum and



palps reddish. The vertex is rather coarsely and thickly punctured and beset with hairs. Elytra strongly elevated and rounded, both in longitudinal and transverse directions, their side margins invisible from above, finely and sparsely punctured, rather strongly shining. The elytra are bronze-black except for the scapular and apical margins, which are pale. Legs reddish with exception of distal portions of the femora, which are fuscous. Under surface, including elytral epipleuræ, red-brown, the metasternum and median area of first abdominal segment black. Prosternal process exceptionally broad. Length  $3\frac{1}{2}$  mm.

*Milichius*, the transliteration of Gemminger and Harold, has been in vogue for this genus but the rules of priority would demand retention of the name as proposed by Gerstæcker. The occurrence of *Meilichius* in India, while not surprising, is noted here for the first time. Arrow did not find any specimens of the genus in the material studied by him and reported in the "Fauna of British India (Coleoptera, Erotylidæ, Languriidæ, Endomychidæ)."

In addition to the type there is another specimen of undetermined sex bearing the same data which is designated paratype.

*Ectomychus africanus* n. sp.

Type, male. "S. O. Kamerun, Lolodorf, L. Conradt 95."

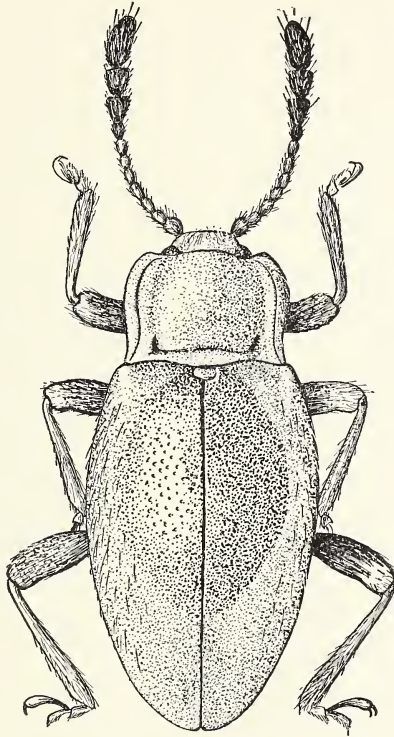
A small, uniformly reddish-yellow insect clothed with yellow, semi-erect hairs of moderate length. Its features are typical for the genus but the second tarsal joint is narrow and more like *Stenotarsus* than the genotype of *Ectomychus*, *E. basalis* Gorham. Head and thorax finely, evenly and rather closely punctured. The raised border of the pronotum is sharply defined internally and is narrowed a little posteriorly. The lateral sulci of the pronotum are almost straight, very slightly convergent anteriorly, not reaching to middle of disc. Pronotum sinuate at base, without transverse sulcus. Scutellum broadly triangular. Elytra together distinctly longer than broad, finely, evenly and densely punctured. Pro-, meso- and metasternum reddish, abdomen yellow and clothed with a long, sparse pubescence. The middle of the first abdominal segment bears a dense tuft of hairs, possibly a sexual feature. Antennæ one-third the length of body, yellow with the three club joints dusky. The ninth and tenth joints are angularly produced internally and all the

club joints are much broader than those of the funicle. The club closely approximates the funicle in length. The trochanter of the hind leg is angulate internally. Length 2.3 mm.

*Danaë nigrosignata* n. sp.

Type, male. S.E. Java.

In size, form and coloration (except elytra) this species is similar to the North American *D. testacea* (Ziegler). Antennæ



2

Fig. 2. *Danaë nigrosignata* n. sp., type.

about  $\frac{2}{3}$  as long as body, joints 2 and 4-8 nearly equal; joint 3 a little longer than 2; joints 9 and 10 obconical, a little flattened, each about as long as joints 7 and 8 together; joint 11  $\frac{2}{3}$  or  $\frac{3}{4}$  as long as 9 and 10 together. The first seven joints

of the antennæ red, joint 8 and the club black. Eyes coarsely granulate. Pronotum with the front angles obtuse, its sides evenly rounded, slightly constricted behind the middle, the hind angles acute and slightly divergent. Margin of pronotum moderately broad, very low. Disc of pronotum strongly convex, lateral sulci obsolete, basal foveæ deep, basal transverse sulcus broad and shallow. Elytra long oval, their sides evenly rounded, umbones perceptible but feebly elevated. Scutellum transversely oval. The most distinctive feature of the insect is a large, oval, black patch upon the elytra, in which feature it resembles *D. atronotata* Pic (from description) but the present species lacks pronotal markings. The prosternum is rather broad between the front coxæ, prolonged posteriorly beyond them as in *D. testacea* (Ziegler). The pronotum is sparsely and very finely punctured; the elytral punctures are sparsely placed and a little coarser than those of the pronotum. The specimen was probably pubescent over its entire surface but now shows a sparse covering of hair only at the sides of the pronotum and elytra. The under surface has a similar sparse pubescence except the central area of the metasternum. Length 3 mm.

From the exposed sixth ventral abdominal segment I think the specimen is a male but there are no sexual features apparent in the antennæ or legs.

*Saula serraticollis* n. sp.

Type, male. "S. O. Kamerun, Lolodorf, L. Conradt 95."

Reddish-brown with the exception of the eyes and last four antennal joints, which are black. Head with scattered, fine punctures. Eyes prominent, coarsely granulate. Head behind the eyes narrowed into a short neck. Antennæ surpassing shoulders of elytra by the length of last two joints. Joints 1-6 reddish-yellow, 7 dusky, 8-11 shining black, joints 9-11 forming a loose-jointed club. Joint 9 longer than broad; joint 10 a little broader than 9; joint 11 oval, its apex evenly rounded. Thorax broader than long, its front angles obtusely rounded. From the front angles the sides of the pronotum are expanded for a third of their length, then evenly but abruptly constricted, expanded again at the hind angles, which are acute and slightly produced. Transverse, basal sulcus almost straight, deeply impressed, lateral sulci absent. The entire surface of the pronotum is thickly, coarsely, subrugosely punctured. There is, on either

side of the pronotum behind the middle, a broad, transverse impression. Elytra twice as long as their breadth together, apices separately rounded, surface finely and evenly punctate. Scutellum broadly triangular.

The occurrence of *Saula* and *Ectomychus* in west Africa is unexpected and one is inclined to question the accuracy of the

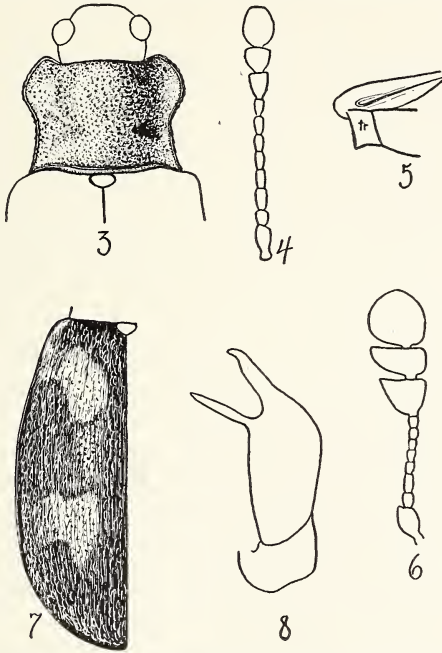


Fig. 3. *Saula serraticollis* n. sp., pronotum of type. Fig. 4. *Saula serraticollis* n. sp., antenna of type. Fig. 5. *Ectomychus africanus* n. sp., hind trochanter of type. Fig. 6. *Ectomychus africanus* n. sp., antenna of type. Fig. 7. *Indalmus hirsutus* n. sp., elytron of type. Fig. 8. *Indalmus hirsutus* n. sp., aedeagus of type.

attached labels. Particularly in the case of *Saula serraticollis*, however, the differences between it and the known species (all Asiatic) seem to indicate a long separation. The rugosity of the pronotal disc, and the constriction and fine serrations of the pronotal margins are all features peculiar to it. On the other hand there are apparent no characters worth generic recognition. The notable expansion of the second tarsal joint (in the Asiatic species of *Saula*) is not shown by the present species. Length 3.5 mm.



**Stenatarsus blackburni** n. sp.

Type, male. New South Wales, Australia.

Large for the genus, long oval in outline, decidedly convex, pubescent. Color purplish-brown with the edges of the pronotum lighter and with the humeri and a median spot on each elytron yellow. Labrum very short and almost truncate in front, clypeus transversely rectangular, the suture deeply impressed. Antennæ less than half the length of body, moderately stout; joint 1 abruptly expanded from the base, joint 2 transverse, joints 3, 4, 6 and 8 about as broad as long, 5 and 7 a little longer than broad, 9 evenly expanded from base to apex and about as broad as long, 10 somewhat transverse but a little longer than 9, joint 11 twice as long as and scarcely broader than 10, obliquely truncate at tip. Pronotum transverse, its elevated margin gradually narrowed from front to base, its sides parallel from base to middle then arcuately rounded to the obtuse front angles. Hind angles right. Base of pronotum broadly convex, transverse sulcus deeply impressed, lateral sulci obsolete but the basal foveæ very deep. Just behind the deep fovea the base of the pronotum is elevated into a blunt tooth. Pronotal punctures fine, shallow and sparse on the disc, indistinct at the sides. Elytra with the humeri prominent and yellow in color. On each elytron there is a broad, black band, which begins at the base and extends posteriorly beyond the middle, expanding behind the umbo to approach the lateral margin. Near the inner margin of this black band and a little in front of the middle of the elytron there is a yellow spot, edged with red. The inner margin of the black band is interrupted for the length of the yellow spot. The elytra are densely and finely punctured with seven rows of larger punctures which end behind the middle, the three rows on the disc indistinct, those on the sides more conspicuous and with larger punctures. Length 7 mm.

Very close to *St. ursinus* Gerstæcker in structure but differing much in coloration. The fifth and seventh joints of the antennæ are relatively longer than in *ursinus*. The name given the species is that of the Reverend T. Blackburn.

AN AMMOBÆNETES FROM NEVADA  
(ORTHOPTERA; GRYLLACRIDIDÆ)BY H. F. STROHECKER  
Kenyon College

A few years ago Ira LaRivers of Reno, Nevada sent me, with other Orthoptera, a fine series<sup>1</sup> of an undescribed species of gryllacridid. The specimens show the trimerous front and hind tarsi and crowded, long spurs on the hind tibiæ characteristic of *Ammobænetes* Hubbell (1936). I have given to the species the name of its discoverer, who has made careful studies of Nevada insects. The use of *spur* and *calcar* below is that of Hubbell (1936, p. 16).

*Ammobænetes lariversi* n. sp.

Type, male. Sand Spring Dune, Churchill County, Nevada, July 5, 1941.

Considerably smaller than the only other described species, *A. phrixocnemoides* (Caudell). Front with a low, broad carina; eyes moderate in size, rather protuberant. Front coxa with a small, lateral spine. All the femora are unarmed. Hind femur stout, tapering rapidly at its apical third. Front tibia somewhat spindle-shaped, convex above, below convex on basal half, plane on apical half. The armament of the front tibia consists of a pair of dorsal calcars (the anterior 2/3, the posterior 3/4 as long as first tarsal joint), a pair of ventral calcars (anterior equal to, posterior much longer than, first tarsal joint), three short, slender spurs on the ventrocephalic carina and four large, blade-like spurs on the ventrocaudal carina. Claws of front tarsus asymmetric, the anterior longer. Middle tibia with four slender spurs on each dorsal edge, four slender spurs on ventrocephalic edge and one on ventrocaudal edge. The left middle tibia has three ventrocephalic and one ventrocaudal spur. The calcars of the middle tibia are proportioned as those of the front tibia but are much smaller. Claws of middle tarsus symmetrical, about equal to the shorter claw of front tarsus. Hind tibia

<sup>1</sup>The specimens came to me in alcohol and were hardened in xylol before pinning.

broadest at its apical third, thence obliquely narrowed to apex, plane above. The dorsal surface of the tibia bears two small spurs on each margin, between which are small denticulations, and seven pairs of very long spurs (including dorsal calcars) on its apical third. Of these long spurs the more distal are sub-spatulate at the apex and those of the posterior or inner series

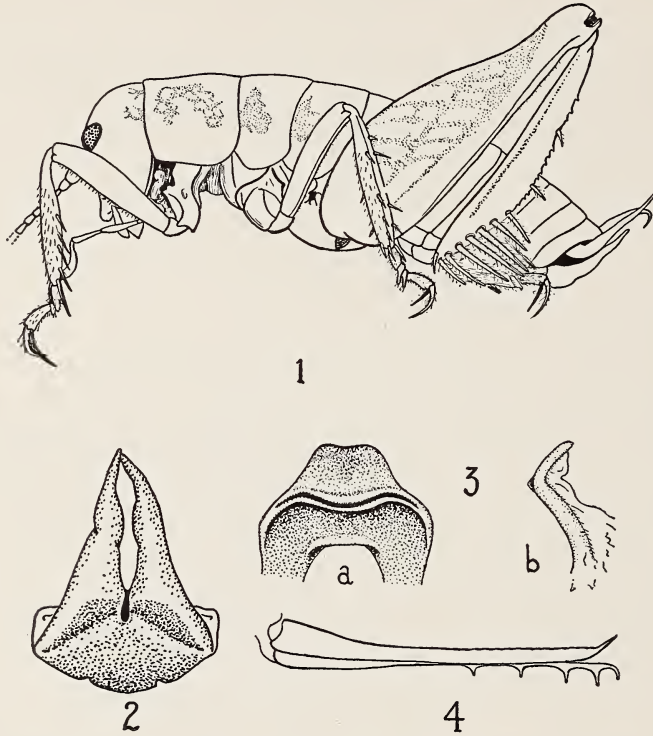


Fig. 1. *Ammobanetes lariversi* Strohecker. Type x10. Fig. 2. Subgenital plate of type. Fig. 3. Pseudosternite of paratype (a) posterior, (b) right lateral view. Fig. 4. Ovipositor of allotype.

are longer than those of the anterior. Ventral calcars of hind tibia short and slender. First joint of hind tarsus longer than the second and third together. Claws symmetrical, longer than claws of middle tarsus. Subgenital plate membranous, produced as two long, tapering processes. The color is pallid yellow-white with a slate colored band between the eyes on the front. The

sides of the head, thorax, first few abdominal segments, hind femur and tibia are marked irregularly with similar color.

Length of pronotum 2.6 mm.; of hind femur 8.7 mm.

Allotype: female. Data same as for type.

Similar to the type except in terminal abdominal structures and the following features: the left, front tibia has four ventrocephalic spurs; middle tibiæ each with three ventrocephalic and no ventrocaudal spurs. Subgenital plate entire, arcuately rounded. Ovipositor bulbous at base, rapidly narrowed in its proximal third, thence almost parallel. The dorsal margin of the upper valve is feebly crenulate in its distal half. The apex of the upper valve is upturned (about  $30^\circ$  from horizontal) and aciculate. The lower valve is equipped with four, widely spaced, slender teeth and a decurved, apical hook. Length of pronotum 3 mm.; of hind femur 9.5 mm.; of ovipositor 7.2 mm.

The series includes, besides the type and allotype, twenty males and forty-two females, all of which are designated paratypes. The entire lot was taken at Sand Spring Dune. Among the male specimens the minimum pronotal length (four specimens) is 2.5 mm., the maximum (one specimen) 3 mm. The other sixteen specimens all show a pronotal length 2.6–2.8 mm. The extremes of hind femur length are 8–10 mm., but sixteen specimens fall between 8.5–9.5 mm. Pronotal extremes among the females are 2.8–3.6 mm.; thirty-six of the specimens fall within the limits 3.0–3.5 mm. Similar data for the hind femur are: extremes 8.8–11 mm.; with thirty-five specimens within the limits 9.5–10.5 mm. For the ovipositor the extremes are 6.6–8.3 mm. All but three specimens fall within the limits 7.0–8.0 mm.

The number of ventrocaudal spurs on the front tibia is a fairly constant feature, probably generic rather than specific. Five specimens show five ventrocaudal spurs on one front tibia, one has five spurs on each front tibia while one specimen has only three such spurs on one of its front tibiæ. The dorsal armament of the middle tibiæ is also rather constant. Four specimens have five spurs in the dorsocephalic series while three specimens have five spurs in the dorsocaudal series. None has a 5–5 armament and in all cases the aberration is unilateral. It is not correlated with sex.



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## NEW NEOTROPICAL PHORIDÆ

BY CHARLES T. BRUES

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Most of the material dealt with in the present communication was contained in a collection belonging to the Entomological Department of Cornell University. This was sent to me for identification and the holotypes of the new species have been returned to the Cornell museum.

Several of the species were collected on the western slope of the Andes in central Peru by Professor J. C. Bradley when he visited the region with an expedition from Cornell University in 1920. Others were obtained during the same year, on the very interesting Chiloë Island, which lies in the Pacific Ocean, just off the Chilean coast.

One species collected some years ago in Cuba by the writer is included also.

*Diploneura* Liroy*Diploneura* (*Dohrniphora*) *pyricornis* sp. nov.

♂. Length 2.5 mm. Brownish testaceous; front black above, shading to pale yellowish brown below at the frontal margin; abdomen honey yellow with the extreme sides of the third and fourth tergites black; antennæ very pale, clear yellow; palpi and legs concolorous with the body. Front fully one-third wider than high, its surface smooth and noticeably shining but not punctate. Postantennal bristles very close together; lower transverse row of four bristles straight, the median bristles equidistant from one another and from the eye margin, the lateral bristles removed from the eye by a short distance; upper frontal row of four with the median pair very slightly higher than the lateral ones, each directly above the lower median bristles, but the lateral ones are very close to the eye-margin; ocellar row of four bristles, with the median ones much nearer to one another than to the lateral bristles. Ocelli in a very low triangle or curved line. Antennæ pyriform or conical, really more or less crescent-shaped, as the edge next the face is con-

cave and the outer one convex, about twice as long as wide; apex pointed and extending well beyond the lowest lateral frontal bristle, not noticeably enlarged. Arista clearly sub-apical, considerably thickened at the base, not much longer than the antenna. Postocular cilia small, the cheeks each with a very strong bristle; palpi not enlarged, densely beset with strong bristles below, near to, and at, the apex. Thorax very stout, the mesonotum very broad and weakly convex, considerably broader than long; its surface shining, with very sparse black hairs; one pair of widely separated dorsocentral bristles. Scutellum very short, more than three times as wide as long; with four marginal bristles of equal length, the median ones very widely separated. Propleura with a large bristle below the spiracle. Mesopleura entirely bare. Abdomen with the sixth tergite lengthened, its upper surface dull, without hairs except for four bristly ones near apex. Hypopygium very inconspicuous, its lamella strongly bristly. Front tibia with the usual four bristles, placed at the basal third, middle, apical third and near apex on the anterior surface; their tarsi simple, moderately slender. Middle tibiae with a hair-seam that extends to its middle as a very thin line; apical half of the tibia with five or six indistinct transverse comb-like rows of minute, white bristles; a pair of bristles, one on each side of the seam, near the base and an anteroventral one near the apex. Hind tibiae with a single dorsal hairseam, weaker toward the apex, and a similar weak series of comb-like bristles, with a series of four rather small bristles on the anterior face between the basal and apical fourth. Hind femora with a series of rather conspicuous curved hairs on the apical third of the lower edge. Wings slightly yellowish; veins brown, the third vein paler. Costa extending somewhat beyond the middle of the wing, its bristles short and closely placed; first section of costa two and one-half times as long as the second and third together; third less than half as long as the second (25:7:3); fork of third vein very acute; fourth vein weakly curved; fifth nearly straight; sixth very weakly bisinuate. Halteres yellow.

Type from "Upper Reaches" of Pachitea, Peru, July 21, 1920, Cornell University Expedition. Type in the Cornell Collection, a second male from the same locality has the abdomen darker above, with the third, and fourth tergites successively

more infuscated and with sharply pale bands along their posterior margins.

This species resembles *D. anterospinalis* Borgm., but differs in the wider front and conspicuously elongated, pointed antennæ of the male.

*Diploneura (Dohrniphora) opposita* Borgmeier.

Arch. Mus. Nac., Rio de Janeiro, vol. 25, p. 107 (1925)

A single female from La Sombre, Peru, August 22, 1920 (Cornell Univ. Exped.), agrees closely with Borgmeier's description of this species which is based on material from Petropolis, Brazil.

*Diploneura (Dohrniphora) monticola* Borgmeier.

Arch. Mus. Nac., Rio de Janeiro, vol. 25, p. 103 (1925)

One female from Bello Horizonte, Minas Geraes, Brazil, November 1919 (Cornell Univ. Exped.).

*Conicera* Meigen

*Conicera chiloënsis* sp. nov.

♂. Length 1.4 mm. Dark brown or piceous, the abdomen black. Pleuræ lighter, distinctly brown above and yellowish brown below. Legs quite uniformly dark brown. Wings slightly infuscated on the apical half; veins dark brown. Front considerably more than twice as broad as long, with only ten bristles, as the postantennals and lower laterals are absent. Antial bristles almost equidistant from one another and the eye-margin, slightly nearer to the latter; curved medially so that they cross one another, directed almost horizontally forward, as strong as the other frontal bristles. Four bristles in the lower frontal line placed near to the lower frontal margin and forming a transverse line that is slightly concave; the bristles equidistant, with the lateral one barely separated from the eye-margin. Ocellar row of four equidistant bristles. Surface of front subshining, slightly pollinose, without median groove. Third antennal joint broad at base, conical, with the upper surface concave so that the tip is crescent-shaped, not extending quite to the level of the top of the eye; arista long, pubescent, thickened basally. Eyes microscopically hairy, cheeks each with three rather weak bris-



gles; postocular cilia strong. Palpi small, with the usual bristles present, but of small size. Mesonotum rather dull, clothed with well developed sparse hairs; much narrowed behind; one pair of long, but not stout, dorsocentral bristles. Scutellum with two very long bristles. Mesopleura entirely bare. Surface of abdomen dull, the hypopygium shining, pollinose along the lower part of the sides. Wings hyaline, with a slight brownish tinge at the base and with distinct infuscation apically. Costa extending to .45 of the wing length; first section more than twice as long as the second (27:12). Costal cilia long, rather closely placed, fully as long as the width of the costal cell, the cilia of the upper series not extending beyond the tip of the first vein. Third vein simple; no indication of a fork. Legs rather slender, the tibiæ all clothed with minute bristly hairs, front tibiæ with a small, but distinct bristle on the anterior side at the basal third; middle tibiæ with an anterior bristle at the basal fifth and a dorsal one barely farther from the base; with a third anterior bristle just before apex. Hind tibiæ with four bristles; one posterodorsal, at basal fourth and another at apical third; one anterodorsal at basal fifth and another before the middle; in addition to these there is a dorsal bristle just before tip. Halteres piceous.

Type ♂ from Ancud, Chiloë Island, Chile, April 2-7, 1920 (Cornell Univ. Expedition).

This is a very unusual species, but agrees rather closely with two described by Schmitz from Patagonia. These he has placed in a separate group on account of the complete absence of post-antennal and lower lateral bristles, long decussate antial bristles and extensive bristling of the hind tibiæ. The present species differs strikingly by the longer second section of the costa which is much longer in the male than in males of the Patagonian forms.

#### Megaselia Rondani

##### *Megaselia* (*sens. str.*) *andicola* sp. nov.

♂. Length 1.4 mm. Black; lower portions of pleuræ piceous or very dark brown; antennæ piceous, with the inner surface of the third joint yellowish; palpi pale yellow; legs testaceous, although appearing darker on account of the black hairy covering, coxæ darker basally. Halteres pale yellowish brown. Wings hyaline, the heavy veins rather pale brownish. Front slightly,

but distinctly wider than high; four postantennal bristles, the lower pair not much shorter than the upper; antial bristles close to the lowest laterals, scarcely below them but much farther from the eye-margin; lower transverse row of four equidistant bristles slight bowed downwards medially; ocellar row as usual, large like the other frontal bristles. Ocellar tubercle and median frontal line well defined, the surface of the front sub-shining, distinctly white pollinose. Postocular cilia stout, of moderate length; cheek just below the eye with two stout downwardly directed bristles; three above these toward the antennæ small and delicate. Palpi small, flat, with moderately long bristles below toward apex. Third antennal joint large, but not noticeably swollen, rounded, the arista one-half longer than the front, with short pubescence. Proboscis very short, stout, bluntly pointed at its tip. Mesonotum shining, with fine pubescence. One pair of dorsocentral bristles set very close to the scutellar suture. Scutellum narrow, triangular, with two bristles. Pleuræ shining, but noticeably pollinose above, entirely without hairs or bristles, except two small bristles at the lower anterior corner of the propleura. Abdomen dull black, segments of approximately equal length, with a few weak, bristly hairs at the sides and a marginal row on the posterior margin of the sixth tergite. Hypopygium simple, cylindrical, appearing quadrate or somewhat tapering posteriorly in lateral view. Legs slender, including the hind femora which are three times as long as broad. Front tarsi slender. Middle tibiæ with the dorsal black line distinct at apex, with about eight weak setulæ just inside the dorsal line. Posterior femora slender, exactly three times as long as their greatest length. Dorsal hair-line of hind tibiæ complete, straight except for a slight angulation very near to the base; with a single postero-dorsal series of eight bristles, each about the width of the tibia. All tarsi very slender. Wings narrow, costa less than half the wing-length (70:31); its bristles delicate, moderately long and rather closely placed; first section of costa as long as the other two sections together; second section three times the length of the third (28:21:7). Third vein absolutely straight except beyond the very narrow cell formed by the very oblique second vein; fourth vein strongly curved at base, but nearly straight beyond; fifth vein curved near base, very slightly sinuous beyond; sixth sinuous; seventh practically straight.

One male from Matucana, Peru, May 27, 1929 (Cornell University Expedition).

Among the Neotropical species this is related to *M. obscurata* Enderlein to which it will run in Borgmeier's key (Rev. Entom., vol. 5, p. 441) but differs in the frontal chaetotaxy. In Borgmeier's earlier paper (Arch. Mus. Nac. Buenos Aires, vol. 25, p. 139) it falls near *M. stephanoidea* Borgm. and *M. concava* Borgm., from either of which it may be distinguished by the lengths of the costal divisions and it lacks the bristles present on the sixth abdominal tergite in *M. stephanoidea*, although this may be a secondary sexual character. It resembles also *M. opilionidis* Borgmeier, but the ovipositor is not chitinized and there are only two scutellar bristles.

*Megaselia* (*sens. str.*) *rimacensis* sp. nov.

♀. Length 1.7 mm. Front and abdomen black; thorax above dark fuscous; pleuræ lighter brown below; front legs and all coxæ pale yellowish; four hind legs brownish yellow with the hind femora indistinctly blackened at tips. Antennæ black; yellow-brown at the base of the third joint; palpi light brown. Wings hyaline, the heavy veins light fuscous; halteres honey yellow. Front subshining, not polished, with a deep median groove. Four postantennal bristles, the lower pair half as long as the upper ones and very much more slender; antial bristles inserted at the same level as the lowest lateral bristles and separated from them by less than one-third the distance to the upper postantennals; middle row of four bristles equidistant, curved downwards medially, the median bristles midway between the ocelli and postantennal bristles; third joint of antennæ much enlarged and flattened, at least as broad as two-thirds the height of the front. Palpi slightly flattened, with five or six rather small bristles. Mesonotum strongly convex, shining; one pair of dorsocentral bristles very close to the semi-circular scutellum, which bears one pair of widely separated long bristles and a single pair of minute hairs. Propleura with several bristles above and below, near the posterior margin. Mesopleura entirely bare, slightly roughened and dull on its upper portion behind. Surface of abdomen opaque above; second to fifth segments slightly decreasing in length; sides of second tergite with half a dozen bristly hairs at each side; all the tergites with a series of minute, bristly hairs along the

posterior margin, noticeably longer on the more apical tergites. Hypopygium small, its surface pruinose; rounded, with scattered, stiff, bristly hairs below and apically above; apical lamella pale yellow, with very weak scattered hairs. Legs slender, except the front tarsi which are comparatively stout although not really thickened. Hair seam on middle tibiae distinct only on basal half; the row of setulae extremely delicate. Hair seam of hind tibiae complete, straight, the setulae distinct, but very weak and closely placed. Costal vein slightly less than one-half the wing length (46:100); costal cilia moderately long, about equalling the length of the third section of the costa. First section of costa slightly more than twice as long as the second; third half as long as the second (35:17:9); fourth vein weakly curved, fourth and fifth each feebly bisinuate; seventh distinct, slightly curved.

Type and one paratype from Matucana, Peru, May 27, 1920. Matucana is in the valley of the Rio Rimac, about 4000 feet above sea level. Type in the collection of Cornell University.

This species is from the same locality as *M. andicola*, but is not very closely related. The tibial setulae are minute and the wing venation is very different. In Borgmeier's key (Arch. Mus. Nac. Rio de Janeiro, vol. 25, p. 139, 1925) it runs to *M. stephanoidea* Borgm. from which it differs by color and the much longer third costal section, while the entire costa is less than half the length of the wing. Among Enderlein's species as tabulated by Borgmeier, it resembles *M. obscurata* and related species, from which it differs at once by the more nearly equal first and second sections of the costa.

*Megaselia* (*s. str.*) *cavita* sp. nov.

♀. Length 2.2 mm. Head and thorax yellow, the ocellar triangle black and the front strongly infuscated, except the sides and the front margin. Abdomen black, suffused with fulvous over the medial portions of the second, third and fourth tergites; sixth tergite with a similar large pale area at each side. Legs and hypopygial projection testaceous. Wings faintly brownish, with strong dark venation. Halteres piceous. Front slightly, but distinctly wider than long, its bristles stout, but not especially long, surface rather shining; ocellar tubercle and median groove well developed. Two large postantennal bristles placed very close together; lower pair absent. Antial bristles on the



lower margin of the front, twice as far from the eye as from the postantennals and dividing the margin into three equal parts. Lowest lateral bristle far above the antial and much farther from the eye than usual. Upper transverse row of four bristles equidistant, forming a line that curves downward medially. Antennæ greatly enlarged, oval or slightly pyriform, as long as half the eye-height, considerably longer than wide; arista stout, as long as the head-height. Palpi small, flattened, with five moderately long bristles along the apical half of their outer edge. Two large downwardly directed bristles on the cheek, but none above these in front. Postocular cilia of moderate size. Mesonotum rather shining, with one pair of dorsocentral bristles. Scutellum broad, fully twice as wide as long, the posterior margin gently arcuate; four equal scutellar bristles. Propleura with several weak bristly hairs, next to the front coxa, and a few similar ones at the upper angle. Mesopleura entirely bare and shining above. Abdomen entirely devoid of any noticeable bristly hairs above, except for a few exceedingly minute ones at the sides of the second tergite, and a weak fringe at tips of the sixth and seventh tergites. Second to fifth tergites of about equal length; sixth noticeably longer. Hypopygium small, retracted, its median projection with unusually weak bristly hairs. Legs slender, including the front tarsi. Middle tibiæ with a very feeble dorsal line and a corresponding weak series of postero-dorsal setulæ; hind tibiæ with dorsal hair-line and a postero-dorsal series of 10-12 weak setulæ the longest of which are much shorter than the width of the tibia; hind femora slender, with no noticeable bristly hairs below. Costa reaching beyond the middle of the wing (100:57), its bristles closely placed, very short, not much longer than the width of the costal vein; first section of costa one-half longer than the second; third very short (48:32:5); cell formed by the second vein very small and narrowly ovate. Third vein widely separated from the costa at its middle as it is curved posteriorly and the first section of the costa is noticeably curved forward. Fourth vein evenly arcuate, not recurved at either base or apex; fifth vein sinuate; sixth very slightly so; seventh strong. Base of the third vein without bristles.

Type from the San Juan Mts., near Cienfuegos, Cuba, Jan. 1927 (C. T. and B. B. Brues).

*M. cavita* is conspicuous by the much enlarged antennæ of the

male which are longer than wide, differing in this respect from *M. amplipennis* Borgm. in which they are widened. From *M. furcella* End., also with enlarged antennæ, it differs by the nearly quadrate front and in the disposition of the frontal bristles. It resembles several other Neotropical species in the long costa, short fringe and the presence of four scutellar bristles. Among these it differs from *M. opilionidis* Borgm. by the bristling of the front; from *M. brasiliensis* Borgm. by the large antennæ; from *M. membranosa* Borgm. by the different wing venation; from *M. parvitergata* Borgm. by the absence of the lower pair of postantennal bristles. From the common *N. xanthina* Speiser and *M. scalaris* it is readily distinguished by the enlarged antennæ of the male.

*Megaselia* (*s. str.*) *femoralis* Enderlein

I collected a large series, representing both sexes in the San Juan Mountains in southern Cuba. Described from Brazil, *M. femoralis* has previously been taken in Panama and as far north as Costa Rica. The present record shows that it extends also into the West Indies. In some Cuban specimens the thorax is quite brownish above and the abdomen is very pale dorsally at the base, with suffused brown on the third to fifth tergites. The front may be brownish below, but always shows the highly polished steel-blue color above.

*Megaselia* (*Aphiochæta*) *asthenichæta* sp. nov.

♀. Length 1.5 mm. Black or very dark piceous, the anterior corners of the mesonotum and the anterior part of the propleura reddish brown; palpi and antennæ entirely black; mesopleura and metapleura irregularly stained with reddish brown; wings slightly, but distinctly infuscated; veins very dark brown. Legs strongly infuscated, especially the middle legs which have the extreme tip of the femora and tibiæ pale; trochanter testaceous; front tibiæ and base of hind femora yellowish testaceous. Halteres very light brown. Front narrow, one-fifth higher than wide, with distinct ocellar tubercle and unusually deep median frontal groove. Four postantennal bristles, the lower pair close together as usual; upper and stronger pair widely separated, as far from the median line as from the eye-margin, placed slightly higher than the antial bristles which are directly below the lowest lateral bristles, next to the eye and at the lateral angle

of the front; middle transverse row of four equidistant bristles forming a practically straight line, its lateral bristles placed midway between the lower and upper lateral bristles. Surface of front slightly shining, but not polished, sparsely clothed with short hairs, the frontal bristles large and stout. Antennæ small, with long, pubescent arista. Palpi very small, with three or four large bristles below. Cheeks each with three stout downwardly directed bristles below and a series of smaller ones extending upward to the antennæ. Postocular cilia of normal length. Mesonotum narrow, its surface shining, clothed with dense short hairs; one pair of dorsocentral bristles. Scutellum subtriangular, with four well developed bristles. Propleura with two stout bristles at the lower anterior angle and one just below the spiracle. Mesopleura with a patch of hairs above and a conspicuous bristle of moderate size, clearly smaller than the frontal bristles; also with a smaller bristle just below the edge of the mesonotum. Abdomen narrowed apically, none of the tergites lengthened, without any bristly hairs above except just before the small, retracted hypopygium; sides of abdomen with sparse bristly hairs, larger on the second segment. Front tibiæ bristly on the dorsal surface, but without any distinct linear series; front tarsi stout, but not conspicuously thickened. Middle tibiæ with a dorsal hair-seam extending almost to the apex, and a posterodorsal series of setulæ, about eight in number, each approximately as long as the width of the tibia; a few anterodorsal setulæ for the basal half. Hind tibiæ with complete dorsal hair-seam and a series about eleven postero-dorsal setulæ, these large and stout, as long as the width of the tibia, except the several ones at the base which are very small and weak; no antero-dorsal setulæ. Wings narrow, nearly three times as long as wide (64:23); costal vein long, extending beyond the middle of the wing (55:100); first division nearly as long as the second and third together, third more than one-third as long as the second (30:24:9). Fringe moderately long, the bristles about equal to the second vein in length. Fourth vein feebly, evenly curved, except for a sharper bend near the base. Fifth vein sinuous, more distinctly bent just before the middle; sixth sinuous; seventh very slightly so. Third vein with a single bristle at the extreme base.

Type from Puerto Bermudez, Rio Pichla, Peru, July 18-19, 1920 (Cornell University Expedition).

This species differs from most of the Neotropical species of the subgenus *Aphiochæta* by the presence of four scutellar bristles in combination with a large bristle on the mesopleura. It resembles *M. luteicauda* Borgm. and *M. pteryacantha* Borgm. in having a bristle at the base of the third vein, but differs by the black palpi, entirely black abdomen and narrower front. From *M. pilipleura* Borgm. it differs in color, size and frontal chætotaxy. From *M. angustifurcate* it differs particularly in wing venation and also by the black antennæ and palpi. In general habitus *M. athenichæta* resembles *M. minor* Zett. although structurally very different.



NOTE ON THE HABITS OF *OSMIA GEORGICA*  
CRESSON<sup>1</sup> AS ASCERTAINED BY THE  
GLASS-TUBE METHOD

BY CARL G. HARTMAN, assisted by  
PAUL and PHILIP HARTMAN and CARL RETTENMEYER

In the summer of 1940, at "Holiday Heights" in Bethlehem, Conn., while amateurishly taking snap-shots and motion pictures of solitary bees and wasps, we were favored by visits of any number of individuals of *Osmia georgica* females to our glass-tube domiciles. We were able to observe, through the transparent walls of the tubes, the domestic activities of the bee, including the manner of making "bee-bread" and laying the egg upon the accumulated mass. Fabre used this method with *Osmia tridentata*, not so much for habit studies as to determine the sequence of the sexes of the offspring and the "control" of sex by the female according, as Fabre believed, to the conditions imposed by the experimenter — a line of investigation as significant today as it was forty years ago, when the senior author's preceptor, Dr. William Morton Wheeler, first discussed the subject with his students.

As the writers find, in any of several books (1) on the life of the bee, no statement concerning the manner in which bee-bread is compounded, it seemed desirable to prepare a note on what we saw in our glass tubes of certain essential activities of this delightful little insect.

Our *Osmia* worked in a glass tube having a bore of 4 to 5 mm. — large enough to work in but too narrow for her to turn around. When the latter was necessary, as when changing from honey deposition to pollen brushing, after invariably trying at least once to turn around within the tube, she would back out, turn around at the entrance on our adhesive-type platform provided for a landing place, and return tail first. This habit is mentioned by Fabre (2) also. It is probable that all tube-filling bees and wasps react to narrow passages in an identical manner,

<sup>1</sup>Thanks are due Dr. H. H. Ross, Illinois State Natural History Survey, Urbana, for kindly identifying the specimen.

for we have seen it so often in various species that we take for granted that insects generally are masters of the situation mentioned.

Storage of bee-bread proceeds with our *Osmia* in a different manner from that described by Fabre for *O. tridentata*. This French species places the honey in the center and surrounds it with pollen; the outer mass remaining dry. The egg is laid in the central portion, where the newly hatched grub first comes upon it: "for the new-born, dainty bread and honey; for the adolescent, just plain dry bread." (2)

Not so with the Connecticut *Osmia* observed by us — her offspring receive bread and honey, thoroughly mixed, throughout their larval life. This follows of necessity from the manner in which the bee applies the honey and the pollen on each and every trip. Entering the nest head-first on her return from a foraging expedition, she proceeds at once to the bottom of the cell and smears the regurgitated honey initially over the partition just built, then on the growing mass of provender. The deposition of honey requires much longer than one might expect, a fact discovered in viewing scenes in the motion picture.

The honey thus applied provides a sticky surface suitable for holding the dry pollen brushed over it. After turning around in the manner indicated above, the bee backs down the nest as far as possible and scrapes the pollen from her abdomen with her hind legs, a procedure which engages her about as long as the deposition of the honey. Thirty-five to forty trips were counted several times (by C. R.) for the storage of a single cell.

To lay the egg the bee backs in and touches the bee-bread with her abdomen. After numerous abdominal contractions (on which the breathing movements are superposed, as in the case of *Trypoxylon* and *Odynerus*) the relatively large egg is expelled and stuck by one end to the mass of provender.

Leaf pulp is used for building the partitions and closing the nest. As witnessed on several occasions by the younger members of the party, the bee scrapes the material from the upper surface of leaves, rolling it (doubtless mixed with glandular secretion as cement) into the usual rounded pellet for ease of carrying. Front legs and mandibles constitute the tools after the manner of most hymenopteran artisans; but one gets the impression from the way the bee doubles up around the struc-

ture being built, so long as this is possible, that the abdomen at times also functions in the building, as seen by Fabre in the case of *O. tridentata*, a species which, however, uses mud as its building material.

After the partition is completed, the next step is not immediate resumption of foraging among the flower blossoms, but instead laying off a "building line" for the next partition. This preliminary structure, made of mud by *O. tridentata*, of leaf pulp by our *Osmia*, is a ring of the material applied to the glass tube at the appropriate place, to "mark off," so it looks to the observer, the limits of the next cell.

When first seen at this work the bee was working with her head outward, tail inward. She had gathered new leaf pulp for the purpose and backed into the cell. With her tail touching the last partition she was laying off the site of the next one, not yet needed; and the whole process looked as though she were measuring with her body, thigmotactically, as it were. Indeed, our notes contain the words "Is she measuring?", an expression Fabre had used fifty years before in connection with *tridentata*.

Parenthetically be it remarked that nowhere in the field of animal behavior is more anthropomorphism exhibited than among students of the solitary hymenoptera. Fabre himself has a unique way of setting up straw effigies of teleology and anthropomorphism, only to knock them down. With the latter he is quite successful but, being an advocate of the notion of perfection and invariability of instinct, his preconceived teleological explanations sometimes find justification in "appropriate" experiments.

All would be well with the idea of *Osmia's* "measuring" were it not for the fact that she seldom works with the body oriented as indicated! More usually she works with tail outward, not inward; nor does she leave the next to secure the few loads of material needed for the ring. Instead, she filches the "mortar" from the finished partition, backing up with each mandible-ful to apply it to the circular line in question. Under such circumstances there is no suggestion of "measuring" even to anthropomorphic eyes.

The last cell is usually empty; that is, there are usually two closing partitions, the outside one, which is flush with the end of the tube, being generally the thickest of all.

## References

- <sup>(1)</sup>H. Bischoff, *Biologie der Hymenopteren*, Berlin, 1927.  
H. Friese, *Die europäischen Bienen*, Berlin and Leipzig, 1922.  
Ch. Fertou, *La vie des Abeilles et des Guêpes*, Paris, 1923.
- <sup>(2)</sup>J. H. Fabre, *Bramble-bees and Others*. A. T. de Mattos, trans. New York, 1922.



MILLIPEDS PRINCIPALLY COLLECTED BY  
PROFESSOR V. E. SHELFORD IN THE  
EASTERN AND SOUTHEASTERN STATES <sup>1</sup>

BY H. F. LOOMIS  
Coconut Grove, Florida

In 1942 and 1943, Professor V. E. Shelford, University of Illinois, Champaign, Illinois, made extensive collections of millipeds in many of the states east of the Mississippi, with some collecting having been done in northeastern Mexico in 1942. These collections were sent to me for study, the result of which constitutes a large part of this paper. Records of established species have been limited to specimens that could be completely identified; no records of females or immature specimens, of which there were considerable numbers referable only to the genus, have been included as they appeared to be of little faunistic value. Descriptions of several new forms collected by others have been included in the paper but where a collector is not named in connection with any species, new or old, he is understood to have been Professor Shelford.

Type specimens are deposited in the Museum of Comparative Zoology, Cambridge, Massachusetts. Paratype specimens, where available, have been deposited in the U. S. National Museum.

*POLYZONIIDÆ*

*Polyzonium bivirgatum* (Wood)

S-1041, Durham, N. C., July 28, 1943; S-2294, Owego, N. Y., Oct. 20, 1943.

*ANDROGNATHIDÆ*

*Andrognathus corticarius* Cope

S-1952, Crittenden, Ky., August 6, 1943.

<sup>1</sup>Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

## CLEIDOGONIDÆ

*Pseudotremia sublevis* sp. nov.

One male (type) and a dozen other specimens including mature females and juveniles collected in Tony's Cave, Giles Co., Virginia, May 9, 1943 by H. W. Jackson, Virginia Agricultural Experiment Station, Blacksburg, Virginia.

*Diagnosis:* In the *princeps* series but with even fewer dorsal tubercles than found in *P. valga* and with less prominent shoulders than other species in the series; gonopods differing from all other species.

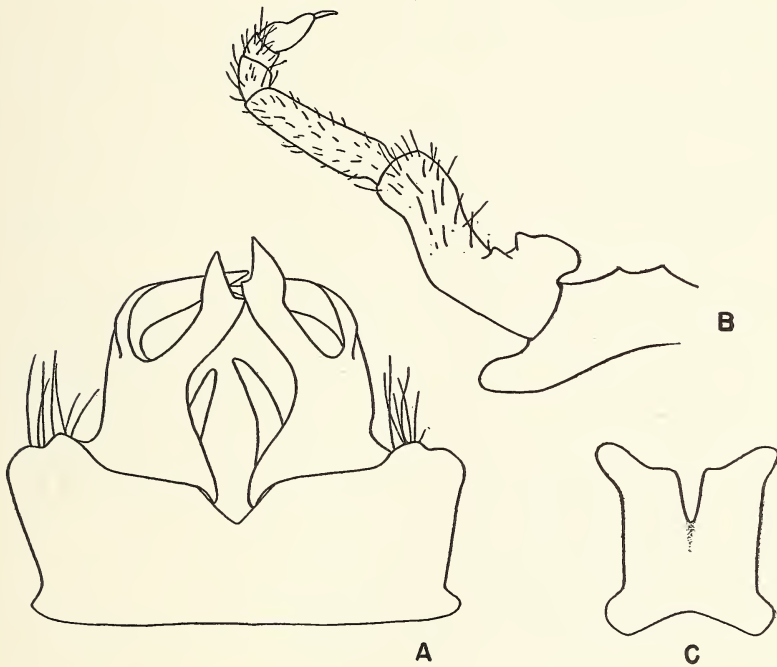


Fig. 1. *Pseudotremia sublevis*. a, Gonopods; b, Ninth leg; c, Bifid laminae.

*Description:* Size large, exceeded only by *princeps*, maximum length 30 mm.; body cylindrical, not rapidly reduced in width at either end, the females even less fusiform than the males with body widest at about segment 9 or 10; color slate blue-gray.

Ocelli 18 or 19, in 6 series paralleling the back margin of the head, 4, 4, 4, 3, 2, 1; counting forward, 5, 4, 4, 3, 2, 1.

First segment with lateral limits sharply angled, not at all swollen; shoulders of segment 2 small but thereafter increasing in size and thickness to segment 6 or 7 after which their prominence decreases and no definite shoulders are evident after segment 20; none of the shoulders elevated as in *princeps* or *simulans*. In the type, tubercles are present adjacent to the shoulders as far forward as segment 7 or 8; but in the other specimens the dorsal surface of segments smooth and shining and with no tubercles on the anterior half of the body and with only a few small indistinct ones near the posterior margin adjacent to the shoulders of segments at the third quarter of the body behind which none are present, the tubercles small and most of them appear to be preceded by a tiny longitudinal ridge; dorsal setæ short, stiff and acute.

Gonopods, ninth leg, and bifid lamina of the gonopods shown in figure 1, *a*, *b* and *c*.

Males with sub-tarsal pads on all legs except the last four pairs.

#### LYSIOPETALIDÆ

##### *Spirostrephon lactarium* (Say)

M-1782, Gainesville, Fla., July 23, 1942; M-1794, Standing Stone Park, Tenn., July 7, 1942; M-1775 and M-1797, Gatlinburg, Tenn., July 7 and 8, 1942; M-1808, De La Howe, Ga., July 10, 1942; H-72, De La Howe Forest, McCormick, S. C., Dec. 17, 1942; S-518, Haleyville, Ala., July 17, 1943; S-850 and S-858, Pisgah Forest, N. C., July 21, 1943; S-1864, Olive Hill, Ky., Aug. 5, 1943.

##### *Spirostrephon texensis* Loomis

S-434, Urania, La., July 14, 1943.

#### IULIDÆ

##### *Ophiulus pilosus* (Newport)

M-1798 and M-1800, Standing Stone State Park, Tenn., July 5, 1942; M-1387, De La Howe, Ga., July 10, 1942.

#### NEMASOMIDÆ

##### *Nemasoma sayanum* Bollman.

M-1787, Standing Stone State Park, Tenn., July 5, 1942.

## PARAIULIDÆ

*Saiulus canadensis* (Newport)

S-1501, Durbin, W. Va., August 1, 1943; S-2209, Rochester, N. Y., October 17, 1943; S-2280, Owego, N. Y., October 20, 1943; S-2356, Ludlow, Pa., October 21, 1943.

*Ptyoiulus pennsylvanicus* (Brandt)

S-2293, Owego, N. Y., October 20, 1943; S-2356, Ludlow, Pa., October 21, 1943; S-2406 and S-2447, Marienville, Pa., October 21, 1943.

## SPIROBOLIDÆ

*Arctobolus dolleyi* Loomis

S-349, Urania, La., July 14, 1943; S-515, Haleyville, Ala., July 17, 1943.

*Arctobolus marginatus* (Say)

S-805, Barnardsville, N. C., July 20, 1943; S-1269, Monterey, Va., July 30, 1943; S-1641, Mt. Lake, Va., August 3, 1943.

*Arctobolus keysi* sp. nov.

The single male, type, collected May 12, 1944 at Lantana, Florida, by Alfred Keys for whom it is my pleasure to name this handsome species.

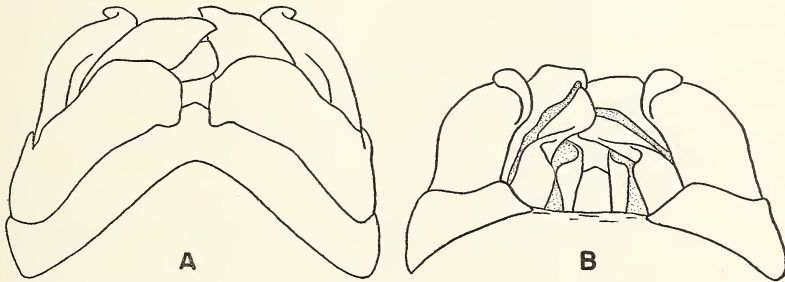


Fig. 2. *Arctobolus keysi*. a, Gonopods, anterior view; b, Gonopods, posterior view.

*Diagnosis:* Coloration different from any other known member of the genus and with gonopods structurally distinct.

*Description:* Length 73 mm.; 47 segments. Living color generally light fawn brown or light khaki with the hindfelt of the



segments slightly darker; narrow anterior margin of the first segment from behind the eyes across its middle bright terra-cotta, as also are the apex of the last segment and adjacent margin, margins of anal valves and the apex and free margins of the preanal scale; eyes black; antennæ and legs dark horn brown.

Head with ocelli in five series paralleling the antennal socket — 6, 8, 9, 8, 7; clypeus having six setigerous fovea on each side; cardo of mandibles deeply concaved to receive the antennæ, its lower edge high, forming an acute crest, lower anterior corner produced forward into an acute lobe.

Anterior margin of first segment slightly produced forward for a short distance on each side just below the eye; lower limits narrowly rounded. Second segment with downward projection narrow. Surface of body finely and rather sparsely punctate, the punctæ slightly more numerous on the hindbelt.

Gonopods as shown in figure 2, *a* and *b*.

Seventh segment long at the middle ventrally, not in the least elevated, completely hiding the gonopods within the body.

Coxæ of legs 3, 4, and 5 produced into moderately conspicuous simple conic lobes; coxæ of legs 6 and 7 with smaller lobes.

#### RHINOCRICIDÆ

##### *Rhinocricus potosianus* Chamberlin

M-1789, south of Mante, Mex., August 6, 1942.

#### XYSTODESMIDÆ

##### *Aporiaria deturkiana* Causey

M-1772 and M-1806, Gatlinburg, Tenn., July 7 and 8, 1943;  
M-1771 and M-1785, Smoky Mts., Tenn., July 8, 1943.

##### *Zinaria cala* Chamberlin

M-1778, San Velasco Hammock, Gainesville, Fla., July 24, 1942.

#### *Cheiropus* gen. nov.

*Diagnosis*: Related to the group of millipeds placed by Chamberlin under *Zinaria*, but with the outer arm of each gonopod relatively stouter, the inner division of its apex expanded and much larger than the outer division.

*Description*: Body large, with the dorsum moderately convex and with overlapping lateral carinæ. Gonopods relatively small

as compared to the size of the body; distal arm of each nearly straight in vertical view, stout, paralleling the opposite arm and terminating in two divisions which together bear some resemblance to a cupped hand with its palm outward and opposed by the thumb.

Type: *C. plancus* spec. nov.

*Cheiropus plancus* spec. nov.

Two males, one the type, from Thomasville, Ga., July 27, 1942, collected from "climax magnolia-beach" woods, No. M-1810; another male, Gainesville, Florida, July 24, 1942, collected in hammock, No. M-1779.

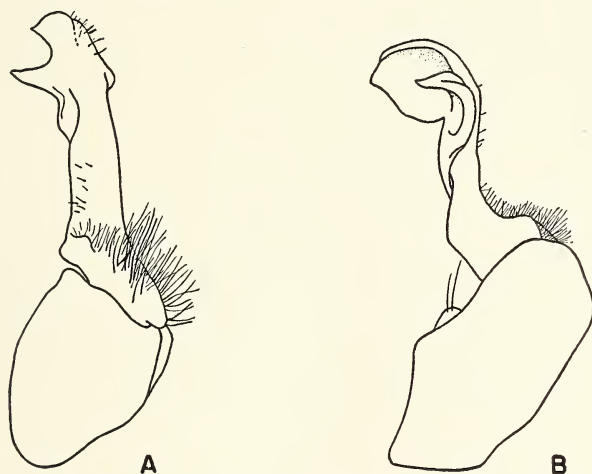


Fig. 3. *Cheiropus plancus*. a, Left gonopod, posterior view; b, Left gonopod, outer lateral view.

Length 38–40 mm., width 10 mm. Surface of dorsum quite coarsely coriaceous. Head and antennæ brown, legs white; segments with dorsum brown except along posterior margin, the back half of the lateral carinæ and their outer portion in front.

Gonopods as shown in figure 3, a and b.

Fourth sternum of the male narrow, scarcely exceeded by the fifth which is definitely narrower than those following; none of the anterior sterna with tubercles. In one male the posterior sternum of the segments back of the middle of the body has a

tiny conic tubercle behind, near the coxal joint of each leg. In the other 2 males there are no sternal tubercles. Following the gonopods the first joint of the legs has a small, slenderly conic tubercle at the ventro-distal limit in 2 males but not in the other; spine at end of second joint of the legs long and slender.

*Cleptoria shelfordi* sp. nov.

A single male (M-1780) collected in cruising oak-pine woods, De La Howe Forest, Station 11, Georgia, July 10, 1942.

*Diagnosis:* As with most species in this family, *shelfordi* differs principally from its relatives in modifications of the gonopods.



Fig. 4. *Cleptoria shelfordi*. Left gonopod, posterior view.

*Description:* Body strongly arched, 58 mm. long and 13 mm. wide; posterior edge of lateral keels slightly overlapping the anterior edge of the ensuing ones; dorsal surface finely coriaceous.

Color of dorsum light brown (in alcohol) to the base of the lateral keels which are colorless; head generally light brown with the antennæ considerably more dilute brown; legs and ventral surfaces colorless.

Gonopods as shown in figure 4.

Sternum between the fourth legs narrow, with two small, high tubercles mesially in contact; fifth sternum wider and

with a pair of broader, lower, well separated tubercles; sixth sternum with a pair of small tubercles; seventh sternum with fainter elevations bearing a few stiff, erect setæ; sternum immediately behind the gonopods with two small, separated clusters of erect setæ; anterior sterna of segments 9 to 17 usually with a small, faint tubercle on either side behind, adjacent to the leg; posterior sterna with a more prominent tubercle in the same relative position.

Beginning near the middle of the body the first joint of the succeeding legs has a small conic tubercle at the disto-ventral limit; second joint of all legs with the customary spine long and stout.

A remarkable peculiarity of the type is that the eighth segment, which appears normal in other particulars, is without any suggestion of legs.

*Mimuloria georgiana* (Bollman)

S-516, Haleyville, Ala., July 17, 1943.

*Apheloria coriacea* (Koch)

S-993, Durham, N. C., July 28, 1943.

*Apheloria trimaculata* (Wood)

S-1642 and S-1797, Mt. Lake, Va., August 3 and 4, 1943;  
S-2228, Ithaca, N. Y., October 18, 1943.

*Rhysodesmus viabilis* Chamberlin

M-1770, north of Mante, Mexico, August 7, 1942.

*Stelgipus* gen. nov.

*Diagnosis*: Possibly related to *Dynoria* but differing in the form of the gonopods which are large, relatively short and heavier than in any other genus of the family.

*Description*: Size above average; dorsum moderately convex. Gonopods large, the distal joint short, stout, curving toward the body and broadest at the apex. Sterna and first joint of legs, behind the middle of the body at least, with conic tubercles; sterna of mid-body segments with grouped setæ.

*Type*: *S. agrestis* sp. nov.

*Stelgipus agrestis* sp. nov.

The type, a male, was dead and completely bleached when found by the writer in a field of goldenrod at Waynesboro, Ga., June 1943.



Length 36 mm., width 10 mm. Dorsum somewhat flattened, broadly convex, the surface slightly coriaceous, lateral keels thin with pores on upper surface. First segment with lateral limits extending somewhat further ventrad than in any species of related genera, much exceeding the keels of the ensuing segments.

Gonopods of the form shown in figure 5, *a* and *b* with the apical arms crossing each other when at rest.

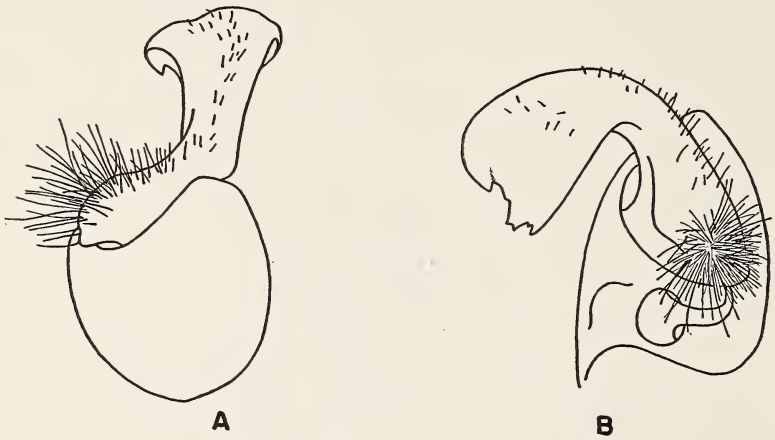


Fig. 5. *Stelgipus agrestis*. *a*, Right gonopod, posterior view; *b*, Right gonopod, mesial view.

Basal joint of legs behind middle of body with a small acute apical tooth below; second joint of all legs with the usual disto-ventral spine well developed.

Sternum between the third legs narrow and occupied by two small, round, contiguous tubercles; fourth sternum wider, with two small conic tubercles slightly separated and bearing one or two stiff setæ; ensuing sterna wider and without tubercles; all sterna from segment 4 to the middle of the body with a transverse oval area containing a few small setæ; from segment 8 caudad the posterior sterna have a small, broadly conic tubercle near each leg, the anterior sterna with smaller tubercles only on segments behind the middle of the body; sterna behind the gonopods slightly narrower than in related genera.

*EURYURIDÆ**Euryurus falcipes* Loomis

S-1949, Crittenden, Ky., August 6, 1943.

*POLYDESMIDÆ**Polydesmus erasus* Loomis

M-1529, M-1777, and M-1793, Standing Stone Park, Tenn., July 5, 1942.

*Polydesmus serratus* Say

S-1079, Greenlea, Va., July 30, 1943; S-1270, Monterey, Va., July 30, 1943; S-1332 and S-1500, Durbin, W. Va., Aug. 1 and 2, 1943.

*Polydesmus moniliaris* Koch

S-1417 and S-1585, Durbin, W. Va., Aug. 1 and 2, 1943; S-1643, Mt. Lake, Va., August 3, 1943.

*Lasiolathus virginicus* Loomis

S-1941, Crittenden, Ky., Aug. 6, 1943; all young specimens.

*STIODESMIDÆ**Ilyma cajuni* sp. nov.

Seven specimens, including three mature males (1 the type) collected under bark of orange trees at Venice, La., February 17, 1944 by Morris Gordon, Division of Foreign Plant Quarantines, Bureau of Entomology and Plant Quarantine.

*Diagnosis:* The great development of the two median rows of tubercles of the penultimate segment into a backwardly produced lobe that far surpasses the tip of the last segment distinguishes this millipede of the Cajun country from its Mexican relatives.

*Description:* Body white or light yellow but the vertex of head and metazonites with what appears to be a light but general accumulation of dark organic matter adhering to the surface; dorsum high and very strongly arched with lateral keels projecting outward almost horizontally from very low on the sides, their outer extremities at the same level as the coxæ; length of male 7.5 mm., female 8 mm.

Head with vertex abruptly raised on either side of the median line into a narrow tongue-like elevation rounded in front adjacent to the antennal socket with its outer limit behind con-

tinued as a low granular ridge curving outward far behind the antennal socket and ending in a distinct angulation at the side of the head; front and clypeal area smooth and hispid; labrum broad, the front margin straight across.

First segment with the rather short anterior margin projecting horizontally at almost a right angle to the strongly convex disc, the margin divided into ten rounded scallops separated by acutely angular indentations, the outer scallop on each side

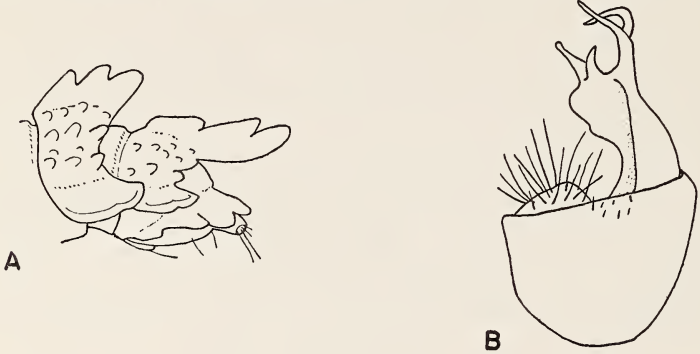


Fig. 6. *Ilyma cajuni*. a, Segments 18, 19 and 20, lateral view; b, Gonopod.

largest; disc with anterior row of four large tubercles and a posterior row of six similar ones, the surface elsewhere with scattered small granules; posterior margin with about 18 small tubercles projecting backward from it.

Segment 2 with keels projecting at right angles to the long axis of the body, not produced forward; three lobes on the outer margin but only two lobes on the outer margin of the keels on all segments thereafter except the poriferous ones where the posterior lobe is replaced by the large, slenderly conic, truncated pore process.

Segments with four major dorsal longitudinal series of tubercles, three tubercles in each row; the outer row of tubercles on each side less conspicuous than the inner row; small scattered granules present between the large rows of tubercles; keels without tubercles or granules. On segments 17 and 18 the outer rows of large tubercles are reduced in size and are almost lacking from segment 19; on segment 18 the two inner rows of tubercles are enlarged and also are slightly produced beyond the

posterior margin; on segment 19 these tubercles are flattened and elongated into a process considerably exceeding the tip of segment 20, as shown in figure 6, *a*, and hiding all but the lateral lobes of it from above, the groove between the two produced series of tubercles broad but shallow, the terminal sinus shallow; posterior margin of segment 20 with six distinct lobes or crenations of which the median two are smaller than the two in either side; subapical cone with four long central setæ and with two much shorter setæ laterad of them on either side.

Gonopods somewhat resembling those of *I. morila* Chamberlin as shown in figure 6, *b*.



## WINGS OF THE MOURNING CLOAK BUTTERFLY SNIPPED BY ANT

BY ARTHUR LOVERIDGE

When passing the stump of a silver birch at noon, I noticed that it was oozing sap from two spots where poles had been cut recently. On each was a Mourning Cloak Butterfly (*Euvanessa antiopa*). One was drinking the sap quietly, the other moved about restlessly and continually flapped its wings. Approaching closer I saw that several ants (subsequently identified for me by Dr. W. M. Wheeler as *Camponotus herculeanus ligniperda* var. *noveboracensis* Fitch) were running about and around the butterfly. One ant in particular seemed to be annoying the butterfly by climbing on its abdomen. This caused the insect to flap its wings violently until the ant decamped. It soon returned and reaching up began biting at the inner posterior edge of the butterfly's hind wings. I now saw for the first time how ragged the wings were at this place, and as I watched, first one and then another piece of wing floated away on the gentle breeze that was blowing. Then I realized that the ant was snipping off pieces. Another ant ran up and touched the butterfly's proboscis, causing the butterfly to draw it up and move about for a time before settling to feed again. Then a wasp (*Polistes* sp.) alighted near the butterfly and fed up to its very flank. At that the butterfly, without ceasing to feed, flapped its wings down and held them so for a moment. The wasp just crouched flat beneath them until they were raised again, then went on with its own meal. I had an excellent view of its action under the wing as my face was level with the stump and a bare eighteen inches away. Then an ant, hurrying up, seized the wasp by one leg; they rolled over and over until they fell off the stump to the ground a foot below. There they separated and the wasp, in leisurely fashion, crawled up the stump and recommenced feeding. I moved slightly but enough to startle the Mourning Cloak, which must have been about full fed by this time, and she flew off (Newton Centre, May 12, 1935).

## CADDIS FLIES (TRICHOPTERA) AND PITCHER PLANTS

BY LORUS J. MILNE AND MARGERY J. MILNE  
University of Pennsylvania and Beaver College

Do caddis worms ever live in the leaf pitchers of pitcher plants? Is the microhabitat formed by the water in a pitcher plant leaf suitable for the larval stages of Trichoptera? This question is opened by the discovery of cases, adults and living eggs of Trichoptera in leaves of the pitcher plant, *Sarracenia purpurea*.

During casual inspection of pitcher plant leaf contents, larval cases obviously of trichopterous origin were discovered in late July at Robinson's Lake, near Irondale (Haliburton County), Ontario, Canada, by the writers. This is a hilltop lake, lying in a rocky depression, fed by rains and emptied by evaporation or by overflow if the level rises sufficiently to reach the low rim. The margins of the lake are largely boggy, where Sphagnum has built a floating web enmeshing waterlogged stumps, half rotted trunks and on which grows a dense mass of laurel and cranberry, with round-leaved sundew and pitcher plants in clumps at intervals. The water of the lake is very dark coffee colored, and the bottom is a tangle of waterlogged branches from trees.

The first cases discovered were in dead, closed pitchers at the base of plants at least eight inches above lake level. The cases were dry and empty. The writers immediately postulated that the caddis worms must have crawled into the pitchers at some time when the lake was, say, ten inches higher and the pitchers were flooded. At the time of observation, however, the lake was unusually high from recent, frequent and heavy rains. It was doubted by natives that the lake had been as high since the past spring, when the ice and snow broke up. Since the depth was greater than usual, the margin of the lake, where shallow enough for the bottom to be inspected through the dark colored water, was not the "normal" lake area, and the complete lack of visible life there (including caddis cases) was not

surprising. The tangle of branches on the bottom of deeper parts of the lake made dredging impossible.

On a return trip to the lake, almost every dead pitcher and every open living pitcher was inspected. Cases were found in dead pitchers two feet above the high lake level, and in living pitchers at all levels. None of the cases contained larvæ, a few retaining a small number of sclerites. In two dead leaves, one remote from the water, one close to it, sets of wings of *Ptilostomis* sp. (Phryganeidæ; probably *postica* Wlk.) were found. One green pitcher close to the water contained a partially digested caddis adult Limnephilidæ; (*Platycentropus indicans* (Wlk.) ♀), while another green pitcher remote from the water contained a freshly dead *Ptilostomis postica* (Wlk.). The latter pitcher, and several other green leaves devoid of caddis cases and adults, contained fresh masses of living, partially developed, caddis eggs. Judging from the size of the masses and their form, they were believed to be limnephilids.

The cases were small, and of two types, usually not more than two cases being found in any one pitcher. Often where two occurred, they were unlike in type. The cases were all constructed of laurel and cranberry leaf pieces, many of which fall into the water of the pitchers and remain there for a long while with little disintegration. The shorter type of case was cylindrical, as much as a centimeter long, and about the same in outside diameter. The leaves were arranged with one edge tangential to the central tube, the leaves or pieces being very numerous, cemented together by their flat surfaces. The outside of this type of case was quite rough due to the irregular shape, size and position of the leaves composing it. The longer type of case was roughly triangular in cross section, formed of fewer pieces of leaf, these with their flat surfaces tangential to the central tube. One or more larger pieces of leaf formed the base of the case, and to the edges of this base a low peaked roof was produced by two sheets of narrower, smaller leaf pieces cemented together along the three corners. These cases were as much as seventeen millimeters in length, eight wide, four high, and of rather flimsy construction. Both cases were thought to be limnephilid structures, but of species smaller than any found dead in the pitchers. The triangular case type might be leptocerid in origin. Several cases were closed at one end as is commonly done for pupation.

The scanty evidence given above is highly suggestive that some species of limnephilid caddis flies have the habit of laying eggs in July in water contained by leaves of *Sarracenia purpurea*, that the insects are able to escape from the pitchers, that the larvæ live in the pitcher water and pupate there. Since the water contains proteolytic digestive substances, such a caddis worm would require an impermeable integument such as found in the pitcher plant mosquito wriggler (*Wyeomyia smithii*) and the larvæ of the large fly, *Sarcophaga sarraceniæ*. It is interesting to note in this connection that large maggots of the latter insect continued to squirm with life for over two hours in seventy percent alcohol, and it was not determined whether they died from alcohol penetration or from suffocation, since the low surface tension of the alcohol did not permit them to use their hydrofuge hairs for surface respiration.

The writers were disappointed not to be able to obtain a definite answer on this matter, but the brevity of wartime vacations and the limitations in pitcher plant supply cut their investigations short. They hope that some readers of the present paper, having a nearby supply of *Sarracenia purpurea* (or other pitcher plant) will be able to get the answer to this interesting problem. They will be happy to assist anyone in the identification of larvæ, pupæ (preferably) or adults of Trichoptera found in pitcher plants.

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NOTES ON *NALLACHIUS AMERICANUS* (McL.)  
(DILARIDÆ, NEUROPTERA)

BY GEORGE C. STEYSKAL  
Detroit, Michigan

On July 8 and again on July 14, 1943, the writer took a single male of *Nallachius americanus* (McLachlan) on the leaves of a shrub a couple feet from a large long-dead tree standing in his neighbor's yard in Detroit, Michigan. The July 14 specimen was sent to F. M. Carpenter, who has kindly confirmed the determination. On June 28, 1944, six females and fourteen males were taken around the same tree and on July 1, 1944, five more males, making a total of six females and twenty-one males. The males were found in 1944 hovering close to the trunk or clinging to it, at distances of four to as much as twenty feet from the ground. The females were not seen in flight but were taken with difficulty from the trunk at the edge of loose bark at heights of six to ten feet. All specimens were taken at dusk; none was seen during several midday visits to the tree.

Inasmuch as Carpenter in his revision of the hemerobioid families of the Nearctic region (1940, Proc. Amer. Acad. Arts Sci. 74 (7):193-280) lists but two males and three females and since our additional material exhibits certain variations from the previously known material, the following notes are offered to assist in defining the range of variation in the species.

The length of the fore wing varies in the males from 4 mm. to 5.5 mm. (allotype ♂, 4 mm.) and in the females from 5 mm. to 6 mm. (holotype ♀, 5 mm.). The larger specimens have the greater number of pectinations in the male antennæ and the more extensive wing venation.

The pectinations of the antennæ of the males vary from seven to ten in number as follows, the minus sign indicating that the first (proximal) pectination is but one-half or one-third the length of the second one. One spm. with 7 pectinations, one with 8-, 7 with 8, 5 with 9-, 5 with 9, one with 10-, and one with 10.

The venation of the wings is rather uniform, but varies from

Carpenter's figures of the types (l.c., p. 273, fig. 73A (♀) and fig. 73B (♂) as follows:

a) Vein  $R_1$  in all specimens has from three to five terminal "twigs" in the fore wings and three in the hind wings.

b) The gradate veinlet between  $R_1$  and  $R_s$  near the tip of the fore wing in fig. 73A is lacking, but one is present a little farther proximad between  $R_1$  and  $Sc$  in all but one wing of one male, as well as one or more less distinct ones near mid-wing.

c) There are typically two gradates between  $R_1$  and  $R_s$  in the fore wings, usually in the vicinity of the middle forks of  $R_s$ , as in fig. 73A. The distal one is lacking in both wings of two males (as in fig. 73B) and in one wing of one male. Three females have a third gradate in one wing and one female has four (2+2) in one wing and three (2+1) in the other. Two males have a third gradate in one wing and one male has 2+1 in one wing and 3+1 in the other. In the hind wings two is also the typical number. There are three in one wing of two females and one male. One male lacks them altogether, three males lack them in one wing (the other wing having two gradates in one specimen and one in the other), and one male has two in one wing and one in the other.

d) In the fore wing of each specimen there is a gradate between MA and MP at approximately mid-length of MP and usually very near or even continuous with the one between MP and  $Cu_1$ .

e) The crossveins between the bases of MP and  $Cu_1$  of the fore wings of each specimen are as in fig. 73B (male).

f) In the hind wing of each specimen there is a gradate between MA and MP near mid-length of MP and approximately opposite the one between MP and  $Cu_1$ , which latter gradate was not found duplicate as in fig. 73B.

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## NOTES ON NEOTROPICAL PLEBEJINÆ (LYCÆNIDÆ, LEPIDOPTERA)<sup>1</sup>

BY V. NABOKOV

Museum of Comparative Zoology

In a recent paper<sup>2</sup> I briefly listed the only *Plebejinæ* (*s.s.*) found in the Nearctic region. Subsequently I decided to see whether any true *Plebejinæ* occurred in the neotropics besides the three or four species the genitalia of which I had happened to examine before. The results proved so unexpected and interesting that it seems worth while to publish the present paper despite its rather superficial and incomplete nature.

In order to cover more ground (and, in some cases, owing to the scantiness of the material at hand) only a very small number of specimens (about 120 in all) have been dissected and drawn (after a few *Catochrysoptinæ* and representatives of other subfamilies had been weeded out by the same method). Some of these figures are appended. All the specimens, except a few supplied with his usual kindness by Mr. W. P. Comstock of the American Museum of Natural History, are preserved in the Museum of Comparative Zoology, Harvard.

A rather drastic rearrangement of the species and groups was an inevitable consequence of this investigation. Seven new genera have been introduced; two have been revised and restricted. In several cases it was found that forms had been assigned by recent authors to the wrong species. Some syno-

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

<sup>2</sup> 1944 [Feb. 1945] *Psyche* 51: 104-138, where the following errata should be corrected: line 12, p. 105, instead of "*hanno* Stoll" read "*ceraunus* Fabricius (*nom. spec.*)"; line 28, p. 107, instead of the misprint "*calliopsis*" read "*calliopsis*"; p. 111, in the sentence beginning "A complete sequence . . ." transpose "palearctic" and "nearctic."



nymms have been tracked down, others are tentatively suggested but cannot be finally disposed of until the types are examined (or neotypes fixed). The brief bibliographical references given are merely intended to indicate the identity of the forms discussed. Beyond the inclusion of some random notes on certain phases of pattern, macroscopical characters are not discussed, and no attempt has been made to revise in this respect the (fortunately rather few) races that have received names.

In spite of the work accomplished since 1909, by Tutt and Chapman in England and by Stempffer in France, entomologists in this country employ the term "*Plebejinæ*" simply as a euphemism for the "*Lycæna*" of German authors, or "Blues,"<sup>1</sup> and "*Plebejus*" is used for a number of heterogeneous Nearctic species only *one* of which (*sæpiolus* Boisduval) belongs structurally to the genus of which the Palearctic *Plebejus argus* Linnæus is the type. In a way the initial blunder was Swinhoe's who while correctly giving a subfamilial ending to the group which Tutt's intuition and Chapman's science had recognized ("tribe" *Plebeidi* which exactly corresponds to the *Plebejinæ* of Stempffer) as different from other "tribes" (*i.e.*, subfamilies) within the *Lycænidæ*, failed to live up to the generic diagnoses which he simply copied from Chapman's notes in Tutt and tried to combine genitalic data he had not verified or did not understand with the obsolete "naked *v.* hairy eyes" system (which at Butler's hands had resulted in probably the most ludicrous assembly of species ever concocted, see for example Butler 1900, Entom. 33:124), so that in the case of several Indian forms which Chapman had not diagnosed, Swinhoe placed intra-generically allied species in different subfamilies and species belonging to different Tuttian "tribes" in the same subfamily.

In reality the subfamily *Plebejinæ* is extremely well differen-

<sup>1</sup> Thus McDunnough uses "*Plebeiinæ*" in his "Check List" of Nearctic Lepidoptera (1938 Mem. S. California Acad. Sci. 1:26), and thus Comstock uses "*Plebejinæ*" in his work on Rhopalocera of Porto Rico and the Virgin Islands (1944, in Miner, Scient. Survey P. R. and V. Isls. 12:492), but the two references the latter author appends (Swinhoe 1910, Lep. Indica 8:10 and Hampson 1918, Novit. Zool. Tring 25:385) are most misleading: the first, because *Syntarucus* Butler, a genus structurally indistinguishable from *Leptotes* Scudder (which is one of the two genera assigned by Comstock to "*Plebejinæ* Swinhoe") is placed by Swinhoe in a different subfamily, namely *Lampidinæ* (now known as *Catochrysopinæ*), and the second, because Hampson's (perfectly invalid) use of "*Plebejus*" and "*Plebejinæ*" refers to a section of a different family, namely *Erycinidæ* (now known as *Riodinidæ*).

tiated in all its genitalic elements (the ædeagus and its appendages, the tegumen, cingula, falces, uncus lobes and valves of the male, and the cervix bursæ and vaginal armature of the female) from the *Catochrysoptinæ* (containing the holotropical *Leptotes* Scudder and a huge array of palæotropical species in several genera), the *Glaucopsychinæ* (containing, among others, the three holarctic genera *Glaucopsyche* Scudder, *Scolitantides* Hübner [to which *Phædrotes* Scudder and "*Shijimia* Matsu-mura" fall as synonyms] and *Philotes* Scudder), the *Everinæ* with the holarctic *Everes*, the *Lycænopsinæ* with the holarctic *Celastrina* Tutt (= *Cyaniris* Scudder, *nec* Dalman), *etc.*

The arrangement proposed in the present paper needs to be prefaced by a few words on taxonomic units. The strictly biological meaning forcibly attached by some modern zoologists to the specific concept has crippled the latter by removing the morphological moment to a secondary or still more negligible position, while employing terms, *e.g.*, "potential interbreeding," that might make sense only if an initial morphological approach were presupposed. What I term species, in my department, can be defined as a phase of evolutionary structure, male and female, traversed more or less simultaneously by a number of, consequently, more or less similar organisms morphologically shading into each other in various individual or racial ways, interbreeding in a given area and separated there from sympatric representatives of any other such phase by a structural hiatus with absence of interbreeding between the two sets. In other words: 1. any two structurally indistinguishable individuals belong to the same species regardless of biological, physiological, geographical or any other factors; 2. structurally distinguishable sympatric non-interbreeding sets represent different species regardless of all other considerations; 3. structurally distinguishable sympatric individuals belong to the same species when they occur within an interbreeding set; 4. structurally distinguishable allopatric sets belong to the same species if the hiatus between their structures is completely bridged by intermediate structures in other, not necessarily intermediate, areas; 5. obviously allied but structurally distinguishable allopatric sets not linked by such intergrades can be said to belong to different or the same species only by analogy, *i.e.*, by analysing the structural gaps between sympatric species or individuals possessing the same general type of structure. Conditions 2 and 4 do not

exclude each other and so it may happen that two structurally distinguishable local forms belong to one species allopatrically because they racially intergrade, but at the same time belong to different species sympatrically because in some other region their structural counterparts occur side by side without interbreeding (this incidentally is the position in *Lycæides*). In such cases one should give precedence to the all important sympatric moment and find somewhere in the spirals of racial intergradation a point at which the whole system can be elegantly, in the mathematical sense (for we are dealing with measurable structures), divided into two parts, *i.e.*, two species, using some combination of trinomials to designate this or that interspecific form (*e.g.*, *Lycæides scudderi doei* Roe *trans ad melissa roei* Doe). This state of affairs is not a flaw in the concept of "species" but an indirect result of its dual nature ("structure" plus "reproduction," "male" plus "female" *etc.*) and should be accepted by the taxonomist with perfect equanimity.<sup>1</sup>

The impact on the eye of a combination of characters in the whole structure or in an element of it, results in the perception of certain structural types. Structures of the same type imply phylogenetic affinities unless it can be proved, as in some cases it is easy to do, that the resemblance is "false" *i.e.*, attained by essentially different means. Such false resemblances are extremely rare and the number of characters involved is small, and this is as it should be, since such "convergence" depends upon the mathematics of chance. False dissimilarities also occur (and are also rare), *i.e.*, the striking difference between one type and another is seen, when analysed, to be due to a simple and brief process of evolution in an unusual direction.

Unless we believe that certain structural resemblances and dissimilarities are not due to chance or to gross adaptional modifications, but can be classified according to their phylogenetic sense, all horizontal genera are artificial groupings — of some practical use to collectors (*e.g.*, the convenient lumping of all small blue butterflies with rounded hindwings and dotted undersides in one "genus") but of no scientific value. This brings us to the question as to whether a classification on the

<sup>1</sup>"Subspecies" (on which I hold rather special views which I shall discuss elsewhere) may be briefly defined as a locally constant phase of specific alar characters with or without a local fixation of some stage within the graded variational range of the specific genitalic structure. The days are quite gone when easy-going describers could give names to these things without a detailed study of genitalic and pattern characters throughout the polytypic species or genus involved.

basis of genitalia reflects natural relationships better than do other principles. I think the answer is "yes."

A "polytypic genus" is determined by structural characters which are common to all the species it includes and the particular combination of which, more than the presence of some particular detail, no matter how striking, distinguishes the group from any other. A "monotypic genus" (*i.e.*, a structurally isolated species which does not fit into any known generic group) obviously lacks the first feature while the number of characters entering the distinctive combination is vastly increased by practically coinciding with the whole array of specific characters, so that the only "reality" a monotypic genus has, lies in the implication that the only species it contains is the only one "known" and that if others were "known," a common denominator now "hidden" in the monotypic genus would be revealed. Among polytypic genera, a "natural genus" is one which reflects the flickering, as it were, of a strongly differentiated type of combinational structure within limits as narrow *per se* as, say, the range of continuous variation within a structurally highly polytypic species, and thus consists of specific structures resembling each other more than they do any other species. If  $h_1, h_2, h_3, h_4$  denote the interspecific hiatuses, and  $H_1, H_2$ , etc. the intergeneric ones, then the lesser the  $h$ 's and the larger the  $H$ 's, the more "natural" the genus is — and the more liable it is to be transformed into a polytypic species by the next reviser with more material at his disposal.

A certain harmony, as yet rather obscure, seems to exist between a particular type of male armature and a particular female one; this has been taken into account in founding the genera discussed below. The impression I have formed so far that with "natural genera" specific differentiation in these organs is more marked (or at least easier to observe) in the male may be due to insufficient investigation, but anyway I cannot find any *exact* correlation between female lock and male key. In what manner and to what extent the sclerotized parts of the sexes in *Plebejinæ* fit each other during copulation is not clear, but I doubt whether the valves, the termination of which is evolutionally the most vulnerable part, come into any direct contact with such structures in the female organ that might lead to some intersexual adaptation.<sup>1</sup>

<sup>1</sup> Lorkoviz states (1938, Mitt. Münchner Ent. Ges. 28:231) in an admirable paper on the European representatives of *Everes* (*Everinae*) that in that genus



Adaptation to surroundings, to climate, altitude *etc.*, and hence "natural selection" in its simplest sense, certainly had no direct action whatever on the moulding of the genital armature, and we know nothing of the physiological processes of which that elaborate sculpture is the structural overflow. While accepting evolution as a modal formula, I am not satisfied with any of the hypotheses advanced in regard to the way it works; on the other hand, I am quite certain that repetitions of structure, on the Siberian tundra and on the paramos of the Andes, on a mountain in India and on an island in the Caribbean Sea, cannot be treated as a result of haphazard "convergence" since the number of coincident characters in one element, let alone the coincidence of that coincident number with a set of characters in another element, exceeds anything that might be produced by "chance." Hence the conviction that there is *some* phylogenetic link where there is a recurrence of similar genitalic characters and that certain groupings — the new genera to which we now must turn — may be so devised as to reflect the natural affiliations of the species.

#### Plebejinæ

Stempffer, 1937-1938, Bull. Soc. ent. France 42: 211-218, 296-300; Nabokov, 1944, Psyche 51: 104-105; = *Plebeiidi*, *sensu* Tutt [*et* Chapman], 1909, British Butt. 3: 150-159; Chapman, 1910, Ent. Rec. 22: 101-103; 1916 Trans. Ent. Soc. London 1916: 157-180; = "*Plebeius* + *Polyommatus*" *s.* Bethune Baker, 1914, Ent. Rec. 26: 164; *Polyommatinæ*, Forster 1938, Mitt. Münchner ent. Ges. 38: 111-116.

#### Parachilades n.g.

(fig. 1, figs. TIT, pl. 2,7)

Type and only known species *Lycæna titicaca* Weymer 1890 (*in* Reiss *et* Stübel, Reisen in Süd-America, Lepidoptera :122-123 "Titicaca Lake; Sajama, Bolivia," pl. 4, fig. 6 [very poor]; *Itylos* [*s.l.*] *titicaca*, Draudt, 1921, *in* Seitz, Macrolep. World, 5 :122, pl. 144, m [coarse copy of original fig.]; *Cupido speciosa*

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the median uncal projection (a structure not found in *Plebejinæ* and wrongly, in my opinion, regarded as being formed by the fusion of the uncus lobes) fits exactly the vaginal plate of the female, both varying together according to the species. See also Chapman 1916, Trans. Ent. Soc. London 1916:170.

Staudinger, 1894, *Iris* 7 : 77-78, "Huallatani and Quebrada Malaga, Bolivia"; *Lycæna speciosa*, *ibid.*, pl. 2, fig. 8 ♂ ; *Itylos* [*s.l.*] *speciosa*, Draudt, 1921, *l.c.*, pl. 144, n, figs. ♂ ♀ ).

Five males and one female investigated: prep. 610, "Titicaca

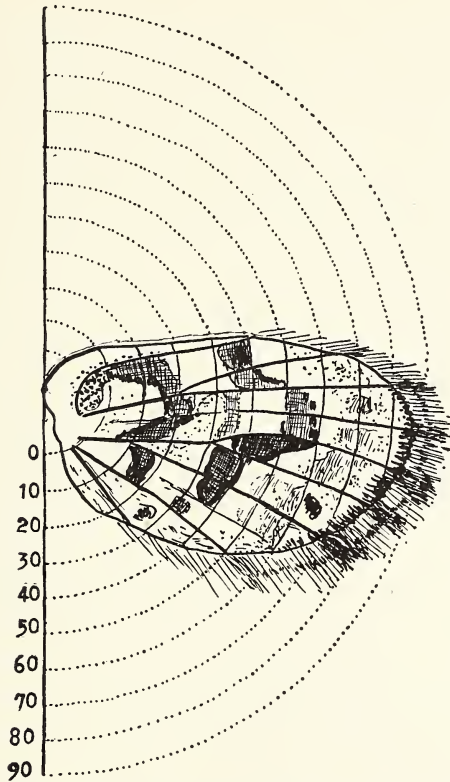


FIG. 1. *Parachilades titicaca*, left hindwing underside x7.

[Lake], Bolivia," *ex coll.* Huntington [*ex coll.* Staudinger-Bang Haas], *Amer. Mus. Nat. Hist.*; prep. 483, 488, 589, 620, ♀ 590, "Sicasica, Bolivia, 1.X.1899" *ex coll.* Weeks, *Mus. Comp. Zool.*

Ædeagus thickish,<sup>1</sup> about 1 mm. long, the suprazonal portion subequal to the subzonal one. In general type fairly close to

<sup>1</sup> In all genera examined the subzonal portion of the ædeagus appears in cross-section as a dorso-ventrad directed oval, the lengthening of which produces the appearance of "thickness" in the organ when the latter is viewed from the side.

*Chilades* (see pl. 2, CON 1), still more curved, however, with a pronounced bulging of the outline (in lateral view) dorsally at the zone (above the zone and less conspicuous in *Chilades*) and a somewhat different structure of the suprazonal portion. Suprazonal sheath terminating on the ventral side in a point (which is not notched as it is in *Chilades*) with two filament-like lateral portions (structurally similar to the spine-like single medial process described by Chapman in other genera and represented in *Chilades*<sup>1</sup>) diverging from it and rimming the vesica, the erected (everted) frothy membrane of which they seem to prop. Vesical opening (on the dorsal side) beginning just above the zone (thus at a more proximal point than in *Chilades*). Vesica very simple and weak as in *Chilades*, *Freyeria*,<sup>2</sup> *Lycæides*, etc. Alulæ considerably more developed than in *Chilades*, forming two petals almost 0.3 long and resembling (or representing) rudiments of the peculiar element (sagum) that exists at various degrees of development in several other neotropical genera where, however, it is well differentiated from the alulæ (except in *Hemiargus*). Furca considerably smaller in relation to the ædeagus than in *Chilades*, singularly thick, pincers-like, connected at its tips with the petals of the alulæ. The whole dorsum (falx + uncus lobe + tegumen) remarkably similar in type to *Chilades*, which type is characterised by the breadth of the robust and long forearm exceeding that of the long finger-shaped uncus lobe,<sup>3</sup> by the humerulus appearing to be produced (owing to the exiguity of the lobe) not from the base of the lobe but from the tegumen proper, and by the latter being smaller by comparison to the falx and the lobe than in other *Plebejinæ*. Differing from *Chilades* in the greater size of the falx and uncus lobe in relation to the rest of the armature and to the size of the

<sup>1</sup> One wonders whether this medial process in *Chilades* is not, perhaps, merely a lesser stage of development of the pointed part of the sheath of *Parachilades*, while the lateral processes in the latter represent a lesser stage of development in comparison to the latero-ventral pointed sheath portions of *Chilades*. I am not fully satisfied with my observations in regard to the ædeagus of these two genera.

<sup>2</sup> I fail to find in either of the two species of *Freyeria* (*trochilus* and *putli*) the cornuti mentioned in the case of *trochilus* by Stempffer (1937, Bull. Soc. ent. France 42:215).

<sup>3</sup> In fact Fruhstorfer, the only German writing author of his time who made any attempt to follow the British authors in the study of Lycænid genitalia for systematic purposes, in an enthusiastic, but amateurish, and poorly illustrated paper on *Chilades* (1916 Zool. Meded. Leiden, 2:90-95) mistook the uncus lobes of *lajus* and *cleotas* for an additional pair of falces (besides confusing generic characters with specific ones).

wings.<sup>1</sup> Falx very big, long and thick, fatter than in *Chilades*, and not distinctly separated to the eye into its components (humerulus, elbow, etc.) owing (1) to its not bunching at the shoulder as it does in *Chilades* (in ventral view); (2) to the unusual (unique in *Plebejinæ*, typical in *Catochrysopterinae*) slant in the part that corresponds to the, very upright, forearm of *Chilades*, with a consequently wide and weak falcular arch; and (3) to its even breadth from basal point to almost three-quarters of its length; thus of a limacine appearance increased by the fact (again unique in this subfamily, but frequent in *Catochrysopterinae*) that in ventral view the point of the oblique falx seems twisted away from the lobe instead of curving hookwise toward the latter as it does in *Chilades* (or other genera) where it attains the tip of the lobe. Uncus lobe narrow and long, exceeding the length of the tegumen (from base of falx to beginning of cingula) which is not the case in *Chilades* nor indeed in any other genus of the subfamily; tapering above the humerulus to form a finger-shaped projection of even breadth throughout; slightly excurved (in contrast to the straight "gothic" projection in *Chilades*) and at least  $1\frac{1}{2}$  narrower than the forearm. Valve exceedingly small and squat, about half the ædeagus and about equal to the falx in length, the first proportion only approached in one other species of *Plebejinæ* (*Hemiargus ramon* Dognin) and the second unique in the subfamily (but common in other Lycænids); of a peculiar stunted appearance, shaped like an elephant, about one and two-fifths as long as broad, thus strikingly different from the elongated shape of *Chilades* and all Old World members of the subfamily; with a strongly and evenly curved processus superior ending in a thickish gradually tapering rostellum (about a third of the valve in length), which continues the even curve of the whole upper margin and comes to rest upon the well-developed, strongly jutting mentum, the tip of which may assume a fluted appearance *in situ*.

Female: fibula of ostium bursæ strongly developed, of the *Chilades* type, with the upper lamella conspicuously long (about 0.3 mm.). Papillæ anales about 0.45 mm. broad and very large in relation to the short looking rods (about 0.6).

Measurements (in mm.): ædeagus 0.9–1, suprazonal portion

<sup>1</sup>The *titicaca* lobe length is only attained in *Chilades* by one species (*cleotas*, pl. 2, CLE 3) in which the whole alar surface is 5.4 times greater and the forewing 2.5 times longer than in *titicaca*, while in *galba* forms (e.g. pl. 2, CON 3)



0.44–0.52 (mean 0.49), subzonal 0.44–0.54 (mean 0.49); breadth (in lateral view) at zone 0.16, proximad 0,12; penis mean 0.85. Furca 0.37. Falx 0.5 by 0.07 to 0.55 by 0.1 (mean 0.52 by 0.08); uncus lobe 0.5 by 0.045 to 0.55 by 0.055 (mean 0.52 by 0.05). Valve 0.54 by 0.39 to 0.55 by 0.4 (mean 0.54 by 0.4).

It is possible that individuals or broods or racially constant forms of *titicaca* with a complete underside forewing set of (seven) II macules and (seven) split I macules exist somewhere in the Andes. The general tendency, however, is to complete obsolescence (Staudinger selected for his figure of "*Lycæna speciosa*" an individual with still visible I RM and  $M_1$ II and  $M_2$ II; Weymer's only fresh specimen had none). The narrow and pointed (almost tineoid) wing-shape is found elsewhere among *Plebejinæ* of great altitudes (e.g. in a Himalayan form of *Albulina orbitulus* Prun.). In the hindwing (see fig. 1), the termen strongly recedes (below vein  $M_2$ ) from scale line 85 to 50 (at vein 2A). The I macules are obsolescent, except the  $CU_1$  præterminal mark which is distinctly pigmented in some specimens. The II macule is weakly pigmented (except marginally, especially along the outer edge in most specimens) from Sc to cell  $M_2$  (between, roughly, scale lines 30–40, 35–50, 50–60, 50–60), fairly strongly (with very strong edges) from  $M_3$  to cell Cu 2 (35–60, 30–40, 30–35,) and is very weak in 1A and 2A. The III macule is weakly pigmented (except the proximal edge) in Sc (0–20) and fairly strongly (with still stronger edges) in  $Cu_2$  (10–20). The I discoidal RM (30–35) is very weak while the II one (R 12–25 + M 5–25) is fairly strong (with still stronger edges). All the macules except the anal ones and the  $Cu_1$  præterminal mark (60–65) fill the transverse breadth of the interspace (forming, if viewed from the termen a capital omega in the case of the II series, and a somewhat similar design in the case of Sc III, II RM,  $Cu_2$  III) and are squarish, or of a roughly triangular shape if extending to 15 or more scale lines (along the upper vein of the cell as Sc III and  $Cu_1$  II do, or along the lower one as II M and  $R_8$  II do). I give these scanty notes and a figure, since no intelligible description of the species exists.<sup>1</sup>

where dwarfs from Cyprus approach my largest *titicaca* (length of fore wing 8.5 mm.) in wing span (though of course the wings remain always much fuller than in *Parachilades*), the lobe is at least twice smaller than in the latter.

<sup>1</sup> For a full discussion of the terminology employed see my paper (1944 *op. cit.*) on the pattern of *Lycænidae* as expressed in *Lycæides*.

*Pseudothecla* n.g.

(figs. FAG, pl. 2)

Type and only known species: *Thecla faga* Dognin 1895, Ann. Soc. ent. Belgique 39: 105-106 "Loja, Ecuador" (= ? *excisicosta* Dyar 1913, Proc. United States Natnl. Mus. 45: 637-638 "Cotahuasi; Chuquibamba, Peru").<sup>1</sup>

One male investigated: prep. 611, "Peru," ex coll. Huntington, Am. Mus. Nat. Hist. (with a somewhat more weakly marked underside than Dognin's description suggests).

Ædeagus two-thirds of a millimeter in length, very slightly incurved distally, rather thickset, not unlike certain *Plebejus* species in type, the suprazonal portion hardly more than half the subzonal one in length, the vesical opening at 0.8 mm. from the zone, the vesica plain, rather weakly defined, thickly shielded ventrally by the suprazonal sheath; alulæ and tabs small. Furca resembling *Parachilades*, the branches still thicker, conspicuously curved, equal in length to the subzonal portion of the ædeagus. Traces of a thin membrane (? rudiments of sagum) between the latter and the furca. Falx bearing a general resemblance to certain *Plebejus* and *Vacciniina* species, its outline, however, more evenly rounded throughout. Forearm slim, incurved, tapering to a sharp point, subequal to the suprazonal portion of the ædeagus, humerulus thickish with a weak shoulder. Uncus lobe small, shorter than the forearm, rather narrow and blunt. Valve of the normal (fishlike) subfamilial shape, but exceedingly small, subequal in length to the ædeagus, about twice as long as broad, nicely tapering basad. Processus superior strongly scooped out at the rostellum which thus seems to be produced from a point lower than the upper margin of the valve and is curiously shaped: anteriorly forming a sharp point, posteriorly producing a kind of small heel at about half of the length of its inner margin.

Measurements (in mm.): ædeagus 0.67, suprazonal portion 0.24, subzonal 0.43 with breadth (lateral view) 0.11; penis 0.64. Furca 0.44. Vertical/Horizontal extension of uncus: forearm 0.27/0.033, humerulus 0.07/0.14, shoulder 0.11/0.05, lobe 0.2/0.06. Valve 0.65 (to tip of rostellum 0.76) with breadth 0.31.

This is a very curious addition to the subfamily.

<sup>1</sup> *Sylphis* Draudt 1921 (in Seitz, Macrolep. World 5: 823, "Cuzco (Peru)," pl.

*Pseudochrysops* n.g.  
(figs. BOR, pl. 2,7)

Type, and only known species: *Hemiargus bornei* Comstock-Huntington 1943 (Ann. New York Acad. Sci. 45 : 102-104, "Pont Beudet, Haiti," pl. 1, figs. 18 ♀, 19 underside; Comstock, 1944, Rhopalocera, in Miner, Scient. Survey Porto Rico and Virgin Isls. 12 : 498-499, fig. 16 venation).

Two male paratypes and one female paratype (all *ex coll.* Am. Mus. Nat. Hist., Mus. Comp. Zool.) investigated: prep. 496, 604, ♀ 605, all "Pont Beudet, Haiti, about 100 ft., 3-4-III-1922."

Ædeagus slim, elongated, 1 mm. long, suprazonal portion equal to subzonal one; ventral part of subzonal sheath slightly notched distally, acuminate in lateral view; vesical opening high, about half-way up from the zone, alulæ small, Chapman's process slight, vesica weak, unarmed, the whole organ vaguely intermediate between *Chilades* and *Freyeria*.<sup>1</sup> Sagum rudimentary, in the form of two weak ill-defined lobes produced from the zone ventrad. Furca well developed, in length subequal to the subzonal portion of the ædeagus, of a conventional subfamilial shape, but with a broad membraneous lining giving it a lobed appearance *in situ*. Falx and uncus lobe different in type from *Chilades* although related to it in general elongation, much more strongly developed than in *Freyeria*, but otherwise definitely allied to the latter. Forearm more than a third of a mm. long, slightly overtopping the uncus lobe, remarkably slender and straight, very gradually tapering to a minutely hooked point, elegantly elbowed, more finely drawn and direct than in *Freyeria*, similar in these features to *Lycæides melissa* Edwards, but combined with a differently shaped, comparatively high shoulder, as in *Freyeria*, only finer in outline. Humerulus more than twice shorter (horizontal extension) than forearm (vertical extension), remaining evenly slender, and hardly thicker (vertical extension) than forearm (horizontal extension), for slightly over half of its length from elbow point, then abruptly expanding to almost double of its vertical extension to form a delicate, small but conspicuous shoulder, its out-

144, n) ought to be also checked in relation to *faga* (*op. cit.* : 823-824, pl. 144, m). Both are doubtfully placed by Draudt in *Scolitantides auct.*

<sup>1</sup> *Freyeria* is less close to *Chilades* than to *Lycæides*, its nearest ally.

line convex posteriorly and somewhat concave below its prominent anterior point. Uncus lobe very long, thicker and blunter than in *Chilades*, somewhat related to *Plebejus*, slightly ex-curved, just above one-half the length of the tegumen proper, twice broader than the forearm and more than five times as long as broad. Valve bearing a false resemblance in shape to *Iolana* Tutt (*Glaucopsychinæ*); in general proportions likewise resembling *Parachilades*; in character of rostellum somewhat allied to *Pseudothecla*; in basic structure truly allied to the next genus; very short, at its broadest (very distal) part about three-quarters as broad as long, shorter than the ædeagus, about sixteen times shorter than the length of the forewing (which is about 11 mm.) [the latter ratio being one-eighth in *Freyeria* (about 7 mm.) where, as in all Old World *Plebejinæ*, the valve is longer than the ædeagus], subtriangular, strongly expanding from its bluntly rounded base to form a buffalo hump; the process superior abruptly sloping from that point to evenly rise again at a point immediately below whence it projects distad as a slender, very slightly incurved, horn-like rostellum, in length just under one-sixth of the whole process. Stretch between rostellum and mentum extensive and steep, lending the valve a gaping appearance, this effect being due not to any special feature of mentum or distal margin of valval membrane, but to the rudimentary or aborted (despite the horn-like free end) condition of the upper process which in all other *Plebejinæ* is long enough to allow the rostellum to rest on the mentum.<sup>1</sup>

Female: fibula well developed, about 0.16 long by as much broad, consisting of a triangular portion over an oppositely directed cordate one. Papillæ anales small, about 0.3 broad by 0.2 long with comparatively very long (0.82) rods.

Measurements (in mm.): ædeagus 1, suprazonal portion 0.5, subzonal 0.5 with breadth (in lateral view) 0.11; penis 0.93. Furca 0.47. Sagum 0.33. Vertical/Horizontal extension of un-

<sup>1</sup> *In situ* the end of the processus superior of *bornoi* tends to be infolded, i.e., to overlay the ventral concavity of the valve as occurs also in *Parachilades*, *Chilades*, and *Hemiargus* (*s.s.*). Another character of these valves (and also that of the next genus) which lack the regular bullula of other genera is the fact that under pressure the whole margin below the rostellum has a trick of bulging (producing as it were a second mentum), a circumstance which incidentally misled Bethune Baker (1913, Trans. Ent. Soc. London 1913: 201-204) in his rather confused attempt to separate what he called *phiala* Grum Grshimailo (of which he examined, at the best, a locotype or cotype — not the actual type as wrongly stated : 204) from the absolutely conspecific *galba* Lederer.



cus : forearm 0.35/0.03–0.36/0.025, humerulus 0.04/0.17, shoulder 0.1/0.07, lobe 0.36/0.065. Valve 0.63–0.66 with breadth 0.5. Rostellum 0.18.

In pattern characters this rare and remarkable butterfly belongs, together with a few other genera or aberrant species, to what may be termed the "catochrysopoid" pattern group in *Plebejinæ* (some notes on the subject will be found further on and at the end of this paper), none of the members of this group having, however, any structural connection whatever with the *Catochrysopinæ* genitally. Moreover, the present assignment of *bornoi* and *faga* to the true *Plebejinæ* adds two "tailed" species to the small number (all in *Chilades*) already known (first recognized by Chapman 1916).

### Cyclargus n.g.

(figs. DOM, AMN, WOO, TH, pl. 3; AMN, pl. 7)

Type: *Lycæna ammon* Lucas 1857

Four species known<sup>1</sup>:

*ammon* Lucas (*Lycæna*, 1857, Lép., in la Sagra, Hist. . . . Cuba 7 : 612, "Cuba," pl. 16, figs. 7 ♂, a ♀, b; *Lycæna filenus* Holland [*nec* Poey] 1931, Butt. book, pl. 68, figs. 2 ♀ [*nec* ♂], 3 ♀, 4 ♂; *Hemiargus ammon ammon*, Comstock-Huntington, 1943, Ann. New York Acad. Sci. 45 : 95–96; "Havana, Cuba, winter brood").

*dominica* Möschler (*Lycæna*, 1886, Abhandl. Senckenberg, naturforsch. Ges. 14 : 26, "Jamaica," fig. 10 [*fide* Comstock-Huntington, 1943, *op. cit.* : 101–102]; *Hemiargus ammon f. dominica*, Draudt, 1921, in Seitz 5: 820; *Hemiargus dominica*, Comstock-Huntington, 1943, *l.c.*).

*thomasi* Clench (*Hemiargus catilina auct. ssp.*, 1941, Mem. Soc. Cubana hist. nat. 15 : 407–408, "Arthur Town, Cat. Isl., Bahamas"; *Hemiargus bahamensis* Clench, 1943, Psyche 49 : 57, "Crooked Isl., Bahamas") comprising *thomasi thomasi* Clench (*Hemiargus ammon thomasi*, Comstock-Huntington, 1943, *op. cit.* : 97 "Bahamas"), *thomasi bethune bakeri* Comstock-Huntington (*Hemiargus ammon ssp.*, 1943 *op. cit.* : 97–99, "Miami, S. Florida, winter brood," pl. 1, fig. 25 ♂; *Hemiargus catilina* Bethune Baker [*nec* Fabricius] 1916, Ent. News

<sup>1</sup> Listed in chronological order. The obvious systematic sequence is: *dominica*, *ammon*, *woodruffi*, *thomasi*.

27 : 454; Holland, 1931, *op. cit.*, pl. 30, fig. 45 ♀, pl. 31, fig. 31 ♀) and *thomasi noeli* Comstock-Huntington (*Hemiargus ammon* ssp., 1943, *op. cit.* : 99-100, "St. Marc, Haiti" pl. 1, fig. 23 ♂).

*woodruffi* Comstock-Huntington (*Hemiargus ammon* ssp., 1943, *op. cit.* : 100-101, "Anegada, Virgin Isls.", pl. 1, fig. 24 ♂).

#### GENERIC DESCRIPTION

Ædeagus in a very general way allied to *Pseudochrysops*, smaller, stubbier, from just under 0.65 to just over 0.8 long; suprazonal portion about half or just over one-half the subzonal one; ventral side of suprazonal sheath notched distally; vesical opening beginning at about half-way or two-thirds from the zone on dorsal side, at first very narrow, with distinct lateral portions then brusquely allowing the vesica to expand; the latter very plump (facing more or less distad), in lateral view not unlike a pin cushion, in dorsal view resembling a bourbon crown; set with about 120-160 comparatively large (0.003) cornuti in several regular rows of about ten and more or less distinctly divided by the thin point of Chapman's process; alulæ and subzonal portion of the usual type in the subfamily, the former about 0.1 long, the latter compressed laterally, broader in lateral than in ventral or dorsal view. Furca small, slightly shorter than the subzonal portion, more efficiently holding it in the forking than in Old World types. Sagum well developed, consisting of two convex (ventrad) lobes about 0.4 long by 0.2 broad, connected at the zone with the alulæ, and below the zone with the points of the furca, converging in front (*i.e.*, on the ventral side) of the ædeagus in the manner of a stiffly bulging short waistcoat, too ample as it were for the body it encloses, and edged at and along its margins (which appear distally projected in lateral view and thus differ from other sagum bearing genera to be discussed) with conspicuous teeth reaching 0.03 in length. Uncus, especially falces, extremely small and weak. Falx allied in type only to one Old World genus, namely *Aricia*; in shape resembling a beheaded dromedary, the part of the "neck" being taken by the straight, rather bluntly tapering, plain-tipped vertical projection (forearm) of the falx, and the "hump" being represented by the high evenly shaped vertical shoulder of the medially thickish, straight, rather long hori-

zontal extension (humerulus) of the falx (see pl. 1, fig. 4). Uncus lobe subtriangular *in situ*, spoon shaped when slightly compressed in flat ventral view, from slightly to one-fifth longer than the falx and hardly two-thirds the length of the lobe of *Pseudochrysops bornei*. Valve allied to that of the latter but better developed in the processus superior, thus approaching a more normal (though still very squat) *Plebejinæ* shape which it resembles only insofar as a puffer resembles a pike; very small and short, hardly attaining the length of the ædeagus, twice or less than twice as long as broad, heavily humped; the hollowed outline formed by the mentum (which here seems somewhat upturned *in situ*) and the (strongly receding here) margin of the body of the valve extending laterally (*i.e.*, subparallel to the long axis of the valve) rather than "vertically" as it does in *bornei* (where the upper process is poorly developed); the free part of the upper process (rostellum) throughout its length snugly resting upon and merging with the hollowed margin, but when manipulated seen to be sinuous, flexible looking and long; ending in a more or less broad coxcomb with well developed or greatly developed teeth oriented along the long axis of the valve, longer relatively to it than in other *Plebejinæ* (except one pale-arctic species, *Plebejus argus* L. where, however, they point obliquely down as in *Itylos*, *sensu mihi*), and providing the main characters for distinguishing the four species.

Female: fibula resembling *P. bornei* but shorter (0.1 long by as much broad distally and twice broader proximally). Everted henia stumpy and short.<sup>1</sup> Papillæ anales about 0.3 long by 0.3-0.4 broad, with rods 0.7 long, thus shorter (both in relative and absolute size) than in *bornei*.

#### *Cyclargus dominica* Möschler

(figs. DOM, pl. 3)

Two males investigated: prep. 501, "Baron Hill, Jackson Town, 1200 ft., March, *leg.* L. Perkins," Mus. Comp. Zool., and 508, *id.*, "July," *id.*

Ædeagus 0.75 long, suprazonal portion shorter by half than

<sup>1</sup> My impression is that the extensibility of the henia and its prop so marked in all *Plebejinæ* (see Chapman, 1916 *op. cit.*) is more limited in *Pseudochrysops*, *Cyclargus* and *Hemiargus* (*s. mihi*) in contrast to the rest of the neotropical genera examined which conform to the Old World type in this respect. I have dissected, however, only a few females and my results should be checked on more material.

the subzonal one with a weakly excurved, somewhat slipper-shaped suprazonal sheath, which opens dorsally at about one-third from the zone. Forearm subequal to uncus lobe. Valve twice as long as broad. Comb narrow, with receding edge; 12 to 16 teeth: first and second equal, slightly broader than, but otherwise as long as, the rest which are sharp and subequal *inter se* except for a perceptible reduction in the last three or four.

Measurements (in mm.): ædeagus 0.75, suprazonal sheath 0.25, subzonal 0.5 with breadth (in lateral view) 0.14; penis 0.65. furca 0.45. sagum 0.45. Vertical/Horizontal extension of uncus (prep. 501): forearm 0.22/0.05, humerulus 0.07/0.19, shoulder 0.13/0.07, lobe 0.23/0.06. Valve 0.55–0.7 with breadth 0.33–0.35; comb: breadth 0.12; first and second tooth: length (bisetrix from apex to line prolonging basad the outer edge of third tooth) 0.016 and 0.016.

#### *Cyclargus ammon* Lucas

(figs. AMN, pl. 3)

Three males and two females investigated: prep. 507, "Sierra Maestra, East Cuba, 1000 ft., 16–VI–1930, leg. Clorinda Querci," *ex coll.* Weeks, Mus. Comp. Zool.; 375, *id.* "23–VII–1930" *id.*; N, *id.*; ♀ 530, *id.*, "3–XI–1929, leg. O. Querci," *id.*; ♀ 529, "Cuba, leg. Ch. Wright," Mus. Comp. Zool.

Differing from *dominica* in the following: Valve somewhat broader; comb broader, with circular edge; first and second tooth (equal) one-third longer than in *dominica* and the rest somewhat broader than in that species.

Measurements (in mm.): ædeagus 0.63–0.75; suprazonal portion 0.23–0.25, subzonal 0.4–0.5 with breadth (in lateral view) 0.14; penis mean 0.65. Furca 0.45. Sagum 0.45. Vertical/Horizontal extension of uncus: forearm 0.16/0.025–0.22/0.04, humerulus 0.05/0.12–0.08/0.16, shoulder 0.1/0.05–0.18/0.06, lobe 0.21/0.05–0.24/0.06. Valve 0.6–0.65 with breadth 0.4–0.42; comb: breadth 0.15; first and second tooth: length (measured as in *dominica*) 0.028 and 0.028.

#### *Cyclargus woodruffi* Comstock-Huntington

(figs. woo, pl. 3)

One male investigated: prep. 537, "Tortola, Virgin Is., 2–IV–1925" *ex coll.* Amer. Mus. Nat. Hist., Mus. Comp. Zool.



Differing from the two preceding species in the following: ædeagus (similarly proportioned and shaped) distinctly larger; uncus lobe slightly longer; comb in actual breadth intermediate between *dominica* and *ammon* but appearing as broad as in *ammon* owing to the greater development of first and second teeth, the latter being intermediate in size between *dominica* and *ammon*, and the former about twice longer than in *dominica* and about one and one-half times longer than in *ammon*; the rest of the comb more finely serrated, with a greater number of teeth (21) than in the two preceding or in the next species.

Measurements (in mm.): ædeagus 0.83, suprazonal portion 0.28, subzonal 0.55 with breadth (in lateral view) 0.15; penis 0.7. Furca 0.42. Sagum 0.43. Vertical/Horizontal extension: forearm 0.2/0.04, humerulus 0.05/0.16, shoulder 0.13/0.06, uncus lobe 0.27/0.06. Valve 0.71 with breadth 0.42; comb 0.15; first and second teeth: length (measured as in *dominica* and *ammon*) 0.039 and 0.02.

### Cyclargus thomasi Clench

(figs. TH, pl. 3)

Nine males and one female investigated (all in Mus. Comp. Zool.): *thomasi thomasi* Clench, holotype, prep. 520, "Arthur Town, Cat Isl., Bahamas, 16-VII-1935, leg. W. J. Clench"; paratype, prep. 492, *id.*; 516, 565, "Great Inagua, Bahamas, II-1934, leg. Armour Exp.; [holotype of "*Hemiargus bahamensis* Clench"] 490<sup>1</sup> "Crooked Isl., Bahamas, 1-III-1934, *id.*"; *thomasi noeli* Comstock-Huntington, paratype, prep. 502, "Haiti, leg. P. R. Uhler"; paratype, prep. 521, "San Domingo, Hispaniola" *ex coll.* Weeks; ♀ 531 "Beata Isl., *id.*, 17-I-1932" *leg.* Armour Exp.; *thomasi bethune-bakeri*, prep. 519, "Ft. Lauderdale, Florida, 23-VI-1933, *leg.* M. Bates"; 581, "Miami, *id.*, 8-15-IX," *ex coll.* Weeks.

Differing from the three other species in the following: ventral outline of suprazonal sheath in lateral view curiously concave above the zone and then angled, this being due to a higher (at two-thirds from the zone) and still more distally facing

<sup>1</sup> This is an aberrative male of *ssp. thomasi* showing a pretty contrast between the blurred and darkened disc of the underside of both wings and the strongly developed white cretules, while a very luminous scintilla rims and almost engulfs the Cu<sub>1</sub> præterminal mark. I doubt very much that this can be a subspecifically constant combination of characters on Crooked Isl.

vesical aperture; uncus a shade slighter than in *ammon*; comb greatly developed: first tooth hypertrophied, four times longer than in *dominica*, two and a half times longer than in *ammon* and twice longer than in *woodruffi*; second tooth about a third of the first (the rest as in *ammon* with same number of teeth as in that species and *dominica*).

Measurements (in mm.): ædeagus 0.68–0.72, suprazonal sheath 0.22–0.27, subzonal 0.45–0.46, with breadth (in lateral view) 0,11; penis mean 0.63. Furca mean 0.38. Sagum mean 0.43. Vertical/Horizontal extension of uncus: forearm 0.14/0.03–0.17/0.035, humerulus 0,045/0,12–0.06/0.14, shoulder 0.1/0.05–0.14/0.06, lobe 0.2/0.05–0.21/0.06. Valve 0.64–0.75 with breadth 0.35–0.4; comb; breadth 0.2; first and second tooth: length (measured as in the three other species) 0.07 (0.06–0.08) and 0.022 (0.02–0.028).

No subspecific structural distinctions are noticeable and anyway the wing-characters on which the subspecific names have been based must be revised as the comparisons were drawn between non-conspecific forms.

The catochrysopoid wing-characters of the *Hemiargus-Echinargus-Chilades-Cyclargus-Pseudochrysoops* macroscopical group<sup>1</sup> in *Plebejinæ* are perhaps most beautifully expressed in the hind-wing underside of *Cyclargus*. These combinational characters are in this genus: the conspicuously strong pigmentation of macules ScII, ScIII, Cu<sub>2</sub>III,<sup>2</sup> 2AII, IIM and lateral macule in 4A (placed in corbic arrangement if viewed from base and strikingly resembling the African *Euchrysoops* group) and of the Cu<sub>1</sub>, Cu<sub>2</sub> and 1A præterminal marks (with scintillæ), in contrast to the extreme weakness of all other whole and split macules; (2) the ornamental concentration of an aurora in Cu<sub>1</sub> in contrast to the whiteness of all the other I intervals; (3) the subtriangular shape of these intervals and of the faint portions of I macules (both wings); (4) the rough quadrate shape of certain macules in the disc (both wings); (5) the strong development of halos, cretules and white scales intermixed with the ground

<sup>1</sup> The only other *Plebejinæ* having certain catochrysopoid wing-characters (of another type) are: the central Asiatic *Agrodiætus elvira* Eversmann (which departs in an extraordinary way from the pattern of its numerous congeners) and the nearctic alpine *Icaricia shasta* Edwards (two characters).

<sup>2</sup> Absent in *ammon ammon* as correctly noted by Comstock and Huntington 1943 *op. cit.* : 96 where, however, there is a clerical error in the notation of the position of the macule in question.

pigment; (6) the halo of I-M partly (posteriorly) fusing with that of M<sub>2</sub>II.

**Hemiargus Hübner [revised]**

(figs. CE, RAM, HA, pl. 4; HAN, CER, pl. 7)

1818, Zuträge Exot. Schmett. 1: 10

Since *Papilio hanno* Stoll 1790, here found to be a different species from *Hesperia ceraunus* Fabricius 1793, is not mentioned in the Zuträge, Scudder's selection (1875, Proc. Amer. Acad. Arts Sci., Boston 10: 186) and Hemming's confirmation (1934, Gen. names Holarctic Butt. 1: 104) of the type as *hanno* Stoll cannot stand.

Type: *Hemiargus antibubastus* Hübner 1818 (= *Hesperia ceraunus* Fabricius 1793, subspecies).

Three known species:

*ceraunus* Fabricius, including *ceraunus ceraunus* Fabricius (*Hesperia ceraunus*, 1793, Ent. Syst. 3: 333, "[W. Indies]"; *Lampides ceraunus*, Butler, 1869, Cat. diurn. Lep. Fabricius: 163, "Jamaica"; *Hemiargus hanno ceraunus*, Comstock-Huntington, 1943, Ann. New York Acad. Sci. 45: 107-108), *ceraunus antibubastus* Hübner (*Hemiargus antibubastus*, 1818, l.c., "Georgia"; *Lycæna hanno* Holland [nec Stoll] 1931, Butt. Book, pl. 32, fig. 3 ♂; *Hemiargus hanno antibubastus*, auct.), *ceraunus filenus* Poey (*Polyommatus filenus*, 1832, Centurie Léop. Cuba: [41-42], "Cuba," pl. [13], figs. ♀ ♂; *Hemiargus hanno filenus*, auct.), *ceraunus gyas* Edwards (*Lycæna gyas*, 1871, Trans. American Ent. Soc. 3: 210-211, "Arizona"; Holland 1931 *op. cit.* pl. 47, figs. 3 ♂, 4 ♂ "typical"<sup>1</sup>; *Hemiargus gyas*, McDunnough, 1916, in Barnes-McDunnough, Contrib. Lep. N. America 3:108-109; *Lycæna astragala* Wright, 1906, Butt. W. Coast: 232-233, "San Bernardino, California," fig. 401 ♂; *Lycæna florenciæ* Clémence, 1914, Ent. News 25:28-29, Huachuca Mts., S. Arizona") and *ceraunus zachæina* Butler-Druce (*Lampides zachæina*, 1872, Cistula ent. 1: 104-105, "Cartago, Costa Rica"; Butler, 1873, Lep. Exot. : 157, pl. 57, fig. 1 [poor]);

*hanno* Stoll, including *hanno hanno* Stoll (*Papilio hanno*,

<sup>1</sup>The locality label of the ♂ figured by Holland should be checked, as one is never safe with that author. McDunnough (1916 l.c.) was the first to point out that *gyas* could not be separated genitically from *antibubastus*, and W. Comstock (1943:109) noted that the latter was structurally identical with *filenus*.

1790, in Cramer, suppl. : 170, "Surinam," pl. 39, figs. 2, 2B; *Hemiargus hanno hanno*, Comstock-Huntington, 1943, *op. cit.* : 104-106, "Paramaribo, Surinam"), *hanno bogotana* Draudt (1921, in Seitz, *Macrolep. World* 5: 819, "Bogota, Colombia," pl. 144,k) and *hanno watsoni* Comstock-Huntington (1943, *op. cit.* : 106-107, "San Juan, Puerto Rico"; pl. 1, fig. 20 ♂ "Guayanilla, Puerto Rico");

*ramon* Dognin (*Lycæna*, 1887, *Naturaliste* 9: 189-190, "Loja, Ecuador," fig. 4 ♂).

#### GENERIC DESCRIPTION

Ædeagus very long in relation to the other parts of the armature, with a neck-like suprazonal portion (as if the corresponding part in *Cyclargus* had been telescoped out). Suprazonal sheath in ventral (1), dorsal (2) and lateral (3) view: (1) slightly expanding at its termination where it is slightly notched, each of the resulting portions being armed with five or six ventro-laterally placed spinules; (2) revealing at more than half-way from the zone a narrow vesical fissure, the rather rough margins of which, just before expanding slightly to form the vesical opening proper (which is as long as the fissure), are somewhat drawn together and produce at this point two surculi, one on each side; (3) rather strongly incurved, with the vesical opening facing more or less distad and appearing still shorter than it is owing to the vesical slit not being seen from this angle, so that the eye mistakes the projection in profile of the paired surculi (directed dorsad and proximad) for the protruding nether "lip" of the opening.<sup>1</sup> Vesica, as seen laterally, pulvinate as in *Cyclargus*, but with smaller cornuti. Alulæ hardly, if at all, differentiated from the sagum, which is rudimentary, with no trace of teeth. Furca small, well adjusted to the ædeagus subzonally as in *Cyclargus*. Falx resembling *Cyclargus* but somewhat stronger and thicker. Uncus lobe evenly tapering to a blunt point. Valve small, shorter than the ædeagus, approaching the *Plebejinæ* shape-norm somewhat better than *Cyclargus* which it resembles only in the shoe-shaped mentum with no trace of a bullula and in the freedom of the rostellum; the latter, however, lacking any serration, with a bluntly tapering

<sup>1</sup> Moreover, from a certain angle, and especially in *hanno*, these surculi are easily mistaken by the eye for modified alulæ that would have been carried away from the zone by the generic distal extension of the ædeagus.



tip, and somewhat resembling in curvature (especially in the genotype) the kind of rostellum obtained among Old World genera only in *Chilades galba* Lederer (*sensu mihi*, i.e. including Eastern Mediterranean, Caspian, Arabian and Indian forms considered by authors as being distinct species, i.e. *galba* Lederer, *phiala* Grum Grshmailo, *ella* Butler and *contracta* Butler) and by an aberrant *Albulina* (*auct.*) species, *felicis* Oberthur, of the southern part of the Central Palæarctic region, in which species, however, the tip is toothed.

Female: henia shortish and curiously thick (with apparently reduced extensibility as in *Cyclargus* and thus unlike *Chilades*), strongly chitinized dorsally. Fibula resembling *Chilades*, pistol-shaped in profile (pointing distad), in ventral view seen to consist of a lamellate ventral piece and a horseshoe-shaped dorsal one.

#### Hemiargus ceraunus Fabricius

(figs. CE, pl. 4; CER, pl. 7)

Twenty-eight males and one female (all in the Mus. Comp. Zool. coll.) investigated: *ceraunus ceraunus* Fabricius, prep. 570 and 571, "Kingston, Jamaica, 6-XII-1871" *ex coll.* Scudder; *ceraunus ceraunus prox.*, prep. 499, "Ennery, Haiti, near 1,000 ft. alt., 16-VIII-1934, *leg.* M. Bates"; prep. 567, "Port au Prince, Haiti, up to 2,000 ft. alt., 2-IX-1934, *leg.* M. Bates"; and prep. 566 "Navassa Is., W. Indies, XII-1929, *leg.* W. J. Clench"; *ceraunus antibubastus* Hübner, prep. 525, "Egmont, Florida, 23-IV-1904," *ex coll.* Fall; prep. 580, "Florida," *ex coll.* Weeks, and prep. 582 ♀, "Ft. Lauderdale, Florida, 10-VII-1933, *leg.* M. Bates," prep. 339, "Valdosta, Georgia, 9-X-1943, *leg.* V. Nabokov"; and prep. 579, "So. Abington, Massachusetts, V-1880, *leg.* J. E. Bates" *ex coll.* Weeks; *ceraunus filenus* Poey, prep. 374, 497, 506, 515, and 561, "Sierra Maestra, E. Cuba, 1,000 ft. alt. . . . *leg.* O. Querci," *ex coll.* Weeks, taken "31-XI-1929," "29-V-1930," "22-VII-1930," "10-XI-1929" and "25-V-1930" respectively (individual 515 with unusually strong macules of series II underside); prep. 562, "Vinales, P. del Rio, Cuba, *leg.* L. de Jaume"; and prep. 563, "Central Soledad, Cuba, 27-VIII-1932, *leg.* B. B. Leavitt"; *ceraunus gyas* Edwards, prep. 523, "Baboquavaria Mts., Pima Co., Arizona, 15-30-VII-1903, *leg.* O. C. Poling," and prep. 574, "Cochise Co., Arizona," *ex coll.* Weeks; *ceraunus gyas prox.*,

prep. 400 and 524, "San Diego, California, 14-VIII-1908, leg. Geo. H. Field," ex coll. Fall; *ceraunus zachæina* Butler, prep. 513, "Punto Araras, Costa Rica, 11-XI-1871," ex coll. Scudder; prep. 510, "Acahuato, Michoacan, Mexico, 3,000 ft. alt., on *Cordia*, 19-VIII-1941, leg. R. Haag," and prep. 509, 572, and 613, "Apatzingan, Michoacan, Mexico, 1,200 ft. alt., moist jungle La Majada, at mud, 8-VIII-1941, leg. R. Haag"; other *ceraunus* forms: prep. 564, "Clarencetown, Long Is., Bahamas, II-1934, leg. Armour Exp.,"; prep. 504 "Vancouver Is." ex coll. Paine; prep. 575, "Colombia," ex coll. Paine.

Suprazonal portion of ædeagus in lateral view somewhat bottle-necked before the slight vesical expansion; longer than the subzonal portion; with five conspicuous spinules on each side: the first (counting proximad), at about 0.05 from tip (thus on the level of the apex of the ventral notch), 0.008 long, the next, immediately beneath, 0.018 (maximum), the third and fourth both 0.022 (max.), likewise placed together, at about 0.015 proximad from second and about the same distad from the fifth which is subequal to the latter. Vesical opening plus fissure somewhat less than half the suprazonal sheath. Surculi forming in profile a small sharp projection about 0.025 long. Furca about a fourth of the ædeagus, connected with the uneven but not actually serrated flaps of the indistinctly two-lobed sagum which rather loosely hangs from the zone ventrad. Falx with a thick blunt forearm and a high shoulder about half the forearm in height. Valve slightly shorter than the ædeagus, about twice as long as broad, resembling a *Chilades* valve in miniature but with a somewhat sharper mentum. Rostellum more or less distinctly angled about half-way down, with a plain, in some specimens slightly upturned tip (as in *Chilades galba*) descending in front of the mentum.

Female: ventral piece of fibula 0.13 long by 0.2 broad. Pa-pillæ anales 0.35 by 0.3. Rods 0.75.

Measurements (in mm.): ædeagus 0.8-1.0, suprazonal portion 0.51-0.56 (mean 0.54), subzonal portion 0.30-0.44 (mean 0.40) with mean breadth 0.09 (in lateral view); penis mean 0.80; furca mean 0.24; sagum mean 0.3. Vertical/Horizontal extension of uncus: forearm 0.23/0.045-0.3/0.06 (mean 0.27/0.05), humerulus mean 0.075/0.15, shoulder mean 0.15/0.09, lobe 0.27/0.05 = 0.33/0.07 (mean 0.30/0.06). Valve: 0.65-0.80 (mean 0.74) with breadth 0.25-0.47 (mean 0.33).

The length of the suprazonal portion is very steady at just above 0.5; the subzonal one is more variable; it reaches 0.44 in most individuals from Jamaica and Mexico, as well as in one Californian specimen and in the only Colombian one. The falx and uncus lobe reach their maximum in one specimen from Cuba (Vinales) as well as in those from Florida and in the very large (length of forewing 13.2 mm.) specimen from Vancouver Island.<sup>1</sup> The valve is rather variable in size, as well as in the length/breadth ratio. The narrowest come from Jamaica, Cuba, and the S. E. States, the broadest from Haiti and Mexico (together with average individuals). The curious bloated appearance of some of the shorter Central American specimens (see pl. 4, CE. Mex., CE.C.R.) is due to the lower margin being strongly convex and there is also a certain fattening of the rostellum.

In result of the separation of *ceraunus* from *hanno* (see next species) a revision of the wing-characters of several races will be necessary, either because they have been described as separate species or because authors assigned them to the wrong species and thus did not compare them to the typical race of the right one. Incidentally, attention should be drawn to the fact that the retention of strong pigment not only in the  $Cu_1$  præ-terminal mark but also in the  $M_3$  one is a phenomenon that occurs, completely and incompletely, racially and individually, both in *ceraunus* and *hanno* (besides being typical in *ramon*), and no subspecies can be based on this character *alone*, since it can be developed in two different races of the same or different species.

**Hemiargus hanno** Stoll  
(figs. HA, pl. 4; HAN, pl. 7)

Material: sixteen males and one female (all in the Mus. Comp. Zool. coll., except prep. 601), as follows: *hanno hanno* Stoll, neotype, prep. 601, "Paramaribo, Surinam, 18-IV-1927," ex coll. Cornell Univ., Am. Mus. Nat. Hist.; *hanno hanno prox.*, prep. 576, "Rio, Brazil, I-1875"; prep. 577 "São Paulo, Brazil,

<sup>1</sup>The occurrence of this species anywhere north of Arizona or the Carolinas (and even there the colonies would probably die out if not regularly replenished by the offspring of new arrivals) is due to direct spring immigration from the south in suitable seasons, which in its turn produces a more or less nomadic summer generation or generations. The same refers to *isola*.

V, *leg.* Bruno Pohl" and prep. 532, ♀, same; *hanno bogotana* Draudt, prep. 602, "Cota, n. Bogota, Colombia, 2,600 m. alt., 28-VIII-1938, *leg.* T. Hallinan" *ex coll.* Am. Mus. Nat. Hist.; *hanno watsoni* Comstock-Huntington, paratype, prep. 569, "San Juan, Puerto Rico, 11-14-II-1914"; other *hanno* forms: prep. 537<sup>a</sup>, "Suapura, Venezuela, 27-VI-1899" *ex coll.* Weeks (strikingly resembling on the underside a specimen of *Chilades galba* Lederer from Daghestan, Russia); prep. 615, "Cariputo, Venezuela, 23-III-1942," *ex coll.* Am. Mus. Nat. Hist.; prep. 517, "Chulamani, Bolivia, 28-XI-1898" *ex coll.* Weeks; prep. 518, "Coroico, Bolivia, V-1899," *ex coll.* Weeks; prep. 600, "El Volcan Chiriqui, Panama, 3-III-1936, *leg.* F. E. Lutz," *ex coll.* Am. Mus. Nat. Hist.; prep. 512, "Taboga Is., Panama, 3-I-1935, *leg.* M. Bates"; prep. 511, "Barro Colorado, Panama, 2-II, *leg.* M. Bates" (strongly pigmented, with broad vadium occupying 20 scale lines in forewing); prep. 568, "Martinique"; prep. 498, "La Vista and vic., La Selle Range, Haiti, 5-7,000 ft. alt., 16-23-IX-1934, *leg.* M. Bates" (with a MS note by Mr. Harry Clench questioning its belonging to "*hanno*" *filenus*).

Differing from *ceraunus* as follows: ædeagus shorter; supra-zonal portion shorter in relation to subzonal; both slightly thicker; supra-zonal tapering more distinctly; broadening more strongly at vesical part; spinules smaller, even the median ones hardly reaching 0.007; surculi much more developed, reaching 0.06 in length; of a quite different shape, *i.e.*, strongly incurved, both quite distinct in profile; sagum consisting of a single short, leaf-like, incurved lobe of a rather thick texture, apparently formed by a fusion of the alulæ; falx and uncus lobe smaller; forearm somewhat more tapering; elbow rounder; shoulder considerably weaker (smaller, lower, rounder); valve smaller; rostellum longer (up to 0.5 long); different in shape — thinner, tentacle-like, sinuous, more or less strongly and evenly arched, without any break in its curve; mentum more prominent, shoe-shaped; lower margin of valve (processus inferior) very curiously chiselled: abruptly broadening (basad from mentum) midway, almost at right angles to the length of the valve, thus forming a kind of keel, its steep distal edge reaching a "vertical" length of 0,08 in some specimens.

Female: ventral lamella of fibula shorter (0.1) and broader (0.3) than in *ceraunus*.



Measurements (in mm.): ædeagus 0.70–0.95, suprazonal portion 0.36–0.52 (mean 0.48), subzonal portion 0.3–0.46 (mean 0.40), with mean breadth 0.11 (in lateral view), penis mean 0.73; furca mean 0.19; sagum mean 0.27. Vertical/Horizontal extension of uncus: forearm 0.15/0.022 to 0.24/0.045 (mean 0.2/0.035), humerulus mean 0.07/0.12, shoulder mean 0.1/0.06, lobe 0.19/0.045–0.26/0.06 (mean 0.24/0.05). Valve: 0.53–0.68 (mean 0.6) with breadth 0.24–0.36 (mean 0.3).

The length of the suprazonal portion of the ædeagus is very constantly around 0.5 in most of the sixteen males measured, gradually reaching 0.52 in a large Bolivian specimen (prep. 517) and in the Bogota one, but abruptly falling to 0.4 in the Cariputo specimen and to 0.36 in the (small) Martinique one. In the latter the suprazonal portion is shorter than the subzonal one (0.46), a ratio not met with in any other specimen; it would be interesting to see whether this applies to a special Martinique race, or is merely the result of irregular dwarfing in this particular individual. The subzonal portion is fairly constant at around 0.39, reaching 0.46 only in the above mentioned specimen and in the Surinam one, and falling to 0.3 in the Cariputo individual. The length of the forearm remains steadily at 0.21 in the majority of the specimens, rising to 0.22 in two (Surinam and Puerto Rico) and to 0.24 in one, but falling to 0.15 in the Cariputo specimen (where the whole armature is greatly reduced in size) and to 0.19 in a dwarf measuring 7 mm. from base of Cu to end of  $M_1$  of forewing (Bolivia, prep. 518) as well as in another (smallish) individual from São Paulo. For the horizontal extension of the humerulus and for the height of the uncus lobe, 0.12 and 0.24, respectively, are the most frequently met measurements, with the humerulus steadier than the lobe which is much more sensitive in its reaction to the vertical growth or dwarfing of the forearm. The valve reaches 0.68 in my only Haitian specimen, but otherwise is very constant at close to 0.6, dwindling to 0.58, 0.56, and 0.53 in the small specimens from Martinique, Taboga, and Coroico.

#### *Hemiargus ramon* Dognin

(figs. RAM, pl. 4)

Two males investigated (both in Mus. Comp. Zool.): prep. 573, "Quayaquil, Ecuador, V-1924," *ex coll.* Weeks, and prep. 616, "San Rafael, Ecuador, VII-1919, *leg.* E. W. Rorer."

Suprazonal portion of ædeagus of the *ceraunus* type but considerably longer,<sup>1</sup> asparagus-like, of even breadth throughout after tapering at about one third from zone. Point of surculi in profile of the *ceraunus* type but still smaller (hardly 0.01). Ventral spinules very minute (less than 0.005). Sagum as in *hanno*. Falx of the *hanno* type but larger, heavier, with the shoulder still less pronounced. Valve of the *hanno* type, with deeply but rather roundly carved out lower margin and a somewhat straighter, slightly thicker rostellum.

Measurements: ædeagus 1.22–1.24, suprazonal portion 0.75, subzonal 0.47–0.49 with breadth 0.1–0.14; penis 1.05–1.1. Furca 0.23. Sagum lobe 0.21 with breadth 0.1. Vertical/Horizontal extension of uncus: forearm 0.25/0.055–0.29/0.06, humerulus 0.065/0.15–0.08/0.15, shoulder 0.1/0.07, lobe 0.21/0.07–0.23/0.06. Valve 0.62–0.65 with breadth 0.34–0.35.

#### Echinargus n.g.

(figs. ISO, N.SP, pl. 5, 7; *n.sp.*, pl. 8)

Type: *Lycæna isola* Reakirt 1866.

Two species known, one unnamed:

*isola* Reakirt (*Lycæna*, 1866, Proc. Acad. Nat. Sci. Philadelphia 1866:332, "Vera Cruz, Mexico"; *Hemiargus isola*, Bethune-Baker, 1916, Ent. News 27:450); and a new species,<sup>2</sup> from Trinidad, British W. Indies.

#### GENERIC DESCRIPTION

Ædeagus shorter and weaker than in *Hemiargus*, intermediate in shape between *Hemiargus* (*hanno*) and *Cyclargus*; much plainer in structure, however, than in either, with very minute cornuti on the similarly shaped vesica. Suprazonal sheath shorter than the subzonal one, weakly notched ventrally, acuminate laterally, with high, rather distad facing vesical

<sup>1</sup>This is the longest ædeagus in *Plebejinæ* except *Aricia isaurica* Staudinger which is subequal, and *Icaricia icarioides* Boisduval which attains the enormous length of 1.75. Incidentally, in Chapman 1916, *l.c.*, the former species (pl. 29, fig. 2, ædeagus) is wrongly figured as *Albulina pheretes* auct. (*orbitulus* Prunner) and vice versa (pl. 30, fig. 4, ædeagus).

<sup>2</sup>Shortly after recognizing this as an undescribed species by studying the Thaxter pair (see below), I learnt from Mr. W. P. Comstock that he knew it already from specimens (one of which he gifted to this Museum) taken on the same island by Mr. E. I. Huntington, and was about to publish it. I refrain from using Comstock's MS. name so as not to interfere with his priority in case my paper appears before his.

opening and small alulæ at the zone. Furca larger or much larger than in *Hemiargus*. Sagum considerably more developed (and reaching in *isola* its maximum for the whole subfamily), consisting of two, ventrally scooped out or fully formed lobes aproning the ædeagus and armed with a set of teeth along the distal part or the whole of the margin. Forearm of falx very slightly curved and sharper than the straight blunt forearm of *Cyclargus* or *Hemiargus*, with a higher and more conical shoulder. Uncus lobe as in *Hemiargus* but slightly more excurved and tending to a hatchet shape under pressure. Valve of a normal subfamilial (fish-like) shape, allied to the *lajus* section in *Chilades*, with a tapering rostellum of the *Hemiargus ceraunus* type but differing from those genera by the presence of a bullula which is typical for holarctic *Plebejinæ* (and also exists in the next three neotropical genera to be discussed). Female: henia long and comparatively thin, thus again differing from *Hemiargus* in a normal "Old-World" direction.

#### *Echinargus isola* Reakert

(figs. iso, pl. 5, 7)

Seven males and one female investigated:

Prep. 540, "Tancitaro, Michoacan, Mexico, 6,000 ft., on *faeces*, 10-VII-1941, leg. R. Haag: 539 (*forma* "*nyagora* Boisduval") *id.*; 478, "Round Mt., Texas, X-1930," *ex coll.* Fall; ♀ 587, "Dallas, Texas, leg. Boll"; 500, 526, 534, "Texas"; 538, "Half Way House, Pike's Peak, Colorado, 9,000-10,000 ft., 16-18 VII-1902," *ex coll.* Weeks (? *ssp. alce* Edwards; see Field 1941, Kans. Univ. Sci. Bull. 26:347).

Ædeagus very poorly chitinised, very anemic looking when teased out of the prodigious structure of the sagum; just over two thirds of a mm. long, the suprazonal portion less than one third of the subzonal one with the vesical opening at two thirds from the zone. Furca extremely long,<sup>1</sup> almost reaching one mm.

<sup>1</sup>This is the only species of the nineteen discussed here that already had been (briefly) described genitally: namely, Bethune Baker 1916, *l.c.*, refers to "a large toothed hood . . . [which] has its origin just above the very short furca." Evidently the greater part of the *very long* furca was screened from the observer by other parts of the armature. In this connection it should be noted that during the time the armatures are studied they should be kept in vials and if mounted at all (subsequently) the parts should be well separated, with the dorsum placed in ventral view. A slide of the whole armature in lateral view (or a photograph of such a preparation) is utterly useless.

and thus of a very holarctic aspect. Sagum hugely developed, consisting of two convex lobes, in ventral view resembling the parietal bones of a skull; about twice as long as broad, only slightly shorter than the prongs of the flexible furca embracing them: thus twice longer than the subzonal portion of the ædeagus which they envelop from the zone down, their strongly serrated edges meeting in front (e.g. ventrally) of the ædeagus and of an imaginary line prolonging it proximad; these teeth of uneven length but on the whole increasing in size proximad; up to 45 teeth along each margin, the first three or four (at the most distal point where the edges begin to meet) about 0.012 long, then ranging (in the same specimen) from 0.02 to 0.04 (and to 0.055 in some specimens) in an unequal sequence; finally reaching 0.1 at the proximal ends of the parting margins where they become clawlike, with clusters of additional spines on the præmarginal surface of the lobes. Shoulder of falx almost as high as the forearm which is about one third of the ædeagus. Valve twice longer than the ædeagus and more than three times as long as broad itself with a long tapering tail, a rather weak hump, a small mentum and a curved rather than bent, thickish, gradually tapering rostellum about 0,2 long.

Female: hena beautifully developed with its distal half (about 0,6) strongly plated; fibula engulfed as it were in this chitination.

Measurements (in mm.): ædeagus 0.6–0.7 (mean 0.69), supra-zonal portion 0.15–0.2 (mean 0.18), subzonal 0.45–0.52 (mean 0.49) with breadth (in lateral view) 0.08–0.09; penis mean 0.62. Furca mean 0.9. Sagum 0.85–0.96 (mean 0.93) with breadth 0.41–0.44 (mean 0.42). Vertical/Horizontal extension of uncus: forearm 0.2/0.03–0.22/0.035, humerulus 0.055/0.13–0.065/0.14, shoulder 0.18/0.05; lobe 0.25/0.08. Valve 1.28–1.31, with breadth 0.33–0.39.

*Echinargus n.sp.*

(figs. N.SP, pl. 5, 7, 8)

Two males and one female investigated: prep. 578, "Port of Spain, Trinidad, XII–1912–V–1913, leg. R. Thaxter," Mus. Comp. Zool.; female, prep. 597 *id.*; prep. 614, "Chancellor Rd., Port of Spain, Trinidad, 21–31–III–1929, leg. E. I. Huntington," *ex coll.* Amer. Mus. Nat. Hist., Mus. Comp. Zool.

Ædeagus just over half a mm. in length, the supra-zonal por-



tion about three fifths of the subzonal one, vesical opening at about two thirds from zone on the ventral side. Furca longer than the subzonal portion of the ædeagus and very thin. Sagum very remarkable: showing a transitional stage of development between *Hemiargus ceraunus* and *Echinargus isola*; each of its twin parts produced ventrad from the zone and embraced by the furca, in shape roughly resembling a high-shouldered falx the forearm of which (copied by the jutting lower portion of each lobe) would terminate in a process resembling a valval comb. For purposes of measurement this peculiar fig-leaf type of sagum may be imagined in the case of each lobe as a roughly equilateral triangle ZPD.<sup>1</sup> (where Z is the præzonal point, P the base of the penis and D the dentate end of each sagum lobe) with ZP (along the ædeagus) and PD (at an angle away from the ædeagus ventrad) and the imaginary line ZD connecting these points (and in position coinciding with the "filled out" ventral margin of each lobe in *isola*) each about 0.3–0.35 long. Actually a large portion (shaped rather like the falcal arch in high-shouldered falces) is left unfilled in the triangle ZPD so that each sagum lobe consists of an upper portion dorsally curving along the ædeagus, ventrally sinuous with a bulge in its outline, and roughly 0.35 long by 0.15 broad at that bulge, and of a lower portion, jutting in a ventral direction, 0.35 long along its straight basal side, 0.3 along its sinuous and oblique opposite margin and 0.04 broad at the beginning of its free part, then widening to 0.1, and at the very end narrowing again to form a spur 0.05 broad with four teeth 0.01 long. Falx and uncus lobe covered by the generic description and the measurements given below. Valve small but at least a fifth longer than the ædeagus, elongated, slightly more than twice as long as broad, with Bayard's angulation well pronounced. Rostellum bent towards the mentum, thin, tapering, about 0.11 long.

Female: henia extruding (semi-exerted) to a length of 0.25 by 0.12 broad medially in lateral view. Fibula consisting of two lamellate portions one longer by 0.04 than the other which is 0.17 long by 0.12 broad, of a suboval shape. Papillæ anales about 0.33 long by 0.42 broad, with rods 0.7 long.

Measurements (in mm.): ædeagus 0.56–0.58, suprazonal portion 0.2–0.21, subzonal 0.36–0.37 with breadth 0.1; penis 0.5. Furca 0.42–0.43. Sagum 0.35 (see description). Vertical/Hori-

<sup>1</sup> Which following the falcal simile would coincide with BHF (see pl. 1).

zontal extension of uncus: forearm 0.18/0.035–0.18/0.045, humerulus 0.04/0.12–0.045/0.14, shoulder 0.11/0.065–0.11/0.07, lobe 0.21/0.05. Valve 0.7 by 0.29–0.31 broad. Rostellum 0.11.

Alar characters, underside, ♀, (see plate 8): 0–150: number of concentric scale lines with common center for both wings (as also in *Cyclargus*). Veins ending at following lines: forewing Sc|65, R<sub>1</sub>|85, R<sub>2</sub>|100, R<sub>3</sub>|120, R<sub>4</sub>|140, M<sub>1</sub>|145, M<sub>2</sub>|145, M<sub>3</sub>|143, Cu<sub>1</sub>|137, Cu<sub>2</sub>|128, 1A|124, 2A|118, hindwing Sc|78, R<sub>s</sub>|94, M<sub>1</sub>|108, M<sub>2</sub>|110, M<sub>3</sub>|110, Cu<sub>1</sub>|108, Cu<sub>2</sub>|100, 1A|94, 2A|85, 4A|40. The evenly rounded stretch of termen 94–108–110–110–108–100–94 is a rare character in *Plebejinæ* (also found in *Cyclargus*).

The following markings are represented: forewing, fairly broad terminal line, split macule I (with inner and outer cretules and uncolored interval) in cells R<sub>4</sub> to 1A, lateral macule in R<sub>2</sub>, macule II (with broad halo) in R<sub>4</sub> to 1A, I discoidal R+M (with broad halo). Example of disposition (on interneural fold); in Cu<sub>1</sub>: terminal line 133–136; outer cretule 127–133; præterminal mark (outer part of split macule I) 123–127; interval 116–123; semimacule (inner part of split macule I) 111–116; crescentic inner cretule 104–111 (thus the whole system of macule I extends from 104 to 133); outer part of halo of macule II 88–94; macule II 81–88; inner part of halo of macule II 76–81 (thus the whole system of macule II 76–94). Hindwing, fairly broad terminal line, split macule I (with crescentic inner and outer cretules; interval uncolored except in Cu<sub>1</sub>) in cells Sc to 2A, poorly pigmented except the præterminal mark in Cu<sub>1</sub>; macule II in same cells, macule III in Sc and Cu<sub>2</sub>; I R+M and II M; lateral macule in 4A. Observations: præterminal marks in hindwing from Sc increasing tornad and together with the intervals tending to a triangular (basad pointed) shape, especially in M<sub>2</sub>, M<sub>3</sub>, weakly pigmented; then in Cu<sub>1</sub> greatly developed (20 scale lines), round, strongly pigmented (“black”) with a distally placed band-like scintilla consisting of 52 scales and about a fifth the mark in extension (proximo distad), and a narrow crescentic interval faintly flushed with the auroral element; then in Cu<sub>2</sub> to 2A mark roundish, but small, decreasing tornad, weakly pigmented. Other catochrysopteroid features, shared with *Cyclargus* and *Hemiargus*, can be easily seen from the figure.

## Pseudolucia n.g.

(figs. CHI, COL, pl. 5)

Type: *Lycæna chilensis* Blanchard 1852.

Two species known:

*chilensis* Blanchard (*Lycæna*, 1852, in Gay, Hist. Chile; Zool. 7:37-38, "Coquimbo, Chile," pl. 3, figs. 4a ♂, b; *Scolitantides chilensis*, Butler, 1881, Trans. Ent. Soc. 1881:467; ?*Lycæna endymion*<sup>1</sup> Blanchard, 1852 *ibid.*:37 "Coquimbo, Chile," pl. 3, fig. 3a ♂, b; *Polyommatus atahualpa* Wallengren, 1860, Wien. ent. Monatschr. 4:37, "Valparaiso, Chile").

*collina* Philippi (*Lycæna*, 1860, Linn. Ent. 14:270-271 "Santiago, Chile"; *Scolitantides*<sup>2</sup> *collina*, Butler, 1881 l.c.; *Lycæna lyrnessa* Hewitson, 1874, Ent. Month. Mag. 11:107 "Chile").

## GENERIC DESCRIPTION

Ædeagus thick-set, with strong fat tabs and alulæ, the latter very homogeneous with the subzonal sheath, sepaloid, arched and raised (as in several suprazonally short palæarctic genera e.g. *Agrodiætus*), the zone dipping medially (ventrally slightly more so than dorsally) and coinciding with the beginning of the vesical opening on the dorsal side. Suprazonal portion, as measured from that medial point ventrally, extremely short, about one third the length of the subzonal one (and still shorter if measured from the apices of the "shrugged" alulæ), thus shorter than in any other species restricted to the New World. The short shield of the (ventral) suprazonal sheath deltoid in ventral aspect, acuminate in lateral view and quite straight i.e. lacking the slight excurvation noticeable in *Hemiargus*, *Cyclargus* etc.; exceeding in length the plain unarmed vesical tip of the penis (which seems sunken between the alulæ). Subzonal sheath thickly lining the penis, curiously shagreened ventrally. Furca strongly developed, its tips connected with the sagum. The latter in shape and position of the *Echinargus isola* type, but considerably smaller (in relation to the ædeagus), its two lobes reaching from the level of the alulæ (to which they are

<sup>1</sup> Rechristened "*sibylla*" by Kirby (1871, Cat. Diurn. Lepid.: 377) who wrongly thought Blanchard's name clashed with *Papilio endymion* [Schiff] = *Meleageria meleager* Esper.

<sup>2</sup> The genus *Scolitantides* Hübner, of which *orion* Pallas is the type, belongs to the *Glaucopsychinæ*. By an amusing coincidence Butler placed almost correctly in that genus the species *plumbea* described *ibid.*

attached) to the level of the base of the penis proper and almost as broad as long; meeting in front (i.e. ventrally) of the ædeagus at about one third of the subzonal portion from the zone, overlapping for a short stretch, then parting again; these front edges coarsely serrated, and the whole præmarginal portion of each lobe strengthened ventrally by an additional sharply localized granulation of the chitinous surface (similar to the shagreened ventrum of the ædeagus as seen in the V-shaped anterior parting of the lobes), a character not found elsewhere in the subfamily. Uncus small, resembling *Pseudothecla* and also the unique plebejinoid uncus<sup>1</sup> of the holotropical *Zizula gaika* Trimen (*Lycæna cyna* Edwards) in *Brephidinæ*. Falx still more curved than in *Echinargus*, differing from *Hemiargus* as a beckoning index does from a warning one; the whole outline from point of forearm to base of humerulus evenly rounded, with a gently sloping shoulder, thus quite different from the "cameloid" falces of the three preceding genera. Uncus lobe still more tending to a hatchet shape than in *Echinargus* (and thus resembling *Eumedonia*). Valve of a typical holarctic shape, with bullula; elongated, nicely angled at Bayard's point, rather exactly three times as long as broad and at least twice longer than the ædeagus, with a sparsely serrated rostellum.

Female: henia long and thin, with a plate-like chitination at the tip.

#### *Pseudolucia chilensis* Blanchard

(figs. CHI, pl. 5)

Three males and one female (all ex coll. Weeks, Mus. Comp. Zool.) investigated: prep. 619, "Central Chile, 1882-1885, leg H. B. James"; 485, 534, "Penco, Chile"; ♀ 533, *id.*

Rostellum about 0.2 long by 0.03 broad (at curve), incurved as in *Echinargus isola* but serrated *i.e.* ending in a beak-like tip, its inner margin concave (fitting the upper, convex, margin of the mentum in situ), its outer (distad facing) edge below the curve sparsely toothed: four teeth in all counting the "heel" of the abrupt curvature as first, the two next slightly larger and slightly incurved projections as second and third, and the beak of the rostellum as fourth. Other male characters covered by

<sup>1</sup> This and the *Catochrysopinae*-like features of the *Parachilades* (and less distinctly-*Chilades*) falx constitute the only two links between the *Plebejinæ* and other subfamilies.



the generic description and the specific measurements given below.

Female: henia found extruding at a length of 0.45 from tip of body; ostium strengthened by a post-vaginal lamella attaining a dorsal length of 0.25 and a lateral one of 0.38 (basad). Papillæ anales: length about 0.45 by 0.4 broad. Rods comparatively short, 0.7.

Measurements (in mm.): ædeagus mean 0.65, suprazonal portion (see also generic description) 0.15–0.18 (mean 0.16), subzonal 0.48–0.53 (mean 0.5), breadth (in lateral view) 0.12; penis 0.56. Furca 0.7–0.9. Sagum (mean) length of lobe 0.48 by 0.42 broad; breadth of granulation 0.1; average length of teeth 0.03. Vertical/Horizontal extension of uncus: forearm 0.21/0.04–0.25/0.05, humerulus 0.05/0.21–0.06/0.21, shoulder 0.11/0.12, lobe 0.2/0.07–0.23/0.07. Valve 1,3–1,4 with breadth 0.45–0.48: teeth (first three measured from tip to a level prolonging basad the anterior edge of each next): first 0.005, second 0.006, third 0.003, fourth (to junction with third) 0.04.

#### *Pseudolucia collina* Philippi

(figs. COL, pl. 5)

Prep. 536, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.; female 591, id.

Differing from *chilensis* in greatly reduced size (except as regards the height of the shoulder, as will be seen by referring to the measurements given below) and in the presence of an additional strip of shagreened chitinisation running along the outer margin of each sagum lobe and proximad converging, but not actually fusing, with the similar granulation along the serrated inner edge. Rostellum thin, whip-like, very similar (in miniature) to the *lajus* group in *Chilades*, very weakly curved, however, and only slightly exceeding the mentum in length (*in situ* resting upon the bullula), about 0.02 broad, not curving and broadening at the tip (as it does in *chilensis*) except for a slight rosette-like expansion due to four somewhat up-turned teeth, the first about 0.01 long, the two next gradually diminishing, the last barely indicated.<sup>1</sup>

Female: henia found jutting to a length of 1 mm. (by about

<sup>1</sup> I do not think I have failed to unfold the tip properly, but still its serration should be checked on more material.

0.07 broad) from the tip of the body. Lamella 0.2 long laterally, twice shorter dorsally.

Measurements (in mm.): ædeagus 0.43, suprazonal portion 0.11, subzonal 0.32 with breadth (in lateral view) 0.06; penis 0.4, furca 0.5, sagum about 0.3 by 0.2. Breadth of inner granulation 0.9, with average length of teeth 0.01; breadth of outer granulation about 0.4. Vertical/Horizontal extension of uncus: forearm 0.14/0.03, humerulus 0.045/0.16, shoulder 0.11/0.09, lobe 0.2/0.06. Valve 1 with breadth 0.33; teeth 0.01 and smaller.

The high development of the auroral element in the ground of *chilensis* and *collina* is approached among the *Plebejinæ* only by the upperside of the Sonoran *Plebulina emigdionis* and by the intense coloration of the forewing underside in certain individuals of the Spanish *Aricia idas* Rambur (rechristened at one time "*ramburi*" by Verity).<sup>1</sup> The upperside of the females oddly recalls certain Australian Lycænids belonging to a widely different subfamily.

The underside maculation in *chilensis* is of a dispositional type frequently met with in *Plebejinæ* (and *Glaucopsychinæ*); the tendency on the part of the II macules in forewing to assume a very distal position (quite normal of course in the case of  $Cu_2+1A$ ) as well as the rather proximal ("glaucopsychoïd") position of  $R_sII$  in hindwing and the weak pigmentation of the I (split) macules, with an aurora visible only in  $Cu_1$  of hindwing (in some specimens but absent in the female type), occur in several palæarctic and nearctic species of both subfamilies. The insulæ and outer cretules are conspicuous on the upperside of the male and are still more conspicuous in Blanchard's figure of *endymion* which on the whole differs from *chilensis* only in being rather thoroughly dusted with blue structural scales (that are sparsely represented basally and along the hindwing dorsum in one of my males of *chilensis*). In my specimens of *collina* (a much smaller species) the distal position of the II macules  $R_4$  to  $Cu_1$  is still better marked and I RM (weak in *chilensis*) is quite absent — a rather unusual character. In the hindwing, however, where II macule  $R_s$  is as proximal as in *chilensis* the resemblance to the latter species abruptly stops at that interspace: the posterior rest of the wing produces in con-

<sup>1</sup> One would like to suggest that in the future no such renaming, however necessary, should be valid unless the author of the new name redescribes the species or subspecies and selects a holotype.

trast to the rather *Plebejus sæpiolus*-like wing of *chilensis* a remarkable homoptoc or mimetic resemblance to *Itylos* and especially to *Parachilades* owing to a combination of seven characters: 1. enlarged, more or less cordate shape of median and posterior II macules; 2. their transverse development and connection; 3. the oblique line into which II macules  $M_2$  to  $2A$  fall; 4. the blurred pigmentation; 5. the weakness of the I macule system; 6. the fusion of distal parts of halos with proximal cretules; and 7. the great development of coarse greyish white scales.

*Scolitantides plumbea* Butler 1881 (Trans. Ent. Soc. 1881:486, "Chile") which is possibly the same as *Lycæna patago* Mabilie 1889 (Nouv. Arch. Mus. Paris 1:143-144 "Punta-Arena" pl. 10, fig. 1 ♂, 2) belongs to a different subfamily, being structurally the only representative of *Glaucopsychinæ* in S. America. *Scolitantides andina* Calvert 1894 (An. Univ. Chile 34:832, "Condes above Santiago"; Elwes 1903 Trans. Ent. Soc. London 1903:288-289) may prove to be a synonym of *plumbea* too.

#### Paralycæides n.g.

(figs. INC, pl. 6)

Type and only species known: *Itylos inconspicua* Draudt 1921, (in Seitz, Macrolep. World 5:822, "Cuzco, Peru," pl. 144, m).

One male investigated: prep. 607 "Cuzco, Peru, 3500 m. alt., leg. Fassl," ex coll. W. P. Comstock, [ex coll. Staudinger-Bang Haas, "vapa Stgr"], Amer. Mus. Nat. Hist.

Extremely close to *Lycæides*, in the falx, furca and valve, and considered here as retaining an ancestral aspect of that genus. *Ædeagus* resembling *Pseudothecla*, thickish subzonally, very slightly incurved, just above 0.8 long; differing from *Lycæides* in the suprazonal portion being twice shorter than the subzonal one and in the higher (at about 0.1 above zone), and thus shorter, vesical opening (the lower point of which is at the zone in *Lycæides*). Vesica unarmed; suprazonal sheath tapering to a point ventrally. Furca very large, equal in length to the *ædeagus*, larger than in *Lycæides* (especially in relation to the other parts of the armature, less so in absolute size). No definite sagum but traces of a membrane between furca and subzonal sheath. Falx of the "plain type" with an outline nicely

rounded throughout, remarkably resembling *Lycæides argyrog-nomon* Bergstrasser (Tutt) in miniature, less distinctly hooked at the tip; distance between point of forearm (F) and posterior point of shoulder (U) equal to that between the latter point and the tip of the uncus lobe (in ventral view); forearm short, shorter than the humerulus, the latter medially not thicker than the former, then very gradually thickening to form a low sloping shoulder with a rather ill-defined basal point. Uncus lobe resembling *Hemiargus*, i.e., poorly developed; thus smaller, narrower and slightly more excurved than in *Lycæides*; in height (length) when measured in the same way as the rest of the genera here treated (i.e., from its tip to the basal point of the humerulus) equal to the humerulus but if measured according to the method adopted for *Lycæides* (i.e., from its tip to the posterior point of the shoulder) considerably less than the humerulus (HU) and somewhat less than the forearm (FH). Valve of the *Lycæides* (and *Freyeria*) type, smallish as compared to *Lycæides*, one and a half times longer than the ædeagus, about twice as long as broad; rostellum narrower in relation to the valve than in *Lycæides*, not exceeding the mentum in length, slightly and evenly expanding at the tip to form a comb consisting of a dozen teeth, each about 0.0065 in length, i.e. longer than in *Freyeria putli* Kollar [Moore] (0.0025), shorter than in average *Lycæides* (0.009), and directed as in those genera (as well as in *Cyclargus*) at right angles to the transverse axis of the rostellum.

Measurements (in mm.): ædeagus 0.82; suprazonal portion 0.27; subzonal 0.55 with breadth 0.15 (in semilateral view); penis 0.66. Furca 0.83. Vertical/Horizontal extension of uncus: forearm 0.22/0.05, humerulus 0.05/0.24, shoulder 0.11/0.15, lobe 0.24/0.075. When the uncus is measured according to the method used for *Lycæides* (see pl. 1, fig. 3, pl. 6, INC 2, and 1944, Psyche 51:108-111, fig. 1) the triangle FHU gives  $0.22+0.24+0.17=0.63$ . These figures come rather close to the dimensions ( $0.25+0.22+0.22=0.69$ ) of the hypothetical ancestor of *Lycæides* as worked out (1944, l.c.) prior to the discovery of the structure of *inconspicua*. Valve 1.2 with breadth 0.53; comb 0.061 broad.

In regard to macroscopical characters it may be briefly noted that the wing-shape recalls that of small arctic or high alpine forms of *Lycæides* while the pattern of the underside (very



proximal position of II macule  $Cu_2 + 1A$  in forewing and II macule  $M_3$  in hindwing, poverty of pigmentation of macules, strong development of halos and other colorless scales) belongs to the same phase, as traversed by the structurally very different genus *Itylos* (s.s.).

*Itylos* Draudt [revised]

(figs. MOZ, RUB, PAC, KOA, pl. 6; MOZ, KOA, pl. 7)

At the end of a jumble of species and forms belonging really to several genera and subfamilies but all crammed into "genus *Lycæna* F, subgenus *Rusticus* Hbn" (whatever that means), Draudt (1921, in Seitz, Macrolep. World 5 : 818) said of *Lycæna ruberrothei* Weeks ["English" text]: "Perhaps better to be placed to *Itylos* beside *moza* and *inconspicua*." This is the first time the genus *Itylos* is "indicated." A few pages further (: 821) *Itylos* Draudt was superficially described and made to include *pelorias* Weymer, *pacis* [Staudinger in commerce] Draudt, *koa* Druce, *vapa* Staudinger [*sp. incert.*], *ludicra* Weymer [*id.*], *moza* Staudinger, *inconspicua* Draudt [*recte Paralycæides sp., supra*], *titicaca* Weymer [*recte Parachilades sp., supra*] and *speciosa* Staudinger [*id.*]. Regarding the two last, however, Draudt said (: 822) that they belonged to "a somewhat deviating group." Under the circumstances, i.e., since *speciosa* Staudinger [= *titicaca* Weymer] is not mentioned in the original list of *Itylos* species (*ruberrothei* Weeks [*fortas.*], *moza* Staudinger and *inconspicua* Draudt [*nom. nud.* at the time]) and is only doubtfully assigned to it when the genus is more fully discussed subsequently, Hemming's selection of *speciosa* Staudinger as the type of *Itylos* (1929, Ann. Mag. Nat. Hist. 3: 240) cannot stand.

Type: *Cupido moza* Staudinger 1894.

Four species known: <sup>1</sup>

*moza* Staudinger (*Cupido*, 1894, Iris 7: 79-80, "Cocapata and Huallatani, Bolivia"; *Lycæna*, *ibid.* pl. 2, fig. 5 ♀; *Itylos moza*, Draudt 1921, *op. cit.*:818 et:821; *Lycæna babhru* Weeks, 1901, Trans. Am. Ent. Soc. 27: 357, "Sicasica, Bolivia"; 1905, Unfig. Lep. : 98, pl. 43, fig. 1 [♀]);

*ruberrothei* Weeks (*Lycæna*, 1902, Ent. News 12: 104 "Sicasica, Bolivia," 1905 *op. cit.* : 99, pl. 43, fig. 2 [♂]; *Itylos?*, Draudt 1921, *op. cit.* : 818);

<sup>1</sup> Listed in systematic sequence.

*pacis* Draudt (*Itylos*, 1921, *op. cit.* : 821, "Cuzco, Peru," pl. 144, 1, *pacis* ♂ ♀; ?*Lycæna pelorias* Weymer 1890, in Reiss et Stübel, Reisen in Sud-America, Lepidoptera : 121-122 "Sajama, Bolivia," pl. 4, fig. 2 ♂);

*koa* Druce (*Lycæna*, 1876, Proc. Zool. Soc. London, 1876 : 239-240, "Pozuzo, Peru," pl. 18, fig. 7 [♂]; ?Weymer, 1890, *op. cit.*: 49 "Antisana, Ecuador"; *Itylos*, Draudt, 1921, *op. cit.* : 821 pl. 144, m; [see also "*Lycæna koa*," Dyar, 1913, Proc. United States Natul. Mus. 45 : 638, who suggests seasonal dimorphism in the tone and density of the blue overlay in Peruvian males].

My study of the bibliography has been very superficial and my material too scanty for a satisfactory revision of these little known species. *Lycæna ludicra* Weymer 1890 (*op. cit.* : 122, "Tacora, Bolivia," pl. 4, fig. 3 ♂) may be a form of *Itylos moza*, or an allied species, with well developed cyanic overlay, and *Itylos grata* Kohler 1934 (Rev. Soc. ent. Argentina 6 : 38-39 "Las Lajas, Argentina," text fig. [poor phot.] ♂) is apparently close to *pacis* Weymer. *Cupido vapa* Staudinger 1894 (Iris 7 : 79, "Huallatani; Cocapata, Bolivia"; *Lycæna vapa*, *ibid.* pl. 2, fig. 4 ♂) may turn out to belong to *Itylos*, and the same may be said of *Lycæna martha* Dognin 1887 (Le Naturaliste 9 : 190, "Loja, Ecuador"), which, judging by the woodcut (l.c. fig. 5 ♂ ♀) combines *Hemiargus* and *Itylos* wing characters and very possibly is a form of *koa* (some specimens of which have a well formed, "black," scintillated præterminal mark in Cu<sub>1</sub>) with strongly developed ornamentation of the catochrysopoid type.

#### GENERIC DESCRIPTION

A very holarctic looking genus. *Ædeagus* acuminate, slightly incurved, in structure and shape closely allied to *Icaricia*, *Aricia*, and *Lycæides*. Suprazonal portion subequal to the subzonal one; suprazonal sheath in ventral view rather narrow above the zone, then slightly broadening, then tapering to a sharp point, and (in side view) laterally enveloping the vesica only immediately above the zone, then gradually turning into a strictly ventral shield. Vesical opening on the dorsal side beginning immediately above the zone, vesica plain, weakly convex, about as long as the subzonal sheath. Alulæ small. Furca well developed. Sagum absent. Falx resembling an enlarged edition of

*Cyclargus*; somewhat allied to *Aricia* but well formed, with a steeper and narrower shoulder. Forearm straight, tapering to a blunt point, falcate arch narrow, shoulder high and conical though not as high in relation to the falx as it is in *Echinargus*. Uncus lobe with *Albulina* affinities, larger than in all preceding groups considerably higher than the forearm. Structure of tegumen at its junction with the uncus more elaborate, than in the preceding genera, of a common holarctic type (*Albulina*, *Plebulina*, etc.). Valve likewise representing the holarctic norm, longer than the ædeagus, with a well developed bullula. Rostellum, broader than in *Aricia*, serrated, exceeding the mentum in length, differing from *Paralycæides* in the latter character as well as in the receding margin of the comb, the sharp regular teeth of which are directed downward.

Papillæ anales with comparatively short rods. Henia well developed, with an oval fibula (*koa*) somewhat resembling *Aricia*.

#### *Itylos moza* Staudinger

(figs. MOZ, pl. 6, 7)

One male investigated: prep. 606, "Bolivia" *ex coll.* Huntington [*ex coll.* Staudinger-Bang Haas], Am. Mus. Nat. Hist., and one female: prep. 528 (*Lycæna babhru* Weeks, holotype), "Sicasica, Bolivia, 1-X-1899," *ex coll.* Weeks, Mus. Comp. Zool.

Ædeagus 1 mm. long with the suprazonal portion slightly shorter (by about 0.1) than the subzonal one. Furca about equal in length to the penis. Forearm a third of the length of the ædeagus, about ten times as long as broad, thus rather thin; humerulus thick, about a third of the forearm in height, and rising to double of that at the shoulder; uncus lobe very slightly excurved, as long as the suprazonal portion of the penis, less than a fourth of that broad, somewhat expanding above the level measured, then gradually tapering to a rather well accused point. Valve large, about one and a half times longer than the ædeagus when measured from the base to the end of the rostellum and less than half as broad as long, with the hump at about two thirds of the length of the upper process from the base of the valve.

Measurements (in mm.): ædeagus 1, suprazonal portion 0.44, subzonal 0.56 with breadth (lateral view) 0.11; penis 0.94. Furca 0.93. Vertical/Horizontal extension of uncus (ventral

view): forearm 0.34/0.03, humerulus 0.09/0.2, shoulder 0.17/0.06, lobe 0.44/0.1. Valve 1.35 (to comb 1.55) with breadth 0.59; average length of teeth 0.01.

### *Itylos ruberrothei* Weeks

(figs. RUB, pl. 6)

Two males investigated (Mus. Comp. Zool.): holotype, prep. 527, "Sicasica, Bolivia, 1-X-1899" (left forewing missing), and paratype, prep. 486, "Alezum, Bolivia, 8-VIII-1899," *ex coll.* Weeks.

Identical in structural shape with *moza*,<sup>1</sup> differing from it only in slightly reduced size (cp. measurements) of ædeagus, furca and uncus, and narrower (cp. to length) valve. Valve variable in length, reduced in the holotype, but equal to *moza* in the other individual.

Measurements (in mm.) [when different the holotype is quoted first]: ædeagus 0.9, suprazonal portion 0.4; subzonal 0.5 with breadth in lateral view 0.1, in ventral 0.08; penis 0.8. Furca (holotype) 0.7. Vertical/Horizontal extension of uncus: forearm 0.24/0.03 and 0.29/0.05, humerulus 0.07/0.12 and 0.07/0.17, shoulder 0.13/0.055 and 0.14/0.05, lobe 0.37/0.8 and 0.4/0.09. Valve 1.14 (to comb 1.24) and 1.35 (to comb 1.55) with breadth 0.41 and 0.5. Average length of teeth 0.01.

### *Itylos pacis* Draudt

(fig. PAC, pl. 6)

One male investigated: prep. 609 "Cuzco, Peru, 3500 m. alt., *leg.* Fassl," *ex coll.* W. P. Comstock [*ex coll.* Staudinger-Bang Haas], *Am. Mus. Nat. Hist.*

Differing from *moza* and *ruberrothei* in the following characters: somewhat thicker forearm, smaller and shorter valve,

<sup>1</sup> Quite possibly more material would show that *ruberrothei* is but a form (individual, altitudinal, or microlocal) of *moza*, similar variations in structural size occurring in other alpine species (e.g., *Agriades glandon*). I have assigned the female specimen (described as *babhru*) to *moza* on macroscopical grounds, the difference between the two consisting solely in *ruberrothei* being less robust in wing shape and less pigmented than *moza* (with otherwise identical underside markings, the presence of which on the hindwing of *ruberrothei* may be easily discerned by means of lens, but has been overlooked both by the describer and artist). Staudinger mentions some very weakly marked specimens in his series of *moza*.



rather medial position of hump, shorter (comparatively to mentum) rostellum and conspicuously longer teeth.

Measurements (in mm.): ædeagus, 0.95, suprazonal portion 0.45, subzonal 0.5 with breadth (lateral view) 0.12; penis 0.85. Furca 0.7. Vertical/Horizontal extension of uncus: forearm 0.29/0.05, humerulus 0.06/0.2, shoulder 0.15/0.06, lobe 0.4/0.9. Valve 1.1 (to comb 1.2) with breadth 0.44; average length of teeth 0.017.

#### Itylos koa Druce

(fig. KOA, pl. 6, 7)

Two males and one female investigated (Mus. Comp. Zool.): prep. 592, 595 and 593 female, "Puno, Peru, 12,500 ft. alt., 1-XI-1898" *ex coll.* Weeks.

Separated in uncus and valve from the precedent structures by a wider hiatus than that existing between *moza* and *ruberrothei* on one hand and *pacis* on the other. Ædeagus slightly shorter and thinner than in *pacis*, furca slightly longer. Forearm shorter, rather thicker at its base, then tapering, shoulder smaller, uncus lobe about six times as long as broad, much narrower throughout than in the other species. Valve smaller, rather proximally humped, hardly more than half as long as broad, only slightly longer than the ædeagus, with a correspondingly reduced comb, very minutely serrated, the teeth a third shorter than in *ruberrothei*.

Measurements (in mm.) [when different, 592 quoted first]: ædeagus 0.84 and 0.8, suprazonal portion 0.42 and 0.4, subzonal portion 0.42 and 0.4 with breadth (lateral view) 0.08; penis 0.8 and 0.75. Furca 0.76. Vertical/Horizontal of uncus: forearm 0.23/0.05 and 0.25/0.05, humerulus 0.08/0.13 and 0.1/0.17, shoulder 0.13/0.05 and 0.17/0.06, lobe 0.31/0.06 and 0.3/0.055. Valve 0.9 (to comb 1) with breadth 0.41 and 0.42; average length of teeth 0.004.

The "vitta" of British authors is a certain combinational pattern element occurring on the hindwing underside of a number of Palæarctic *Plebejinæ* (and especially conspicuous in certain *Agrodiætus* species). It is made up of halo and cretule fusions and can be divided into four phases of development: 1. halo  $M_2$  (its posterior distal part) and cretule  $M_2$  fuse in the posterior part of the cell, *i.e.*, below the interneural fold in  $M_2$ , the resulting white streak occupying the whole space between the fold

and vein  $M_3$ ; 2. a similar somewhat weaker fusion is added (not occurring alone) in the anterior part of cell  $M_3$  and blends along vein  $M_3$  with the fusion in the posterior part of cell  $M_2$ ; 3. halo IM (lower part of first discoidal) fuses with halo  $M_2$  which is fused with cretule  $M_2$ ; 4. halo IIM is also involved, this producing a white comet tail traversing most of the wing, "splitting" it longitudinally and widening distally (owing to fusion 2). When, as often happens in *Agrodiætus* the rest of the halos and cretules are reduced while the median macules themselves are "dissolved," so to speak, in the vitta, the effect is very striking. In *Itylos* the vitta effect is produced quite differently and may be termed a *pseudovitta*. At its full development it is formed by the fusion of the halos and cretules in  $M_3$ ,  $CU_1$ ,  $CU_2$ , and IA, and would not be distinguishable from similarly formed blendings in *Lycæides*, *Cyclargus*, etc., had not the following three factors been present: 1. owing to the very proximal ("lagging") position of second macule  $M_3$  the fusion is lengthened in that cell; 2. together with the shorter fusions in the cubital cells it forms an elongated shiny white mark subparallel to the costa; 3. this blending is especially conspicuous because absent in  $M_2$  and  $M_1$ .

#### CONCLUSIONS

The following general remarks may be added. Of the nine neotropical genera none occur elsewhere. Three, namely *Parachilades*, *Paralycæides* and *Itylos*, have retained in the Andes (whither they brought them) structural shapes closely similar to such structures from which *Chilades*, *Lycæides* and *Aricia*, respectively, can be easily imagined to have been derived in their Old World homes. Three, namely *Pseudochrysops*, *Hemiargus* and *Echinargus* reveal certain characters of the palæotropical *Freyeria* (the first) and *Chilades*, but have become strongly differentiated in the neotropics. Still more remote is the relationship between *Cyclargus*, *Pseudothecla* and *Pseudolucia* on one side and Old World forms on the other. It is to be noted however that *Cyclargus* and *Hemiargus* are allied to *Aricia* and *Itylos* in the falx. The general *Hemiargus* - *Echinargus* - *Cyclargus* type of ædeagus is not found in the Old World and apparently represents a very ancient type retained and developed in the neotropics, but extinct or unrecognizably altered elsewhere.

One can assume, I think, that there was a certain point in time when both Americas were entirely devoid of *Plebejinæ* but were on the very eve of receiving an invasion of them from Asia where they had been already evolved. Going back still further, a modern taxonomist straddling a Wellsian time machine with the purpose of exploring the Cenozoic era in a "downward" direction would reach a point — presumably in the early Miocene — where he still might find Asiatic butterflies classifiable on modern structural grounds as Lycænids, but would not be able to discover among them anything definitely referable to the structural group he now diagnoses as *Plebejinæ*. On his return journey, however, he would notice at some point a confuse adumbration, then a tentative "fade-in" of familiar shapes (among other, gradually vanishing ones) and at last would find *Chilades*-like and *Aricia*-like and *Lycæides*-like structures in the Palæarctic region.

It is impossible to imagine the exact routes these forms took to reach Chile, and I have no wish to speculate on the details of their progress, beyond suggesting that throughout the evolution of *Lycænidæ* no two species ever became differentiated from each other at the same time in the same habitat (*sensu stricto*), and that the arrival of *Plebejinæ* in South America preceded the arrival in North America (and differentiation from Old World ancestors) of the genera *Icaricia* and *Plebulina* (and of the species *Plebejus sæpiolus*) while the latter event in its turn preceded the invasion of North America by holarctic species which came in the following sequence: *Lycæides argyrognomon* (subsequently split), *Agriades glandon*, *Vacciniina optilete*. It is to be noted that only those *Plebejinæ* which breed freely in the far north of Eurasia (besides enjoying an enormous distribution in other, mainly alpine regions) are common to both Eurasia and America.

In regard to certain Lycænids of other subfamilies, such as the holotropical *Zizula gaika* Trimen and the South African and American genus *Brephidium*, the difficulty of making them take the Bering Strait route is very great, but in the case of *Plebejinæ*, the discontinuity in distribution is not so disconcerting, and I find it easier to give a friendly little push to some of the forms and hang my distributional horseshoes on the nail of Nome rather than postulate transoceanic land-bridges in other parts of the world.

The majority of neotropical *Plebejinæ* possess a sagum or rudiments of one. It is completely absent only in *Itylus* as it is absent in all palæarctic, nearctic and palæotropical species. This structure can be loosely defined as a fultura superior in relation to the furca (fultura inferior), but its function, if any, is obscure. One is inclined to assume that at the time of the invasion of the neotropical region from the north there existed Eurasian forms with rudiments of a sagum (possibly allied at that stage to the anellus now possessed by the *Catochrysoptinæ* and other subfamilies) which in the subsequent flurry of hectic central palæarctic evolution was lost (and had been already lost by the ancestors of *Itylus*) but in the comparative peace of the neotropics continued to develop owing to that peculiar evolutionary inertia which in the absence of any obstruction keeps a structure tending to its maximum along certain inheritable lines.

In all (80 to 100) Old World and nearctic species the valve is of a very constant general shape.<sup>1</sup> Among the 19 neotropical species known, "normal" shape occurs in 11 species. The rest show four types of variation unparalleled elsewhere. In this respect the peculiar reduction of the valve in *Parachilades*, *Pseudochrysoptis* and *Cyclargus* would seem to be a case of stunting rather than the retention of a very short valve from which the normal elongate structure of the subfamily was evolved ("pulled out" as it were). In regard to *H. hanno* and *ramon* one suspects that the unusual shape is due to the irregular dwarfing of a *ceraunus*-like valve which had initially attained a very full shape (suggested by some of the Central American specimens), the "keel" in *hanno* and *ramon* being probably the remnant of an ample lower margin.

The underside wing pattern of neotropical *Plebejinæ* falls into two main types: catochrysoptoid and ityloid. The catochrysoptoid type (*Pseudochrysoptis*, *Cyclargus*, *Hemiargus* and *Echinargus*) is shared in the Old World by the small Palæotropical section (*Chilades*<sup>2</sup> and less strikingly, *Freyeria*) and in result, certain *Hemiargus* and *Echinargus* forms are remark-

<sup>1</sup> A slightly aberrant structure occurs only in *Chilades galba* and *Albulina (auct) felicis* and this leads to a false resemblance to certain *Glaucopsychinæ*.

<sup>2</sup> Which, moreover, in *Chilades cleotas* (a species ranging from the Malay to the New Hebrides, at least) evolves a likeness to *Talicerca nyseus (Everinæ)*, the behavior of which (deducible from a note in Moore) is that of a "protected" species. *Freyeria* on the other hand tends, mainly owing to its small size, to a *Brephidium* aspect.



ably similar to *Chilades* forms (especially to the *galba* group), the remarkable point being that while the palæotropical ones are sympatric with the kind of *Catochrysopinæ* which they resemble (and which is especially well represented in Africa, e.g., "*Euchrysops*"<sup>1</sup>), the latter does not exist in the neotropics (where the sparse representatives of the *Catochrysopinæ* belong, as exemplified by the holarctic *Leptotes*, to a different phase of pattern). The Ityloid pattern group includes: *Itylos*, one of the two *Pseudolucia* species, *Paralycæides* (to a certain extent) and *Parachilades*. At its initial stage the "pseudovitta" of *Itylos* copies the differently formed vitta of certain palearctic *Plebejinæ* (cp. *Agrodæetus damon* or *Aricia donzelli*).

Taking 100 as the minimum number of known *Plebejinæ* (see footnote further on) the following figures may be given for the various regions where these insects occur. Only six species exist in the Palæotropical region proper, one reaching the Palæarctic, another reaching both the Palæarctic and S. Africa and a third extending into Australia. As many as 19 (probably more) exist in the neotropical region (12 of these are restricted to the Andes) and nowhere else, except for the fact that 2 reach the nearctic as 2 do in regard to the Caspian and E. Mediterranean region (these four invaders are not taken into account further on<sup>2</sup>). As many as 60 occur in the Central Palæarctic (between 40° and 90° longitudes). One half of these, with the addition of only half-a-dozen (most of which are poorly differentiated) not occurring elsewhere, are found in the Western Palæarctic (the whole of C., N.W. and W. Europe having 20, all of which it shares with the Mediterranean area, while 27 can be collected in a narrow area stretching from the southern Alps to the mountains of Spain); but in the Eastern Palæarctic the number dwindles to 12, all of which occur also in the Central Palæarctic.

Some 30 (of which only 3 are holarctic) are found in the New World, and of these hardly a dozen exist in N. America. All these occur in its western part; only 5 reach eastern Canada and only one sparsely occurs in a large<sup>3</sup> area between the

<sup>1</sup> Provisionally: *Euchrysops* Butler, *sensu mihi* = *Euchrysops* s. Bethune Baker + *Neochrysops* Bethune Baker minus the *niobe* group, for which the erection of a separate genus is necessary.

<sup>2</sup> In the eastern part of the Central Palæarctic half a dozen palearctic species attain along the mountain chains technically tropical territory.

<sup>3</sup> The paucity of true butterflies in the eastern United States is unrivalled in any other general area of the same size in the temperate part of holarctic territory.

Atlantic and the Mississippi, while 2 representatives of the neotropical group invade the more southern states.

In conclusion the following complete list of the genera of the *Plebejinæ* of the world is appended.<sup>1</sup>

PLEBEJINÆ (*s.s.*)

100–120 species in 24 genera

- I *Parachilades* Nab.: t. *titicaca* Weymer; 1; Neot. in Andes.
- II *Chilades* Moore: t. *lajus* Cramer; 4–5; PT, one reaching P.
- III *Pseudochrysops* Nab.: t. *bornoi* Comstock-Huntington; 1; Neot. in W. I.
- IV *Cyclargus* Nab.: t. *ammon* Lucas; 4; Neot. in W. I. to Fla.
- V *Hemiargus* Hübner: t. *cerargus* Fabricius; 3; Neot., one reaching S. Nea.
- VI *Echinargus* Nab.: t. *isola* Reakirt; 2; Neot., one reaching SW Nea.
- VII *Pseudolucia* Nab.: t. *chilensis* Blanchard; 2; Neot. in Andes.
- VIII *Pseudothecla* Nab.: t. *faga* Dognin; 1; *id.*
- IX *Paralycæides* Nab.: t. *inconspicua* Weymer; 1; *id.*
- X *Lycæides* Hübner: t. *argyrognomon* Bergstrasser (Tutt); 6; P, Nea, P+Nea.
- XI *Freyeria* Courvoisier: t. *trochilus*; 2; PT one reaching P, the other <sup>2</sup> reaching AU.
- XII *Plebejus* Kluk: t. *argus* Linnæus; 7–8; P, one in Nea.
- XIII *Plebulina* Nab.: t. *emigdionis* Grinnell; 1; S.W. Nea.
- XIV *Itylos* Draudt: t. *moza* Staudinger; 4; Neot. in Andes.
- XV *Aricia* R.L.: t. *agestis* [Schiff]; 6–8; P.
- XVI *Icaricia* Nab.: t. *icarioides* Boisduval; 5; W. Nea.

<sup>1</sup> Abbreviations: t—type of genus. P—Palearctic Region. PT—Palæotropical (excluding AU—Australia), Nea—Nearctic (excl. Florida), Neot.—Neotropical. The figure after the type refers to the number of species in the genus. When two numbers are given, the second includes additional species which I have not dissected myself, but which have been figured (genitalia) by other observers. I have not taken into account several names in Forster's (1938, *l.c.*) list which in various respects is very unreliable.

<sup>2</sup> The correct name of which is *Freyeria putli* Kollar—granted of course that *Chilades putli* Moore and *Chilades trochilus isoptalma* Waterhouse (*nec* Herrich-Schaffer) which I have dissected are the same as *Lycæna putli* Kollar from North India whence I have no material.

- XVII *Polyommatus* Latreille: t. *icarus* Rottemburg; 7-9; P.  
 XVIII *Vacciniina* Tutt: t. *optilete* Knoch; 4; P, one P+Nea.  
 XIX *Eumedonia* Forster: t. *eumedon* Esper; 1; P.  
 XX *Albulina* Tutt: t. *orbitulus* Prunner; 6-7; P.  
 XXI *Agriades* Hübner: t. *glandon* Prunner; 4; P, one P+  
 Nea.  
 XXII *Cyaniris* Dalman: t. *semiargus* Rottemburg; 1,<sup>1</sup> P.  
 XXIII *Meleageria* Stempffer: t. *meleager* Esper; 1; P.  
 XXIV *Agrodiætus* Hübner (incl. *Lysandra* Hemming): t. *da-*  
*mon* Schiff; 25-35; P.

## EXPLANATION OF PLATE 1

All figures  $\times 180 \div 2$ 

1. *Ædeagus* of *Agrodiætus* (= *Lysandra*) *cormion* Nabokov (? hybrid between *Agrodiætus coridon* Poda and *Meleageria meleager* Esper), paratype, "Moulinet, Alpes Maritimes [S. France], 20-VII-1938 leg. V. Nabokov," Am. Mus. Nat. Hist., in dorsal view.
  2. *Ædeagus* (generalised *Hemiargus* s.l. etc.) in lateral view;
  3. Plain falx (*Lycæides*); 4 Humped falx (*Hemiargus* etc.);
  5. Angulate falx (*Agrodiætus cormion*, same specimen as 1).
- 1,2. Measurements of *ædeagus* (= penis + sheathing): d. distal point (often notched) of suprazonal sheath shielding vesica ventrally (projecting from under the vesica in fig. 1 as seen from the dorsal side of the organ); lt. lateral edges of ventral part of suprazonal sheath (when fully developed these enfolding edges just reach the dorsal side of the organ and in dorsal view appear to line the vesica laterally as in *Agrodiætus* etc.); o. point at which the suprazonal sheath opens on the dorsal side (this point coincides with the zone in several genera, e.g. *Agrodiætus*); c. Chapman's process: a not unfrequently occurring spine-like or filament-like prolongation (of the dorsal lining of the sheath) running along the vesica. v. vesica (exposed distal portion of penis proper) studded with cornuti (minute hook-like or spine-like structures not represented in a number of genera); e. everted frothy membrane of vesica in erection; z. zone (level at which the organ is attached to the genital cavity); aa. alulæ (out-turned flaps of subzonal sheath); p. base of penis enclosed in subzonal sheath; tt. proximal tabs of subzonal sheath.
- dt. length of *ædeagus*; dz. length of suprazonal sheath ventrally; oz. length of suprazonal sheath dorsally (excluding Chapman's process); do. length of vesical opening on the dorsal side; zt. length of subzonal sheath with breadth measured at w in lateral view; vp. length of penis proper.
- 3,4,5. Right uncus lobe with falx in flat ventral view; FHBUSA- falx, LUB-uncus lobe.
- F- point of forearm; H- point of elbow; B- basal point of humerulus; U- posterior point of shoulder proper; S- summit of shoulder; u- anterior point of shoulder; A- apex of (proximally directed) falcial arch; L- distal point of uncus lobe.

<sup>1</sup> *persephatta* Alpheraky which Stempffer (followed by Forster) makes congeneric with *semiargus* (apparently on the strength of a casual note in Chapman) belongs to another subfamily (*Glaucopsychinæ*).

FH— vertical extension of forearm with its horizontal extension measured at level f; Ah— vertical extension of humerulus, and HB— horizontal extension; Sb— vertical extension of shoulder proper with its horizontal extension measured at level s; LB— vertical extension of uncus lobe with its horizontal extension measured at l. (For valve see expl. of pl. 6, fig. MOZ 3)

In *Lycæides* the triangle FHU (with HU giving the oblique length of the humerulus and with FU equal to LU) provides characters for separating the species, while in *Agrodiatus* and some other genera the length of the elbow (AH) is of taxonomic importance.

I take the opportunity to figure the genitalia (1,5) of the curious butterfly described by me much too briefly in 1941 (J. New York Ent. Soc. 49: 265–267). Both in ædeagus and in falx it seems to be intermediate between *A. coridon* Poda and *M. meleager* Esper.

## EXPLANATION OF PLATE 2

TIT — *Parachilades titicaca* Weymer (f. "*speciosa*"), prep. 488, "Sicasica, Bolivia, 1–X–1899" ex coll. Weeks, Mus. Comp. Zool.

CLE — *Chilades cleotas kaiphos* Fruhstorfer, prep. 585, "Morobe Dist., New Guinea, 19–II–1932, leg. H. Stevens" Mus. Comp. Zool.

PAN — *Chilades pandava* Horsfield [*fide* Moore] (Swinhoe 1910 [*Edales*], Chapman 1916), prep. 548, "Kandy [Ceylon]" ex coll. Weeks, Mus. Comp. Zool.

CON — *Chilades galba contracta* Butler (*Chilades cnejus* Chapman, nec Fabricius), prep. 596, "Karachi [N.W. India]" ex coll. Weeks, Mus. Comp. Zool.

FAG — *Pseudothecia faga* Dognin, prep. 611, "Peru," ex coll. Huntington, Am. Mus. Nat. Hist.

BOR — *Pseudochrysope bornoi* Comstock-Huntington, paratype, prep. 496, "Pont-Beudet, Haiti, about 100 ft. alt., 3–4–III–1922," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.

1 — Ædeagus, lateral view. 1a — tip of same in ventral view.

2 — furca (BOR with membranous lining).

3 — uncus lobe, falx and part of tegumen, ventral view.

4 — valve.

5 — rostellum.

All figures  $\times 90 \div 2$

## EXPLANATION OF PLATE 3

DOM (1–4) — *Cyclargus dominica* Moschler, prep. 501, "Baron Hill, Jackson Town (Jamaica), 1200 ft. alt., III, leg. L. Perkins," Mus. Comp. Zool.

AMN — *Cyclargus ammon* Lucas

AMN 1 — prep. 507 "Sierra Maestra, E. Cuba, 1,000 ft. alt., 16–VI–1930, leg. Clorinda Querci," ex coll. Weeks, Mus. Comp. Zool.

AMN 1a, 2,3,4 — prep. 375 "*id.* 23–VII–1930, *id.*," *id.*

WOO — *Cyclargus woodruffi* Comstock-Huntington, prep. 537, "Tortola, Virgin Islands, 2–IV–1925 ex coll. Amer. Mus. Nat. Hist., Mus. Comp. Zool.

TH. (TH., NO., BE.) — *Cyclargus thomasi* Clench

TH.TH1 — *thomasi thomasi* Clench, prep. 565, "Great Inagus, Bahamas, II–1934, Armour Exp.," Mus. Comp. Zool.



- TH.TH 4 — *id.*, prep. 516, *id.*  
 TH.TH. 1b, 2,3 — *id.*, holotype, prep. 520, "Arthur Town, Cat Isl., Bahamas, 16-VII-1935, leg. W. J. Clench," Mus. Comp. Zool.  
 TH.NO 3 — *thomasi noeli* Comstock-Huntington, paratype, prep. 502, "Haiti, leg. P. R. Uhler," Mus. Comp. Zool.  
 TH.BE 1a — *thomasi bethune-bakeri* Comstock-Huntington, prep. 581, "Miami, Florida, 8-15-IX," ex coll. Weeks, Mus. Comp. Zool.  
 TH.BE 3 — *id.*, prep. 519, "Ft. Lauderdale, Florida, 23-VI-1933, leg. M. Bates," Mus. Comp. Zool.  
 1, a,b — aedeagus, with sagum and furca (except AMN 1a)  
 1 — lateral view  
 1 a — ventral  
 1 b — dorsal  
 2 — uncus lobe and falk, ventral view.  
 3 — valve  
 4 — comb of valve,  $\times 360 \div 2$   
 All figures, except when otherwise stated,  $\times 90 \div 2$

## EXPLANATION OF PLATE 4

- HA (with abbreviations of localities) — *Hemiargus hanno* Stoll  
 HA. Sur. — *H. hanno hanno* Stoll, neotype, prep. 601, "Paramaribo, Surinam, 18-IV-1927," ex coll. Cornell Univ., Amer. Mus. Nat. Hist.  
 HA. Bra. — *H. hanno hanno prox.*, prep. 577, "Sao Paulo, Brazil, V, leg. Bruno Pohl," Mus. Comp. Zool.  
 HA. Ven. — *H. hanno ssp.*, prep. 537<sup>a</sup>, "Suapure, Venezuela, 27-VI-1899," ex coll. Weeks, Mus. Comp. Zool.  
 HA. Bol. — *H. hanno ssp.*, prep. 517, "Chulumani, Bolivia, 28-XI-1898, ex coll. Weeks, Mus. Comp. Zool.  
 HA. Col. — *H. hanno bogotana* Draudt, prep. 602, "Cota, n. Bogota, Colombia, 2,600 m. alt., 28-VIII, 1938, leg. T. Hallinan," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.  
 HA. Pan. — *H. hanno ssp.*, prep. 600 "El Volcan Chiriqui, Panama, 3-III-1936, leg. F. E. Lutz," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.  
 HA. Bar. — *H. hanno ssp.*, prep. 511, "Barro Colorado, Panama, 2-II, leg. M. Bates," Mus. Comp. Zool.  
 HA. Mar. — *H. hanno ssp.*, prep. 568, "Martinique" Mus. Comp. Zool.  
 HA. P.R. — *H. hanno watsoni* Comstock-Huntington, paratype, prep. 569, "San Juan, Puerto Rico, 11-14-II-1914," Mus. Comp. Zool.  
 HA. His. — *H. hanno ssp.*, prep. 498, "La Vista and vic., La Selle Range, Haiti, 5-7,000 ft. alt., 16-23-IX-1934, leg. M. Bates," Mus. Comp. Zool.  
 RAM — *Hemiargus ramon* Dognin, prep. 616, "San Rafael, Ecuador, leg. E. W. Rorer, VII-1919," Mus. Comp. Zool.  
 CE (with abbreviations of localities) — *Hemiargus ceraunus* Fabricius  
 CE. CE. — *H. ceraunus ceraunus* Fabricius, prep. 570, "Kingston, Jamaica, 6-XII-1871," ex coll. Scudder, Mus. Comp. Zool.  
 CE. His. — *H. ceraunus ssp.*, prep. 499, "Ennery, Haiti, n. 1,000 ft. alt., 16-VIII-1934, leg. M. Bates," Mus. Comp. Zool.

- CE. Nav. — *H. ceraunus* ssp., prep. 566, "Navassa Is., West Indies, XII-1929, leg. W. J. Clench," Mus. Comp. Zool.
- CE. Cub. — *H. ceraunus filenus* Poey, prep. 515, "Sierra Maestra, E. Cuba, 1,000 ft. alt., 10-XI-1929, leg. O. Querci," ex coll. Weeks, Mus. Comp. Zool.
- CE. Bah. — *H. ceraunus* ssp., prep. 564, "Clarencetown, Long Is., Bahamas, II-1934, leg. Armour Exp.," Mus. Comp. Zool.
- CE. Fla. — *H. ceraunus antibubastus* Hübner, prep. 525, "Egmont, Florida, 23-IV-1904," ex coll. Fall, Mus. Comp. Zool.
- CE. Mass. — *H. ceraunus antibubastus* Hübner, prep. 579, "So. Abington, Massachusetts, V-1880, leg. J. E. Bates," ex coll. Weeks, Mus. Comp. Zool.
- CE. Ari. — *H. ceraunus gyas* Edwards, prep. 523, "Baboquavaria Mts., Pima Co., Arizona, 15-30-VII-1903, leg. O. C. Poling," ex coll. Weeks, Mus. Comp. Zool.
- CE. Cal. — *H. ceraunus gyas* Edwards prox., prep. 524, "San Diego, California, 14-VIII-1908, leg. Geo. H. Field," ex coll. H. C. Fall, Mus. Comp. Zool.
- CE. Mex. — *H. ceraunus zachæina* Butler prox., prep. 613 and 509, "Apatzingan, Michoacan, Mexico, 1,200 ft. alt., moist jungle La Majada, at mud, 8-VIII-1941, leg. R. Haag," Mus. Comp. Zool.
- CE. C.R. — *H. ceraunus zachæina* Butler, prep. 513, "Punto Araras, Costa Rica, 11-XI-1871," ex coll. Scudder, Mus. Comp. Zool.
- CE. Col. — *H. ceraunus* ssp., prep. 575, "Colombia," ex coll. Paine, Mus. Comp. Zool.
- 1 — ædeagus with furca and rudimentary sagum, lateral view  
 a — distal portion, ventral view  
 b — id., dorsal view
- 2 — uncus lobe, falx and part of tegumen
- 3 — valve

All figures  $\times 90 \div 2$

#### EXPLANATION OF PLATE 5

- N.SP — *Echinargus* sp. prep. 578, "Port of Spain, Trinidad, XII-1912-V-1913, leg. R. Thaxter," Mus. Comp. Zool.
- ISO — *Echinargus isola* Reakirt
- ISO 1,2 — prep. 540, "Tancitaro, Michoacan, Mexico, 6,000 ft. alt., on *faces*, 10-VII-1941, leg. R. Haag," Mus. Comp. Zool.
- ISO 1a, 3 — prep. 478, "Round Mt., Texas, IX-1930, ex coll. Fall," Mus. Comp. Zool.
- CHI — *Pseudolucia chilensis* Blanchard
- CHI 1, a,b — prep. 619, "Central Chile, 1882-1885, leg. H. B. James," ex coll. Weeks, Mus. Comp. Zool.
- CHI 2,3,4 — prep. 534, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.
- COL — *Pseudolucia collina* Blanchard, prep. 536, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.
- 1,a, b, ædeagus with sagum and furca (ISO 1a, sagum separate)
- 1 — lateral view, 1 a, ventral view, 1 c, dorsal view
- 2 — uncus lobe, falx and part of tegumen
- 3 — valve
- 4 — comb of valve  $\times 360 \div 2$

All figures, except when otherwise stated,  $\times 90 \div 2$

## EXPLANATION OF PLATE 6

- INC — *Paralycoides inconspicua* Draudt, prep. 607, "Cuzco, Peru, 3,500 m. alt., leg. Fassl," ex coll. W. P. Comstock, Am. Mus. Nat. Hist.
- KOA — *Itylos koa* Druce, prep. 592, "Puno, Peru, 12,500 ft. alt., 1-XI-1898," ex coll. Weeks, Mus. Comp. Zool.
- PAC — *Itylos pacis* Draudt, prep. 609, "Cuzco, Peru, 3,500 m. alt., leg. Fassl" ex coll. W. P. Comstock, Am. Mus. Nat. Hist.
- RUB — *Itylos ruberrothei* Weeks
- RUB 1,a,2,3 — holotype, prep. 527, "Sicasica, Bolivia, 1-X-1899" ex coll. Weeks, Mus. Comp. Zool.
- RUB 4 — paratype, prep. 486, "Alezum, Bolivia, 8-VIII-1899" ex coll. Weeks, Mus. Comp. Zool.
- MOZ — *Itylos moza* Staudinger, prep. 606, "Bolivia," ex coll. Huntington, Am. Mus. Comp. Zool.
- 1 — ædeagus with furca, lateral view (except RUB 1 where the furca is not shown and KOA 1 where it is in ventral view as also in RUB 1a)  
a — ædeagus, ventral view
- 2 — Uncus lobe, falx and part of tegumen (note VAP 2 to which the method of measurement used for *Lycoides* has been applied)
- 3 — Valve: sp — superior process; r — rostellum (free end of superior process); c — comb (serrated distal margin of rostellum); ip — inferior process; m — mentum (jutting end of inferior process); b — bullula (membranous swelling between mentum and rostellum); bs — base. The length of the valve is measured from m to bs; its breadth at the broadest part (at the "hump" or Bayard's angulation).
- 4 — comb of valve  $\times 360 \div 2$ :  
All other figures  $\times 90 \div 2$

## EXPLANATION OF PLATE 7

## Female armature

- TIT — *Parachilades titicaca* Weymer, prep. 590, "Sicasica, Bolivia, 1-X-1899," ex coll. Weeks, Mus. Comp. Zool.
- BOR — *Pseudochrysops bornoi* Comstock-Huntington, paratype prep. 605, "Pont Beudet, Haiti, about 100 ft. alt., 3-4-III-1922," ex coll. Am. Mus. Nat. Hist., Mus. Comp. Zool.
- AMN — *Cyclargus ammon* Lucas, prep. 530, "Sierra Maestra, E. Cuba, 1,000 ft. alt., 3-XI-1929, leg. O. Querci," ex coll. Weeks, Mus. Comp. Zool.
- HAN — *Hemiargus hanno hanno* Stoll prox., prep. 532, "São Paulo, Brazil, V, leg. Bruno Pohl," Mus. Comp. Zool.
- CER — *H. ceraunus antibubastus* Hübner, prep. 582, "Ft. Lauderdale, Florida, 10-VII-1933, leg. M. Bates," Mus. Comp. Zool.
- N. SP — *Echinargus* sp., prep. 597 "Port of Spain, Trinidad, XII-1912-V-1913, leg. R. Thaxter," Mus. Comp. Zool.
- ISO — *Echinargus isola* Reakirt, prep. 587, "Dallas, Texas, leg. Boll," Mus. Comp. Zool.
- CHI — *Pseudolucia chilensis* Blanchard, prep. 533, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.
- COL — *Pseudolucia collina* Philippi, prep. 591, "Penco, Chile," ex coll. Weeks, Mus. Comp. Zool.

MOZ — *Itylos moza* Staudinger, prep. 528 (*Lycæna babhræ* Weeks, holotype)  
"Sicasica, Bolivia 1-X-1899," ex coll. Weeks, Mus. Comp. Zool.

KOA — *Itylos koa* Druce, prep. 593, "Puno, Peru, 12,500 ft. alt., 1-XI-1898," ex  
coll. Weeks, Mus. Comp. Zool.

1 — papillæ anales (Kusnezov 1912) (note pathological swelling of rod of left  
papilla in N. SP. 1a)

2 — fibula, with or without portion of henia, dorsal view

3 — same, lateral view

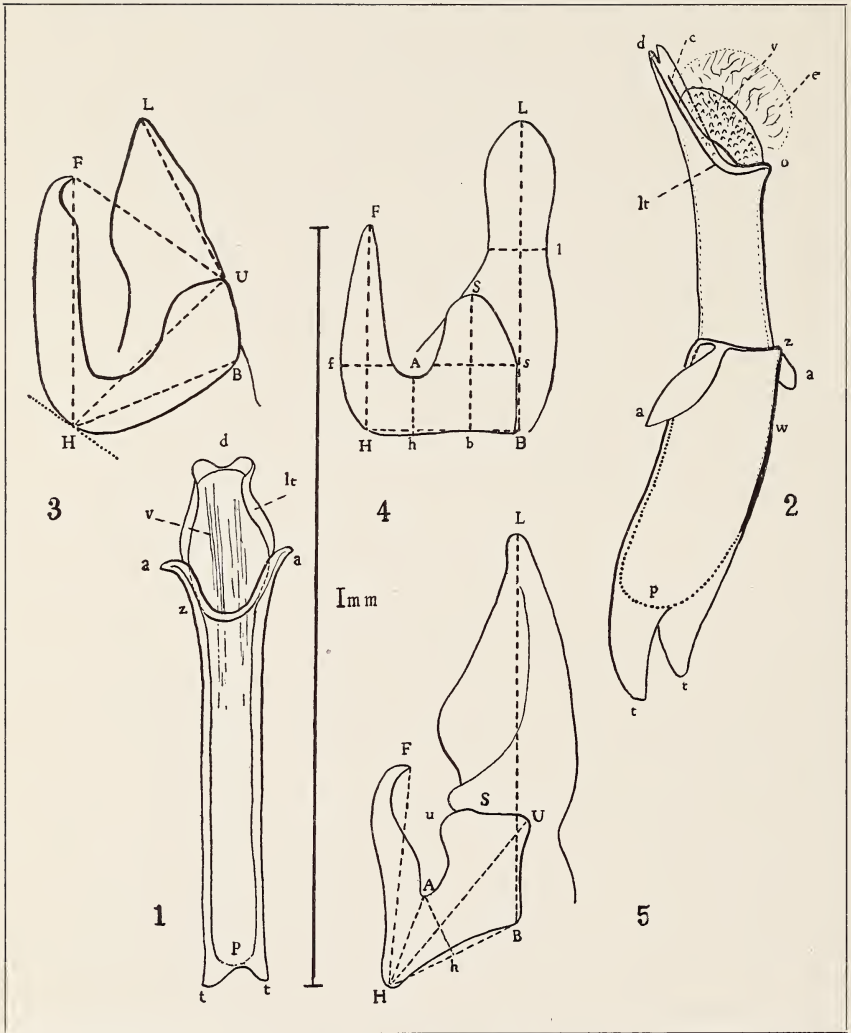
4 — henia (Chapman 1916), completely exerted in COL 4 and ISO 4, lateral view.

All figures  $\times 90 \div 2$

#### EXPLANATION OF PLATE 8

*Echinargus*, n. sp., "Port of Spain, Trinidad, XII-1912-V-1913, leg. R. Thaxter,"  
Mus. Comp. Zool. Left Hindwing underside,  $\times 6.5$ .

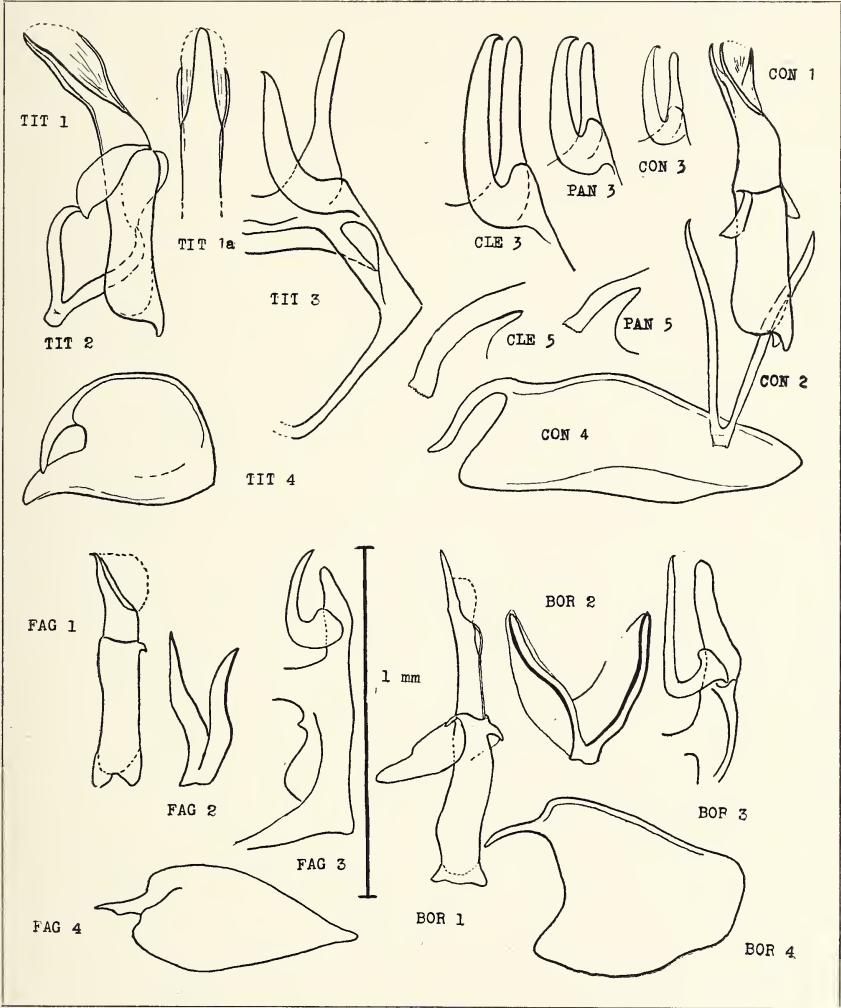




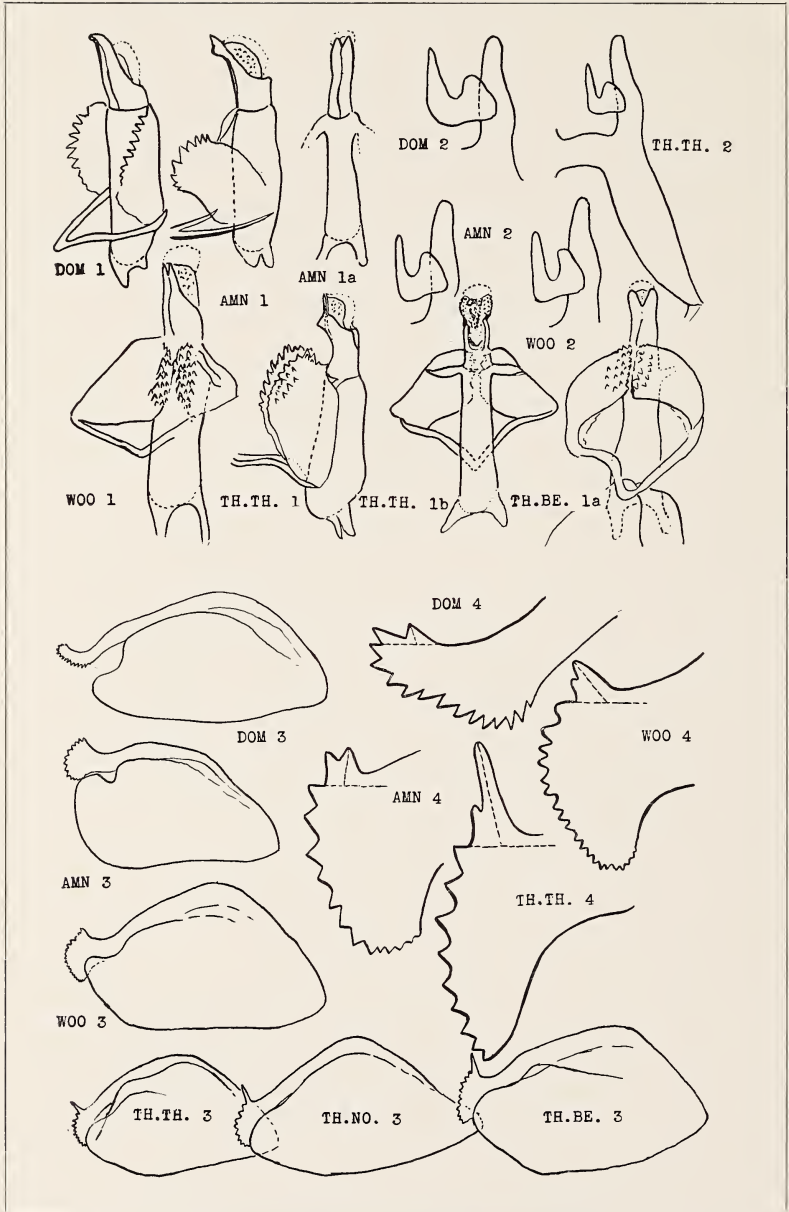
NABOKOV — NEOTROPICAL PLEBEJINÆ

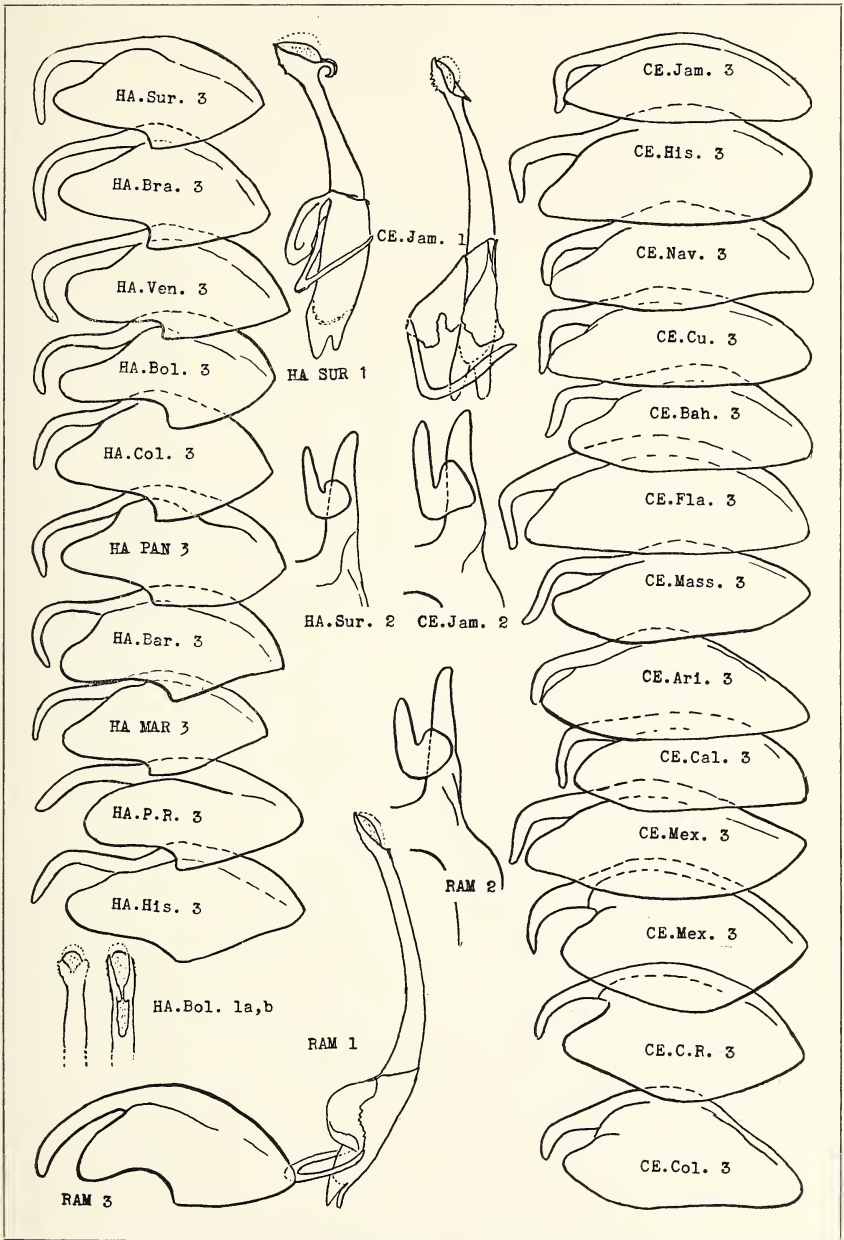
PSYCHE, 1945

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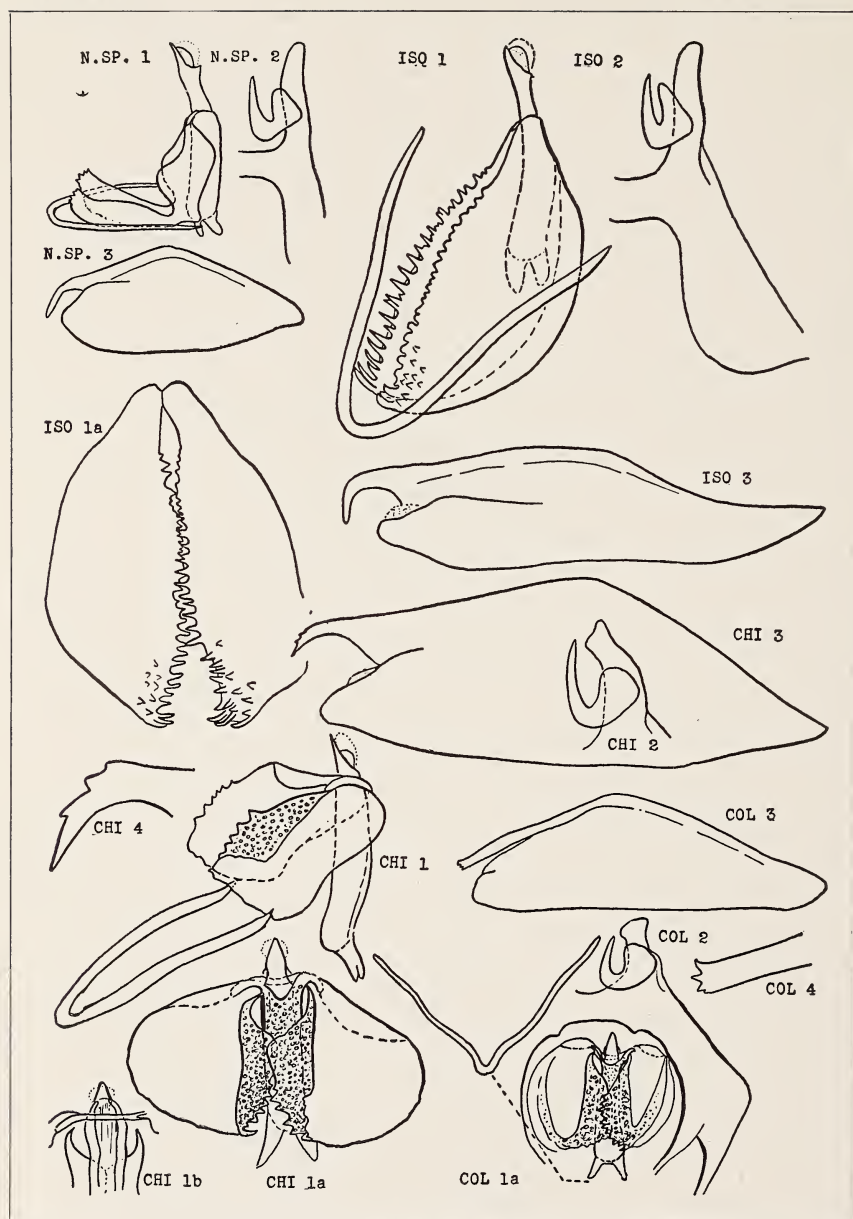


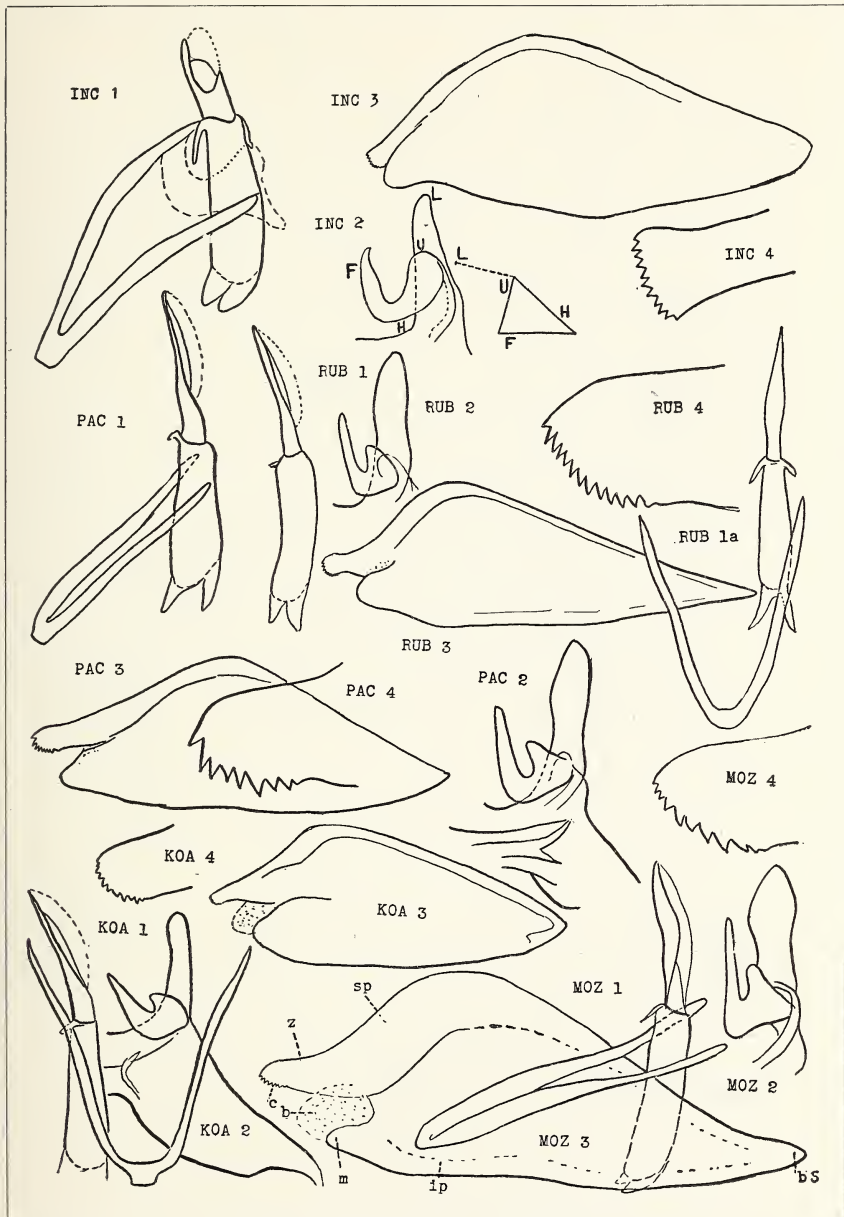
NABOKOV — NEOTROPICAL PLEBEJINÆ

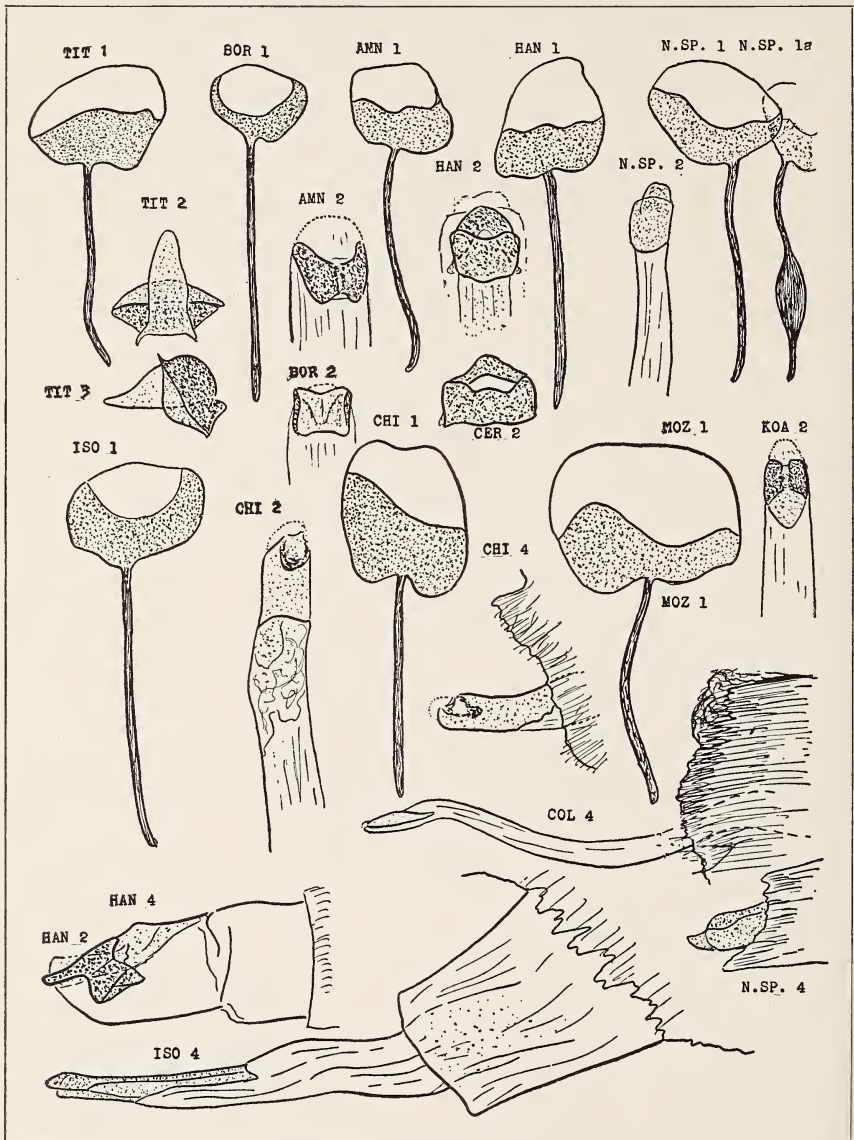




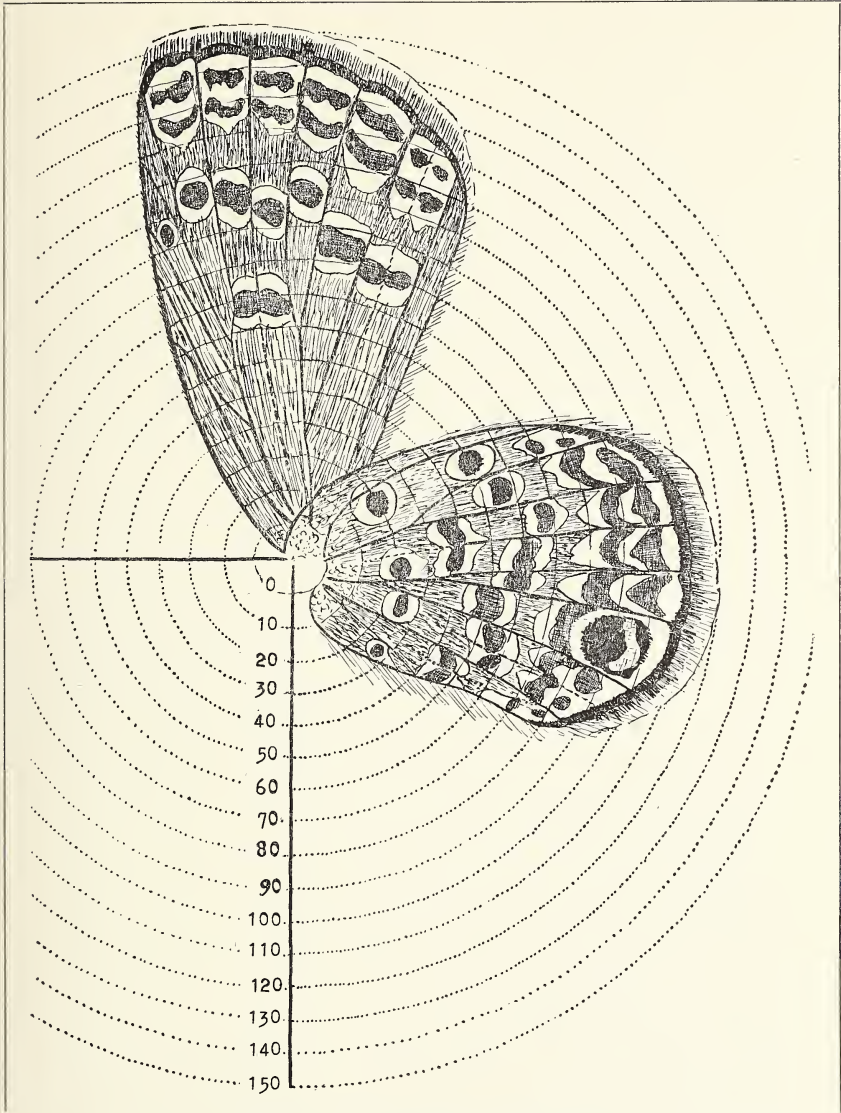








NABOKOV — NEOTROPICAL PLEBEJINÆ



NABOKOV — NEOTROPICAL PLEBEJINÆ



TWO NEW FORMS OF *MONOMORIUM* (FORMICIDÆ)

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In the Nearctic fauna we have one very widely distributed species of *Monomorium* (*M. minimum* (Buckley)), and several other species of more local occurrence, and while *minimum* is a quite variable ant, it seems not unlikely that some of the variations may be distinct populations that warrant recognition. Examples of such are present in my collection, and are here described with the conviction that they are valid, although subsequent information might make it necessary to alter this conclusion.

*Monomorium pensulatum* sp. nov.

Plate 9.

*Worker*. — Length 1.8–2.0 mm.

Head almost rectangular, convergence anteriorly nearly imperceptible; occipital angles abrupt but rounded, posterior margin straight; clypeus produced in front and furnished with two carinæ which project as distinct, sharply pointed teeth beyond the border; posterior clypeal margin extending deeply between the frontal carinæ, which are short and do not continue far behind the antennal insertions. Antennæ 12-segmented, the last three segments forming a distinct club; scape failing to reach the posterior angle of the head by a distance equal to  $1\frac{1}{2}$  times its width at the apex; mandibles evenly curved, 4-toothed; maxillary palpi 1-segmented; labial palpi 2-segmented. Eye separated from mandibular fossa by a distance equal to  $1\frac{1}{4}$  times its diameter.

Thorax at the rounded humeral angles  $\frac{2}{3}$  as wide as the head; long and narrow, in profile moderately and evenly arched; mesoepinotal impression distinct and fairly deep. Epinotum with rounded angle, so that the basal and declivious faces pass gradually into each other; epinotal spines absent. Petiolar surface rounded, the sides subparallel and the superior border

entire; anterior face flat, posterior face convex; peduncle short but evident and without ventral spine. Postpetiole globose and approximately equal to petiole in width, slightly lower in height. Gaster pyriform.

Sculpture: Entire body glabrous, except the mesoëpinotal impression and mesonotal and epinotal pleuræ which have very fine rugulations, and the mandibles which are finely striate.

Pilosity: Long, fairly numerous hairs on dorsum of head (including clypeus), thorax, petiole, postpetiole, coxæ, trochanters, femora, prosternum, gula, and venter of gaster. Pubescence conspicuous on antennæ and legs, extremely dilute on gaster, apparently absent on the head and thorax, and merging into hairs on the scapes.

Color: Deep, metallic, bluish black like the queen but not as pronounced as in that caste; mandibles and tarsi yellow; antennæ, coxæ, femora and tibiæ brownish.

*Female.* — Length 4.5–5.0 mm.

Head, excluding mandibles, slightly wider than long, with rounded occipital angles, and decidedly convergent anteriorly; posterior border straight. Clypeus broadly rounded with two widely separated, longitudinal carinæ which project anteriorly as rather short, blunt teeth, the border of the clypeus between them appearing as a wide, shallow emargination. Frontal carinæ short, extending posteriorly and parallel until near their termination opposite the anterior edge of the eyes, where they diverge in evenly rounded curves. Eyes moderate and oval in outline, placed mid-way between the mandibular fossæ and the posterior angles of the head. Ocelli prominent. Antennæ 12-segmented, the last four segments forming an indistinct club; scape evenly curved at the base. Mandibles 4-toothed, the basal tooth blunt, and the rest increasing in length to the rather long, sharp, apical tooth. Maxillary palpi 2-segmented. Labial palpi 2-segmented.

Thorax from above as wide as the head and evenly tapered from end to end; in profile the mesonotum is moderately elevated and curved dorsally; scutellum divided into two lateral triangles which are separated by the forward extension of the postscutellum to meet the scutum; parapsidal furrows distinct but shallow; metanotum in the form of the usual transverse band. Epinotum in profile is evenly rounded and descends abruptly from the metanotum, there being no angular separa-

tion of basal and declivious faces. Petiole with a well-marked peduncle bearing a long, low, mid-ventral keel terminating in a small tooth; anterior surface of node rather steep and flat, posterior surface convex; summit of node truncated and with a broad, shallow emargination across its whole width, the lateral angles rounded. Postpetiole globose, and  $\frac{1}{3}$  wider than the petiole, its dorsal border flat and entire. Abdomen egg-shaped as usual in ant queens. Legs slender. Wings hyaline and with veins much reduced; costal, median and radial cells present, one closed discoidal cell weakly indicated.

Sculpture: Front and sides of head with fine, longitudinal rugæ, and clypeus longitudinally striated except in the median area; vertex and gula non-striated; all surfaces of the head except the front and clypeus pitted with abundant, deep punctures; mandibles striato-punctate. Thorax, including the epinotum, with numerous though more scattered punctures, and its surface very shining; a few striations appear on the post-scutellum and on the pleuræ just below the wing insertions; metanotum with rather coarse, transverse rugæ, and the epinotum has coarse, parallel rugæ on all surfaces, trending antero-posteriorly on the sides and transversely across the base and the declivity. Petiole and postpetiole, except the dorsal surfaces, with distinct rugulations. Abdomen smooth and shining, but having deep, piligerous punctures.

Pilosity: Head, thorax, petiole, postpetiole, and abdomen covered with abundant, long, light yellow, flexuous hairs, except the mid-dorsal areas from anterior to posterior in each of these regions; legs, scapes, and antennal funiculi equally pilose. Pubescence on all parts absent or at most extremely dilute.

Color: Yellowish brown to brown on the head, thorax, legs, scapes, funiculi, and sides of petiole and postpetiole; mandibles, tibiæ, and tarsi lighter; postero-dorsal portion of head, the mesonotum, petiole, and postpetiole darker and in some specimens almost black; entire gaster, except the posterior tip, of a deep, bluish black, metallic luster.

Type locality: South Miami, Florida.

Cotypes: in the author's collection (1 queen and 1 worker).

Paratypes: in the author's collection and in the U. S. National Museum.

Described from 64 females (only one of which retained a fore and a hind wing), and numerous workers collected by my wife,

Ella Virginia Gregg, in a pine-palmetto woodland. The nest was indicated by a crater in a rather sandy patch of soil. Upon excavation to obtain the colony, a great deal of porous limestone was encountered, and many of the ants were distributed through the interstices of the rock. My wife's attention was attracted by the ever increasing number of deälated females which issued from the crevices, but her efforts to continue digging met with much difficulty. Although over 60 queens were secured, we are certain many more were beyond our reach. A heavy shower put an end to operations and we were unable to return to the site to ascertain the extent of the colony. *Monomorium* is known at times to have many queens, and occasions such as this case probably indicate the adoption of recently deälated females either of the same or adjacent nests.

The worker of *peninsulatum* differs from that of *minimum* in the following respects: the petiolar node is noticeably larger and higher, and its anterior face is more vertical so that the peduncle appears more distinct; the mesopleuræ and sides of the epinotum have delicate rugulations unlike those parts in *minimum* which are smooth and shining; the coloration is a deeper black, with bluish, metallic reflections in certain lights, and the clypeal teeth are slightly further apart.

The *peninsulatum* female may be distinguished by the fact that it is of larger size (*minimum* being about 4 mm.), the ocelli are much larger and more prominent, the clypeal teeth are blunter and a little more widely separated, and the whole body appears quite shining though the sculpturing is more pronounced. Punctures are deep and numerous on the head and thorax, and obvious, coarse rugæ cover the entire epinotum (present on *minimum* only at the extreme ventral aspect of the declivity). Petiole and postpetiole are more quadrate and angular, and the superior face of the former is depressed into a wide, shallow notch. Peduncle is more pronounced and has a ventral ridge and tooth which are almost absent in *minimum*. Hairs are coarser and more abundant. Color of much of the head and thorax is yellowish or reddish brown, and the gaster is of a dark, bluish black that is more noticeable than in the worker, the entire ant contrasting strongly with the queen of *minimum* which has a uniformly brownish black body.

Notwithstanding the fact that the worker of this species and that of *M. minimum* are very similar, they still can be separated



by certain constant characters as indicated above. The queens, moreover, show decided differences, and it is felt the specimens represent a new form which deserves specific rank. While *minimum* is widely distributed from east to west, there seems to be little cause for questioning the distinctness of the form I have called *peninsulatum* after the portion of the country from which it was obtained. In all probability it will be found on some of the adjacent islands; it may even be a West Indian ant which has entered continental United States at its most southern extremity. If this remains an undoubted species, the known formicid fauna of Florida will have increased to 118 ants. Dr. M. R. Smith (1944), in an addition to the list of ants of that state, brought the total from 107 to 117 species.

The new ant appears to be very similar to one described by W. L. Brown as *Monomorium viridum* from New Jersey. Judging from the description of this species, the female *M. peninsulatum* may be said to differ from that of *viridum* in the following respects. There are no transverse striæ in the ocellar triangle nor behind it, the anterior faces of the petiole and postpetiole are sculptured and not smooth, the clypeal teeth are quite short and blunt, the head and thorax have slight or no indication of metallic blue, and the color of the abdomen is metallic blue, not green. The size is a little smaller than *viridum*, the female measuring 4.5 to 5.0 mm. instead of 5.3 to 5.7 mm., and the worker being 1.8 to 2.0 mm. instead of 1.8 to 2.8 mm.

*Monomorium minimum* subsp. *emersoni* subsp. nov.

*Worker*. — Length 1.6–1.8 mm.

Practically indistinguishable from the same caste of *M. minimum* (typical) except that it is perhaps a shade lighter in color.

*Female*. — Length 4.3 mm.

Differs from the queen of *minimum* in the much more slender construction of the head and thorax, being much narrower than in the typical form; abdomen, however, of the same width. The petiole and postpetiole are both slightly wider than in *minimum*, and the petiolar node is more rounded and with a more concave anterior face which causes the peduncle to contrast with the node; sides finely rugose. The thorax bears wings, as shown by their stumps, but none were present on the specimens examined.

The epinotum is transversely striated over its complete upper and lateral surfaces, contrary to that of the type; the angle between the base and the declivity is more pronounced, and the whole structure is longer and higher. Slight tubercles are present in the positions usual for epinotal spines. Surface somewhat less shining than in *minimum*, especially the head which is almost opaque. Hairs slender and abundant on all parts, but longer on the gaster. Color dark brown instead of black; antennæ and legs lighter, with tibiae and tarsi yellowish.

Described from one queen and numerous workers taken by Dr. A. E. Emerson in April, 1937 at Globe, Arizona, and the writer derives pleasure in naming this ant after his former teacher. The nest was under a stone at an elevation of 6,300 feet. Two additional colonies of the species, each with a deälated female, were collected by Dr. Emerson, the one at Austin and the other at San Marcos, Texas, and these seem to be identical with the types from Arizona.

Cotypes: in the author's collection (1 queen and 79 workers).

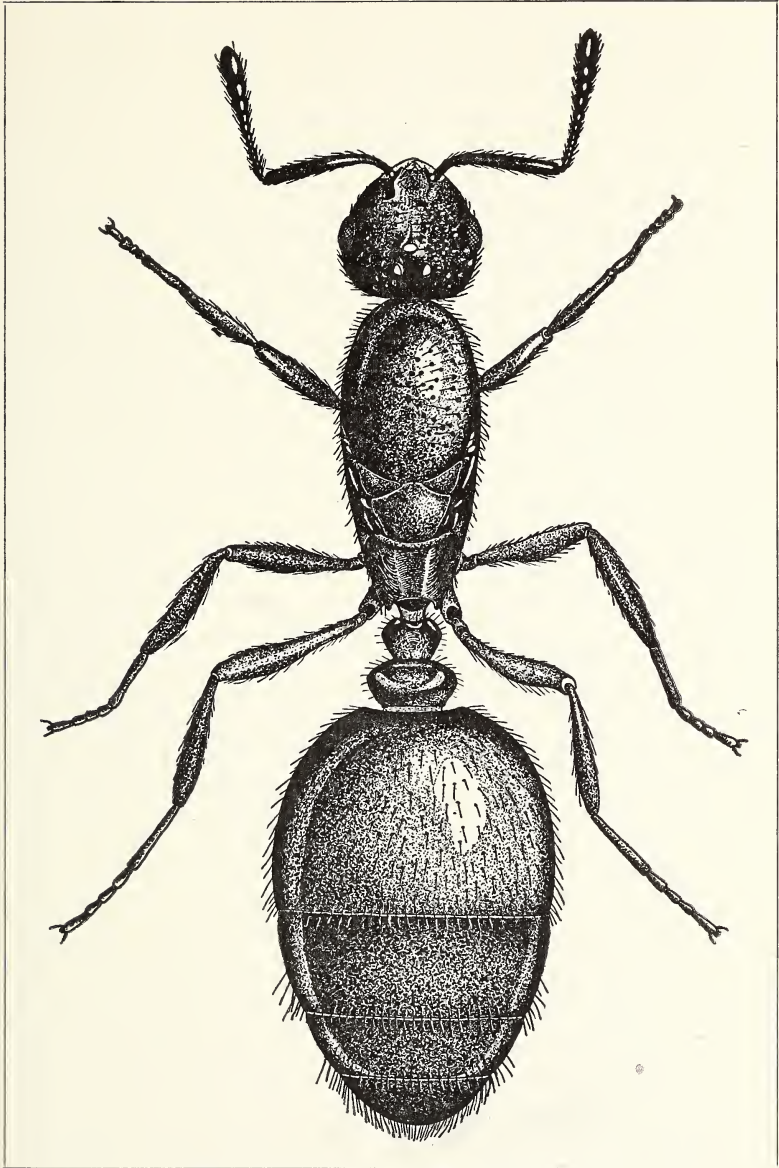
Paratypes: in the author's collection and the U. S. National Museum.

Both *Monomorium minimum* subsp. *emersoni* and *M. peninsulatum* can be distinguished readily from *M. minimum* subsp. *ergatogyna* Wheeler from Santa Catalina Island, California, and the subspecies *cyaneum* and *compressum* Wheeler from Hidalgo, Mexico, as well as the European *M. minutum* Mayr, by the fact that the females are winged while those of the latter are wingless and ergatoid as far as observed (Wheeler 1914). The bluish black color of *peninsulatum* might lead to confusion with *cyaneum*, but the apterous condition of the latter makes the distinction possible, and also their wide geographic separation lends support to this judgment. From *M. carbonarium* F. Smith and its subspecies *ebeninum* Forel, all of the above species may be differentiated by the rounded shape of the epinotum and the superior border of the petiolar node, as these structures are angular and the node has the upper surface weakly notched in the former insects.

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GREGG — *Monomorium peninsulae* sp. nov.



PANORPIDÆ FROM CHINA (MECOPTERA)<sup>1</sup>

BY F. M. CARPENTER  
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Among the Chinese Panorpidæ in the Museum of Comparative Zoology there are several specimens which were not treated in my previous paper on Mecoptera from China.<sup>2</sup> Most of these were collected by Gaines Liu in Anhwei and Szechwan Provinces, but a few were obtained by L. Gressitt in Kiangsi and Kwantung. They form the basis of the present paper, which also includes the description of a new species in the U. S. National Museum, and notes on Navas' types in the Muséum National in Paris.

## Genus PANORPA Linn.

Including the two described below, nineteen species of this genus are known from China.

*Panorpa obliqua*, n. sp.

Plate 10, fig. 2, 3, 8; plate 11, fig. 9.

Body brown, with the vertex, thoracic nota and abdominal tergites very dark brown. Fore wing: length, 12 mm.; width, 3.5 mm.; membrane faintly yellow, markings brown; apical<sup>3</sup> band greatly interrupted, maculate; pterostigmal band complete, connecting with a more proximal band to form a large "V" near the middle of the wing; basal band interrupted, consisting of a large rounded spot on the anterior margin, and an irregular patch along the posterior margin; 2nd basal spot well developed, first absent or very small; both marginal spots absent. Crossveins not margined. Hind wing: similar to the fore in markings, except that the left "arm" of the "V" is usually interrupted. Anal horn absent. ♂ genitalia: genital bulb rounded, forceps

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

<sup>2</sup> Proc. Ent. Soc. Wash., 1938, 40:267-281.

<sup>3</sup> I have used here the same terminology for wing markings and genitalia as employed in my revision of the Nearctic Mecoptera (Bull. Mus. Comp. Zool., 1931, 72:205-277).

short, outer margins slightly concave; prominent lobes on inner margin of forceps near the base; hypovalvæ short, uniting near the middle of the genital bulb, and extending slightly beyond the base of the forceps; ventral valves simple, each consisting of a slightly flattened process, with a few short barbs on inner surface distally, and terminating in a longer series of barbs directed inwards; præiproct much narrowed distally, with a pair of broad terminal lobes, close together. ♀: internal skeletal plate of ninth segment large, with two long, slender distal processes and a pair of large, ear-like flaps laterally; the usual axis is short, but there is a very slender median process extending posteriorly.

*Holotype* (♂): Museum of Comparative Zoology, no. 27325. Hong San, S. E. Kiangsi Province, China. June 28, 1936 (L. Gressitt).

*Allotype*: same collecting data as holotype, except for date — June 29, 1936; in Museum of Comparative Zoology.

*Paratypes*: 1 ♀, same collecting data as holotype, except for date — June 30, 1936; in the Museum of Comparative Zoology.

This strikingly marked species is easily recognized by the oblique stripe traversing the middle of the wing, and extending posteriorly and distally from the anterior margin. The short hypovalvæ of the male genital bulb are unique among the known Chinese species of *Panorpa*, but are very much like those of certain Japanese and Siberian species (e.g., *P. wormaldi* MacL., *preyeri* MacL., etc.) to which *obliqua* is undoubtedly closely related. Certain North American species of *Panorpa* (e.g., *lugubris* Swed., *nuptialis* Gerst., *rufa* Gray) have similar hypovalvæ, but their other genital structures are very different from those of *obliqua* and the other Asiatic species indicated.

### *Panorpa tetrazonia* Navas

Plate 10, fig. 1, 5, 6; plate 11, fig. 10.

*Panorpa tetrazonia* Navas, 1935, Notes d'Ent. Chin., Mus. Heude, 2 (5):96, fig. 61.

This species was based on a single male from Kuling, Kiangsi Province, and deposited in the Musée Heude, Shanghai. In the Museum of Comparative Zoology there are four males and five females which I consider to be this species. Four of these (1 ♂, 3 ♀) were collected in Taipingshien, Anhwei Province, China, October 1932 (G. Liu); and the others on Huang Shan, in

Anhwei, only a few miles southwest of Taiping. These localities are only about one hundred miles from the type locality, Kuling, in northern Kiangsi Province.

The wing markings of the Anhwei specimens are identical with those shown in Navas' figure of the wing, and the general body structure fits his description. I have therefore redescribed the species here on the basis of the new specimens, although a study of the genitalia of the type will be necessary before the specific determination is certain.

Body light to dark brown, the thoracic nota and abdominal tergites being somewhat darker than the rest of the body. Fore wing: length, 12-13 mm.; width, 3-3.5 mm. Membrane faintly yellow, markings brown, apical band interrupted posteriorly and usually with a few small clear spots around the cross-veins; pterostigmal band complete, forked posteriorly; between pterostigmal and basal bands an elongate spot at anterior margin; basal band complete but slender; first basal spot present, second basal and both marginal spots absent. Cross-veins not margined. Hind wing: similar to the fore in markings, except that the basal band is interrupted and the first basal spot is absent. Anal horn absent. ♂ genitalia: genital bulb oval; forceps moderately long, slender, the outer margins not concave; forceps with prominent lobes; hypovalvæ broad and short, not extending as far as the bases of the forceps; ventral valves conspicuous, each arising from a very slender stalk which widens abruptly and gives rise to a long curved process; the wide head of the stalk and the curved process bear numerous long barbs; preëiproct with a shallow distal concavity. ♀: internal skeleton of ninth abdominal segment, with broad plate and short axis; anterior processes of plate slender and convergent distally.

Although the wing pattern of this *Panorpa* is not very distinctive, no other known Asiatic species has precisely the same markings. The male genital structures, especially the ventral valves, are most unusual, as is also the form of the internal skeleton of the ninth abdominal segment of the female.

***Panorpa lutea*, n. sp.**

Plate 10, fig. 7; plate 11, fig. 11.

Body reddish brown, darker brown on vertex, thoracic nota and abdominal tergites. Fore wing: length, 15 mm.; width, 3.5 mm. Membrane deep yellow or orange, markings dark brown;

apical band separated by a wide hyaline stripe into a large anterior apical area and a small posterior spot; pterostigmal band entire, forked posteriorly; a short rectangular spot between the pterostigmal and basal bands; basal band complete and very broad; first basal spot present, second and both marginal spots absent. Cross-veins not margined. Hind wing: similar to fore wing in markings. ♀: internal skeleton of ninth abdominal segment small, with a very short axis and convergent posterior processes. ♂ unknown.

*Holotype* (♀): Museum of Comparative Zoology, no. 27326. Huang Shan, Anhwei Province, China (G. Liu). A second female (in poor condition) was collected on Kinhua Shan, Anhwei, China, October 1932 (G. Liu).

This strikingly marked species is unlike any other described Asiatic species of *Panorpa*. The male should be easily recognized by the orange color of the wings.

*Panorpa davidi* Navas

Plate 10, fig. 4.

*Panorpa davidi* Navas, 1908, Mem. Real. Acad. Cienc. Barc., 1908: 415, fig. 19a,b. Esben-Petersen, Coll. Selys, 1921, 5(2): 29, fig. 21-23.

The type of this Tibetan species has been redescribed and figured by Esben-Petersen (1921), but his drawing does not show clearly the characteristics of the male genital bulb. I therefore include here a figure of the genital bulb of the type which I made at the Muséum National in Paris in 1938. The hypovalvæ and ventral valves are slender and long, and the inner surface of the ventral valves bears a series of short barbs. At the base of the forceps the bulb itself gives rise to a prominent papilla, along the inner surface of which there is a row of stout hairs. An excellent photograph of the wings has been published by Esben-Petersen.

Genus *NEOPANORPA* Weele

Including the three described below, twelve species of *Neopanorpa* are known from China.

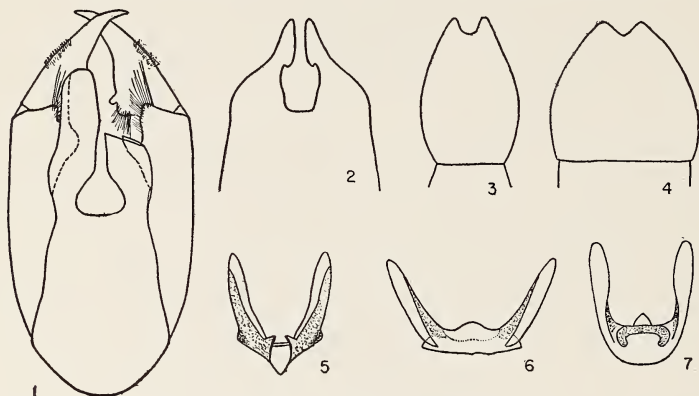
*Neopanorpa parva*, n. sp.

Text-figures 3, 5; Plate 11, fig. 13.

Body: light to dark brown, darker on vertex, thoracic nota and abdominal tergites. Fore wing: length, 11-13 mm.; width,



2-2.8 mm. (holotype, length, 11 mm.; width, 2 mm.) wing membrane hyaline, markings gray-brown; apical band broken posteriorly; pterostigmal band wide and forked posteriorly; basal band reduced to a few spots. ♀: subgenital plate slender



Text-figures 1-7. Fig. 1. *Neopanorpa pilosa*, n.sp., ventral view of male genital bulb (holotype). 2. *Neopanorpa pilosa*, n.sp., distal part of preëpiproct of male (holotype). 3. *Neopanorpa parva*, n.sp., subgenital plate of female (holotype). 4. *Neopanorpa cavaleriei* Navas, subgenital plate of female. 5. *Neopanorpa parva*, n.sp., internal skeleton of ninth abdominal segment of female (holotype). 6. *Neopanorpa pulchra*, n.sp., internal skeleton of ninth abdominal segment of female (holotype). 7. *Neopanorpa cavaleriei* Navas, internal skeleton of ninth abdominal segment of female.

with a narrow distal incision; internal skeleton of ninth abdominal segment small, with nearly parallel arms and very short axis. ♂ unknown.

*Holotype* (♀): Museum of Comparative Zoology, no. 27327. Kwanshien, Szechwan Province, China, July 16, 1937 (G. Liu).

*Paratypes*: 4 ♀, same collecting data as the holotype; in Museum of Comparative Zoology.

This species has wing markings resembling those of *N. cavaleriei* Navas, but it is much smaller than the latter and the wing membrane is hyaline, not yellowish.

### *Neopanorpa cavaleriei* Navas

Text-figures 4, 7.

*Neopanorpa cavaleriei* Navas, 1908, Mem. Real. Acad. Cienc. Barc., 1908: 415, fig. 23. Esben-Petersen, 1921, Coll. Selys, 5(2): 83, fig. 93, 94.

I have determined as this species one female from Yim Na San, East Kwantung Province, June 16, 1936 (L. Gressitt). It

is the same size and has the wing markings and color of the male  $\delta$  type, which I examined in the Muséum National in Paris. The type locality of *cavaleriei* is Kweiyang, Kweichow Province, some 600 miles from East Kwantung, but Navas has also recorded the species from Tonkin, Indo-China, and "Tibet." The subgenital plate of the specimen from Yim Na San is shown in figure 4, and the internal skeleton in figure 7. The latter is somewhat like that of *parva*, but has blade-like and twisted arms. The wing membrane and markings of *cavaleriei* are similar to those of the Formosan *N. ophthalmica* Navas, but the internal skeletal plate of the female of *ophthalmica*, which is well represented in the Museum of Comparative Zoology, is very different from that shown in figure 7.

***Neopanorpa pulchra*, n. sp.**

Text-figure 6; Plate 11, fig. 12.

Body light brown, slightly darker above. Fore wing: length, 14 mm.; width, 3 mm. Membrane hyaline, markings gray-brown. Apical band wide and entire, contiguous with pterostigmal band along costal margin; pterostigmal band wide, with a short fork posteriorly; basal band entire. Subgenital plate like that of *parva* but with a more shallow distal notch. Internal skeleton broader than long with widely divergent arms and no axis.  $\delta$  unknown.

*Holotype* ( $\text{♀}$ ): Museum of Comparative Zoology, no. 27328. Ta Han, Hainan Island, Kiangsi Province, June 23, 1935 (L. Gressitt).

There is a second specimen in the collection which almost certainly belongs to this species, but since the end of the abdomen has been broken off, I have not designated it a paratype. It was collected at Hong San, southeast Kiangsi Province, July 15, 1936 (L. Gressitt).

This species has the general wing pattern of *parva* but the wing is more slender and has more extensive markings. The internal skeleton differs in having widely divergent arms.

***Neopanorpa pilosa*, n. sp.**

Text-figures 1, 2

Body light brown, the vertex, thoracic nota and first four abdominal tergites dark brown. Male with the median process of the third abdominal tergite well developed, reaching almost

to the anterior of the fourth segment. Fore-wing: length, 17.5 mm.; width, 3.8 mm. Wing membrane nearly hyaline, faintly smoky in appearance; no markings; pterostigma pale yellow. ♂ genitalia: genital bulb slender, forceps rather short, outer margins gently curved, and with a large cluster of short black hairs near the middle; each of the forceps has a prominent lobe on the inner margin near the base, bearing a number of long black hairs; similar hairs arise from a short papilla on the genital bulb at the base of the forceps; hypovalvæ broad and long, reaching well beyond the base of the forceps; each is folded along the outer margin; preëpiproct with a pair of thick, distal processes, enlarged distally and directed inward towards the interior of the bulb. ♀ unknown.

*Holotype* (♂): United States National Museum. Suifu, Szechwan Province, China; 1000 ft. August 1928 (D. C. Graham).

This species bears some resemblance to *nigritis* Carp. but is much larger and has a lighter body. The male is readily distinguished by the long hypovalvæ and the patch of hairs on the forceps.

## EXPLANATION OF PLATES

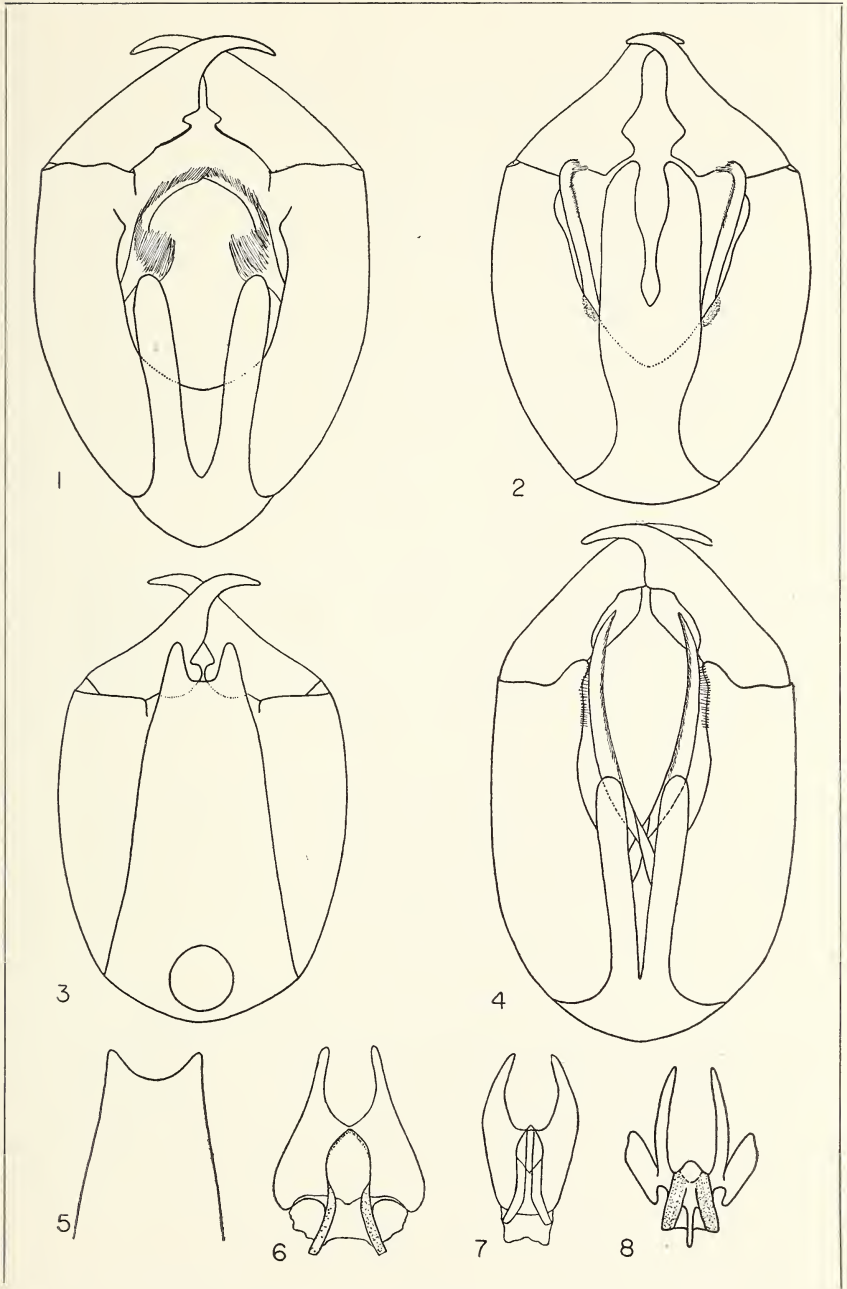
### Plate 10

- Figure 1. *Panorpa tetrazonia* Navas, ventral view of male genital bulb.  
 Figure 2. *Panorpa obliqua*, n.sp., ventral view of male genital bulb, holotype.  
 Figure 3. *Panorpa obliqua*, n.sp., dorsal view of male genital bulb, holotype.  
 Figure 4. *Panorpa davidi* Navas, ventral view of male genital bulb, holotype.  
 Figure 5. *Panorpa tetrazonia* Navas, distal part of preëpiproct of male.  
 Figure 6. *Panorpa tetrazonia* Navas, internal skeleton of ninth abdominal segment of female.  
 Figure 7. *Panorpa lutea*, n.sp., internal skeleton of ninth abdominal segment of female, holotype.  
 Figure 8. *Panorpa obliqua*, n.sp. internal skeleton of ninth abdominal segment of female, allotype.

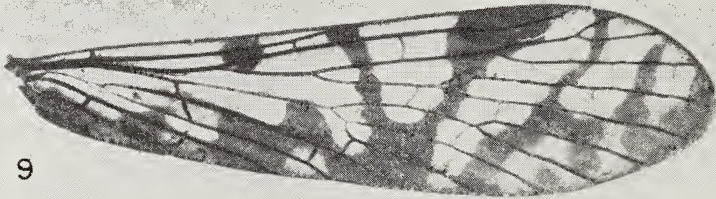
### Plate 11

The photographs do not indicate relative sizes.

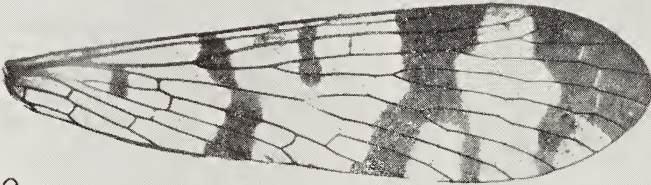
- Figure 9. Fore wing of *Panorpa obliqua*, n.sp., allotype.  
 Figure 10. Fore wing of *Panorpa tetrazonia* Navas.  
 Figure 11. Fore wing of *Panorpa lutea*, n.sp., holotype.  
 Figure 12. Fore wing of *Neopanorpa pulchra*, n.sp., holotype.  
 Figure 13. Fore wing of *Neopanorpa parva*, n.sp., paratype.



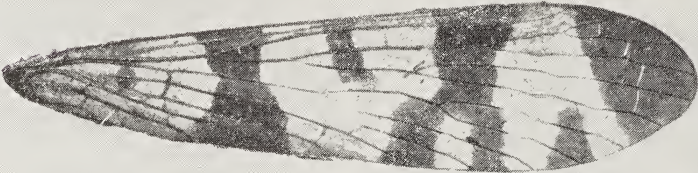




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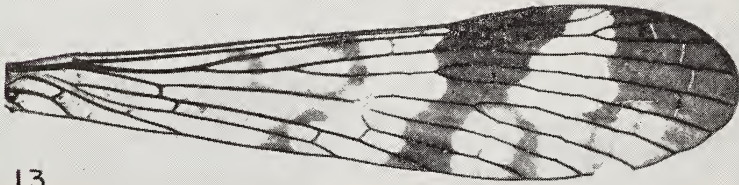
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CARPENTER — PANORPIDÆ FROM CHINA

## TEN NEW SPECIES OF EMPIDIDÆ (DIPTERA)

BY A. L. MELANDER  
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In collecting any group of insects some species are rarely encountered while others are common. In the Empididæ species of *Empis*, *Hilara*, *Rhamphomyia* and *Platypalpus* are numerous and are frequently taken, but it is a fortunate day when the collector can find a *Ragas*, a *Gloma*, or an *Anomalempis*. These last three represent archaic genera, and perhaps in their conservative characters they are handicapped in competition with those genera where speciation runs rife.

In the following pages are presented descriptions of ten new Empididæ, selected because of rarity or other noteworthy interest. Unless otherwise mentioned the specimens were collected by myself and the types are in my extensive collection of this family.

*Anomalempis archon*, n.sp.

Female. Length 3.75 mm. Entirely black, the halteres, pulvilli, abdominal hairs and terminal fringe of abdomen alone whitish. Sides of front coarctate, at middle one-fifth the length between antennæ and front ocellus, hairs of occiput conspicuous. Dorsum of thorax and abdomen polished, pleuræ and coxæ gray pruinose, dorsocentrals in more than single row, acrostichals biseriate, notal hairs long and thin. Hairs of middle coxæ longer than trochanters, all femora with setæ underneath, each tibia with about six extensor setæ. Wings hyaline, stigma narrow, pale brown.

Holotype: Katmai, Alaska, August, 1917, received from Professor J. S. Hine.

A larger and more bristly species than *A. tacomæ* Melander from Mount Rainier, Washington, but in structure and neuration exactly resembling the figure in *Genera Insectorum*, fasc. 185, pl. 5, f. 39 (not f. 38, which is *Syndyas polita* Loew). In the Washington species the sides of the front are much less

bowed and the width is one-half the height; the femoral setæ are lacking, the hind tibiæ have but a single seta, and the coxal hairs are shorter.

*Chersodromia megacetes*, n. sp.

Length 2 mm. Body black, thinly coated with cinereous pollen except the following polished places: face, proboscis, a narrow vertical stripe on sides of lower occiput, mesonotum except a narrow margin on sides and rear, most of sternopleura, terminal plate of pygidium and side of front coxæ. Palpi yellowish. Mesonotal hairs abundant, dark, leaving two approximated glabrous stripes anteriorly, separated by the biseriate hairs of the median line; scutellum thinly cinereous, two apical scutellars. Last tergite of abdomen of male somewhat enlarged on the left side; pygidium enormous, massive, twisted to the right, ventral bowl nearly twice as long as wide, below and laterally on the right side with a few short hairs, left side above with a shining spatulate valve, terminal disk rounded triangular; last segment of female abdomen compressed and shining, as long as other single segments. Legs black, the knees, extremities of tibiæ and the tarsi fuscous; femora without bristles other than a small one near knee, hind tibiæ with a few small bristles on apical half and inwardly with a terminal lappet, middle tibiæ with a flexar comb of short setulæ. Wings and veins whitish, the costal bristle black but the minute hairs whitish, crossveins touching, or the posterior crossvein slightly before the anterior; halteres wholly white.

Type, allotype and seven paratypes: Corona del Mar, California, 28 December 1944. Seven additional paratypes from the same locality, 25 July 1942, from Laguna Beach, 25 January 1935 and 22 May 1944, and from San Clemente Beach, 23 May 1944. In all, five males and eleven females were taken. The insects occur on the dry sand above the line of washed-in seaweed. They are reluctant to fly, can be driven into the collecting net, and are prone to take refuge in the burrows of Amphipods.

The species name, while literally meaning a great whale, has been applied to anything excessively large. In the present instance the monstrous pygidium, bulking as much as the remainder of the abdomen, and relatively larger than possessed by any other fly, warrants even this hyperbolic appellation.



*Chersodromia insignita*, n.sp.

Length 2 mm. Body black, overlaid with brownish gray pruinosity, the sternopleura mostly polished; hairs and bristles black; base of legs dark; wings maculate. Front about twice as long as width at middle, sides of face diverging below, the face about three times as long as width at antennæ; two vertical bristles, one pair each of converging and diverging ocellar bristles; antennæ black, third joint orbicular, style subdorsal, about three times length of third joint; proboscis black, but little projecting beyond the palpi, which are large, flat, orbicular and glistening white in the male and dusker but glistening in the female. Two dorsocentrals, one humeral, three intra-alar, one post-alar, scutellum with two bristles and two small lateral hairs. Abdomen of male stoutly cylindrical; seventh tergite oblique, lengthened on right side and with hind margin setose, eighth segment filling in the shortened left side of the seventh segment as a shining black triangular plate which is long-setose behind; abdomen nearly bare; pygidium massive, shining above, the globular ventral part pruinose like the preceding abdominal segments, claspers wide and stout. Coxæ mostly blackish, legs robust, all femora stout, piceous, knees, tibiæ and base of tarsi brownish; front tibiæ swollen and bearing a preapical flexar bristle, middle tibiæ with two widely separated extensor bristles, of male narrowed on apical third where there is a flexar strigil of about ten short spines, hind tibiæ with about ten irregular bristles toward tip; metatarsi cylindrical, the front ones two-fifths the tibial length. Wings fully developed, basal half whitish hyaline, with a strong sudden infumation in marginal cell beginning opposite crossveins and diminishing but pervading apical half of wing, veins white to, and including, crossveins but apically brownish, costal ratio 12:4:6:3, basal costal bristle black, costal hairs black, hairs of hind margin pale, second vein noticeably diverging from third, sections of fifth vein 5:4; halteres black, the short stalk brown; alulæ and hairs blackish.

Monterey, California; 25 September 1934, twelve specimens.

This is the only species of *Chersodromia* having an extended stigmatic spot on the wings.

*Coloboneura nubifera* Coquillett, from Alaska, likewise possesses a dark wing-cloud. It measures three to four millimeters and differs in having the darkening of the wings restricted to



the anterior distal quarter of the wing and in having the second basal cell shorter than the first.

*Chersodromia cana*, n.sp.

Female. Length 1.4 mm. Body and legs wholly black, more or less overlaid with white-gray pruinosity which is dense on the thorax except the sternopleural spot; all hairs white, all bristles short and black; halteres and palpi white. Front twice as long as width at bottom, face with coarctate sides, five times as long as narrowest width, two pairs of verticals, one of frontals; second joint of antennæ nearly equal to the rounded third joint, style subapical, about twice as long as the third joint; proboscis retracted. Dorsum of thorax rather evenly covered with appressed white hairs, scutellum with two bristles and two lateral white hairs, one each of humeral, notopleural, propleural and intra-alar. Vestiture of abdomen sparse, last segment compressed. Middle tibiæ with two extensor bristles, hind tibiæ with two extensors near middle and three before tip, front tarsi shorter than tibia, the joints almost globular, the first joint not twice as long as wide. Wings milky white, no stigma, basal costal bristle black, all hairs of wing margin small and white, veins white on basal half and gray on apical half, costal ratio from humeral crossvein 8:3:5:3, crossvein near middle of fifth vein.

Holotype: Laguna Beach, California, 25 January 1935.

In the European species, likewise, when the dorsocentral bristles are not developed the notal hairs are pale. Our species differs in having the legs completely black. The distinction between bristles and hairs is clearly indicated by the color.

It is worth recording that a specimen of *Chersodromia* which I collected on the beach near St. George, Bermuda, on February 1, 1934, appears to be identical with *Ch. beckeri* Melander from the Baltic Sea. Unfortunately the Bermuda as well as the Baltic specimens are known from females only. It may be that the discovery of males will enable a distinction to be made.

KEY TO THE AMERICAN SPECIES OF *CHERSODROMIA*

1. Mesonotum shining black, no dorsocentrals; pygidium about as large as the rest of the abdomen; legs blackish; halteres white. Cal. *megacetes*, n.sp.  
Body overlaid with grayish pollen. .... 2.
2. Hairs of mesonotum white, bristles black, no dorsocentrals; legs blackish; halteres white. Cal. *cana*, n.sp.

- Hairs and bristles of thorax black, dorsocentrals present though sometimes small. . . . . 3.
3. Wing with darkening on apical half; legs fuscous; halteres black; two scutellars; second basal cell longer than first. Cal. *insignita*, n.sp.  
Wings without cloud, uniformly whitish; legs and halteres yellowish. . . . . 4.
4. Bristles and hairs of costa and notum black; second basal cell shorter than first. North Atlantic Coast. *Houghii* Mel.  
Bristles and hairs of costa and notum pale; basal cells equal. Fla. *nana* Coq.

### *Ragas primigenia*, n.sp.

Male. Length 2 mm. Black, with a thin coating of fine brownish pollen. Hairs of lower occiput silky; eyes fully contiguous along the front; ocellar triangle prominent, with five setæ; third antennal joint triangular, twice as long as deep, style one-fourth the length of the third joint, thick, with a small apical seta; proboscis shining, incurved, sharp, in length one-third the head-height. Notum and pleuræ bare of hairs, lateral bristles very small, single hum., ia., and npl., 6 scutellars, dorsocentrals uniseriate, sparse, short, the posterior three longer, acrostichals biseriate, sparse and short. Abdomen nearly bare, pygidium small and open, its valves bifurcate and forcipate. Legs nearly bare, slender, front coxæ studded anteriorly with six stubby spines, front trochanters large and furnished with a curved row of about ten spinous bristles, middle femora beneath near middle with two strong bristles. Wings infumated, veins heavy and dark, stigma strong and elliptical, second basal cell a little longer than the first and parallel-sided, discal cell large, acutely pointed at base, the underside one-fourth its length, third vein ending just beyond tip of wing, its sections 2.5 : 1, sections of fourth vein 1 : 5 : 5, of fifth vein 1 : 2, axilla rounding into the prominent anal lobe; halteres blackish.

Holotype: La Jolla, California, 1 January 1935.

This is the first valid occurrence of this genus in America, the previous citations of *Ragas* having been assigned to other genera. There is only one other known species, *R. unica* Walker, from Europe. It is smaller than our form, lacks the armature of the legs, and has thinner veins. Otherwise the two species are closely related. In Curran's book on the genera of North American Diptera *Ragas* would lead to couplet 33 on page 211, differing in having an almost straight complete auxiliary vein and a full anal angle to the wing.

**Gloma fuscipes**, n.sp.

Length 3 mm. Body of male piceous black, legs light fuscous; body of female more or less testaceous below, legs mostly yellowish, bristles and hairs shorter than in male. Face deeply recessed; occiput of both sexes blackish, nearly bare behind the orbital fringe; antennæ short, the arista arising from the base of the deflected reniform third joint; proboscis short and fleshy, palpi black and hairy. Humeri marked with a fuscous point, 1 hum., 3 npl., 3 ia., acrostichals long and scattered, biseriate. Abdomen of male shining; hairs at incisures nearly as long as the segments, two irregular intermediate rows of shorter hairs. Hind tibiæ with about seventeen extensor hairs. Wings somewhat smoky, stigma darker, base in female paler than in male, veins thin and piceous, basal cells coextensive, auxiliary vein evanescent toward tip, alulæ pale, the fringe dark.

Type male: Puget, Washington, 4 July 1925; allotype: Potlatch, on Hoods Canal, Washington, 28 July 1917. Four male and three female paratypes, Canyon Creek, 26 July 1925, and Mount Constitution, 31 July 1908, both in Washington; Mount Hood, Oregon, at 3000 ft., 29 July 1921; Moscow Mountain, Idaho, 10 August 1924, and Lookout Mountain, Priest Lake, Idaho, 20 August 1919.

The genus *Gloma* is remarkable in the Empididæ in having the arista truly dorsal on the small stubby reniform third joint. The South American *Hyperperacera* Collin, which also has a dorsal arista, has bristly metapleuræ.

The species of *Gloma* are rarely encountered, and occur in the forests of the Pacific North-west. But three species exist in the American fauna, the earlier references to *Gloma* pertaining to Oreogeton, with *Gloma phthia* Walker belonging in *Syneches*.

**Gloma pectinipes**, n.sp.

Length 4 mm. Similar to the preceding species, but larger and with the hairs and bristles abundant and prominent. Lower occipital hairs numerous. Thorax thinly overlaid with cinereous pollen, a fuscous point on the humeri. Abdomen subshining. Fringe of the hind tibiæ with about twenty hairs. Wings somewhat smoky, stigma darker, veins piceous, alulæ dusky; halteres black. The distinctive characters are given in the following table.

Type and allotype: Seward, Alaska, 26 July 1921, J. M. Aldrich (U.S.N.M.). A paratype, Anchorage, Alaska, 20 July, also from my friend, the late Dr. Aldrich.

KEY TO THE AMERICAN SPECIES OF GLOMA

1. Posterior terminal prong of basal valve of pygidium slender and as long as the bunch of preapical hairs (in the European *fuscipennis* Meig. the posterior prong is very thin and much longer than the anterior); coxæ and legs black; radial and cubical veins distinctly stronger than the medial. Wash.  
*luctuosa* Mel.

Posterior prong stout and short, about half as long as the hairs of the preapical group; radial and cubital veins scarcely stronger than the medial. . . 2.

2. Eight or more scutellar bristles, ten or more dorsocentrals; coxæ and legs dark fuscous, both sides of hind femora of male fringed with long hairs, under side of middle femora with about five hairs along the apical half; female black; length 4 mm. Alaska.  
*pectinipes*, n.sp.

Four scutellars, eight or fewer dorsocentrals; coxæ and legs light fuscous, of female paler, hairs of under side of femora not longer than diameter of the femur; female body more or less testaceous; length 3 mm. Ida., Wash., Oreg.  
*fuscipes*, n.sp.

*Oreogeton xanthus*, n.sp.

Length 7 mm. Male entirely luteous, subshining, female with head and antennæ sometimes blackish, with thin dust; bristles and hairs black. Third antennal joint about as long as deep, shorter than the basal two together, arista apical; proboscis small, fleshy, palpi with numerous bristles. Valves of pygidium deeply emarginate at middle above, the apical corner bluntly digitate, posteriorly with numerous hairs. Middle coxæ with blunt setæ, those of hind coxæ short; male with eight to ten flexar setæ on middle femora rather uniformly distributed, the middle tibiæ pectinate within with fine setæ, and only slightly bent at middle; tarsi simple, last two joints fuscous. Wings with yellowish tinge, stigma slightly darker, veins yellow, the first, second and third setulose above and the second and fourth underneath, sections of fifth vein subequal.

Type and allotype: Mount Baker, Washington, Skyline Trail, 10 August 1925. Six male and five female paratypes: topotypic, and also from Mount Rainier, at White River, 20 July 1924, and Everett, Washington, 4 July 1924.

In the table of species in Fascicle 185 of the Genera Insectorum, page 99, *xanthus* leads to *capnopterus*, but is readily distinct in its yellow color and in having many setæ under the middle femora of the male. *Xanthus* is the only species having



the apical finger of the pygidial valves twisted inward. In all the others (male of *rufus* not in collection) the valve ends in a continuous thin blade-like triangle or hook.

*Hilara cavernicola*, n.sp.

Length 2.25 mm. Testaceo-fuscous, head and genitalia becoming fuscous; all bristles short. Front of female twice as long as wide, of male two and one-half times, middle frontal seta minute, face as wide as front, gray-dusted, occipital row of brownish hairs inconspicuous, ocellar bristles shorter than style; basal joints of antennæ yellowish, third joint brown, triangular, scarcely longer than deep, style slightly longer than third joint; proboscis brown, palpi yellow, with a single small pale seta and a few small hairs. Thorax dusted with concolorous pollen, not vittate, pleuræ concolorous with dorsum, dorsocentrals uniseriate, about ten in number and similar to the acrostichals which are in four rows with about eight to the inside row, four scutellars. Abdomen of male with yellowish incisures, of female wholly fuscous, hairs sparse, short and pale, pygidium about the size of the fifth segment, the valves with hook-like process at anterior apex. Legs without bristles, slender in all parts, coxæ and legs pale yellow, becoming slightly darker distally where the ends of the tarsi may be light brown, tibiæ almost equal in length to tarsi which are simple and slender, the metatarsi about equal to the two following joints. Wings hyaline, stigma very faint, veins very thin and light brownish, sections of third vein proportioned 1:7:5, of fourth vein 1:4:6, of fifth vein equal; halteres pale yellow, alulæ and fringe pale.

Over one hundred specimens mounted, from Lucerne, Lake Chelan, Washington, 29 July 1919.

Most of the species of *Hilara* are characterized by their males having enlarged front metatarsi. In Europe there are only some half-dozen species which have slender tarsi, and in the United States but one, *H. johnsoni*. The discovery of an additional species which has probably reverted to this generalized condition therefore carries unusual interest. Nearly all the species of *Hilara* frequent open water, over which they weave their aërial dance. The present species was found swarming in an abandoned mine, evidently attracted there by the enclosed darkness rather than by any dampness.

**Empis (Enoplempis) ctenocnema, n.sp.**

Length 7 mm. Thorax cinereous piceous, notum quadrivittate with brown; four small scutellars. Abdomen with a few lateral setulæ in vertical row on first two segments. Legs including coxæ testaceous, tarsi apically piceous, hind femora slightly swollen and bent at apical fifth but without any hairs at swelling, hind tibiæ with slight swelling on underside toward knee corresponding with femoral bend and with a slight depression corresponding with femoral swelling, fringed on both sides with close black hairs; when the knee is flexed the femoral twist lies between the two fringes.

Two males, one female, Tuxedo, New York, 29 May 1926.

Very close to *E. nodipes* Melander, from New Mexico, to which it leads in the table of species of *Empis*, Trans. Am. Ent. Soc. xxviii, p. 284 (1902). It differs from the description on page 324 only in the structure of the knee specialization of the hind legs.

NOTES ON HIPPOBOSCIDÆ. 19. ADDITIONS TO THE  
LARGER SPECIES OF *LYNCHIA*, WITH DE-  
SCRIPTIONS OF TWO NEW SPECIES<sup>1</sup>

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Material of the larger species of *Lynchia* studied since the publication of my earlier paper in 1933 (*Psyche*, XL, pp. 68-82) has led me to modify some of my conclusions. *Lynchia wolcotti* Swenk appears to be a valid species and is here recognized as such. The African fly formerly referred to *L. palustris* was misidentified and is now described as a new species. An additional new species of this group is described from Ceylon.

The following emended key supersedes that published in 1933.

1. Mesonotum and disk of scutellum densely and fairly uniformly covered with soft, short hairs, directed backward; scutellum without median longitudinal groove. Frons very wide; inner margins of eyes distinctly converging below; postvertex very short and wide, about one-fourth to one-third the length of mediovertex; frontal bristles numerous, in several irregular rows. Palpi short, at most as long as fronto-clypeus. Wing membrane bare over much of the basal two-thirds (more extensively in the female than in the male). Subcosta (Sc) usually complete, ending in costa. Wing 5.5 to 7 mm. long. *L. pilosa*.  
Mesonotum almost bare, except for narrow patches of long hairs behind the humeral callosities and before the scutellum; scutellum with only a few lateral setæ and apical fringes of soft hairs, the disk mostly bare. Palpi at least as long as fronto-clypeus. Upper side of wing mostly covered with microtrichia; only the axillary cell (2d An) or that cell and the hind fourth to half of the anal cell (Cu+1st An) bare . . . . . 2.
2. Upper side of wing with only the axillary cell (2nd An) mostly devoid of microtrichia. Subcosta (Sc) usually

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

- complete, ending in costa. Frons nearly twice the width of an eye . . . . . 3.
- Axillary cell (2d An) and hind fourth to half of anal cell (Cu+1st An) devoid of microtrichia . . . . . 4.
3. Frons very wide, at most as long as wide at postvertex. Frontal bristles fairly numerous, mostly in one rather irregular row. Palpi at most half as long as the height of the head. Wing 7 to 8 mm. long . . . . . *L. schoutedeni*.
- Frons longer than wide at postvertex. Frontal bristles very few, in one row. Palpi nearly as long as the height of the head. Wing 9 mm. long . . . . . *L. majuscula*.
4. Frontal bristles few, placed mostly in one, irregular row. Subcosta (Sc) usually incomplete, not ending in costa . . . . . 5.
- Frontal bristles numerous, in more than one row. Frons one and one-half times to twice the width of an eye; inner margins of eyes distinctly diverging to postvertex. Subcosta (Sc) usually complete, ending in costa . . . . . 7.
5. Inner margins of eyes strongly diverging to postvertex; frons wider than an eye in both sexes, slightly narrower in male than in female. Smooth postvertex short and transverse, the anterior margin longer than the sides, usually without median pit. Wing 7 to 8.5 mm. long.  
*L. americana*.
- \* Inner margins of eyes subparallel or slightly diverging. Smooth postvertex rather long and semi-elliptical, the anterior margin about as long as the sides, often with a median pit or rudimentary ocellus . . . . . 6.
6. Frons narrow, at most as wide as an eye (even in the female), usually narrower. Wing 6.5 to 8 mm. long.  
*L. wolcottii*.
- Frons wider than an eye in both sexes, usually much so. Wing 6.5 to 7 mm. long . . . . . *L. fusca*.
7. Postvertex long, semi-elliptical, the anterior angles broadly rounded, the anterior margin convexly curved and about as long as the sides. Wing 7.5 to 8.5 mm. long (New World and Hawaii) . . . . . *L. nigra*.
- Postvertex short, more transverse, the anterior angles more abruptly rounded off, the anterior margin much longer than the sides. Wing 8 to 8.5 mm. long (Africa). *L. dukei*.



*Lynchia pilosa* (Macquart)

*Olfersia pilosa* Macquart, 1843. See J. Bequaert, 1933, p. 70. Additional reference: *Olfersia pilosa* Speiser, 1907, in Sjöstedt, Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro, II, pt. 10, pp. 4 and 7 (off *Choriotis kori*, Kibonoto, Tanganyika Territory).

*Male*. — Head seen in front about one and one-quarter times as wide as high; frons at its narrowest about twice as wide as the eye, measured along inner orbits about as long as its greatest width at vertex, the sides converging strongly from vertex to fronto-clypeus in upper half and more gradually in lower half; inner orbits (parafrontalia) very broad, at their widest more than half the width of mediovertex (frontalia), divided into a narrow, smooth and bare juxta-ocular zone and a much wider alutaceous inner zone bearing many soft, yellowish, reclining setæ in several irregular rows; one stiff, long black bristle at inner margin of parafrontalia near upper third and a few similar black bristles (one very long) near fronto-clypeus; one very long and thick, black vertical bristle; postvertex (vertical triangle) very short and wide, semi-elliptical with drawn-out sides, the anterior margin even, without median depression or pit, the occipital margin nearly straight; apex of fronto-clypeus with a narrow, deep median notch, the antero-lateral angles moderately produced. Palpi very short, thick, about as long as fronto-clypeus (measured from ptilinal suture to apical notch), covered with many long, black and yellowish setæ. Dorsal appendage of second antennal segment short, with obtuse apex, bearing apically many long, stiff, black bristles, mostly curved downward. Thorax: anterior margin broadly concave; pronotum exposed from above as a membranous sclerite, the hind margin of which overlaps the anterior margin of mesonotum; humeral callosities short, broadly rounded off at apex; median notal and transverse mesonotal sutures deep and nearly complete. Scutellum transversely rectangular (somewhat as in *Pseudolynchia*), slightly over three times as wide as its greatest length, the anterior (mesonotal) margin nearly straight, the hind margin slightly convex medially, somewhat angular at the sides, without median groove or depression. Thorax (including scutellum) covered uniformly with numerous, short, soft, appressed, yellowish hairs, directed backward and each arising from a small papula; the hairs are stiffer and black on the humeral callosities and notopleura; in addition there are long,

stiff, black bristles as follows: on each side, two on the humeral callosity, three or four at the hind corner of the notopleuron, one prealar, one postalar, one prescutellar, one scutellar (in the side corner), and six on the metepimeron; hind margin of scutellum densely fringed on the sides, weakly in the middle. Legs long and stout; femora much swollen, but without distinctive features; fourth tarsal segment of fore legs not produced, normal; hind tarsal segments broader than usual, densely covered beneath with stiff, black bristles. Wing short and broad; microtrichia covering the membrane except for the following areas: most of axillary cell (2d An), most of first basal cell (R), entire second basal cell (M), and basal half of the combined discal and second posterior cells ( $M_2$ ); first basal cell (R) long, narrow, parallel-sided; second basal cell (M) short, at most one-third of the length of the first, slightly widened apically and closed by a hyaline, unsclerotized, straight, vertical anterior basal cross-vein ( $M_3$ ), the upper outer angle being nearly square; subcosta (Sc) usually complete, ending in costa; apical portion of costa (beyond tip of first longitudinal vein) moderately swollen, distinctly thicker than basal portion; longitudinal veins all crowded near anterior margin; costa densely setulose, all other veins bare. Abdomen: one very large sclerotized basal tergite, with straight hind margin, covered with many evenly distributed short setæ; remainder of dorsum mostly soft and membranous, without sclerotized plates, uniformly covered with short setæ and some larger and heavier ones at extreme sides; one large preanal, sclerotized tergite, sparsely covered with short setæ and bearing on each side a group of ten to twelve very strong, spine-like bristles, three to five of which are much longer than the others and placed near the hind margin; venter entirely soft and membranous, fairly uniformly covered with short setæ, posteriorly with much longer ones; before the genital opening a pair of small prominent lobes, sclerotized at the broadly rounded tips, which bear many long setæ.

*Female*. — Differs from the male in the following particulars. Frons relatively narrower, at its narrowest about one and two-thirds the width of an eye. Membrane of wing bare over about the basal two-thirds: microtrichia covering only the apical two-thirds to three-fourths of the first posterior cell ( $R_5$ ), more extensively along third longitudinal vein ( $R_{4+5}$ ) than at fourth longitudinal vein ( $M_{1+2}$ ), the apical fifth to fourth of the com-

bined discal and second posterior cells ( $M_2$ ), and a short area in the tip of the combined third posterior and anal cells (Cu+1st An).

Total length, from notch of fronto-clypeus to apex of abdomen (alcoholic specimens): 5.5 to 7.5 mm.; length of wing: 5.5 to 7 mm.; width of wing: 2.2 to 2.8 mm.

*L. pilosa* is isolated in the genus *Lynchia*, owing to the uniform covering of setulæ on thorax and scutellum, the unusual development of the pronotum, the crowding of the longitudinal veins toward the costa of the wing, and the sexual dimorphism in the extent of the microtrichia over the wing membrane. Most of these characters differentiate *L. pilosa* also from the smaller species of the genus *Lynchia*.

Additional Specimens. — KENYA COLONY: Masai Reserve. — UGANDA: Katwe, Toro, one female and two males, off *Lissotis m. melanogaster* (Rüppell) (G. H. E. Hopkins), and one female, off *Francolinus levaillanti mulemæ* Ogilvie-Grant (G. H. E. Hopkins). Maruanaita Hill, Gié, Karamojo, one female, without host (G. H. E. Hopkins). — SOUTHERN RHODESIA: Salisbury, one male, without host (M. C. Z., Cambridge, Mass.). — BECHUANALAND: Ghanzi, Mongalatsila, off *Choriotis kori* (Burchell) (J. Maurice. — Brit. Mus.). — ZULULAND: Nongomo, one male, "ex Paauw" (H. H. Curson).<sup>1</sup> — MOROCCO: Tiznit, two females and one male, off Sandgrouse, *Pterocles orientalis* (Linné) (Col. R. Meinertzhagen).

This species is now known from Zululand, the Orange Free State, Transvaal, Bechuanaland, Southern Rhodesia, Tanganyika Territory, Kenya Colony, Uganda, southern Abyssinia and Morocco. It is normally a parasite of the Otitidæ (Bustards, Koris or Knorhaans) and will probably be found wherever these birds occur. In particular, it should be looked for in the savannas of the Katanga and the northeastern Uele (Belgian Congo), where Bustards are fairly common. The occurrence of this fly on Sandgrouse in Morocco is of unusual interest. The flies were taken on this host in winter (November 6, 1938). Colonel Meinertzhagen (*in litt.*) points out to me that "Sandgrouse inhabit much the same type of country as Bustard and in this particular area of Morocco the Bustard is not uncommon in spring and summer, but absent in winter. It is also to be

<sup>1</sup>"Paauw" is one of the vernacular names of the Bustards in South Africa.

noted that Bustard and Sandgrouse, though not in the least related, are the only bird groups which have a pinkish under-down." I suggest that Sandgrouse and Francolins act as facultative, and perhaps temporary, hosts for specimens of *L. pilosa* that hatch at the season when Bustards are absent.

Bigot (1863, in Maillard, Notes sur l'Ile de la Réunion, 2d Ed., II, p. M38) includes *Olfersia pilosa* in his list of the Diptera of Reunion. If this record was based on a specimen taken in Reunion, it was certainly an erroneous identification.

#### *Lynchia schoutedeni*, new species

*Lynchia palustris* J. Bequaert, 1933, Psyche, XL, p. 71 (♂; off *Haliëtor africanus*, Mongende, Belgian Congo). Not of Lutz, Neiva and da Costa Lima, 1915.

*Male*. — Head seen in front about one and one-third times as wide as high; frons at its narrowest about twice as wide as the eye, measured along inner orbits distinctly shorter than its greatest width at vertex, the sides converging markedly from vertex to lower third and slightly diverging opposite fronto-clypeus; inner orbits (parafrofrontalia) broad, at their widest about half the width of mediovertex (frontalia), mostly smooth and shiny; frontal bristles moderately numerous, mostly placed in one irregular row; one very long and thick vertical bristle; postvertex (vertical triangle) rather long and wide, more than one-third of the length of mediovertex, transversely lozenge-shaped, the occipital margin nearly straight, the anterior margin straight and much longer than the sides, with a slight median triangular depression, but without pit; fronto-clypeus deeply notched medially at apex, the antero-lateral angles moderately produced. Palpi short, thick, slightly longer than fronto-clypeus (measured from ptilinal suture to apical notch), densely setulose and with one long bristle near the tip. Dorsal appendage of second antennal segment short and broad, its apical portion bearing many bristles, mostly curved downward. Thorax: anterior margin nearly straight; humeral callosities fairly long and prominent, with broadly rounded apex; median notal and transverse mesonotal sutures deep, the transverse suture broadly interrupted medially. Scutellum semi-elliptical, less than three times as wide as its greatest length, the anterior (mesonotal) margin slightly convex, the hind margin very strongly and evenly so, the disk with a fine longitudinal groove. Thorax mainly bare; a few soft, short and long hairs, directed back-



ward, in a transverse group on each side behind the humeral callosity, far from the middle line; two or three soft setæ on each side just before the scutellum; a few short setæ at apex of humeral callosity, followed by one very long bristle; notopleura with a few scattered short setæ and two long bristles posteriorly; on each side one prealar, one postalar and one scutellar bristle; metepimeron with a few short, stout setæ; scutellum with a fringe of long, soft hairs at hind margin and a few preapical hairs in a transverse row. Legs stout and rather short; femora much swollen, without distinctive features; fourth tarsal segment of fore legs not produced, normal; hind tarsal segments short and broad. Wing short and broad; microtrichia covering the membrane except for nearly the entire axillary cell (2d An); first basal cell (R) long, narrow, parallel-sided; second basal cell (M) long, more than one-third, but much less than one-half of the length of first, moderately widened apically and closed by a partially sclerotized, slightly curved, nearly vertical anterior basal cross-vein ( $M_3$ ), the upper outer angle being nearly square; subcosta (Sc) complete, ending in costa; apical portion of costa scarcely thicker than basal portion; longitudinal veins evenly distributed; costa densely setulose, all other veins bare. Abdomen: sclerotized basal tergite extending the entire width, bearing few short and soft setæ, the sclerite very short in the middle, produced into long and narrow side lobes; remainder of dorsum mostly soft and membranous, with many short, soft setæ, except for a median almost bare area bearing microscopic transverse striolæ; one small, median, transversely elliptical sclerotized plate a short distance behind the basal tergite and on each side a narrow partly sclerotized pleurite; preanal tergite forming one large, transverse, sclerotized plate, with straight anterior and hind margins and broadly rounded sides, sparsely covered with short setæ and laterally toward the apex with much longer bristles which are not at all spine-like (5 or 6 longer bristles on each side); venter mostly soft and membranous, fairly uniformly covered with short setæ; before the genital opening a pair of prominent lobes, sclerotized at the broadly rounded tips, which bear many setæ.

Total length, from notch of fronto-clypeus to apex of abdomen (alcoholic specimen): 8 mm.; length of wing: 7.8 mm.; width of wing: 2.7 mm.

*Female.* — Dorsum of abdomen mostly bare and microscopi-

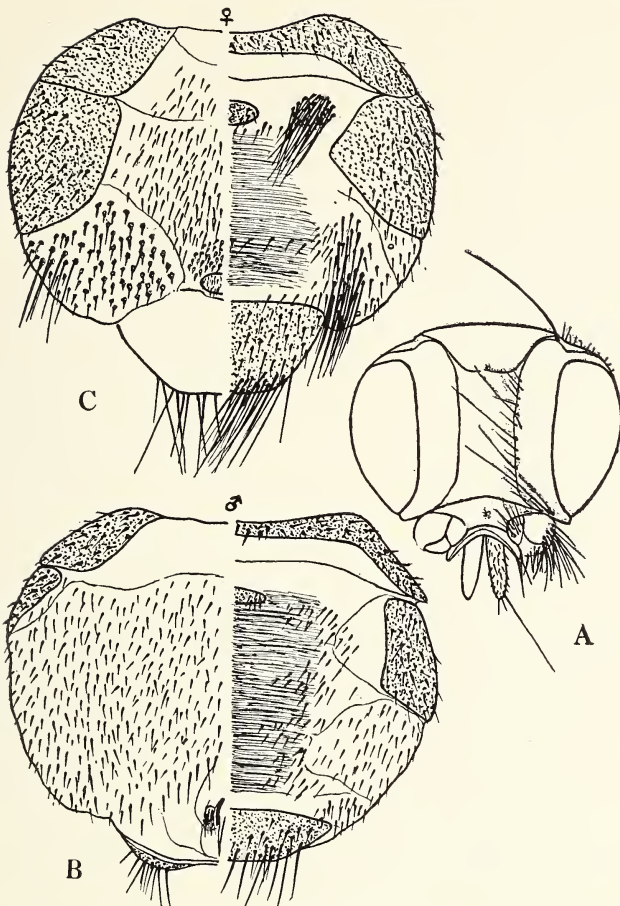


FIG. 1. *Lynchia schoutedeni* J. Bequaert, n. sp. A, head of male holotype; B, abdomen of male holotype from above (right) and below (left); C, abdomen of female paratype, Katwe, from above (right) and below (left).

cally striolate in the middle (as in male); but the sides, beyond the pleurite, with strong setæ which become very long and are more or less crowded into a brush posteriorly; in addition, a large brush-like patch of long and strong bristles on each side anteriorly near the small median, elliptical sclerotized plate. Preanal sclerotized plate semi-elliptical in outline, rounded-truncate behind, the long apical bristles stronger and more nu-

merous than in male (9 to 12 on each side); this preanal sclerite is flattened and completely bare on the ventral side, a striking peculiarity of the species. Apical portion of venter covered with very short setæ arising from unusually large, sclerotized papulæ. Otherwise as in male.

Total length, from notch of fronto-clypeus to apex of abdomen (alcoholic specimen): 8 mm.; length of wing: 7.8 mm.; width of wing: 2.7 mm.

Specimens Examined. — BELGIAN CONGO: Holotype, male, Mongende, off Cormorant, *Haliëtor africanus* (Gmelin) (H. Schouteden. — Congo Museum, Tervuren). — KENYA COLONY: Allotype, female, Naivasha, off *Phalacrocorax carbo lugidus* (Lichtenstein) (A. Meinertzhagen. — Museum Comp. Zoöl., Cambridge). — UGANDA: Male and female paratypes, Entebbe, off *Haliëtor africanus* and off *Anhinga rufa rufa* (Daudin) (G. H. E. Hopkins. — Brit. Mus.). Female and male paratypes, Kampala, off *Anhinga rufa rufa* (G. H. E. Hopkins. — Mus. Comp. Zoöl.). Female and male paratypes, Bulengugwe, off *Anhinga rufa rufa* (W. G. Eggelius and G. H. E. Hopkins. — Brit. Mus.; Mus. Comp. Zoöl.). Male and female paratypes, Katwe, Toro, off *Anhinga rufa rufa* and *Phalacrocorax carbo lugubris* Rüppell (G. H. E. Hopkins. — Mus. Comp. Zoöl.). Male and female paratypes, Kome Island, Lake Victoria (G. D. H. Carpenter. — Brit. Mus.). — ETHIOPIA: Female paratype, Dambi Ford, in tent, probably off a Cormorant (Major Cheesman. — Brit. Mus.). Several specimens are infested with myialgid mites, the infestation being particularly heavy on one of the flies from Katwe, off *Anhinga rufa*.

A study of a cotype of *Olfersia palustris* Ad. Lutz, Neiva and da Costa Lima (1915, Mem. Inst. Osw. Cruz, VII, p. 183, Pl. XXVIII, fig. 4), from the State of Piahy, Brazil, shows that I was mistaken in referring to that species the African parasite of Cormorants. The true *O. palustris* is one of the small species of *Lynchia*, the wing being about 5 mm. long. It is very closely related to, or possibly even identical with, *Lynchia albipennis* (Say).<sup>1</sup>

<sup>1</sup>I am indebted to the late Dr. Ad. Lutz for a cotype of *Olfersia palustris*, now deposited at the Museum of Comparative Zoölogy. I surmise that the length of the wing as given originally (7 mm.) was either an oversight or meant to cover the distance from the clypeus to the tips of the folded wings. It should be noted that the total length of the body as given (5 mm.) is too small for any of the large species of *Lynchia*.

For a long time I was undecided as to whether the African parasite were not *Lynchia massonnati* (Falcoz) (*Ornithoponus massonnati* Falcoz, 1926, Faune de France, XIV, Diptères Pupipares, p. 31, figs. 28–29), based upon the female fly off *Platalea leucorodia*, from the region of the Dombes, Dept. Ain, France, which Massonnat (1909, Ann. Univ. Lyon, N.S.,

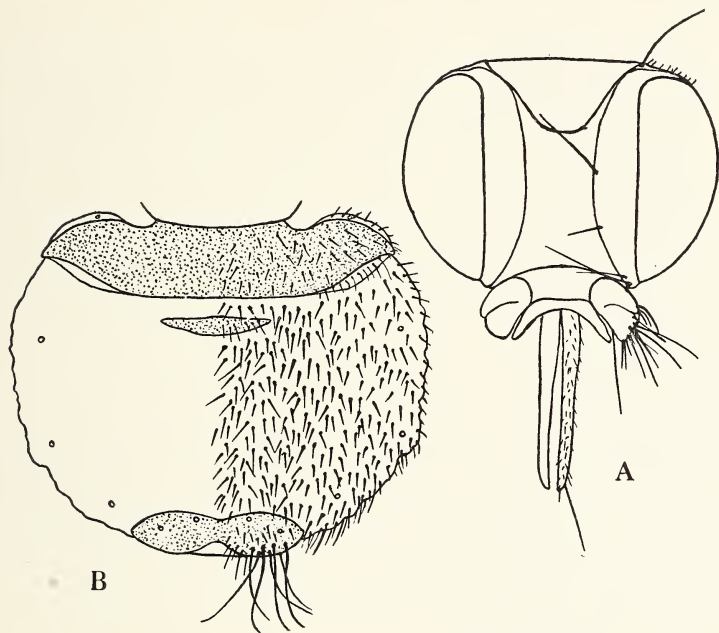


FIG. 2. *Lynchia majuscula* J. Bequaert, n. sp., male holotype. A, head; B, abdomen from above (right) and below (left).

CXXVIII, p. 304, Pl. V, figs. 40–42) had referred to *Lynchia americana*. While it seems fairly certain that Massonnat's fly was not the American *Lynchia americana* (Leach), it does not seem possible to regard it as identical with the African parasite of Cormorants. Neither Massonnat nor Falcoz mentions or figures the peculiar brush-like setæ on the sides of the abdomen. These are so characteristic of the female of *L. schoutedeni* that they could hardly have been overlooked. It is possible, however, that Massonnat's specimen was really a male, in which case it might well have been my new species.



*Lynchia majuscula*, new species

*Female*. — Head seen in front slightly wider than high; frons about twice as wide as eye, measured along inner orbits about one and one-third times as long as its width at vertex, with nearly parallel sides; inner orbits (parafrofrontalia) wide, slightly more than half the width of mediovertex (frontalia); frontal bristles reduced to a small group on the gena near lower edge of eye, and two or three on the middle; one very long vertical bristle; postvertex (vertical triangle) long, more or less triangular and broadly rounded anteriorly, nearly as long as wide and about half as long as mediovertex, apparently without median anterior depression or pit; occipital margin straight; fronto-clypeus of the usual shape, the antero-lateral angles moderately produced. Palpi unusually long and slender, only slightly shorter than the height of the head. Thorax: anterior margin straight medially; humeral callosities broad, moderately prominent, bluntly rounded at apex, with one long bristle and eight to ten short setæ; anterior half of mesonotum (mesoscutum) on each side anteriorly with a narrow, transverse patch of short, soft hairs and a few setæ, the patch not reaching the middle line; one very long prealar bristle; dorsal portion of mesopleura (notopleura) with a few scattered short setæ and, posteriorly, with one long bristle; a few setæ near outer hind margin of mesonotum and one long postalar bristle; hind margin of scutellum evenly and moderately convex, weakly fringed and in each corner with one long scutellar bristle; metepimeron with 5 or 6 strong, short bristles and some softer setæ. Legs without distinctive features; fourth tarsal segment of fore legs not produced. Wing long and broad; microtrichia covering most of the membrane; axillary cell (2d An) bare, except for a very narrow zone along the sixth longitudinal vein (2d An); first basal cell (R) long, narrow, parallel-sided; second basal cell (M) less than half but over one-third of the length of the first, closed by a nearly vertical anterior basal cross-vein ( $M_3$ ); subcosta (Sc) complete, ending in costa; costa densely setulose; third longitudinal vein ( $R_{4+5}$ ) with a few setulæ close to the tip; other veins bare. Abdomen: a broad, short, transversely lozenge-shaped basal tergite, followed by a small transverse median sclerite; preanal tergite consisting of two elliptical plates, broadly connected medially and each bearing a group of eight

long bristles and a few shorter ones; remainder of dorsum soft and fairly uniformly covered with many short setæ on small papulæ; in addition the integument of the median area is microscopically, transversely striolate; ventrally there is apparently only one small, crescent-shaped sclerite, placed immediately in front of the anal ring and more or less divided longitudinally; ventral surface uniformly covered with many setæ, slightly

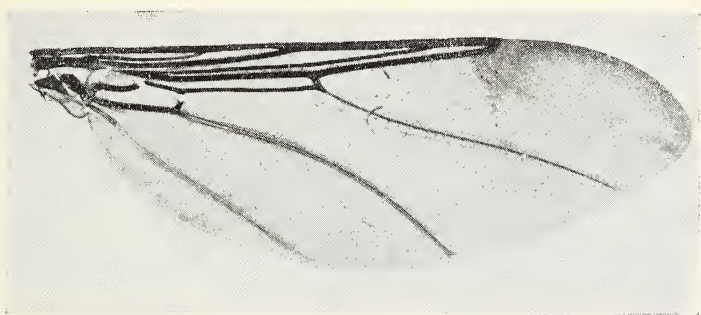


FIG. 3. *Lynchia majuscula* J. Bequaert, n. sp. Wing of male holotype. Photograph by F. M. Carpenter.

longer than those of dorsum; soft portion of abdomen very superficially divided along the sides into five segments, each corresponding to one of the spiracles.

Total length, from notch of fronto-clypeus to apex of abdomen (somewhat flattened on the slide): 8 mm.; length of wing: 9 mm.; width of wing: 3 mm.

Specimen Examined. — CEYLON: Holotype, female, off a Falcon, *Spilornis cheela spilogaster* (Blyth), April, 1935 (sent by the late Dr. G. A. H. Bedford. — Mus. Comp. Zoöl.).

*L. majuscula* appears to be most closely related to *L. schoutedeni*, described in this paper, agreeing with it in the characters of the wing. It is, however, slightly larger, being the largest member of the genus I have seen thus far. In addition to the differential characters given in the key, attention may be called to the difference in the pilosity of the dorsum of the abdomen and in the shape of the postvertex.

The description is based on a single specimen mounted on a slide in Canada balsam, after treatment with potash. It is possible that the frontal bristles were actually more numerous on the fresh specimen.

*Lynchia americana* (Leach)

*Feronia americana* Leach, 1817; *Hippobosca bubonis* Packard, 1869. See J. Bequaert, 1933, p. 72.

The synonymy, distribution and hosts of this fly will be discussed fully in a forthcoming paper on the North American Hippoboscidae.

*L. americana* is one of the most common and widespread Nearctic hippoboscids. It is known in the Dominion of Canada from Ontario and Nova Scotia; and in the United States from Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, the District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Louisiana, Texas, Kentucky, Ohio, Indiana, Illinois, Wisconsin, Iowa, Nebraska, Minnesota, Kansas, Colorado and Nevada. Farther south it seems to be very rare, as I have seen only one specimen from Mexico (Grito) and one from Panama (Juan Diaz). The published records from California and the Galapagos were based on misidentifications.

The known host list is very large, but this species is most commonly found on diurnal and nocturnal birds of prey and on Ruffed Grouse. H. S. Peters (1935, Ann. Carnegie Mus., XXIV, p. 57) reported a specimen off an American Egret (*Casmerodius albus egretta* Gmelin), with a Mallophagan (*Esthiopterum botauri* Osborn) attached, a most unusual find. The only record I have from a passerine host is a specimen taken at White Plains, New York, off a White-throated Sparrow, *Zonotrichia albicollis* (Gmelin), by Mr. C. Farley. *L. americana* has become established on the introduced Ring-necked Pheasant, *Phasianus colchicus torquatus* Gmelin.

Since this paper was sent to press, I received from Dr. A. Stone several specimens of *L. americana* taken off Wild Turkey in North Carolina (Durham; Rockingham Co.) and Mississippi (Picayune).

The statement in my earlier paper (1933, p. 75) regarding the occurrence of pupæ in the ears of Great Horned Owl, should be deleted. In C. W. Johnson's paper it refers to *Ornithoica vicina* (Walker) (cited as *O. confluenta*).

*Lynchia fusca* (Macquart)

*Olfersia fusca* Macquart, 1845. See J. Bequaert, 1933, p. 77<sup>1</sup>; 1940, Rev. Acad. Colombiana Cienc. Ex. Fis. Nat., III, pt. 12, p. 416; 1943, Jl. of Parasitology, XXIX, p. 132.

This species will be more fully discussed in a forthcoming paper.

*L. fusca* is fairly common in Oregon and California, but it is also found occasionally in the eastern United States (South Carolina, Georgia, Florida, Texas, Tennessee, Kansas, Colorado, and Michigan). It was originally described from Colombia, and has also been taken in Panama and Brazil.

It is mainly found on Owls, more rarely on diurnal birds of prey.

*Lynchia wolcotti* (Swenk)

*Olfersia wolcotti* Swenk, 1916, Jl. New York Ent. Soc., XXIV, p. 132 (no sex. Michigan: Ann Arbor, off *Buteo platypterus*).

My surmise that *O. wolcotti* might be a synonym of *L. fusca* (J. Bequaert, 1933, p. 78) was incorrect. Through the courtesy of the late Prof. Myron H. Swenk, I was able to study the type now in the Department of Entomology, University of Nebraska.

Specimens Examined. — MICHIGAN: Ann Arbor, off *Buteo p. platypterus* (R. H. Wolcott. — Holotype). McMillan, off *Accipiter v. velox* (O. M. Bryens, June 6, 1933; recorded also by H. S. Peters, 1936, Bird-Banding, VII, p. 13). — NEBRASKA: Lincoln, off *Buteo p. platypterus* (C. E. Mickel). — PANAMA: El Volcan, Chiriqui, July 6, 1937, off a Hawk (C. B. Worth).

Apparently a rare species, which has been taken thus far only from diurnal birds of prey.

*Lynchia nigra* (Perty)

*Hippobosca nigra* Perty, 1833; *Ornithomyia intertropica* Walker, 1849; *Olfersia acarta* Speiser, 1902. See J. Bequaert, 1933, p. 79<sup>2</sup>; 1933, Proc. California Ac. Sci., (4) XXI, p. 134;

<sup>1</sup> The reference to Ad. Lutz, Neiva and da Costa Lima, 1915, Mem. Inst. Osw. Cruz, VII, p. 182, should be deleted. These authors undoubtedly referred to *L. fusca* some of the smaller *Lynchia* and their specimens seem to have been at least partly *L. angustifrons* (v. d. Wulp). The latter is a valid, distinct species, not a synonym of *L. fusca*. The flies off Owls, which Ad. Lutz, Neiva and da Costa Lima (*op. cit.*, p. 181) called *Olfersia nigra* Perty, were almost certainly *Lynchia fusca* (Macquart).

<sup>2</sup> The reference to Ad. Lutz, Neiva and Da Costa Lima (1915, Mem. Inst.



1940, Mem. Soc. Cubana Hist. Nat., XIV, p. 322; 1940, Rev. Acad. Colombiana Cienc. Ex. Fis. Nat., III, pt. 12, p. 416; 1941, Occ. Papers B. P. Bishop Mus., XVI, p. 281; 1942, Bol. Entom. Venezolana, I, p. 82.

This species will be fully discussed in the forthcoming revision of North American Hippoboscidae.

Additional Neotropical Specimens. — MEXICO: Nayarit, off "Chicken Hawk" (Amer. Mus. Nat. Hist.). Chichen Itza, Yucatan, off *Geranospiza nigra* (Du Bus), *Buteo magnirostris conspectus* (Peters) and *Asturina nitida plagiata* Schlegel (J. Van Tyne). San Carlos Bay, Sonora, off *Buteo borealis calurus* (G. Augustson). Los Frailes Bay, Lower California, off *Polyborus cheriway audubonii* Cassin (G. Augustson). Pedregal, Munic. Tancitaro, 6,000 ft., Michoacan, off *Buteo borealis* (H. Hoogstraal). La Puerta de Hambre, Munic. Apatzingan, 1,200 ft., Michoacan, off *Falco mexicanus* Schlegel (R. Traub). Apatzingan, Munic. Apatzingan, 1,200 ft., Michoacan, off young Hawk (R. Traub). — REPUBLIC OF HONDURAS: Subirana, Yoro (Stadelmann). — VENEZUELA: San Felipe, off *Herpetotheres c. cachinnans* Linné (P. Anduze). — BRITISH GUIANA: Upper Rupununi River (Ogilvie). — BRAZIL: Maracajú, Matto Grosso, off *Cathartes aura* (Linné) and "gavião" or fulvous-bellied Kite (R. M. Gilmore).

In North America *L. nigra* is known from British Columbia, Quebec, New York, Kansas, Colorado, Utah, Arizona, New Mexico, Montana and Texas. It has also been taken in the Galapagos, Hawaii, and Bolivia.

All the known hosts are diurnal birds of prey.

#### *Lynchia dukei* (Austen)

*Olfersia dukei* Austen, 1911. See J. Bequaert, 1933, p. 80. Since publishing this paper I have examined the type at the British Museum.

Additional Specimens. — BELGIAN CONGO: Butiaba, Lake Albert, off *Haliæetus vocifer* (Daudin) (A. Meinertzhagen). The specimen previously recorded from Ganda Sudi was off *Hieraaëtus ayresii* (Gurney). — CAMEROON: Metet, off a Hawk

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Osw. Cruz, VII, p. 181) should be deleted. The specimens which these authors referred to *L. nigra* were almost certainly *L. fusca* (Macquart), while their *Olfersia raptatorum* was possibly *L. nigra*.

(A. I. Good). Lolodorf, off *Gypohierax angolensis* (Gmelin) (A. I. Good). Sangmelima (A. I. Good). — UGANDA: Kampala, off *Polyboroides typicus* (Smith) (G. H. E. Hopkins). Katwe, Toro, off *Haliæëtus vocifer* (G. H. E. Hopkins). Entebbe, off *Haliæëtus vocifer* (G. H. E. Hopkins). Kaswama, off *Haliæëtus vocifer* (G. H. E. Hopkins). Mityama, off "eagle" (G. H. E. Hopkins). — KENYA COLONY: N'gong, off *Buteo rufosfuscus augur* (Rüppell) (G. van Someren). — TANGANYIKA TERRITORY: Dodoma, off *Aquila rapax* (Temminck) (A. Loveridge). Magrotto Plantation near Tanga, off *Gypohierax angolensis* (A. Loveridge).

*L. dukei* is strictly Ethiopian and known at present from Cameroon, French Congo, Belgian Congo, Abyssinia, Uganda, Kenya Colony and Tanganyika Territory. It is the African representative of the New World *L. nigra*, from which it is possibly not specifically distinct.

Like *L. nigra*, it is known only from diurnal birds of prey.

#### Unrecognized Species

Several of the described, larger species of *Lynchia* cannot be recognized with certainty from the inadequate descriptions. Some of them are evidently synonyms of the species recognized in this paper.

1. *Lynchia massonnati* (Falcoz, 1926). See J. Bequaert, 1933, p. 72, and the discussion of *L. schoutedeni* in the present paper.

2. *Lynchia villadæ* (Dugès, 1887). See J. Bequaert, 1933, p. 76. Possibly a synonym of *L. americana* (Leach).

3. *Lynchia macquartii* (Rondani, 1878). See J. Bequaert, 1933, p. 78. Possibly a synonym of *L. fusca* (Macquart).

4. *Lynchia raptatorum* (Ad. Lutz, Neiva and da Costa Lima, 1915). See J. Bequaert, 1933, p. 82. A synonym of either *L. nigra* (Perty) or *L. fusca* (Macquart). In view of the fact that *raptatorum* was said to occur in several Brazilian localities and on four species of diurnal birds of prey, I now consider that it was most probably *L. nigra*.

5. *Lynchia penelopes* Weijenbergh, 1881. This, the genotype of *Lynchia*, has unfortunately not been seen by any subsequent student. It is doubtful whether the type is still in existence. Specimens should be collected again from the type host,

*Penelope canicollis* Wagler, in northern Argentina. It is most probably a species distinct from any recognized in the present paper.

6. *Ornithomyia rufiventris* Bigot, 1885, Ann. Soc. Ent. France, (6), V, p. 243 (no sex; no host. Brazil: Porto Alegre). Speiser saw the type and recognized it as a *Lynchia*, a genus which he called *Olfersia* (1902, Zeitschr. Syst. Hym. Dipt., II, p. 169). It was evidently either *L. fusca* (Macquart) or *L. nigra* (Perty), most probably the latter.

7. *Lynchia pallidilabris* (Rondani). *Olfersia pallidilabris* Rondani, 1878, Ann. Mus. Civ. Genova, XII, p. 161 (no sex; no host; Mexico). The size (6 to 7 mm. long) places it among the larger species. One can only surmise that it was either *L. fusca* or *L. nigra*.

TWO NEW SPECIES OF PSAMMOCHARIDÆ<sup>1</sup>

BY NATHAN BANKS

Museum of Comparative Zoology

In the course of rearranging the Museum collection of these insects, I found the two following new species.

*Arachnophila brevihirta* sp. nov.

Extremely similar to *A. divisa* Cresson in structure and color, the first two segments of abdomen being rufous above. On the propodeum the dorsal groove is scarcely, if at all, visible (distinct in *divisa*). In the wings there are two slight differences; in the twelve specimens of *divisa* before me the third submarginal cell is triangular but not pedicellate, and the basal vein is exactly interstitial with the transverse; in the eight specimens of *brevihirta* the third submarginal cell is distinctly pedicellate, and the basal vein ends a trifle before the transverse. The fine hairs on body and femora are shorter, except those at and near tip of abdomen, which are as long as in *divisa*; those on head nearly one-half shorter, those on pronotum still shorter, those on propodeum fully one-half shorter, as are also those on basal part of abdomen; those on the femora are fully one-half shorter, this is most noticeable on the hind femora where the hairs are less than one-half the breadth of the joint (in *divisa* as long as breadth of joint).

Length of fore-wing 5.5 to 7 mm.

Type from Chicago, Ill. July (C. T. Brues) M.C.Z. No. 26739; paratypes from Chicago, Ill.; Roggen, Colo. August (Rodeck); Sheldon, N. Dak. August (Stevens); Benzie Co., Mich., July (Dreisbach); and two with less red on abdomen from Chipawa Co., Mich., July (McAlpine); and Huron Co. Mich., August (Gaige).

The *Arachnophila septentrionalis* Kincaid from Alaska is

<sup>1</sup>Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.



probably not an *Arachnophila*, for nothing is said about hair on abdomen and femora and the third submarginal cell is far from being triangular.

*Ageniella pallida* sp. nov.

Pale yellowish to pale rufous throughout, the only dark mark is the extreme base of the petiole; legs pale yellowish, also basal part of antennæ (rest broken), body slightly sericeous on coxæ and pleura. Wings hyaline, veins and stigma pale yellowish. Very little hair on body, a few fairly distinct at tip of abdomen. Clypeus nearly three times as broad as long, lower edge convex, few small hairs; face about as broad as high, not narrowed above, no distinct frontal groove; lateral ocelli very much closer to each other than to eyes; pronotum about as long above as in *accepta*, arcuate behind; propodeum plainly longer than broad, no median groove, seen from side evenly convex; petiole moderately long, abdomen much broader than propodeum; legs rather slender, hind femora reach tip of abdomen; mid and hind tibiæ with a few short spines above, mostly in rows, inner spur of hind tibiæ about one-third of basitarsus.

In fore-wings the marginal cell is about its length from tip, upper and lower sides parallel for some distance, tip rather blunt, a little broader than second submarginal cell, latter small and little longer below than broad, narrowed nearly one-half above, receiving the first recurrent vein scarcely more than one-fourth from base; third submarginal cell almost twice as long below and fully twice as long above as the second cell, outer side scarcely oblique, but a little curved above, apex of cell only a trifle broader than base, receiving second recurrent vein just before middle; basal vein ends plainly before transverse; in hind wings the anal vein ends much before forking of cubitus, outer cross-vein much nearer base of radial sector than to tip.

Length of fore-wing 5 mm., of body 7.5 mm.

One female from Austin, Texas (Graenicher coll.).

Type M. C. Z. No. 26738.

Its generally pale color, the parallel-sided marginal cell, and the shape of third submarginal cell all separate it from our other species of the genus.

NOTES ON THE LIFE HISTORY OF  
*PERIPLANETA FULIGNOSA* SERV.BY PHIL RAU  
Kirkwood, Missouri

In a lot of *Periplaneta americana* that came from New Orleans in June 1937, there were three adult females which resembled *P. americana* in size and shape, but the color, instead of being golden-brown, was a dull brownish-black or "off-black." I became suspicious about the species later when the egg-cases began to protrude from their bodies, for they were almost twice the size of those deposited by *P. americana*.

Specimens of the nymphs, which so little resembled either *fulignosa* or *americana*, as well as the mother, were sent to Mr. Morgan Hebard, who named them *Periplaneta fulignosa* Serv. They have been recorded only from southern United States, where they are common in storehouses, docks, etc. He is quite sure that this species, like other members of the genus, is an adventive in America from the old world. He added the note "that the nymphs are so parti-colored that they might have been mistaken for *Periplaneta brunnea*, another adventive pest, were it not known that they were the immature insects of the adult sent to me."

Four egg-cases were obtained from the three females, and from them hatched 22, 22, 26, and 26 young respectively. This is almost twice the number per egg-case than for its contemporary, *P. americana*.

One female that became adult on June 29 protruded her first egg-case 12 days later, and another egg-case after 11 days. In two cases, notes were made on the period of incubation: one protruding egg-case removed from the mother's body on July 10 gave forth its nymphs August 13; the other egg-case, removed from another mother on June 14, gave forth its young on July 31, the two having a period of incubation of 35 and 47 days respectively.

The young nymphs ate readily of cinnamon roll, could neatly hollow out a grain of corn, and drank much water. They

were very lively, ran about the jar rapidly and in their efforts to escape easily walked over the band of vaseline that was spread to prevent their leaving the jar. When they run about they curl up the ends of their abdomens very much like rove beetles; the young of *Parcoblatta pennsylvanica*, *Blatta orientalis*, or *Periplaneta americana* do not have this peculiar behavior.

On hatching, the nymphs are black with white bands on two abdominal segments; the basal segment and one in the middle. Several weeks after hatching I noticed that the first 4 or 5 joints of the antennæ were also white. A month or six weeks later, probably after a moult, the white band on the middle segment became broken so that the center third of it was black. I found still later that both of the white segments in all nymphs in this jar changed to an inconspicuous light brown color while the insect itself was still dull black. On that day I was again surprised to find that in addition to the 4 or 5 segments of white at the tip of the antennæ there was a white portion covering one-fourth of the antennæ at its point of attachment. By August 31, they had grown to about one-half inch in length, and when a moult occurred on November 7, the few that had not died were of a light brown color, resembling very much the half-grown nymphs of *P. americana*.

I do not know if the nymphs I have obtained are pure *P. fuliginosa* or hybrids between them and their traveling companions, *P. americana*. If the three females of *P. fuliginosa* were trapped in New Orleans just before shipping to St. Louis, it is likely that they mated with their own species, but if they grew up among the *americana* in the breeding cages of the dealer, from whom I obtained them, it is quite likely that they were fertilized by the males of *americana*. Then again, they might have been bred in confinement for a number of generations with the result that crossings and re-crossings often may have occurred. The fact, however, that the few roaches which reached middle age became more and more like *P. americana* leads me to believe that the nymphs which Mr. Hebard said could easily be mistaken for *P. brunnea* are not pure stock, but are of hybrid origin, mixed with *americana* for one or more generations.

OBSERVATIONS ON THE SUBGENUS  
RHACHIOCREMA (HYMENOPTERA: FORMICIDÆ)  
WITH THE DESCRIPTION OF A NEW  
SPECIES FROM BORNEO

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Of the several subgenera of *Crematogaster* perhaps the least known is *Rhachiocrema*. The species which belong to this subgenus possess enormously developed epinotal spines. These arise from a relatively narrow thorax but project rearward at a very wide angle so that the distance between their tips exceeds the width of the head or gaster. Up to the present *Rhachiocrema* has been represented by only two species, *wheeleri* from the British Solomon Islands and *paradoxa* from New Guinea. This paper carries the description of a third species from Borneo. References to *Rhachiocrema* in the literature are scattered and brief. As far as can be determined it has been mentioned only three times since its original description. It is regrettable that two of these references contain serious factual errors. In one case the error has gone uncorrected for more than twenty years. This is not surprising in view of the rarity of the species involved. It has recently been my good fortune to receive a small collection of ants taken in New Guinea by Pvt. Howard Levy, Sn.C., a former City College student. This collection contained four species of *Crematogaster*, three of which have a bearing on the status of *Rhachiocrema*. A study of these specimens and a review of the literature both indicate that considerable clarification is needed in the case of this subgenus.

*Rhachiocrema* was erected as a subgenus by Mann in 1919 (1). Among the ants which he collected in the British Solomon Islands was a remarkable *Crematogaster* taken in the mountains on the island of Malaita. He described this insect as the species *wheeleri* and designated it as the type of the new subgenus *Rhachiocrema*. The only other member of the subgenus cited by Mann was *paradoxa*, a species from New Guinea which Emery had described in 1894 (2). In view of subsequent events



it is worth repeating that, as delimited by Mann, the subgenus *Rhachiocrema* contained only two species, *wheeleri* and *paradoxa*. Other features connected with Mann's characterization of *Rhachiocrema* were by no means so clear. The antennæ were said to be elongate, twelve-jointed and with a distinct two-jointed club. The first and last of these characters would not, of themselves, confer distinction since several species in the subgenus *Orthocrema* have elongate antennæ with two-jointed clubs. But the number of antennal joints, as given, is unique for *Crematogaster*. All other known species have eleven-jointed antennæ or, in the case of the subgenus *Decacrema*, ten- or nine-jointed antennæ. If *Rhachiocrema* possessed twelve-jointed antennæ its status could be defended without reference to any other structure. Unfortunately this is not the case. Mann overlooked the fact that Emery had described *paradoxa* as having eleven-jointed antennæ, and he miscounted the antennal joints of *wheeleri*. Both species have eleven-jointed antennæ and Mann's description and figure of *wheeleri* cannot be relied upon in this particular. When Wheeler published a key to the subgenera of *Crematogaster* in 1922 (3) he included *Rhachiocrema* with that group of subgenera which have eleven-jointed antennæ. Although no comment was made concerning the correction it may be presumed that it was based upon an examination of type specimens of *wheeleri*. To make certain that there is no further confusion in this matter I requested Prof. F. M. Carpenter to examine the type material of *wheeleri* in the collection of the Museum of Comparative Zoology. Prof. Carpenter has very kindly done so and informs me that specimens have antennæ of eleven joints. While this fact does not necessarily invalidate the status of *Rhachiocrema* it does place a different value on the other diagnostic characters.

Mann's description of *Rhachiocrema* appeared after the Myrmicine section of the *Genera Insectorum* (4) had gone to press. In the preface to that section Emery stated that it was limited to species described up to the end of 1918, but he made an exception in the case of *wheeleri*. This species was not listed in the usual way but referred to in a footnote on the "*paradoxa* group," a cluster of four species which Emery included in the subgenus *Orthocrema*. This footnote contained a peculiar anachronism. Although it correctly cited *wheeleri* as the type of *Rhachiocrema* and gave accurate reference to Mann's publi-

cation it further stated that Mann had elevated the "*paradoxa* group" into the subgenus *Rhachiocrema*. As has already been shown Mann made no such proposal, nor could he have done so for the description of *Rhachiocrema* was published two years before the "*paradoxa* group" first appeared in print. It is easy to dismiss Emery's mistake as a slip resulting from last minute alterations. It is not so easy to dismiss the consequences of the error. Regardless of what Emery believed and whether he intended to do so or not he originated the concept that all the members of his "*paradoxa* group" belong to the subgenus *Rhachiocrema*. There is clear proof that one eminent myrmecologist has accepted this view. When Menozzi published a key to the Malayan and Papuan species of *Orthocrema* in 1935 (5) he omitted the species in the "*paradoxa* group." The lack of dissident opinion in the literature indicates that the acceptance has been general. Yet the heterogeneity of the "*paradoxa* group" is evident from Emery's own work. During the course of his studies on New Guinea ants he described or redescribed each of the four species which he later built into the "*paradoxa* group." Three of them he figured as well. It is scarcely conceivable that Emery was unaware of their marked dissimilarities. These are even more evident when specimens are available for comparison. In the material sent from New Guinea by Mr. Levy were specimens of *paradoxa*, *polita* and *irritabilis* var. *le-guilloui*. The remaining species in the group, *emeryi*, was not represented. The structural contrast between *paradoxa* and the species *irritabilis* and *polita* is striking. For the purpose of this study only two characters will be considered. In *paradoxa* the antennal scapes project beyond the occipital margin by at least one-quarter of their length and the funiculus is provided with a distinct two-jointed club. The huge epinotal spines are more than half as long as the thorax. The base of each spine is stout and cylindrical and, although they arise at the angle between the basal and the declivious faces, their bases are so large that the angle itself is virtually obliterated. There is no infraspinal area in the usual sense of the term because the bases of the two spines involve the entire width of the thorax. In *irritabilis* the antennal scapes barely reach the occipital border; in *polita* they exceed it by an amount less than the greatest thickness of the scape. In both these species the funicular club is not distinctly two-jointed. The antepenultimate joint is enlarged so that, as Emery

noted, the club may just as well be considered three-jointed. The epinotal spines of *polita* are short, their length scarcely exceeding half the distance which separates their bases. The spines of *irritabilis* are about as long as the distance between their bases but by no stretch of the imagination can they be considered comparable to the colossal spines of *paradoxa*. As nearly as can be determined from Emery's description and figures of *emeryi* (6) (originally described by Emery as *biroi*, a preoccupied name which was later replaced by Forel) this insect is related to *irritabilis*. The epinotal spines are about the same length in the two species but they turn upward in *emeryi* and downward in *irritabilis*. A significant feature of Emery's figure of *emeryi* is the two-jointed funicular club. The length of the scape cannot be estimated since it was not figured and the description merely states that it is long. But even granting the unlikely supposition that the scape of *emeryi* is as long as that of *paradoxa* there is still no possibility of regarding the two insects as closely related.

From the above it seems clear that the only member of the "*paradoxa* group" which can be assigned to Rhachiocrema is *paradoxa* itself. The fact is rather too obvious, for the dissimilarity between *paradoxa* and the remaining species is so marked that it brings up a second problem. Since Emery was fully acquainted with the structure of *paradoxa* his inclusion of that species in the subgenus Orthocrema raises a question as to the validity of Rhachiocrema. Several of the subgeneric characters of Rhachiocrema are more clearly marked in *paradoxa* than in *wheeleri*. Hence if Orthocrema is sufficiently flexible to include *paradoxa* then *wheeleri* must also be included and there is no reason for the existence of Rhachiocrema. But it is by no means certain that Emery's treatment of Orthocrema can be justified. The form which Emery gave to his emended version of Orthocrema differed substantially from the original concept of the subgenus which Santschi presented in 1918 (7). Emery combined with Orthocrema the species which Santschi had placed in Neocrema as well as some of the species which Forel had allotted to Physocrema. Emery's reason for this arrangement is interesting and his statement on the matter is given in translation below:

"This subgenus (*i.e.*, Orthocrema) represents, in my opinion, the primitive stock, or at least that which comes nearest to the

primitive forms in the genus. Mr. Santschi in his recent study on the subgenera of *Crematogaster* has excluded from it certain species which show a furrow or a more or less marked impression on the postpetiole, on which he finds his subgenus *Neocrema*. This division which comprises neotropical and malagasian species does not seem homogeneous to me; this is why I have fused it with *Orthocrema*."

If *Neocrema* is heterogeneous neither it nor *Orthocrema* would become more homogeneous when fused. It is unlikely, therefore, that Emery's arrangement of *Orthocrema* was designed to secure structural uniformity. On the contrary he seems to have deliberately constructed a heterogeneous assemblage for the sake of having all the species which he considered primitive in the same subgenus. However desirable this may be from a phyletic standpoint it is not sound taxonomy to found a group on inconstant characters, which was what Emery did. He apparently regarded as primitive the rectangular petiole and the entire, globose postpetiole which many of the species in *Orthocrema* possess. But neither of these features holds for all the species which Emery included in *Orthocrema*. In the Australian species *frivola* the postpetiole is as clearly bilobed as in any species of *Acrocœlia* and the petiole is not markedly rectangular. The shape of the petiole of *paradoxa* is certainly very far from rectangular. Yet both these extreme conditions can be reached through species in which the conditions are intermediate so that from a phyletic viewpoint the assemblage can be defended. I believe that the phyletic gain which accrues to Emery's arrangement is more than offset by the taxonomic disabilities which it entails. In the form which Emery gave it the subgenus *Orthocrema* has to be characterized along such generous lines that no satisfactory delimitation of the group is possible. The recognition of *Neocrema* and *Rhachiocrema* as valid subgenera relieves *Orthocrema* of its most incongruous species and permits a much better demarkation of all three subgenera. That the three subgenera tend to intergrade is not a matter for concern for other subgenera of *Crematogaster* also possess integrating species.

I propose to treat *Rhachiocrema* as a valid subgenus even though the features which separate it are not as distinct as was originally supposed. Reference has already been made to the fact that antennal structure cannot be used as a basis for sepa-



ration. The same is true of the pedunculate petiole, for the new species described in this paper has a petiole that is closely similar to that of several species in the subgenus *Orthocrema*. The one remaining separatory character is the structure of the epinotal spines and, since spine length is such a notoriously variable characteristic, one hesitates to place much value on such a character. In *Rhachiocrema*, however, the spines show certain features that appear to exclude the possibility of confusion with long-spined species in other subgenera. In addition to their extreme length the spines of *Rhachiocrema* are not evenly tapered from base to tip. The taper of the thickened basal half of each spine differs from that of the thinner apical half. This break occurs suddenly at a point near the middle of the spine so that when the spine is viewed from the correct angle the two parts can be clearly distinguished. In other species of *Crematogaster* having long epinotal spines, as for example in the South American species *acuta*, the spines are evenly tapered from base to tip.

*Key to the species of Rhachiocrema*

1. Anterior peduncle of the petiole fully as long as the node itself, the node rounded above and without posterior angles; epinotal spines reflexed at the tip (New Guinea) ..... *paradoxa*  
 Anterior peduncle of the petiole shorter than the node, the node flat above and with distinct posterior angles; epinotal spines straight at the tip ..... 2
2. Entire insect shining and finely punctate; clypeus with five or six longitudinal ridges; color black (British Solomons) ..... *wheeleri*  
 Head shining with sparse punctures, sides of the mesonotum and much of the epinotum densely and coarsely punctate and subopaque; clypeus bicarinate; color sordid yellow, the gaster castaneous, (Borneo) ..... *macracantha*

*Crematogaster (Rhachiocrema) macracantha* sp. nov.

Worker: Length 3.5 mm.

Length of the head from the anterior edge of the clypeus to the occipital border 0.75 mm. The head is slightly longer than broad with the occipital angles broadly rounded and the middle of the occiput flat. The sides in front of the eyes are almost straight, converging gradually to the level of the antennal insertions but more sharply convergent and more curved from that point to the insertion of the mandibles. Eyes suboval, the lower edge much more flattened than the upper, moderately convex with about 10-11 facets in greatest diameter, the facets coarse. Clypeus moderately projecting with two prominent carinae.

There is often a delicate carinula lateral to each carina. The central lobe of the clypeus between the two carinæ is distinctly sulcate. Both the sulcus and the carinæ fail to extend entirely across the clypeus so that the posterior part of the clypeus forms an evenly convex bulge between the frontal lobes. The latter are narrow in front, scarcely covering the insertions of the antennæ, but broad and poorly defined behind so that the frontal area is not clearly marked. Antennæ eleven-jointed. Antennal scape long, slightly curved and rather thick at the tip. The scape exceeds the occipital margin by one-quarter of its length. Funicular joints all longer than broad, the first joint as long as the following three together, the last two joints forming a distinct club. Mandibles rather narrow and bearing four teeth, the two outer teeth longer than the inner two.

Overall length of the thorax including the neck 1 mm. Promesonotum seen from above pear-shaped, the promesonotal suture absent. The sides of the thorax at the mesoëpinal suture are strongly constricted above but less so on the lower portions of the meso- and metapleuræ. Epinotum diamond-shaped, about as wide as the pronotum with much of its upper face built into the expanded bases of the spines. The spines long, straight and widely divergent; the basal half of each spine stout, the apical half much thinner. The distance between their tips is 1.4 mm. Seen in profile the promesonotum is not strongly convex. In some specimens it descends through an even curve to the shallow mesoëpinal suture. In others there is a short, steep posterior face which breaks the even outline of the promesonotum. Basal face of the epinotum virtually flat between the base of the spines and the mesoëpinal suture. Declivous face largely involved with the base of the spines, the portion below the spines much shorter than the basal face. Anterior peduncle of the petiole distinct but only about one-quarter as long as the node, the latter somewhat longer than broad, broader behind than in front, with the sides feebly convex and narrowing to the shoulders which join the anterior peduncle. The posterior face of the node is straight and transverse, with a distinct angle where it joins the side. Posterior peduncle of the petiole almost as wide as the node itself and not quite as long as the anterior peduncle. Postpetiole seen from above transversely oval with distinct anterior and posterior peduncles. Seen in profile the petiole is wedge-shaped with a very feebly sinuate

lower surface and a small but distinct tooth under the anterior peduncle. The angles at the posterior face of the node stand out clearly above the posterior peduncle. Postpetiole in profile rounded above, the anterior peduncle sharply set off from the convex anterior face, the posterior peduncle forming an even concavity with the posterior face, the ventral surface flat with a constriction at the anterior peduncle. Gaster triangular, the anterior segment strongly rounded. Sting long.

Sculpture and pilosity: head smooth and shining with a few small, scattered punctures bearing long, rather coarse, erect yellow hairs. Mandibles feebly striate and with sparse, fine, short, subappressed hairs. Prothorax for the most part shining, the neck and the humeral angles coarsely punctato-striate and dull. A few coarse, erect hairs occur on the dorsum of the pronotum. Mesonotum, most of the epinotum and the sides of the petiole densely punctate, feebly shining to dull. Dorsum of the mesonotum and the anterior portion of the basal face of the epinotum with several longitudinal striæ in addition to the punctures. The punctures also occur on the basal half of the epinotal spines but are more feeble there than elsewhere. Declivous face of the epinotum, upper face of the petiole and most of the postpetiole smooth and shining. Epinotum without erect hairs, petiole and postpetiole each with two or more erect hairs. Gaster very delicately coriaceous, the sculpture not heavy enough to dull the shining surface. All gastric segments with moderately numerous erect, yellow hairs. Antennal scapes densely clothed with appressed hairs. Those on the funiculi equally numerous but not so closely appressed; the hairs on the funicular clubs very short, fine and erect. Hairs on the legs rather sparse, fine and closely appressed except for one or two long, erect hairs near the base of each femur.

Color: head, thorax and appendages sordid yellow, the gaster castaneous.

Type locality: Mt. Penrissen, Sarawak, Borneo.

Described from a series of thirty workers taken by E. Mjoberg and given to me many years ago by Dr. W. M. Wheeler.

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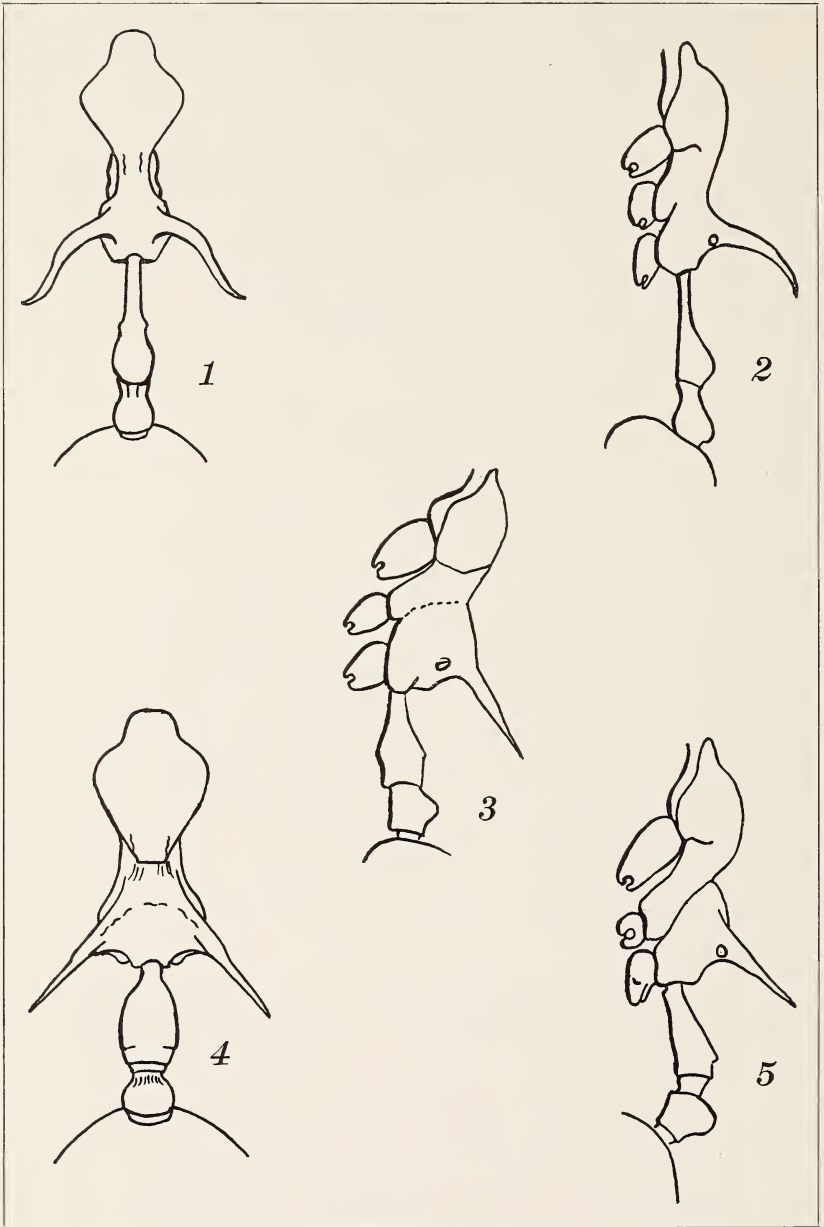
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## EXPLANATION OF PLATE 12

FIGS. 1 and 2. *Crematogaster (Rhachiocrema) paradoxa* Emery. Fig. 3. *Cr. (Rhachiocrema) wheeleri* Mann after Mann. Figs. 4 and 5. *Cr. (Rhachiocrema) macracantha* n. sp.





CREIGHTON — RHACHIOCREMA

TROPIDUCHIDÆ AND KINNARIDÆ FROM THE  
GREATER ANTILLES<sup>1</sup>  
(HOMOPTERA: FULGOROIDEA)

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The material on which this paper is based was collected a few years ago by Dr. P. J. Darlington in the hilly country of Hispaniola and Puerto Rico, and is deposited in the Museum of Comparative Zoölogy. The two groups discussed — the Neotropical Paricanine Tropiduchidæ and the Kinnaridæ — appear to have their maximum number of genera and species in the western Caribbean area and to be comparatively poorly represented in the Americas outside this region. Whether the Paricanini of the Old World form a natural group, and whether they are truly co-tribal with the Caribbean generic complex are problems which must wait for solution until the Asiatic species have been critically studied. For the time being the writer proposes to regard the tribe as extending to America, and lists the following characters as being common to the Neotropical genera that are assigned to it: vertex usually longer than wide, posterior margin deeply concave, disc depressed, ecarinate, or with median carina very prominent in the depressed area, or replaced by a vertical plate; frons much longer than wide (1.5 to 1 or longer) with a broad longitudinal median raised band, lateral margins sinuately expanding to near fronto-clypeal suture that incurved; head in profile usually with lateral margins curving evenly from vertex into frons; pronotum short, median carina prominent, disc not bounded by lateral carinæ, or if so bounded then narrow and strongly eminent; mesonotum short, flattened, scarcely half as wide as long; tegmina with a nodal and an apical line of transverse veins, apex of clavus situated near or basad of middle of commissural margin, subapical cells not exceeding six, apical rarely exceeding twelve; post-

<sup>1</sup> Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

tibiæ trispinose. All the species known to the writer in this tribe are boldly marked on the frons, lateral fields of the pronotum, carinæ, etc., with black, orange, or red, or a combination of these colors, usually in vittæ.

The types of all species described as new are deposited in the Museum of Comparative Zoölogy. The writer's thanks are rendered to the Curator, Prof. N. Banks for permission to examine the collection and to him and to Prof. F. M. Carpenter for assistance in the preparation and publishing of this paper.

Family TROPIDUCHIDÆ  
Subfamily Tambiniinæ  
Tribe Paricanini

*Achilorma* Metcalf and Bruner

Metcalf and Bruner, 1930, *Psyche* 37:400

Vertex nearly twice as broad as long, anterior margin moderately convex, evenly rounded, posterior margin rectangularly excavate, lateral margins parallel, disc strongly depressed, anterior border of depression strongly convex, slightly extending before anterior margin of eyes, strongly carinate medially, frons longer than broad (about 1.3 to 1), lateral margins diverging and straight to just below level of antennæ, then incurved to fronto-clypeal suture, a broad longitudinal raised band medially with a shallowly impressed trough on each side; these medially-raised and medio-lateral impressed areas continuing on to clypeus; clypeus laterally carinate. Pronotum subequal in length at middle to vertex, disc strongly eminent, tricarinate, with a small round impression on each side of middle line, lateral carinæ of disc diverging posteriorly at 45° to medial carina, posterior margin obtusely angularly excavated in middle, curving cephalad near sides; mesonotum broader than long, tricarinate, lateral carinæ convex, disc about 1.5 times as long as wide (excluding scutellar apex). Hind tibiæ with three spines.

Tegmina about 3.2 times as long as broad, costal and commissural margins subparallel, apical margin symmetrically and almost semicircularly rounded; Sc+R and M not forked before nodal line, Cu1 forked a short distance before level of apex of clavus, M and Cu1a rather shorter than Sc+R; fourteen apical cells, six subapical; apex of clavus distad of middle of commis-

sural margin, area of membrane much less than that of corium (by approximately a third).

Genotype, *Achilius bicinctus* Spinola 1839, Ann. Soc. Ent. France, 8:321.

#### *A. bicincta* Spinola

Female. Length, 5.0 mm.; tegmen, 6.0 mm.

Pallid stramineous, possibly green in life, carinæ of head and thorax, a stripe at sides of abdomen and a suffusion on post-femora red, sometimes concolorous, the carinæ probably also piceous in some specimens; a spot on ventrolateral margin of pronotum on each side, a spot on pleurite immediately beneath the base of each tegmen piceous.

Tegmina ivory hyaline, a fuscous band from costa to anal angle just distad of basal cell, a fuscous band lying along nodal line on its distal side, and accordingly arcuately curved basad, veins of apical line of cross veins narrowly fuscous, a broad slightly paler fuscous border along apical margin, becoming paler at Cu and evanescent before apex of clavus; veins testaceous. Wings with apical lobe faintly suffused fuscous, R-M and M-Cu cross veins dark fuscous, veins otherwise testaceous, slightly tinged fuscous at apical margin.

Ovipositor with third valvulæ each bearing eight spines on margin.

Described from two females collected at Tonala, Chiapas, Mexico (July 31, 1909) in the collection of the A. M. N. H. They agree with Spinola's description and differ from his figures only in the slightly longer sunken disc of the vertex, the forking of Cu1 before the nodal line and in having one or two more apical veins. The shape of the tegmina is identical. Though this species should fall into the Tambiniinæ on the position of the nodal line, it undoubtedly belongs to the group of Neotropical Paricanine forms. *Achilorma fowleriana* Kirk. is not congeneric with *bicincta*.

#### *Arenasella* Schmidt

(figs. 17-19)

Vertex as long as broad, anterior margin strongly convex, lateral margins parallel, posterior margin deeply concave; most of disc of vertex much depressed, anterior margin of sunken area strongly convex almost subangularly so, reaching beyond



eyes for half their length; sunken area traversed by a strong median carina; anterior margin curving uninterruptedly on to frons; frons much longer than broad (1.5 to 1), lateral margins sinuately expanding to near apex, thence incurved to suture; median carina forming a distinct raised band; clypeus medially and laterally carinate. Pronotum in middle scarcely two-thirds as long as vertex, anterior margin of disc convex, heavily carinate; disc narrow, subtriangular, sides not strongly diverging posteriorly; median carina very thick; lateral carinae of disc less so, a pair of carinae on each side of pronotum near and at lateral margins; mesonotum about twice as wide as long, flattened, tricarinate, lateral carinae not converging posteriorly. Post-tibiae trispinose.

Tegmina with Sc+R+M stalk very short, Sc+R and M not forked before nodal line, Cu1 forked a short distance before nodal line; fourteen apical cells, six subapical; apex of clavus not reaching to middle of commissural margin, membrane distinctly larger than corium.

Genotype, *A. rubrovittata* Schmidt 1932 *Stett. Ent. Zeit.* 93:39.

*Achilorma fowleriana* Kirk. is placed in this genus. The type locality of *fowleriana* is given as Teapa in Tabasco, Mexico. Specimens examined by the writer came from Teapa, Mexico. Specimens examined by the writer came from Teapa, Mexico and Cerro Zunil, Guatemala. The small fork of Cu1 before the nodal line is variable.

#### Cyphoceratops Uhler

Uhler 1901, *Proc. Ent. Soc. Wash.* 4:510.

Genotype, *C. furcata* Uhler *loc. cit.* 511.

This genus must be placed in the Paricanini as the structure of the frons, vertex, pro- and mesonotum and the tegminal venation are characteristic, though the apex of the clavus is distad of the middle of the commissural margin.

#### Parahydriena Muir

Muir, 1924, *Proc. Haw. Ent. Soc.* 3:464.

Genotype, *P. hyalina* Muir *ibid.*

Vertex twice as long as broad, lateral margins parallel, anterior margin convex, posterior margin deeply excavated, middle of vertex produced dorsally in a vertical triangular plate

with its anterior twin borders convex and posterior border straight or slightly concave; anterior margin with a median groove; frons longer than wide (2.3 to 1), lateral margins sinuately expanding to near apex, then incurved, carinate; median carina in form of a raised band terminating basally against cephalic horn, from which it is separated by a slight groove; clypeus one-third length of frons with a strong median carina, lateral margins carinate. Pronotum short, sloping anteriorly, median carina distinct, lateral carinæ of disc absent, lateral margins carinate between eye and tegula. Mesonotum tricarinate, lateral carinæ meeting medial carina near its anterior end. Hind tibiæ with three spines before apex.

Tegmina devoid of costal area, M leaving Sc+R near base, Sc+R and M not forked before nodal line, Cu forked just distad of middle of corium; a single subapical line of cross veins in membrane, forming six subapical cells and fourteen apical.

*P. hyalina* Muir  
(figs. 14, 15, 27, 31)

Female. Length, 6.0 mm.; tegmen, 6.5 mm.

Green; margins and carinæ of front and vertex, sides of cephalic horn and head above eyes, a stripe on each lateral field of pronotum, a transverse stripe at apex of femora, two spots on mesothoracic pleurites piceous, often bordered red; a spot on metapleurites, postcoxæ, a suffusion on legs, patches on pronotum and mesonotum, abdominal tergites and lateral fields of abdominal ventrites greenish fuscous.

Ovipositor with eight teeth on third valvulæ.

Described from a single female taken between 1,000 and 2,000 ft., San José de las Matas, Dominican Republic, by P. J. Darlington (June, 1938). This specimen has a higher cephalic crest than that of the Puerto Rican type.

Family KINNARIDÆ  
Subfamily Kinnarinæ

*Southia* Kirkaldy

Kirkaldy, 1904, Ent. 37:279.

Genotype, *Delphax opposita* F. 1803, Syst. Rhyng.:84.

Head with eyes scarcely more than half width of pronotum. Vertex very narrow, anterior margin very short, curving into

frons; lateral margins concave, diverging basally, raised; posterior margin rectangularly excavated, a transverse carina before level of anterior margin of eyes, disc deeply depressed; frons narrow, four times as long as wide at widest part, lateral margins much raised, gradually diverging to level of median ocellus, thence gradually curving inward to suture, median carina absent, median ocellus distinct; frons curving at base uninterruptedly into vertex; clypeus narrow with a strong median carina, lateral margins carinate; genæ slightly tumid below antennæ; antennæ with basal joint conspicuous, one third length of second joint, second joint cylindrical. Pronotum with anterior margin concave behind eyes, acutely produced at middle, posterior margin shallowly angularly emarginate, median carina prominent, lateral carinae of disc absent, lateral margins distinctly carinate between eye and tegula. Mesonotum feebly convex, posteriorly flattened, not depressed, tricarinate, tip of scutellum pointed. Legs slender, hind tibiæ unarmed. Abdomen with wax-bearing plates very prominent on segments 6, 7 and 8.

Tegmina with Sc+R+M stalk as long as basal cell, Sc+R forking near stigma. Nine apical cells, four subapical.

*Southia iridescens* n.sp.

(figs. 11-13, 33)

Female. Length, 3.1 mm.; tegmen, 5.3 mm.

Vertex, frons, except on lateral margins, genæ, pro- and meso-coxæ and postfemora, and abdomen fuscous; mesonotum fuscous with a dark green iridescence; clypeus, lateral margins of frons, and pronotum testaceous; rostrum, legs, except pro- and meso-coxæ and postfemora, basal joint of antennæ, anterior and posterior margins of pronotum, and tegulæ stramineous; second joint of antennæ reddish brown; membrane of abdomen pallid.

Tegmina hyaline, ivory-yellow, a small dark spot at stigma bordered with pale, a minute fuscous spot beyond apex of clavus, apex of M faintly smoky; veins testaceous. Wings hyaline, veins fuscous.

Ovipositor with third valvulæ bluntly triangular, thickened.

Described from one female collected on El Tucuche, Trinidad, B. W. I. by P. J. Darlington (April, 1929). The genus

*Southia* differs from *Paroecidius* Myers (type, *P. luizi* Myers, seen) in the shape of the vertex, in the length of the first segment of the antenna and in the number of subapical cells; from *Oecidius* Van Duzee in the lower lateral carinæ of the frons, in the more prominent median carina on the clypeus, and in the less slender legs, as well as in the characters mentioned previously. In superficial appearance this insect is like *Oecidius fulgidus* Van Duzee (type seen) though it lacks the pallid scutellar apex.

#### Subfamily Prosotropinæ

#### Quilessa Fennah

Fennah, 1942, Proc. Ent. Soc. Wash., 44, 5:103.

Genotype, *Q. lutea* Fenn. loc. cit. 104.

#### *Quilessa tristis* sp. nov.

(figs. 1, 20, 38, 39)

Female. Length, 2.1 mm.; tegmen, 2.7 mm.

Piceous; rostrum, fore and middle legs and hind tarsi pale testaceous, antennal collar and apical margin of first antennal joint narrowly pallid, postfemora fuscous, posttibiæ suffused fuscous, pale at apex, membrane of abdomen red.

Tegmina hyaline, heavily suffused smoky-brown on basal third, between posterior claval vein and commissural margin, in distal part of costal cell, in a broad band around apical margin extending inward as far as subapical cells, and slightly at Cu, in the posterior subapical cell; veins piceous, wings hyaline, faintly clouded fuscous distally, veins dark.

Pregenital plate large, quadrate, slightly broader than long, in ventral view with lateral margins slightly diverging distally; posterior margin shallowly concave, interrupted in middle by an almost semicircular plate directed caudad.

Ventral (3rd) valvulæ of ovipositor broad, expanding distally, apical margin oblique, minutely crenulate; dorsal (1st) valvulæ with more sclerotized portion sinuately tapering to a bluntly rounded apex, a large semilunate translucent lobe pendent from its lower border.

Described from a single female taken in Maricao forest, 2,000–3,000 ft., Puerto Rico, by P. J. Darlington (May 30–June 2, 1938). This species differs from others of the genus in the shape of the pregenital plate and in the tegminal coloration.



*Quilessa fasciata* sp. nov.

(figs. 2, 28, 35, 36)

Female. Length, 1.8 mm.; tegmen, 2.0 mm.

Lateral carinae very feebly present on margins of disc of pronotum.

Vertex and frons fuscous, frons rather paler; median carina throughout and lateral margins at base of vertex pale testaceous, genae fuscous below antennae, antennae fuscous; pronotum fuscous, median carina, lateral carinate margins, posterior and ventro-lateral borders pale; mesonotum fuscous, scutellum pale; tegulae fuscous, pale along inner posterior margin; sternum pale, lightly suffused fuscous; legs pallid yellow; abdomen fuscous, membrane red.

Tegmina yellowish, hyaline, clouded brown near base, and with a broad band of brown from middle of costa to commissural margin just basad of claval apex; veins pale distad of nodal line. Wings hyaline, veins testaceous, distally pallid.

Pregenital plate large, almost square, anterior margin shallowly convex, lateral margins in ventral view parallel, posterior margin transverse.

Third valvulae of ovipositor moderately narrow, tapering distally; dorsal margin straight, ventral margin convex: first valvulae narrower, porrect, tapering distally to a blunt point, dorsal margin slightly convex, ventral margin straight.

Described from two females taken in Maricao forest, 2,000-3,000 ft., Puerto Rico, by P. J. Darlington (May 30-June 2, 1938). This species is distinguished by the shape of the pregenital plate and the tegminal coloration.

*Quilessa pellucida* sp. nov.

(figs. 3, 21, 40, 41)

Male. Length, 1.7 mm.; tegmen, 2.0 mm.

Piceous, legs fuscous near joints, membrane of abdomen red.

Tegmina hyaline, lightly suffused brown on basal fifth, veins and margin testaceous to fuscous. Wings hyaline, veins testaceous.

Anal segment with lateral lobes prominent, produced distally. Periandrium thin, scoop-like, incompletely divided into two unequal lobes by a deep notch passing medio-ventrally from apex; lobe of left side very broad, ventral margin in profile

strongly convex, dorsal margin straight, turning upward near apex; lobe of right side much narrower, curving dorsally and tapering evenly to an acute point. Penis with a long sinuate spinose process arising one-third from base on left side directed dorsally and caudad, apical portion of penis lobate, in profile with dorsal margin shallowly convex, apical margin oblique, minutely denticulate, apical process a stout, curved spine directed dorsally and posteriorly.

Genital styles in profile expanding from base, ventral margin almost straight, curving distally into a narrow lobe, dorsal margin concave, rising steeply and curving mesally to meet vertical apical margin in a blunt point.

Described from a single male taken in Maricao forest, 2,000–3,000 ft., Puerto Rico, by P. J. Darlington (May 30–June 2, 1938). This species is distinguished by the genitalia and the tegminal coloration. It differs from all the lesser Antillean species in not having a lateral process projecting from the hind margin of the pygofer, a difference which may prove to be of generic value if other forms like *pellucida* are found with a generally similar ædeagal armature.

*Quilessa funebris* sp. nov.

(figs. 4, 30, 42, 43)

Female. Length, 1.7 mm.; tegmen, 2.1 mm.

Piceous; rostrum, legs excluding pro- and meso-coxæ testaceous, slightly suffused fuscous; membrane of abdomen red.

Tegmina smoky brown, a hyaline spot in middle of corium between M and Cu1 extending slightly beyond M towards R, a smaller hyaline spot at base of longest apical cell (M2), a pale line just distad of nodal line; first subapical and inner margin of posterior subapical cell almost hyaline; veins fuscous. Wings hyaline, very slightly tinged fuscous; veins fuscous.

Pregenital plate subquadrate, twice as broad as long, anterior margin straight, lateral margins in ventral view parallel, posterior margin rather strongly convex. Ovipositor with third valvulæ fairly broad, dorsal and ventral margins almost parallel, apical margin very oblique, first valvulæ about two and a half times as long as broad, bluntly rounded distally, dorsal and ventral margins weakly convex.

Described from a single female taken on El Yunque, Puerto

Rico, at about 3,000 ft., by P. J. Darlington (May, 1938). This species is distinguished by the shape of the pregenital plate and of the valvulæ of the ovipositor, and by the coloration.

#### Atopocixius Muir

Muir 1926 Proc. Haw. Ent. Soc. VI, 2:335.

Genotype, *A. ornatus* Muir *loc. cit.* 336.

Head with eyes a little more than half width of pronotum. Vertex longer than wide expanding to base which is shallowly emarginate; median and lateral carinæ well developed, curving uninterruptedly on to frons; no transverse carina. Frons longer than its widest part (1.4 to 1), base scarcely half as wide as apex, sides expanding to nine-elevenths from base, then evenly converging to apex, median carina distinct, lateral margins slightly raised. Clypeus at base four-fifths as wide as widest part of frons, tapering acutely to apex, median carina distinct, lateral margins slightly raised. Frons in profile slightly convex sloping into vertex in a somewhat acutely angulate curve; clypeus almost flat; no median ocellus; genæ slightly tumid below antennæ; no subantennal process; antennæ with basal segment very short, second segment slightly longer than broad, eyes widely emarginate ventrally. Pronotum three-quarters as long as vertex, anterior margin of disc convex, posterior margin shallowly excavated, curving anteriorly at sides, median carina prominent, lateral carinæ of disc present, incurved anteriorly, lateral margins carinate between eye and tegula. Mesonotum feebly convex, tricarinate, hind portion only slightly depressed, tip of scutellum acute. Hind tibiæ unarmed. Tegmina with sides expanding distally for three-quarters of length, almost symmetrically rounded at apex; clavus not granulate; apex of clavus situated three-quarters from base of tegmen; costal cell wide, slightly expanding apically, Sc+R joined to near stigma, common stalk Sc+R+M half as long as basal cell; typically seven or eight apical cells, the first two (or three) with curved sides, followed by a smaller triangular cell; second cell of M long with lateral margins decurving distally; distal portion of M curving posteriorly; third cell of M curved, subtrapezoidal, first cubital triangular or even semilunate, posterior cell pentagonal; a subapical series of four cells, the anterior forming a quarter circle, second rectangular, third pentagonal, fourth quadrangu-

lar. Wings with four apical cell elongate-triangular with a very short basal stalk.

This genus is near *Quilessa*, but differs in the shape of the vertex and of the frons, in the presence of a distinct pronotal disc bounded by carinæ, in the pronounced curvature of the veining at the apex in the tegmina, in the relatively more elongated and shorter-stalked fourth apical cell in the wings, in the wider lateral lobes of the male anal segment and in the basic form of the ædeagal armature. The four known species of this genus agree in possessing a small dark spot at the basal end of the stigma and a second dark spot in the third apical cell of M, but this character may not be of significance in identifying the genus.

***Atopocixius collaris* sp. nov.**

(figs. 7, 26, 29, 44-46)

Male. Length, 1-8 mm.; tegmen, 2.0 mm.

Female. Length, 1-9 mm.; tegmen, 2.1 mm.

Scutellar portion of mesonotum scarcely depressed.

Vertex, frons, clypeus, anterior margin medially and lateral fields of pronotum, tegulæ, mesonotum except on lateral margins and scutellum, postfemora except at base and apex, and abdominal sclerites piceous; lateral margins of vertex at base, lateral margins of frons in apical half, genæ below antennæ, rostrum, upper surface of pronotum, tip of scutellum and legs whitish yellow; lateral margins of mesonotum orange brown; membrane of abdomen red.

Tegmina fuscous; distal half of costal cell except for an oblique fuscous band, middle portion of first subapical and apical cells from stigma as far as M2, a narrow spot overlying vein forming base of second apical cell of M, hyaline, the intervening veins heavily infuscate except at node; base of tegmen, scutellar margin and a small triangular spot at apex of clavus pallid yellow; a dark fuscous spot at base of stigma and another at base of third apical cell of M. Wings hyaline, veins fuscous.

Anal segment of male with lateral lobes broad produced beyond anal margin scarcely or not incurved distally. Ædeagus with a slender sclerotised rod in middle line dorsally, a sinuate distally bifurcate spinose process arising near middle of ventrolateral margin on each side, directed obliquely backward and outward; a pair of vertical spinose processes at apex, slightly



curved anteriorly near tip. Genital styles in profile fairly narrow, dorsal margin convex basally, concave in middle, slightly convex distally, distal lateral process shallowly emarginate, distal and proximal protuberances of equal height; apex of each style curved posteriorly, lip-like.

Pregenital plate of female twice as wide as long, subquadrate; anterior and posterior margins transverse, lateral margins in ventral view distinctly convex.

Described from one male taken at Constanza, Dominican Republic, at 3,000–4,000 ft. (August, 1938) and one female from Mt. Diego de Ocampo, Dominican Republic, at the same altitude (July, 1938), both collected by P. J. Darlington. This species is distinguished by the shape of the genitalia, and by the body and tegminal coloration.

*Atopocixius melanocephalus* sp. nov.

(figs. 5, 10, 37, 49, 50)

Male. Length, 1.9 mm.; tegmen, 2.0 mm.

Piceous; rostrum, legs, and anterior portion of discal carinae of pronotum fuscous.

Tegmina hyaline, fuscous or brown in corium between Sc+R and commissural margin, costal cell infuscate at base, traversed by a very oblique fuscous band in distal quarter; first subapical cell mostly hyaline and a hyaline area in each apical cell from stigma as far as M2 a clear spot overlying the cross vein at base of second apical cell of M; common vein of clavus pale just distad of junction, and a small pale area at apex of clavus; a small fuscous spot at base of stigma and another at base of third apical cell of M. Wings hyaline.

Anal segment of male with lateral lobes produced, broad, not incurved. Ædeagus almost straight, slightly tapering distally; periandrium with a pair of minute teeth on each side ventrolaterally two-thirds from base; narrowing abruptly at apex and produced into a pair of long recurved thin processes, each of which gives off a short spine dorsally towards the apex, and at tip is laterally compressed into a flat lobe continued dorsally in a short horizontal spine directed anteriorly; penis with a pair of narrow sclerotised arms tapering distally, each bearing on its inner face dorsally a series of five short teeth directed mesally and posteriorly. Genital styles in profile fairly narrow, dorsal margin slightly convex at base, strongly concave distally, dorso-

lateral process of each side slightly notched, distal lobe very much larger than proximal; ventral margin convex, apical margin deflexed, in profile minutely excavated.

Described from a single male taken at 1,000–2,000 ft., San José de las Matas, Dominican Republic (June, 1938), by P. J. Darlington. This species is distinguished by the shape of the male genitalia and by the coloration.

*Atopocixius major* sp. nov.

(figs. 6, 22, 25, 34, 47, 48)

Male. Length, 2.0 mm.; tegmen, 2.5 mm.

Female. Length, 2.2 mm.; tegmen, 2.7 mm.

Frons, except on lateral margins distally, clypeus, sides of head before eyes, lateral fields of pronotum, mesonotum, except on margins and scutellum, tegulæ, pro- and meso-coxæ, basal two-thirds of postfemora, and abdomen piceous; vertex, lateral margins of frons distally, genæ, rostrum, upper surface of pronotum, mesothoracic pleurites below tegulæ, tip of scutellum and legs, except basal part of postfemora, sulphur yellow; margins of mesonotum reddish brown; membrane of abdomen red.

Tegmina fuscous; a spot covering apex of costal and base of first subapical cells, middle and distal areas of apical cells from stigma to M2, a small spot overlying M cross vein in membrane, and a small area at apex of clavus hyaline; a spot at base of stigma and another at base of third apical cell of M dark fuscous; base of tegmen and scutellar margin pallid yellow; veins fuscous. Wings hyaline, slightly smoky at base, veins fuscous.

Anal segment of male short, lateral lobes broad, produced distally, not incurved. Ædeagus with periandrium tapering distally, somewhat oblique and expanded near apex, the two sides together assuming a shallow scoop-like form; dorsal margin of each side at apex with three or four minute teeth and a short almost horizontal apical spine. Penis slightly curved, ventral margin weakly convex, dorsal margin sinuate, subparallel to near apex, then abruptly decurved to meet ventral margin in a short spine directed posteriorly and outward, continuing outward curvature of each lateral arm of penis. Genital styles in profile rather narrow, dorsal margin slightly convex at base, thence strongly concave, dorso-lateral apical process deeply excavated, distal protuberance narrowly lobate, much

longer than proximal; ventral margin convex, apical margin deflexed, lip-like.

Pregenital plate of female twice as wide as long, subquadrate, anterior and posterior margins parallel, lateral margins in ventral view slightly convex.

Described from one male and one female taken between 3,000 and 7,000 ft. in Valle Nuevo, S. E. Constanza, Dominican Republic, by P. J. Darlington (August, 1938). This species is distinguished by its size, by the shape of the male genitalia, and by the coloration.

#### *Lomagenes* gen. nov.

Head with eyes scarcely two-thirds width of pronotum. Vertex as long as wide, lateral margins expanding to base, which is shallowly emarginate; anteriorly a broad transverse ill-defined ridge or obsolete carina separating vertex from frons; about midway between this and base a prominent transverse carina, angulate at middle with apex cephalad, with a median carina passing forward from it to curve on to frons; vertex basad of this angulate carina depressed, the depressed part being two and a half times as wide as long. Frons longer than its widest part (1.4 to 1), base slightly more than half as wide as apex, lateral margins sinuately expanding to three-quarters from base then curving inward to suture; median carina distinct, lateral margins carinate, slightly raised. Clypeus at base three-quarters as wide as widest part of frons, tapering acutely to apex; median carina absent, lateral margins carinate; clypeus and apical half of frons only slightly convex in profile, suture impressed, frons at base subangularly rounded into vertex; no median ocellus, genæ rather tumid below antennæ; no subantennal process; antennæ with basal segment very short, second segment slightly longer than broad; eyes widely emarginate ventrally. Pronotum as long as vertex, anterior margin medially convex, shallowly emarginate behind eyes, posterior border shallowly emarginate, curving anteriorly at sides; median carina distinct, lateral carinae of disc obsolete or absent, lateral margins strongly carinate between eyes and tegulæ; mesonotum feebly convex, distinctly tricarinate, scutellar area depressed, tip of scutellum acute. Hind tibiæ unarmed.

Tegmina with sides expanding apically for two-thirds of

length, almost symmetrically rounded at tip; clavus not granulate. Costal cell wide, slightly expanding apically, Sc+R joined to near stigma, common stalk Sc+R+M half as long as basal cell. Typically eight apical cells, the anterior trapezoidal, second quadrilateral with straight sides, third small, triangular, fourth elongate, rectangular, fifth triangular, sixth elongate, wedge-shaped, seventh triangular, eighth pentagonal; a sub-apical series of three cells, the first forming a quarter circle, second subrectangular and third quadrilateral; clavus joining commissural margin about two-thirds from base of tegmen.

Genotype, *Lomagenes delphacoides* sp. nov.

This genus is near *Quilessa* but differs in possessing no median carina on the clypeus and an angulate carina on the vertex with a sunken area behind it.

***Lomagenes delphacoides* sp. nov.**

(figs. 8, 9, 23, 24, 32)

Female. Length 2.0 mm.; tegmen, 2.7 mm.

Vertex, except carinæ, base of frons, upper surface of pronotum except anterior margin, fuscous; carinæ of vertex, basal half of frons, clypeus, thoracic pleurites, anterior margin of pronotum, margins of mesonotum, tegulæ, reddish-brown; apical portion of frons, genæ below antennæ, legs, valvulæ of ovipositor, testaceous; mesonotum and scutellum fuscous-piceous with a faint greenish iridescence; abdomen piceous.

Tegmina hyaline, slightly suffused yellowish-brown on clavus in basal third and apical quarter; veins and margin testaceous-fuscous. Wings hyaline, veins fuscous.

Pregenital plate quadrate, slightly more than twice as broad as long, anterior margin transverse, minutely crenulate, lateral margins in ventral view slightly diverging posteriorly, feebly convex, posterior margin transverse or very shallowly concave. Third valvulæ of ovipositor broad, tapering distally to a blunt point, dorsal margin almost straight, ventro-apical margin oblique. First valvulæ narrow, bluntly rounded distally.

Described from one female taken at about 6,000 ft. at Loma Vieja, S. Constanza, Dominican Republic, by P. J. Darlington (August, 1938).



## Dineparmene gen. nov.

(fig. 16)

Vertex a little longer than wide, lateral margins diverging basally, posterior margin very shallowly excavate, anterior margin transverse curving uninterruptedly into frons; lateral margins carinate, median carina distinct to base and passing anteriorly into median carina of frons, no transverse carina; frons longer than broad (1.4 to 1), lateral margins expanding distally not narrowing to suture, or scarcely so; greatest width of frons below level of antennæ; width at base slightly more than half width at apex; median carina present throughout, no median ocellus; clypeus at base scarcely as wide as widest part of frons, flattened, weakly carinate medially, lateral margins carinate; vertex and basal half of frons forming in profile an even curve, apical half of frons feebly convex, suture impressed; genæ somewhat tumid; antennæ with basal segment very short, ring-like, second segment slightly longer than broad. Pronotum as long as vertex, posterior border shallowly excavated, sloping obliquely anteriorly near sides; median carina distinct, no lateral carinae on disc, lateral margins carinate between eye and tegula; mesonotum convex, strongly tricarinate, scutellar area much depressed; posttibiæ unarmed. Abdomen with wax-bearing plates rather prominent.

Tegmina with sides subparallel; Sc+R forking near stigma, a short Sc+R+M stem basally, nine cells on apical margin. Wings with fourth apical cell about three times as long as its basal stalk.

Genotype, *Eparmene cubana* Myers 1928, Studies on Cuban Insects: 20.

This genus has the wax-bearing surfaces of the abdomen developed to a larger size than seems to be usual in Prosotropinæ. It differs from *Eparmene* Fowler in having the frons reaching its greatest width below the level of the antennæ, the maximum width in *Eparmene* being reached at the upper level of the antennæ; in having the basal joint of the antennæ very short, this being unusually long in *Eparmene*, and in not having a tricarinate pronotum. The description has been drawn up from the monotype with the original description at hand. It is worth recording that the waxy secretion of *D. cubana* is unusual in taking the form of curved thick parallel rods, which are translucent and opalescent.

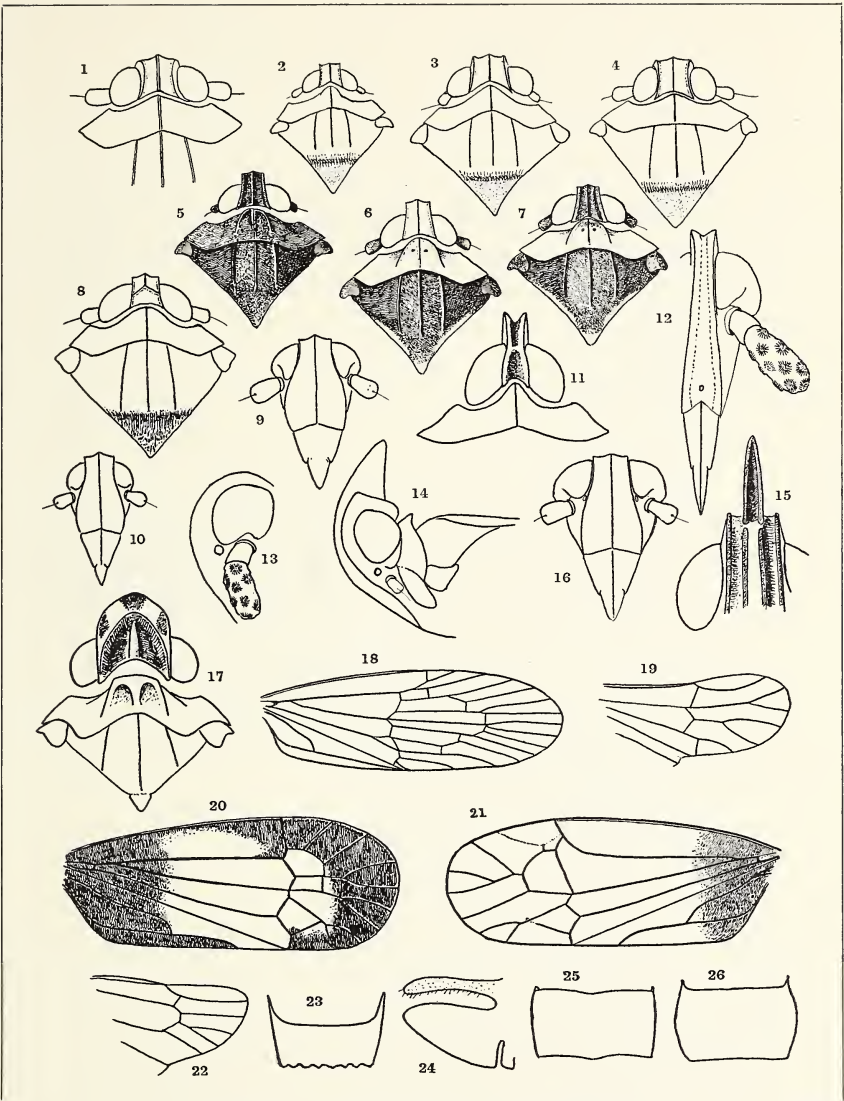
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## EXPLANATION OF PLATES

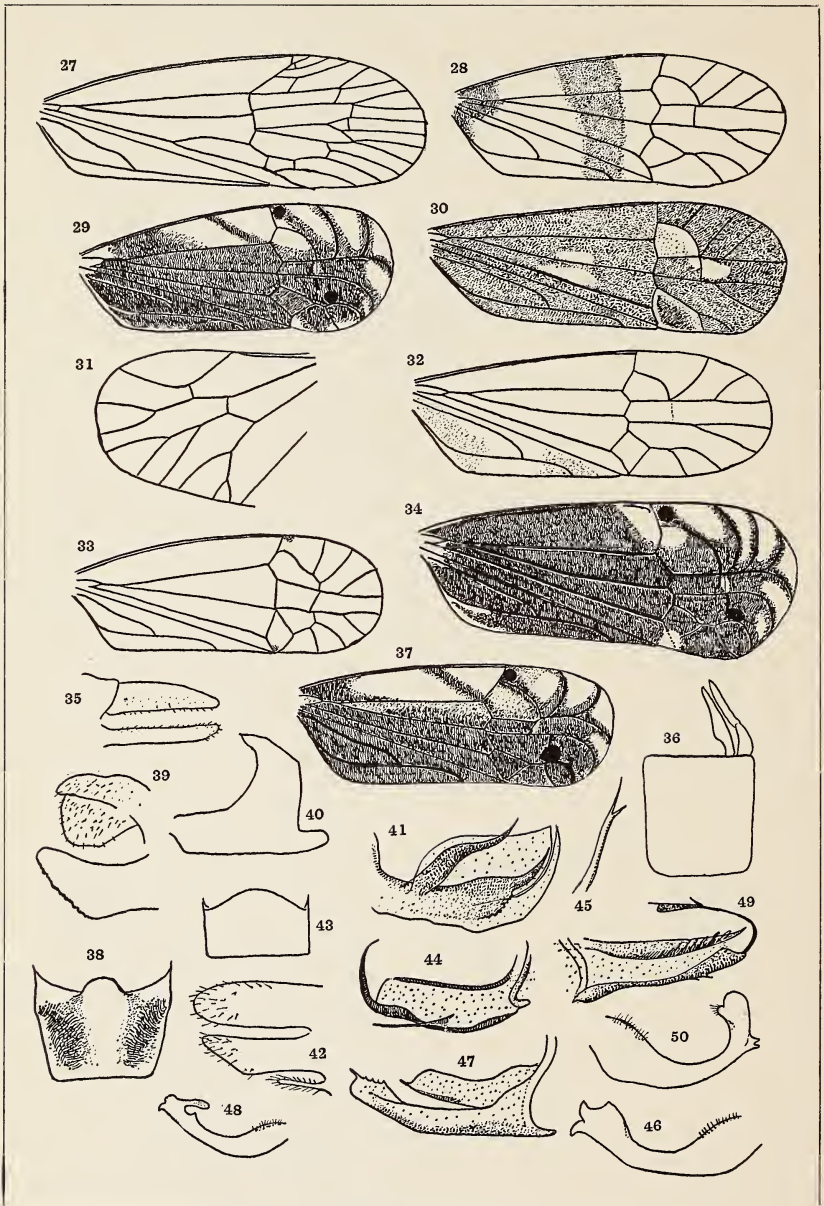
1. *Quilessa tristis* Fenn. Head and prothorax, dorsal view.
2. *Q. fasciata* Fenn. Head and thorax.
3. *Q. pellucida* Fenn. Do.
4. *Q. funebris* Fenn. Do.
5. *Atopocixius melanocephalus* Fenn. Do.
6. *A. major* Fenn. Do.
7. *A. collaris* Fenn. Do.
8. *Lomagenes delphacoides* Fenn. Do.
9. *L. delphacoides* Fenn. Head, facial view.
10. *Atopocixius melanocephalus* Fenn. Do.
11. *Southia iridescens* Fenn. Head and prothorax, dorsal view.
12. *S. iridescens* Fenn. Head, facial view. (Right side omitted.)
13. *S. iridescens* Fenn. Vertex and basal part of frons in profile.
14. *Parahydriena hyalina* Muir. Head and pronotum, side view.
15. *P. hyalina* Muir. Base of frons and process of vertex, anterior view.
16. *Dineparmene cubana* Myers. Head, facial view.
17. *Arenasella fowleriana* Kirk. Head and thorax, dorsal view.
18. *A. fowleriana* Kirk. Tegmen.
19. *A. fowleriana* Kirk. Apical portion of wing.

20. *Quilessa tristis* Fenn. Tegmen.
21. *Q. pellucida* Fenn. Tegmen.
22. *Atopocixius major* Fenn. Apical portion of wing.
23. *Lomagènes delphacoides* Fenn. Pregenital plate of female, ventral view.
24. *L. delphacoides* Fenn. Valvulæ of right side of ovipositor, lateral view.
25. *Atopocixius major* Fenn. Pregenital plate of female, ventral view.
26. *Atopocixius collaris* Fenn. Do.
27. *Parahydriena hyalina* Muir. Tegmen.
28. *Quilessa fasciata* Fenn. Do.
29. *Atopocixius collaris* Fenn. Do.
30. *Quilessa funebris* Fenn. Do.
31. *Parahydriena hyalina* Muir. Apical portion of wing.
32. *Lomagènes delphacoides* Fenn. Tegmen.
33. *Southia iridescens* Fenn. Do.
34. *Atopocixius major* Fenn. Do.
35. *Quilessa fasciata* Fenn. Valvulæ of ovipositor, left side, lateral view (figured upside down).
36. *Q. fasciata* Fenn. Pregenital plate of female and valvulæ of right side, ventral view.
37. *Atopocixius melanocephalus* Fenn. Tegmen.
38. *Quilessa tristis* Fenn. Pregenital plate of female, ventral view.
39. *Q. tristis* Fenn. Valvulæ of ovipositor, right side, lateral view.
40. *Q. pellucida* Fenn. Left genital style, lateral view.
41. *Q. pellucida* Fenn. Ædeagus, left side, lateral view.
42. *Q. funebris* Fenn. Valvulæ of ovipositor, right side, lateral view.
43. *Q. funebris* Fenn. Pregenital plate of female, ventral view.
44. *Atopocixius collaris* Fenn. Ædeagus, right side, lateral view.
45. *A. collaris* Fenn. Ædeagal spine of right side, dorsal view.
46. *A. collaris* Fenn. Right genital style, lateral view.
47. *A. major* Fenn. Ædeagus, right side, lateral view.
48. *A. major* Fenn. Right genital style, lateral view.
49. *A. melanocephalus* Fenn. Ædeagus, left side, lateral view.
50. *A. melanocephalus* Fenn. Left genital style, lateral view.



FENNAH — TROPIDUCHIDÆ AND KINNARIDÆ





FENNAH — TROPIDUCHIDÆ AND KINNARIDÆ

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# PSYCHE

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## A REVIEW OF THE CHRYSOPIDÆ (*NOTHOCHRYSIDÆ*) OF CENTRAL AMERICA<sup>1</sup>

BY NATHAN BANKS

Museum of Comparative Zoölogy

Many years ago the writer described a few species from Central America, including Baja California. Since then Navas has published a large number of species. For some years the author has had a manuscript synopsis of the species in the Museum. In 1937 Professor Roger Smith visited the various European museums to study the types of Chrysopidæ; he has given me a copy of these notes. With this most useful help I have felt emboldened to present tables to the species known to me, with descriptions of some new forms.

Besides the specimens at the Museum of Comparative Zoölogy I have seen those belonging to the American Museum of Natural History, the Academy of Natural Sciences of Philadelphia, and the U. S. National Museum.

As to classification, I have made an attempt to get away from dependence upon the divisory veinlet.

In the Central American forms I see, outside of the Apochrysinæ, three groups, one those represented by *Nadiva* and allies, in which the joints of the antennæ are very broad, the thorax broad, the venation more or less irregular, particularly in the discoidal cell; the anal area of the hind wings is large and the branches of anal veins sometimes forked. The second group is that based on *Chrysopa* and allies in which the stigmal area is unmarked, and the medius of fore wing slopes down evenly to its marginal fork. This genus should be divided. The third group is that of *Nodita* and *Leucochrysa*, in which there is a dark mark at the base of stigma, and the medius curves to

<sup>1</sup>Published with the aid of a grant from the Museum of Comparative Zoölogy at Harvard College.

join the outer gradates; if not curving it is at least bent somewhat before forking. If one has assorted many specimens of *Nodita* and *Leucochrysa* he will find specimens that arouse doubt. Specimens put in *Nodita* sometimes have the divisory vein ending at the upper end of cell, and Navas has described one (*notha*) with the divisory vein ending as in *Leucochrysa*. A specimen that has the divisory cell as typical of *Leucochrysa* as in *L. varia* was the last straw. For in other structures and in coloration it agrees closely with the large species of *Nodita*, *azvedoi*, *maronica*, *egregria*, etc., having the radial sector much curved, partly black, the costal area rather narrow, the marginal forks wholly brown, and in the hind wing the marginal vein on hind margin is brown.

I am convinced that the difference between *Nodita* and *Leucochrysa* does not reside in the divisory cell, but in the course of the radial sector.

In *Nodita* the costal area at broadest is rarely equal to the radial area (at broadest), and the radial sector at widest part of the radial area is at least as near to medius as to the radius.

In *Leucochrysa* the costal area at broadest is about equal to or broader than the radial area (at broadest), and the radial sector at broadest part of radial area is plainly nearer to radius than to the medius.

Between *Nodita* and *Chrysopa* I have depended chiefly on the dark mark in stigma for *Nodita*. Many species of *Nodita*, on drying, tend to have the pronotum collapsed transversely, a deep groove along the middle; the transverse groove being close to the hind margin; some *Nodita*, however, show the transverse groove near middle of length.

Those species of *Nodita* and of *Leucochrysa* perhaps in which the medius does not so plainly curve to join the outer gradates might go into another genus; but I would prefer to find for it some other character. The width of the costal stigmal area in the true *Leucochrysas* is usually more than those that would be split off by this division; but the width grades so much it is not dependable. It might even be suggested to unite the large and typical *Leucochrysa* with the large *Nodita* into one genus, there is much in common, but the comparative widths of the costal and radial areas appear to keep them apart.

The genera are much the same as those of northern South America, and in several cases the species; in northern Mexico

there are several species which occur in the southern part of the United States.

I have listed as "species" all forms that I could distinguish fairly definitely by color as well as by structure. The markings of the head and thorax and sometimes of abdomen are generally constant. There is always some variation, but it is often in extent or distinctness of development, rather than presence or absence. Specimens sometimes become discolored, and then it is difficult to determine face-marks. The study of male genitalia in this group will serve better to differentiate the species, but tends to neglect other structures which may be of value in defining subspecies, varieties, and races, which will surely follow more extensive studies. Taxonomy is not simply to show how species can be separated, but just as truly to show how they can be allied, — classified. Although the genitalia in many groups are the most valuable in distinguishing forms, one should remember that in Nature no species is kept separate by the structure of its genitalia.

The name *Chrysopa* is a pure synonym of *Hemerobius*, and no scrapping of rules can change that fact. But until *Chrysopa* can be split into a number of genera (only one small one will have to take the name *Hemerobius*) I shall utilize the old name. Rambur a hundred years ago provided a name for the *Hemerobius* of McLachlan and Hagen.

*Key to Genera*

1. Third cubital cell not divided; costal area very broad; no regular series of gradates; five or six branches of radius beyond subcosta; radials often connected by cross-veins . *Apochrysinæ*

Third cubital cell divided in some way; costal area much narrowed at stigmal area; rarely more than three branches to radius beyond subcosta; cross-veins in middle area mostly in two or three series . . . . . *Chrysopinæ* 2

2. Antennæ on basal half, at least, with the joints plainly broader than long;

a — Thorax moderately slender; antennæ with basal joints rather widely separated, and slender; in male with a process between antennæ . . . . . *Meleoma*

b — Thorax broad, basal joints of antennæ stout and little separated, no process between them; in hind wing branches of anal often forked . . . . . *Nadiva*



- Joints of the antennæ, except a few toward base, are plainly longer than broad, pronotum often more slender, and in hind wings the anal branches not forked . . . . . 3
3. Medius of fore wing slopes down to its marginal fork, scarcely, if at all, bent; no dark spot at base of the stigma; antennæ but little longer than wings . . . . . 4
- Medius before marginal fork usually curves up a little to run into the outer gradate series; if it does not it is at least bent at that place; nearly always a dark spot at the base of the stigma; antennæ often very long; divisory vein often oblique and straight . . . . . 8
4. Divisory vein ends on the end of third cubital cell and about parallel to both medius and cubitus . . . *Chrysopodes*  
Divisory vein ends on the medius, before end of the cell, and is often curved . . . . . 5
5. Inner series of gradates absent in either hind or both pairs of wings; radius usually has three or more branches to the margin beyond end of subcosta; small species with few cells and the cubital area broad . . . . . 6
- Inner series present with at least one gradate in both wings 7
6. Wing veins and much of body greenish; no inner gradates in either wing . . . . . *Chrysopiella*  
Wing veins and much of body brownish; inner gradates usually present in fore wing . . . . . *Eremochrysa*
7. In male a process between the antennæ, in female the basal joints of antennæ more widely separate than in *Chrysopa* . . . . . *Meleoma*
- No process between the antennæ, which are rather close to each other at base . . . . . *Chrysopa*
8. Divisory vein parallel to each side of the third cubital cell; a series of cross-veins connecting some of the radials . . . . . *Carcarulla*  
Divisory vein oblique . . . . . 9
9. A cross-vein before radial sector, usually but five cubital cross-veins beyond the divisory cell . . . . . *Berkmansus*  
No cross-vein before radial sector; usually six or more cubitals beyond divisory cell . . . . . 10
10. With a more or less complete third gradate series between the other two . . . . . *Neula*  
No intermediate gradate series . . . . . 11

11. Some costal cross-veins above origin of radial sector strongly sinuous; divisory cell more or less of a V; costal area wider than radial; costal stigmal area four times as broad as the subcostal stigmal area . . . . . *Vieira*

No such sinuous costals, costal stigmal area usually less broad . . . . . 12

12. Radial sector more strongly curved, so that the widest part of the radial area is nearer to the medius than to the radius; costal area usually rather narrow and not as broad as radial area; divisory vein usually ends on the medius plainly before end of cell . . . . . *Nodita*

Radial sector less curved so that at the widest part of the radial area it is as near or nearer to radius than to medius; costal area usually broader than radial area; divisory vein usually ends on the end of the cell . . . . . 13

13. Stigma with a large black spot extending back to the radial sector; costal stigmal area usually twice as broad as the subcostal stigmal area . . . . . *Gonzaga*

Stigmal mark much smaller; costal stigmal area rarely twice as broad as the subcostal stigmal area . . . . . *Leucochrysa*

Two genera recorded from this region by Navas I have not been able to recognize in the material studied.

*Ancylochrysa* 1928 from Costa Rica from the odd divisory vein it might be near *Goliva*; but he says nothing about short antennal joints, the radial sector is little curved and the costal area broad as in *Leucochrysa*; the radius has several branches to margin beyond end of the subcosta; the medius slopes evenly to its marginal fork.

*Orlandsia* 1914a from Chiriqui has the divisory vein as in *Nodita*, otherwise it is (according to figure) much like *Ancylochrysa*, the costal area being broad, the radial sector little curved, the medius running to its marginal fork without a bend, no mark in stigma, and the costal part of stigma much broader than the subcostal; both have a very broad post cubital area.

#### APOCHRYSINÆ

Four forms are known from Central America.

*Lainius constellatus* Navas 1913, from Guatemala.

*Domenechus sigillatus* Navas 1913, from Guatemala.

Kimmins 1940 states this is the *Apochrysa mirifica* Gerst.

*Loyola croesus* Gerst. 1893, from Chiriqui.

*Loyola mirifica* Gerst. 1888, from Chiriqui.

Kimmins 1940 puts this in *Domenechus*.

#### CHRYSOPINÆ

##### *Table to Species of Chrysopa*

- |   |                  |
|---|------------------|
| 1. Face with dark marks as in <i>Ch. oculata</i> , second joint of antennæ dark, beyond pale . . . . .  | <i>mexicanus</i> |
| No such marks . . . . .   | 2                |
| 2. Antennæ beyond second joint black, at least for a short distance . . . . .   | 25               |
| Antennæ beyond second joint wholly pale . . . . .   | 3                |
| 3. Basal joint of antennæ with dark spot or stripe . . . . .  | 4                |
| Basal joint unmarked . . . . .  | 12               |
| 4. Basal joint with two dark stripes, gradates parallel and near together . . . . .   | <i>arioles</i>   |
| Basal joint with but one dark stripe . . . . .  | 5                |
| 5. A good-sized black spot each side on pronotum . . . . .  | <i>discolor</i>  |
| No such spots . . . . .   | 6                |
| 6. Palpi dark . . . . .   | 7                |
| Palpi pale . . . . .  | 10               |
| 7. Inner gradates bowed up toward radial sector; branches of radial sector much bent by inner gradates . . . . .  | <i>annotaria</i> |
| Inner gradates parallel to outer row; branches of radial sector scarcely bent by inner gradates . . . . .   | 8                |
| 8. Head, face, vertex, and basal antennal joint suffused with reddish; practically all cross-veins dark; about five inner gradates . . . . .                                      | <i>dampfina</i>  |
| Head not suffused with reddish; inner gradates often but three; third cubital cell much narrowed at base, and often but one branch to hind margin, two from fourth cell . . . . . | 9                |
| 9. Abdomen pale as the thorax; pronotum narrowed from base to the front . . . . .   | <i>valida</i>    |
| Abdomen darker than thorax; pronotum not narrowed, except near front . . . . .  | <i>tolteca</i>   |
| 10. Reddish mark on cheeks, face broadly reddish; vertex red each side; gradates not parallel; pronotum with two red spots on each side before margin . . . . .                   | <i>batesi</i>    |
| No reddish or other mark on cheeks . . . . .  | 11               |

11. Inner gradates not reduced, both series more or less plainly bordered, and not parallel . . . . . *infausta*  
 Inner gradates often reduced about half, close to and nearly parallel to outer row, not bordered; radials dark only in middle . . . . . *caligata*
12. Venation almost wholly pale greenish, gradates not dark; divisory cell usually ends before the cross-vein above . . 13  
 Venation with some cross-veins at least partly dark and the gradates dark . . . . . 14
13. Cubital area more than one half as wide as the post cubital; reddish on cheeks usually extends upward by side of eye, no black streak . . . . . *comanche*  
 Cubital area not quite one half as wide as the post cubital area; a black streak by side of the red on cheek . . *californica*
14. Seven cubital cross-veins beyond the divisory cell; a dark spot on each cheek and one each side on clypeus; venation largely green . . . . . *facialis*  
 Six cubitals beyond divisory cell . . . . . 15
15. Some veins behind radial sector bordered with yellowish, the gradates bordered with brown; no mark on cheeks; palpi pale . . . . . *parishi*  
 No veins bordered with yellowish . . . . . 16
16. Palpi dark or lined; inner gradates arise before or very near the penultimate cubital cross-vein . . . . . 19  
 Palpi pale; inner gradates arise much beyond the penultimate cubital cross-vein . . . . . 17
17. A reddish or dark spot at each corner of the pronotum; no marks under eyes . . . . . *tetrasticta*  
 Not four spots on pronotum, a mark under each eye . . 18
18. Pronotum red on sides; cubital area as broad as post cubital area; usually twelve radials, and but three or four inner gradates . . . . . *brevihirta*  
 Pronotum not red on sides; cubital area not nearly as broad as post cubital area, all cubital cells longer than broad; usually about ten radials and five inner gradates . . . . . *fairchildi*
19. Inner gradates strongly divergent from the outer ones 20  
 Gradates parallel or nearly so; often a red or dark mark under eye . . . . . 21



20. Gradates converge behind so their bases are near each other . . . . . *bouvieri*  
 Gradates have bases very far apart . . . . . *divergens*
21. Pronotum as long as broad, with an interrupted red stripe each side, not on margin . . . . . 22  
 Pronotum broader than long . . . . . 23
22. Pronotum much longer than broad; inner gradates nearer to radial sector than to outer, arise at or before penultimate cubital cross vein . . . . . *angusta*  
 Pronotum only a little if any longer than broad; inner gradates arise beyond penultimate cubital cross-vein . *yucatanensis*
23. Divisory cell ends at or before the cross-vein above; cheeks reddish . . . . . *exotera*  
 Divisory cell ends well beyond the cross-vein above . . . 24
24. Cheeks dark; most cross-veins dark at ends; inner gradates parallel, each veinlet far from next . . . *perfecta*  
 Cheeks pale; cross-veins not dark at ends; inner gradates slightly divergent and each veinlet is close to next . . *forreri*
25. A dark mark in a curve across upper edge of clypeus; palpi marked with dark; gradates parallel . . . *aztecana*  
 No dark across on clypeus or face . . . . . 26
26. Two dark lines on each basal antennal joint . *bilineata*  
 But one dark line on basal antennal joint . . . . . 27  
 No dark line on basal antennal joint . . . . . 31
27. Black spot on cheeks; palpi pale . . . . . 28  
 No dark on cheeks; pronotum reddish on sides . . . . . 29
28. Radial area not as wide as postcubital area; many cross-veins dark . . . . . *gradata*  
 Radial area about as broad as the postcubital; posterior half of wing with mostly pale veins (except gradates) . *indicata*
29. Inner gradates near to radial sector, gradates not quite parallel; many costals wholly dark . . . . . *sarta*  
 Inner gradates close to outer row and parallel thereto . 30
30. Some gradates and some branches of radial sector bordered; pronotum about twice as broad as long . . *berlandi*  
 No gradates nor other veins bordered; pronotum only a little broader behind than long, narrowed toward front . . *adoina*
31. Palpi partly dark; cubital area as broad as the costal

- area; costals and radials wholly dark; pronotum not margined with reddish . . . . . 32
- Palpi not marked with dark, costals and radials less dark; wings rather slender . . . . . 33
32. Pronotum with a pair of submedian dark stripe . *incerta*  
 Pronotum without any stripes . . . . . *leptana*
33. Margin of pronotum reddish . . . . . 34  
 Margin of pronotum not reddish . . . . . 35
34. Cheeks with reddish mark; basal joint of antennæ reddish . . . . . *lateralis*  
 Cheeks not marked . . . . . *claveri*
35. Inner and outer gradates very close to each other, and parallel . . . . . *everes*  
 Gradates widely separated, inner sloping upward, and not parallel . . . . . *everina*

Species that I have not recognized in the material and could not place from the descriptions and notes, some of which are probably synonyms.

*Chrysopa sanguinea* Navas 1927, near to *caligata*, but it does not agree in various points.

*Chrysopa rubricosa* Navas 1914, the figure shows marks on head that I have not seen in any species.

*Chrysopa effusa* Navas 1911, may possibly be *Ch. gradata*; the latter has some of the branches of cubitus as Navas figures for *effusa*, but the divisory cell is not dark.

*Chrysopa guatemalteca* Navas 1914 is very near *Ch. sarta* Bks. There are fewer gradates in *sarta* than stated for *guatemalteca*, and *sarta* has no dark in hind wing, and antennal stripe broad. If the same, *guatemalteca* has a month or more priority.

*Chrysopa bouvieri* Navas 1923 and *Ch. divergens* Navas 1931 according to description and Smith's notes must be very similar if not identical; those we have agree possibly a little better with *divergens*.

*Chrysopa bulbosa* Navas 1926 will run in the key to *Ch. infausta*; however, there is nothing unusual about the basal joint of antennæ in *infausta*; and *infausta* has the stripe on basal joint lateral, not dorsal, the pronotum not margined, etc.

*Chrysopa cajensis* Navas 1930 in table goes to *yucatanensis* and I consider it the same.

*Chrysopa hieronyma* Navas 1917 seems to be *tetrasticta*.

*Chrysopa obesa* Navas 1929. A broad bodied species with wholly green wings; may be a *Nadiva* but not *N. balboana*.

*Chrysopa senior* Navas 1927, wing 20 mm. long, is different from any I have.

*Chrysopa morrisoni* Navas 1914, veins all green, has dark dots or lines on vertex or pronotum, and thus readily separated from the all green veined species known to me.

*Chrysopa varicosa* Navas 1914 is stated to have a dark lunule below each antenna, and peculiar modifications of certain veinlets of the inner gradates; I have seen similar modifications in one species, but that species has no lunules on face, nor does it agree otherwise with the description of Navas, so it is probably also a distinct species.

*Chrysopa lafoni* Navas 1911, and *Ch. nativa* Navas 1911, both from Costa Rica and fore wings 17 mm. long, do not fit anything I have seen.

*Chrysopa sulcata*, *Ch. salleana*, *Ch. ceratica* of Navas and *Ch. explorata* Hagen belong to *Nodita*; *Ch. dolicharthra* Navas is a *Meleoma*.

*Chrysopa externa* var. *marginata* Navas 1927, from Guatemala, is described in one line and a half. The pronotum is marked on the anterior middle with dark red; I have not seen it.

*Chrysopa josephina* Navas 1926 is said to have twelve joints of antennæ black, and outer gradates bordered; it agrees fairly well with what I have as *berlandi*, but here the gradates are not bordered, but this is not always dependable.

*Chrysopa josephina* Navas 1930, appears to be *Ch. angusta* Navas.

*Chrysopa longicella* Navas 1914; I identify this with *Ch. bimaculata* McClendon, described from southern Texas; I have specimens from Guatemala, Nicaragua, and Canal Zone; except for minor details and size there is little to separate this from *tolteca* Bks. and so I have united them. *Ch. valida* from Baja California is closely related and with more material may prove to be the same.

*Chrysopa lateralis* Guerin 1843, I have not seen but placed in synopsis according to his description; it was from Vera Cruz, Mexico.

## RECORDS

*Chrysopa nigricornis* Burm. 1839

One from Durango, Mexico, March.

*Chrysopa leptana* Bks. 1914

Type from Oaxaca, Mexico, another from Apatzingan, Mexico, 7 August.

*Chrysopa gradata* Navas 1913

From Rosaria San Juancito, Honduras.

*Chrysopa indicata* Navas 1914

From Jalapa, Vera Cruz, Mexico, La Campana, Pan., September, and Santa Ana, Costa Rica, March.

*Chrysopa everes* Bks. 1920

From Puerto Castilla, Honduras, 21 June, and Barro Colorado, Canal Zone, 10 to 13 November, 26 February, and 23 March.

*Chrysopa azteca* Bks. 1903

Type from Tuxpan, Mexico, 9 May.

*Chrysopa berlandi* Navas 1923

From Barro Colorado, Canal Zone.

*Chrysopa claveri* Navas 1911

From Barro Colorado, Canal Zone; Cayuga, Guatemala, October.

*Chrysopa incerta* Bks. 1895

Types from El Taste, Baja California.

*Chrysopa sarta* Bks. 1914

Type from Orosi, Costa Rica.

*Chrysopa tolteca* Bks. 1901

Type from Tomellin, Oaxaca, Mexico, June; others Chavarrillo, Vera Cruz, Mexico, April; Cayuga, Guatemala, May; Chinandega, Guatemala, Gualan, Guatemala, 2 December; and Barro Colorado, Canal Zone, Tuxepec, Oaxaca, Mexico, November, and Tabernilla, Canal Zone, May. Normally there is but one branch from the third cubital cell to the hind margin.



*Chrysopa valida* Bks. 1895

Types from El Taste and San Jose del Cabo, Baja California, September. The name is not preoccupied by *Hemerobius validus* Erichson as the latter belongs in the genus *Berkmansus*.

*Chrysopa dampfina* Navas 1927

Puerto Castilla, Honduras, 21 June.

*Chrysopa arioles* new name

From Honduras, June, and Piedras Negras, Peten, Guatemala, April–May. This is the *C. binaria* Navas 1928, but he had already used the name in 1923 for a South American species.

*Chrysopa mexicana* Bks. 1901

From Hapan, Vera Cruz, Mexico, July, and San Pedro, Coahuila, Mexico, 22 August.

*Chrysopa exotera* Navas 1914

From Tuxpan, Mexico, 9 May, Guadalajara, Mexico, 14 Sept., 25 June, Tegucigalpa, Honduras, 2 February, Rosario San Juancitio, Honduras, Panajachel, Guatemala, 20 March, and Santa Engracia, Mexico, 11 April.

*Chrysopa divergens* Navas 1931

From Barro Colorado, Canal Zone, 26 February, 13 March, 19 April.

*Chrysopa tetrasticta* Navas 1914

From Moca, Guatallon, Guatemala, March–April.

*Chrysopa angusta* Navas 1914

From Rosario Mines, Honduras, 20 March.

*Chrysopa yucatanensis* Navas 1929

From Puerto Cortez, Honduras, 18 March, and Barro Colorado, Canal Zone, 11 February, and Frijoles, Canal Zone, 18 February.

*Chrysopa perfecta* Bks. 1895

Types from El Taste, and San Lazaro, Baja California.

*Chrysopa forreri* Navas 1914

From Mazatlan, Mexico.

*Chrysopa parishi* Bks. 1913

From Barro Colorado, Canal Zone, 15 July, 13 November, and El Volcan Chiriqui, Panama, 17 February.

*Chrysopa facialis* Bks. 1905

Many from Durango, Mexico, in March, April, May, and June, also San Juan de Allende, Mexico, 15 March, Gomez Palacio, Durango, Mexico, May, San Pedro, Mexico, 14 December, and Guanajuato, Mexico.

*Chrysopa californica* Coq. 1890

From Tlahualito, Durango, Mexico, 26 August, and Guadalajara, Mexico, 14 August.

*Chrysopa comanche* Bks. 1938

From San Jose de Guaymas, Mexico, 10 April, Sierra de los Burros, Coahuila, Mexico, 8 and 18 June, Guadalajara, Mexico, 25 June, Juarez, Mexico, 3 July, Panajachel, Guatemala, 20 March, Puerto Castilla, Honduras, 4 April, and La Ceiba, Honduras.

## NEW SPECIES

*Chrysopa adoina* sp. nov.

Head pale, no marks on face; palpi unmarked; antennæ black, except basal joint pale with a reddish stripe above; pronotum with a reddish stripe along each side, rest of thorax, abdomen and legs unmarked.

Wings with very pale venation, some costals and radials, cubitals and post cubitals brown in middle, rarely all over, gradates pale brown, not bordered, intermediates dark at lower end, branches of radial sector not dark anywhere; in hind wings the gradates are faintly dark.

Pronotum a little broader behind than long, narrowed toward front. Fore wings have three or four inner, seven outer gradates, parallel and near each other; branches of radial sector scarcely bent at inner gradates; eleven radials; third cubital cell longer than second, divisory cell long, slender and narrow toward tip, base slightly oblique, six cubitals beyond; costal area not as broad as postcubital, but about as broad as cubital, radial area plainly a little broader than postcubital area, the radial sector, however, but little curved. In hind wings ten radials, seven cubitals, only one or two inner, and six outer gradates, parallel, and near each other.

Length of fore wing 12 mm., width 4 mm.

Two taken at quarantine, one at New Orleans from Mexico, 4 Febr. 1936, and the other at Charleston from Honduras,

26 June, 1931, apparently associated with bananas. Type U.S.N.M., paratype M.C.Z. 25643. Differs from *berlandi* as shown in table; it has much the appearance of *Ch. cubana*, but it is larger, the pronotum a little longer, sides more sloping forward, and the costal area is proportionally a little broader.

*Chrysopa annotaria* sp. nov.

Face pale, a red-brown stripe on cheeks, no other marks; palpi deep black; antennæ pale at first, but soon brownish, not longer than wings, basal joint with a red line on outer side and above is a short reddish line, not reaching either end (probably absent in some specimens); vertex with a red dot each side behind near eye; pronotum pale, in front each side suffused with reddish, broader than long; rest of thorax pale; abdomen mostly black above. Fore wings with gradates dark, and the inner ones bordered with brown; costals and radials rather dark at anterior ends, a few other veins toward base partly dark, last cubital dark, and the marginal forkings partly dark.

Hind wings with pale venation, almost no veins darkened, some of the gradates faintly in certain views; stigma greenish.

In fore wing six inner and outer gradates, the outer row parallel to outer margin, the inner row, arising from near penultimate cubital, curves upward toward the radial sector; the second veinlet in this gradate row has chitinous dots or lines close by in the membrane and is more broadly bordered than the others; the branches of the radial sector are much bent at the inner gradates; six cubital cross-veins beyond the divisory cell, latter ends much beyond the cross-vein above; third cubital cell hardly as long as second, and no broader; subcostal stigmal area with two or three cross-veins. Costal area at broadest as broad as postcubital area, and broader than the radial area, latter, at broadest, about twice as broad as cubital area.

In hind wings the gradates are also far apart, inner of five, outer of six, but not very divergent.

Length of fore wing 14 mm., width 5 mm.

From Boquete, Chiriqui Province, Panama, 10 May (Fairchild). Type M.C.Z. no. 25645.

*Chrysopa varicosa* Navas has, according to description and Smith's notes, a very similar wing, with the peculiarities of the inner gradates, but the face has a reddish brown lunule under each antennæ, and no dark line on basal joint of antennæ. *Ch.*

*sanguinea* Navas has a line on antennæ, but palpi pale, and a line behind the antennæ. Other species with line on basal antennal joint have been seen, and are in the synoptic key.

*Chrysopa batesi* sp. nov.

Head pale; a broad red stripe on each side covering cheeks and extending inward and upward on inner side of eye, past the antenna, and broadly onto sides of vertex; palpi pale; antennæ pale, basal joint with a rather broad outer reddish stripe; pronotum much broader than long, sides parallel, two red spots half way from center to side margin; mesonotum with a red mark each side on anterior lobe, extending back along middle; abdomen with a row of red marks each side above.

Fore wings with the gradates wholly dark; origin of radial sector, radials almost wholly, and some costals at lower ends dark; stigma pale yellowish. In hind wings the gradates slightly dark. In fore wings four or five inner and seven outer gradates, outer row parallel to margin, inner row plainly divergent; six cubitals beyond the divisory cell, latter ends much beyond the cross-vein; third cubital cell as long as second, broader. In the subcostal stigmal area two or three cross-veins; hairs on veins rather short; branches of radial sector slightly bent at inner gradates; costal area at broadest is equal to the radial and also to postcubital area, latter about a third broader than cubital. In hind wings four inner and five outer gradates, not quite parallel, and the inner series nearer to the radial sector.

Length fore wing 12 mm., width 4.5 mm.

From Barro Colorado, Canal Zone, 9 October (M. Bates). Type M.C.Z. no. 25646.

Agrees partly with *bouvieri* and *divergens*; but neither have stripe on basal joint of antenna, and neither have extensive red marks on head.

*Chrysopa brevihirta* sp. nov.

Head pale, a faint reddish mark between antennæ and also a faint reddish suffusion on the vertex just back of each antenna, no mark on cheeks; palpi and antennæ pale yellowish, unmarked; pronotum pale, with a red stripe each side, rest of thorax, abdomen, and legs pale, unmarked. Fore wings with the gradates brown, radials and costals, and a few other cross-



veins toward base paler brown; in hind wings the gradates only faintly brown.

Pronotum broader behind than long in middle, sides sloping forwards. In fore wing the costal area at broadest is not nearly as wide as the radial area, latter a little broader than post-cubital area, which is scarcely wider than the cubital area; three or four inner gradates, seven or eight outer ones, in parallel series, the inner row nearer to outer than outer to the margin, inner arising not far before the last cubital cross-vein; six cubitals, beyond divisory, latter ending beyond the cross-vein above; the third cubital cell a little longer than the second, and plainly broader; twelve radial cross-veins; the costal stigmal area hardly one half as broad as the subcostal area, and the latter with six or seven cross-veins. Hair on veins very short, on the broadest costal cells the hair is not one fourth the width of the cell; although several of the costal cells toward base are unusually broad; there are the usual seven cross-veins before the origin of the radial sector.

In hind wings three or four inner and seven outer gradates, parallel, and near together.

Length of fore wing 14 mm., width 5 mm.

From Tuxpan, Mexico, 9 September (McClendon coll.).  
Type M.C.Z. no. 25649.

#### *Chrysopa caligata* sp. nov.

Head pale, unmarked; palpi pale; antennæ longer than fore wings, pale, first joint with a red stripe above; pronotum broader than long in middle; narrowed near front a red stripe each side, not quite on margin; rest of thorax and abdomen pale, unmarked.

Fore wings with some costals, radial, cubitals, and branches of cubitus dark in middle, or almost wholly dark; gradates plainly dark brown; some marginal forkings dark; stigma pale; in hind wings outer gradates dark. In fore wings the radial area is much broader than the costal area and as broad as the post-cubital area, latter about as broad as the costal area; six cubitals beyond divisory cell, latter ends plainly beyond cross-vein above; three or four inner, and seven or eight outer gradates, inner close to and parallel to the outer row; third cubital cell as long as second; branches of radial sector scarcely bent at inner gradates; hair of moderate length. In hind wings two or

three inner and six or seven outer gradates, in parallel rows. Subcostal stigmal area rather broader than costal and with five cross-veins.

Length of fore wing 12 to 13 mm., width 4.2 to 4.5 mm.

From Barro Colorado, Canal Zone (Banks), and Puerto Cabello, Panama, 11 June (Englehart). Type M.C.Z. no. 25648; paratype, Barro Colorado, C. Z., 11 March (A.M.N.H.). Possibly close to *Ch. sanguinea* Navas, but nothing is said of red on pronotum, and there is a mark on cheek (not in *caligata*). One from Guatemala, August (U.S.N.M.) is probably the same.

*Chrysopa everina* sp. nov.

Similar to *Ch. everes*; black antennæ beyond second joint, becoming paler beyond middle; cheeks, palpi, basal antennal joint, all unmarked; nor even a red dot by eyes on the vertex, pronotum, thorax, abdomen, legs all pale. Wings with the gradates in fore wings dark brown, in hind wings more faintly brown; scarcely any other veins dark in either wings, some of radials a darker green in middle; stigma only faintly darker. Antennæ shorter than wings; pronotum much broader than long, sides parallel, front margin convex, a distinct median groove in the part behind the transverse furrow.

Wings moderately broad, hind wings acute at tip. In fore wings the costal area at widest is as broad as the postcubital area, and almost equal to the radial area; the cubital area about three fourths as wide as the postcubital; inner gradates five, outer seven, inner row plainly a little divergent from the outer and arising from near the penultimate cubital cross-vein, last three of inner series nearer to radial sector than to the outer row; six cubital cross-veins beyond the divisory cell, latter ends beyond the cross-vein above; third cubital cell as long as second and broader. In hind wings the gradates are also rather far apart, three or four inner, and five or six outer ones.

Length of fore wing 11.5 mm., width 4.5 mm.

From Lancetilla, Tela, Honduras, 4 May (M. Bates). Type M.C.Z. no. 25644.

Readily separated from *everes* by the more widely separated gradates.

*Chrysopa fairchildi* sp. nov.

Head, palpi, and antennæ pale, without marks, vertex each side by eye faintly suffused with rufous; pronotum, thorax,

abdomen, and legs pale, unmarked; wings with greenish venation, in fore wings the gradates wholly dark; some of the costals in middle, some branches of cubitus, the last few cubitals, and radials more or less, dark; in hind wings the gradates less plainly dark.

The antennæ shorter than wings; pronotum broader behind than long in middle, sides sloping toward front.

Wings moderately broad, hind wings acute at tip; in fore wings five inner, seven outer gradates, in parallel rows, the inner much nearer to outer than outer row to margin, the inner row arising nearer to the last cubital cross-vein than to the penultimate. Costal area at widest not equal to radial area, the latter equal to the postcubital area, and this last about one and a half times broader than the cubital area; six cubital cross-veins beyond divisory cell, the latter ending beyond the cross-vein above; the third cubital cell as long as the second and a little broader; branches of radial sector but little bent at inner gradates; in hind wing two to three inner and five outer gradates, parallel and near each other.

Length of fore wing 12 mm., width 4.3 mm.

From Juan Mina, Rio Chagres, Canal Zone, 11 April (G. B. Fairchild). Type M.C.Z. no. 25650.

#### *Chrysopa infausta* sp. nov.

Body pale, no mark on face nor cheeks; palpi pale; antennæ pale, the first joint with a red stripe on outer side, and the second joint partly reddish; pronotum with a narrow red line on each side margin; rest of thorax, the abdomen and legs all pale, unmarked.

Fore wings with nearly all cross-veins wholly or partly dark, and both gradate series bordered with dark, branches from radial sector and from cubitus mostly pale, marginal forkings dark; stigma pale yellowish.

Wings rather narrow; fore wings almost and hind wings plainly acute at tips. In fore wings the costal area at broadest not nearly as broad as the radial area which is equal to the postcubital area, the latter one third broader than the cubital area; six cross-veins beyond the divisory cell, latter ends well beyond the cross-vein above; four or five inner, six outer gradates, outer parallel to outer margin, inner somewhat divergent from outer, last one or two of inner series nearer to outer than

the others; branches of radial sector not at all bent at inner gradates; third cubital cell about as long as second, the divisory cell a little more than one half its length; the subcostal area of stigma plainly broader than the costal part and with three cross-veins. In hind wings three inner and five outer gradates, not parallel.

Pronotum broader than long, sides parallel, but narrowed near front.

Fore wings 10.5 mm. long; 3.5 mm. wide.

From Hamburg Farm, Costa Rica, April (C. W. Dodge).

Type M.C.Z. no. 25647.

Of the size and general appearance of *Ch. gradata* and *Ch. longicella*; *gradata* has black antennæ, dark mark on cheeks, and gradates parallel. *Ch. longicella* has the palpi partly black, the gradates not bordered, and the rows nearer each other, and parallel. *Ch. infausta* is very similar to *bimaculata*, but differs in pale palpi and the bordered gradates.

#### Key to Species of *Nodita*

1. Antennæ beyond second joint wholly black, pronotum showing transverse groove . . . . . 2
  - Antennæ if dark only on basal third or less, or only beneath . . . . . 3
2. Outer part of hind marginal vein of hind wings plainly brown; palpi pale; basal joint of antenna with reddish stripe . . . . . *panamana*
  - Outer part of hind marginal vein of hind wing not brown, palpi marked with dark; basal joint of antennæ not plainly striped . . . . . *ramosa*
3. Very large species, fore wings about 20 mm. long or longer; hind margin of hind wings often with a distinct brown shade or at least the marginal vein brown . . . . . 4
  - Smaller; hind margin of hind wings not brown . . . . . 8
4. Pronotum with a row of reddish spots or a stripe much before side margin, pronotum longer than broad . . . . . 5
  - If red on pronotum it is close to side margin, and pronotum about as broad as long . . . . . 6
5. Pronotum with a row of red spots each side . . . . . *luctuosa*
  - Pronotum with a stripe each side . . . . . *egregia*



6. Radial sector dark for a space before the stigma, usually outer gradates only dark . . . . . 7  
 Radial sector not partly dark, both rows of gradates dark . . . . . *singularis*
7. Divisory veinlet ends on end of cell as in *Leucochrysa*; pronotum with a reddish spot each side near middle of length . . . . . *alloneura*  
 Divisory veinlet normal for *Nodita*; pronotum with a stripe each side . . . . . *maronica*
8. Radial sector in fore or hind wings black in part near stigma, at least branches each side black . . . . . 9  
 Radial sector not black in part . . . . . 15
9. Palpi partly black; often a dark or reddish band across lower part of face, or a spot on each side . . . . . 10  
 Palpi pale; if a band on face it is just below antennæ . . . 14
10. Tip of hind wings dark; usually some outer gradates bordered with dark . . . . . 11  
 Tip of hind wings not dark; outer gradates not bordered 12
11. Inner gradates dark; most cross-veins dark; basal part of antennæ below with dark marks . . . . . *orthones*  
 Inner gradates partly pale; many cross-veins pale; basal part of antennæ not dark below, some cross-veins bordered . . . . . *askanes*
12. Antennæ black about one third way out beyond second joint; marginal forks not wholly dark . . . . . *navasi*  
 Antennæ at most dark for a short distance below . . . 13
13. Radial sector in both wings partly black; end of third cubital cell very oblique; marginal forks almost wholly black . . . . . *lancala*  
 Radial sector in hind wings only partly dark; end of third cubital cell scarcely oblique; marginal forks dark only at base; wings narrower . . . . . *caucella*
14. A red spot each side near middle of face . . . *pallescens*  
 No such spots . . . . . *mexicana*
15. Hind wings much marked with dark, the tips black . . . . . *postica*  
 Hind wings little if any marked with dark . . . . . 16
16. Basal joint of antennæ nearly wholly dark above, and often on outer side; usually several of the gradates bordered;

- palpi pale; pronotum hardly longer than broad, and with a reddish line on side . . . . . *cortezi*  
 Basal joint at most with one or two stripes . . . . . 17
17. One or two dark or reddish bands across face; vertex with an angulate red line . . . . . 18  
 No bands across face, at most a spot each side . . . . . 20
18. Two stripes on basal joint of antennæ, one inner, one above; pronotum plainly longer than broad, with two dark spots each side . . . . . *Leucochrysa duarte*  
 Basal joint with but one dark stripe . . . . . 19
19. One dark band across face, basal part of antennæ dark for a few joints beyond the second . . . . . *maculata*  
 Two reddish bands across face and upper clypeus, basal part of antennæ not black; vertex with some dark transverse marks more or less distinct . . . . . *serrei*
20. Several joints of antennæ beyond the second with a dark mark beneath; vertex with an angulate red line in front; palpi pale . . . . . *antennata*  
 No joints marked beneath with dark on antennæ . . . . . 21
21. Basal joint of antenna with a reddish or dark stripe, several of the outer gradates bordered . . . . . 22  
 Basal joint of antenna without a distinct stripe, but sometimes wholly pale rufous; outer gradates not so plainly bordered . . . . . *læertes*
22. Palpi pale, unmarked . . . . . *punctata*  
 Palpi largely dark . . . . . *salleana*

SPECIES DESCRIBED FROM THIS REGION BUT NOT RECOGNIZED,  
 OR PERHAPS SYNONYMS

*Nodita explorer* Hagen 1861, type appears to be lost; agrees in some ways with *N. antennata*, but said to have a large dark spot on face.

*Chrysopa sulcata* Navas 1921, according to Smith notes is a *Nodita*; in the synopsis it will run to *duarte* from which it differs in having the pronotum broader than long.

*Nodita campioni* Navas 1914, is related to *askanis*, but the latter has a band across lower part of face at clypeal border, inner gradates not dark, and pronotal stripes have an inward projection.

*Nodita fuscinervis* Navas 1914, a rather large species, fore wing 19 mm. long, is about size of *pallescens*, but latter has the antennæ pale at base, no veins near wing base black, face differently marked.

*Nodita nevermanni* Navas 1928, is said to have basal antennal joint dark above which would thus fit *cortezi*, but the figure shows the pronotum shorter.

*Nodita salleana* Navas 1911 (*Chrysopa*). It is put in the synopsis through description and Smith notes.

*Nodita antica* Navas 1913 will run out to *N. punctata*, but from figure is a Leucochrysa. *Nodita lateralis* Navas 1913 also goes to *N. punctata* in table, but may be different.

*Nodita superior* Navas 1913 is a rather large species, with two curved marks on vertex; I have not seen it.

*Nodita zapotina* Navas 1913 seems to agree well with *N. antennata*.

*Nodita centralis* Navas 1913 may be *luctuosa* or near it, but the description does not fully agree.

*Nodita ceratica* Navas 1911 (*Chrysopa*) is a small species with several joints of antennæ near base dark; I cannot match it with any I have here.

*Nodita alternata* Navas 1913 may be the same as *N. mexicana* Bks.

*Nodita indiga* Navas 1928. Probably related to what I described as *N. askanes*, but no mention of dark area on radial sector, and over outer gradates.

*Nodita postica* Navas 1913 seems to be close to *radiosa* Gerst. or the same; I have not seen *N. radiosa* from Central America.

#### RECORDS

*Nodita luctuosa* Bks. 1914

Type from Orosi, Costa Rica.

*Nodita egregia* Navas 1913

From El Valle, Coclé Prov., Panama, 20 May.

*Nodita maronica* Navas 1915

From Barro Colorado, Canal Zone 10-13 November and 3 January. Described from French Guiana.

*Nodita ramosa* ? Navas 1917a

From Barro Colorado, Canal Zone, 20 July, 2 August; both specimens have palpi marked with black and may be new.

*Nodita maculata* Navas 1928

From Boquete, Chiriqui, Panama, 10 May, and El Volcan Chiriqui, 30 April.

*Nodita singularis* Navas 1913

One from El Cermeno, Panama, April–May, agrees well with the description.

*Nodita caucella* Bks. 1910.

From El Cermeno, Panama, April–May, and Panama City, Panama, 4 May. Described from Colombia.

*Nodita antennata* Bks. 1915

Type from Tuxpan, Mexico, 4 May.

*Nodita mexicana* Bks. 1900

From Cavarillo, Vera Cruz, Mexico, Lancetilla, Honduras; and Taboga Island, Panama, 10 June.

*Nodita punctata* Bks. 1903

Type from Guatemala; others, Barro Colorado, Canal Zone, November; and Corozal, Panama, 12 February.

*Nodita cortezi* Navas 1913

The specimens which agree with the description and figure have a dark brown spot below the base of each antennæ, not mentioned by Navas or Smith, but they could be overlooked. *N. calverti* Bks. 1914a is the same species, published a few months later. Specimens from Pedregoso, Costa Rica, February; La Campina, Panama, September, El Cermeno, Panama, April to May, and Costa Rica. *N. nevermanni* Navas 1928 may be the same species.

*Nodita navasi* Kimmins 1940

Kimmins lately renamed the second *Nodita alternata* 1914 of Navas; specimens from Lancetilla, Honduras.

*Nodita serrei* Navas 1923

From El Cermeno, Panama, April to May.

## DESCRIPTIONS OF NEW SPECIES

*Nodita alloneura* sp. nov.

In general structure close to *N. maronica*, but has the divisory cell as in *Leucochrysa*. Markings also similar, the radial sector



is black for some distance before stigma and branches each side black for a short distance; the marginal forks are wholly brown, and the hind margin of hind wings is brown; both rows of gradates pale. Stigma yellowish, with a prominent black spot at base. There are no marks on head, and antennæ pale. The pronotum is shorter than in *maronica*, being plainly broader behind than long in middle; there is a red spot near margin at about middle of length; lateral lobes of mesonotum with a small red spot in front; abdomen with a reddish spot each side on each segment, forming a row close to the median line.

The fore wings are nearly as broad as in *maronica*; the radial sector strongly curved, the radial area at widest much broader than the costal area; the inner gradates of twelve or thirteen extending somewhat basally; the outer gradates probably of twelve or more, the more basal ones being perfectly continuous with the medius, the two rows being more divergent and further apart than in *maronica*. There are nineteen radials and eight cubital cross-veins beyond the third cubital cell. In hind wing the radial sector is also black before stigma, other veins pale; the gradates, eight to ten, are more nearly parallel than in fore wing.

Length of fore wing 20 mm., width 7.5 mm.

One from Barro Colorado, Canal Zone, 2 December (M. Bates coll.). Type M.C.Z. no. 25652.

#### *Nodita askanes* sp. nov.

Face with a reddish spot each side between the eye and upper corner of clypeus; maxillary palpi largely black; antennæ pale, basal joint with a rather broad reddish stripe on outer side, second joint with a dark mark, six to ten joints beyond marked with black beneath; vertex with a reddish spot each side just above outer base of antennæ; pronotum with a moderately broad red stripe each side, at about middle there is a projection inward (somewhat like *indiga*), mesonotum usually has a reddish dot each side, and sometimes one over base of fore wings; abdomen with two large black spots above, one toward base, other toward tip; legs pale, unmarked.

Fore wings with radial sector more or less plainly black near the stigma, and two or three branches each side are black, and some of them bordered near the sector; origin of radial sector, last cubital cross-vein, first one or two of outer gradates also

bordered with brown; outer gradates and some of the inner row, most of the marginal forks at base and sometimes the last two or three of the branches of cubitus are brown; some of the costals, radials, and cubitals are usually partly brown; stigma brown at base. In hind wings the cross-veins and gradates mostly pale, sometimes one or two of the marginal forks dark, the radial sector is faintly dark toward the stigma and latter brown at base; the tip of wing has a prominent brown spot.

The pronotum is broader behind than long and with a median depressed line. In the fore wings the costal area (at broadest) is about as wide as the postcubital area, not as broad as the radial area; basal side of divisory cell moderately oblique and about one half to two fifths of the outer side; seven cubitals beyond divisory, all the cells longer than high; gradates usually five or six in each row, the rows parallel, but not very near each other, the branches of radial sector much bent at inner gradates; several cross-veins in subcostal stigmal area, many in costal area.

In hind wings usually four or five inner, five or six outer gradates, nearly parallel, seven cubital cross-veins.

Length fore wing 13 mm., width 4.5 mm.

From Moca, Gautalon, Gutemala, March, April, 1000 m. (Bequaert), old specimen "Guatemala," and Subirana, Yoro, Honduras, 7 March (Stadelman). Type M.C.Z. no. 25654.

#### *Nodita lærtes* sp. nov.

Face with a small reddish spot below each antenna, and not far from inner edge of eye (sometimes obscured by discoloration); palpi pale; vertex with a small spot or two short fine divergent lines of red in front, or sometimes absent; antennæ pale, basal joint without stripe, but sometimes more or less wholly rufous above; no dark dots on under side of antennæ toward base; pronotum with a short stripe or line near middle each side, sometimes reaching front; mesonotum usually brown on the lateral lobes and extending slightly over base of wing; the front of anterior lobe usually marked with reddish or dark; abdomen with two large dark spots above; legs pale.

Fore wings with gradates and last one or two cubitals wholly dark, not bordered; origin of radial sector, marginal forks at base, and many cross-veins at one or both ends dark; stigma

with a prominent dark brown spot at base. In hind wings the venation is mostly pale, the outer gradates dark.

Pronotum hardly as long as broad behind, narrowed toward front, depressed along middle. Fore wings rather broad and blunt toward tip; ten or eleven radial cross-veins, four to six inner and five to seven outer gradates, nearly parallel; the inner gradates usually arising beyond the penultimate cubital cross-vein; the branches of radial sector not much bent by the inner gradates; the costal area almost as broad as the postcubital, the radial area broader than either; in hind wings seven cubital cross-veins, about eight radials, gradates with usually four in each row, parallel, but rather widely separated.

Length of fore wing 10 to 11.5 mm., width 4 to 4.5 mm.

Several from Juan Mina, Rio Chagres, Canal Zone, 11, 12 April (Fairchild coll.). Type M.C.Z. no. 25656. *N. ceratica*, *indiga*, and *championi* have dark dots on under side of antennæ toward base, but are otherwise somewhat related.

#### *Nodita orthones* sp. nov.

Face with a black spot under each antenna, and another in middle below them, maxillary palpi mostly dark, the depression of vertex dark each side; antennæ pale, basal joint rather slender, with a reddish streak on outer part above, not a definite stripe, rest of antennæ wholly pale; pronotum with a reddish stripe each side, rather broad in front, middle of pronotum depressed and dark (probably discolored) meso- and metanotum mostly dark, extending out on base of wings; abdomen without definite dark spots; legs pale.

Fore wings with the radial sector dark for quite a long distance; gradates black, outer ones and base of radial sector bordered; nearly all other cross-veins and marginal forks wholly dark brown, a few of radials not wholly dark, the intermediates and branches of radial sector to the inner gradates dark, between the gradates series the branches are mostly pale; stigma with a rather pale brown spot at base. In hind wings some of the costals, the gradates, the marginal forks, and the last few radials are dark, the radial sector is plainly dark for a short distance; the tip of wing and the base of stigma are brown.

The pronotum is nearly as long as broad behind, the median depression prominent, no transverse groove.

The fore wing has the costal area rather narrow, not as broad

as the postcubital area, and the latter not nearly as broad as the radial area; base of divisory cell about two thirds of outer side, and moderately oblique, tip of third cubital cell plainly oblique, seven cubitals beyond the divisory, the cells mostly longer than broad; a few cross-veins in subcostal stigmal area, many in the costal area, five inner and six outer gradates, only slightly divergent, branches of radial sector much bent at inner gradates. In hind wing four gradates in each series, rows slightly divergent, seven cubital cross-veins.

Length of fore wing 13 mm., width 4.7 mm.

One from Juan Mina, Rio Chagres, Canal Zone, 12 April (Fairchild). Type M.C.Z. no. 25655.

*Nodita pallescens* sp. nov.

Face with a rounded red spot on each side below antenna; palpi pale; front of vertex with an angulate red line across; antennæ pale, the basal joint with a faint reddish spot at outer tip, no distinct stripe; pronotum with a faint line each side, on the posterior part is a dark line on each side, its front end bent toward the middle; meso- and metanotum greenish, unmarked. Abdomen pale, slightly darker at ends of segments; legs pale, very slender.

In the wings the veins are very fine; in fore wings the gradates are mostly dark (not black), the marginal forks also, the radial sector at base and toward stigma a rather long stretch dark; nearly all the cross-veins are partly dark, usually only in middle. In the hind wings the radial sector and two or three radial cross-veins dark near stigma; the gradates are scarcely darkened, the outer ones more plainly so; the stigma is not plainly brown at base, but the subcostal vein there is black.

The pronotum is about as long as broad behind, near front much narrowed.

The wings are long and slender; in the fore wings the costal area is almost as wide as the post-cubital, the radial area broader than either; the third cubital cell is scarcely narrower at base than at the oblique tip; the divisory cell ends far beyond the cross-vein above, the base quite oblique and but little more than one half of the outer side, seven or eight cubitals beyond; eight inner and nine outer gradates, the rows slightly divergent, branches of radial sector strongly bent by inner gradates, and more than usual by the outer series; fifteen radial cross-veins;



subcostal stigmal area with only a few cross-veins, costal area densely veined. In hind wings four or five inner and six outer gradates, nearly parallel, but not very near each other; eight cubital cross-veins, twelve or thirteen radials.

Length of fore wing 18.5 mm., width 6 mm.

One from San Jose, Guatemala, February 1905 (Baker).  
Type M.C.Z. no. 25651.

*Nodita panamana* sp. nov.

Head pale, a reddish spot or line under each eye; palpi pale; first three joints of antennæ pale, beyond deep black, basal joint with a reddish stripe above. Thorax pale; pronotum with red stripe each side; lateral lobes of mesonotum often with a dark dot toward front; abdomen pale, unmarked; legs pale.

Fore wings with long yellowish brown stigma, anterior end darker; gradates and outer marginal forks wholly dark, costals dark at one or both ends, radials and some others dark in middle or at one end; radial sector toward stigma dark for some distance, and dark at origin. In hind wings the radial sector is also dark for a space, the outer gradates and the outer part of marginal vein dark brown.

Pronotum almost as long as broad behind, narrowed somewhat toward front.

In fore wings the costal area at broadest is hardly as broad as the postcubital, the radial area much broader than either; base of divisory cell but little oblique, only about one half length of outer side which is curved; usually six or seven inner and eight outer gradates, not quite parallel, branches of radial sector much bent by the inner gradates; third cubital cell nearly as broad at base as at tip which is oblique, other cubital cells longer than broad, seven cubital cross-veins beyond the divisory; in subcostal stigmal area are a few cross-veins, many in costal area.

In hind wings about five or six inner and seven outer gradates, in slightly divergent rows, and rather further apart than in fore wing; seven cubital cross-veins; the radial area is broader than the postcubital.

Length of fore wing 15 mm., width 5 mm.

Many specimens (alcoholic) from La Campana, Sept., and El Cermen, April, May, June, both Panama (Zetek coll.).  
Type in U.S.N.M. Paratypes there and in M.C.Z. no. 25659.

*Key to Species of Leucochrysa*

- 1. Fore wings about 20 mm. long or more . . . . . 2
- Fore wings about 15 to 17 mm. long . . . . . 6
- Fore wings about 12 to 13 mm. long, divisory vein usually ends on medius before end of cell . . . . . 7
- 2. Fore wing with a dark streak or umbra behind the rhagma . . . . . *dolichocera*
- No such streak . . . . . 3
- 3. In fore wing a cell behind third cubital cell is opaque, sometimes also opaque above it . . . . . *clara*
- No such opaque cell . . . . . 4
- 4. Radial sector much curved and black for a space before the stigma . . . . . *Nodita alloneura*
- Radial sector only slightly curved and not black toward stigma . . . . . 5
- 5. Pronotum plainly longer than broad behind, and tapering forwards . . . . . *varia*
- Pronotum about as broad behind as long in middle, less tapering in front . . . . . *pretiosa*
- 6. Base of radial sector covered by a large dark spot; inner gradates not extended basally . . . . . *notha*
- Base of divisory cell covered by a black mark; inner gradates extended basally . . . . . *erminea*
- 7. Two spots each side on margin of pronotum, one reddish, one nearly black; a reddish spot under each eye; basal joint of antennæ with reddish stripe above; outer gradates bordered . . . . . *duarte*
- A marginal line on pronotum; no spot under eye; basal antennal joint reddish on outer side . . . . . *antica*

*Leucochrysa variata* Navas 1913 and *L. angradi* Navas 1911 I presume are the same as *pretiosa* Bks. 1910, at least I do not know how to separate them. *L. negata* Navas 1913 appears to be different from any I have seen, although said to be similar to *variata*. *L. delicata* Navas 1925, I think is surely *pretiosa*.

RECORDS

*Leucochrysa clara* McLachl. 1867  
 From Bugaba, Panama and El Volcan Chiriqui, 24 February.  
*L. scioptera* Navas 1913 is the same species.

*Leucochrysa varia* Schneider 1851

Recorded from the region by Navas, but probably *pretiosa*.

*Leucochrysa pretiosa* Bks. 1910

From Barro Colorado, Canal Zone, January, 15, 22, 25 July, December; El Cermeno, Panama, April, May; La Campana, Panama, September, Cayuga, Guatemala, June; Volcan Sta. Marta, Guatemala, June; Limon, Costa Rica, 24 May; and Alta Vera Paz, Guatemala, 24 April. In *pretiosa* the inner gradates are more nearly parallel to the outer and do not extend up so near to the radial sector as in *varia*. Also in *pretiosa* the divisory cell has the outer side little longer than basal side; in *varia* the basal side is usually much shorter, but there is variation; the sure way to separate them is by the longer pronotum of *varia*. From the Hagen collection we have a type or cotype of *varia*.

*Leucochrysa notha* Navas 1913 is not a *Nodita*, but I have not seen it in my material.

*Leucochrysa dolichocera* Navas 1913 I have not seen, but is evidently related to the South American group of *longicornis* and so placed in synonymy.

*Leucochrysa vulnerata* Navas 1914 from Guatemala; probably related to *pretiosa*.

## DESCRIPTIONS OF NEW SPECIES

*Leucochrysa duarte* sp. nov.

Face with a reddish spot each side near eye (not below), the two connected by a faint line; last joint of maxillary palpi mostly black; a dark spot just above base of antennæ, basal joint of antennæ blotched with reddish, on the outer side nearly forming a stripe, second joint reddish, third joint black in front, beyond wholly pale; pronotum with two somewhat rounded reddish spots on each side margin, one at anterior end, very dark, other at about middle; a small reddish spot on each lateral corner of the anterior lobe of the mesonotum, a reddish and blackish mark on base of each wing, scarcely extending over the lateral lobes, rest of thorax pale yellowish; abdomen pale, with three large black spots above, one near base, the others on adjoining segments near tip; legs pale.

Fore wings with a dark spot over base of radial sector, and the outer gradates black and plainly margined with brown, also

over the last cubital, and the bases of marginal forks; inner gradates dark, one or two of them faintly margined; the stigma with a large dark spot at base, and behind are three or four dark radials, faintly margined; the cubital cross-veins are also dark and some slightly bordered; many costals wholly or partly brown. In the hind wings the outer gradates faintly dark; the stigma with a large brown spot, and behind one or two radials dark. The pronotum is plainly longer than broad, the sides parallel. In the fore wings there are eleven radials, five or six outer and five inner gradates, not parallel, rather wide apart, the inner row nearer to radial sector than to the outer row, latter rather close to outer margin; branches of radial sector much bent at inner gradates; veins only sparsely haired; divisory cell long, tip sharp-pointed and on one wing almost reaches the end of cell, base slightly oblique, hardly one half of outer side, seven cross-veins beyond; costal area nearly as wide as post-cubital, but the radial area still broader (at its broadest); cubital area not one half of postcubital. In the hind wings the postcubital area is not quite as broad as the radial; four inner, five outer gradates, nearly parallel, but well separated; six cubitals, eight radial cross-veins.

Length of fore wing 11 mm., width 3.8 mm.

One from Pedrogoso, Costa Rica, 2100 ft., February, (Rounds coll.). Type M.C.Z. no. 25658.

Differs from *Nodita cortezi* in longer pronotum, with two rounded spots each side (instead of one line); the reddish (instead of brown) spots below antennæ, and further down; in the partly black palpi; and the basal joint of antennæ not so much dark; and by the slightly curved radial sector belongs in *Leucochrysa*. From *Leucochrysa notha* and *antica* Navas it is separated by the spots on face and side of pronotum; the stripe on basal joint of antenna on upper (not outer) side; the palpi are marked with dark, and the inner gradates run up closer to the radial sector.

#### *Leucochrysa erminea* sp. nov.

Face without definite marks, except dark spot under each eye; palpi pale, marked with dark; antennæ very long, pale, basal joint and second dark above, a faint dark mark over two more joints; pronotum broader than long, sides dark; mesonotum dark over base of fore wings, metanotum dark in front,



scutellum pale; abdomen with two segments toward tip reddish above. Fore wings with dark spot over the short vein below divisory cell, more over base of radial sector; dark spot at base of stigma, another over last cubital cross-vein, one or two cross-veins before also brown, outer gradates brown, also base of outer forks, few cross-veins dark at one end, mostly pale. In hind wings the stigma dark at base, veins mostly pale, outer gradates partly dark.

In fore wings the costal area fully equal to radial area in width; fifteen radials, eight cubitals beyond third cubital cell, eight or nine inner gradates, six outer ones, inner row extended basally, four cubital cross-veins beyond its origin, slightly divergent from outer row. In hind wing eight cubital cross-veins, seven inner and six outer gradates, inner row extended basally a little.

Fore wing 15.5 mm. long, 5.5 mm. wide.

One from Barro Colorado, Canal Zone, August (F. H. Hull). Type M.C.Z. no. 25657.

### Neula Navas

I consider my *Allochrysa titan* as belonging to this genus. In the genotype from Colombia Navas shows an intermediate row of gradates; in *titan* the row is broken, two in one wing, four in other; however, it agrees with *Neula* in many other points. The radial area is broadest toward base (not in middle as in *Nodita*); and at middle (half way from origin to stigma) the radial sector is much nearer to radius than to medius. The costal area is not as broad as the radial area; the antennæ are very long; it differs from *Leucochrysa* chiefly in having the radial sector more sinuous.

### *Neula titan* Bks. 1915

I have seen only the type.

The palpi are partly black; the pronotum broad, the transverse groove near the hind border, in front of groove there is a slight elevation. The postcubital area about twice as broad as the cubital. The third cubital cell has one branch toward the margin and it soon forks, one part running into the fork of first anal vein, the other reaching the hind margin, alike in both fore wings. There are 20 to 22 radials, 13 to 14 inner gradates,

12 to 13 outer, the rows far apart and not parallel, giving room for the middle row; seven intermediates; ten cubitals beyond the third cubital cell. In hind wing eleven gradates in each row, rows fairly parallel; about nine or ten cubitals. The legs are rather stout, the hind tibia about three and a half times the length of the hind tarsus; front tibia hardly more than twice as long as tarsus.

Leimon, Costa Rica, 24 May (Schaus).

*Chrysopodes sallei* sp. nov.

Body and appendages pale, palpi pale; basal joint of antenna with two red brown stripes, one on outer side and one above; no mark on cheeks, pronotum with a red brown stripe each side; abdomen unmarked.

In the fore wings some of the costals, most of the radials, three intermediates, the gradates, all of the cubitals, and some of the branches of the cubitus are dark; stigma but little marked. Pronotum a little broader behind than long in middle, sides parallel to near front and then much narrowed; the transverse groove close to the hind ridge.

Wings moderately slender, tips in a point, hair of moderate length. In fore wings the costal area is not as broad as radial, the latter a little broader than the postcubital, and this much broader than the cubital area; eleven radials, five cubitals beyond the third cubital cell, all but the last one oblique; divisory veinlet parallel to the medius, latter slopes straight to its marginal fork; four inner and seven outer gradates, the rows parallel and near each other, the inner very far from radial sector. In hind wings two or three inner and four outer gradates, also parallel and near each other, seven cubital cross-veins.

Length of fore wing 14 mm., width 4.8 mm.

One labeled "Mexique Salle" from Hagen collection. Type M.C.Z. no. 25663.

Easily separated from *C. canudasi* Navas by the two stripes on basal antennal joint, fewer gradates, unmarked marginal forks.

*Chrysopodes canudasi* Navas 1913

Described from Guatemala; I have not seen it.

## RECORDS OF OTHER GENERA

*Berkmansus cinctipes* Bks. 1915

Type from Corozal, Panama. Described as a *Leucochrysa*; in structure like *B. elegans* Guerin, but without large marks. Besides the two dark bands on the tibia the tip of tarsus is black, and the outer margin of wing is dark at end of each vein. There are five or six cubitals beyond the third cubital cell; the gradates are parallel, the inner row almost as near to radial sector as to the outer row.

*Chrysopiella sabulosa* Bks. 1915

One from Tlahualilo, Durango, Mexico, 30 August, does not differ from specimens from Arizona.

*Eremochrysa punctinervis* McLachl. 1869

From Tlahualilo, Durango, Mexico, 30 August, and Sierra de los Burros, Coahuila, Mexico, 3 June. Like Texan specimens; *E. digueti* Navas 1911 may be the same species.

*Nadiva balboana* Bks. 1941

Types are from Barro Colorado, C. Z. in March and April.

*Meleoma innovata* Hag. 1861

From Contreras, Mexico, 2 July, and Amecameca, Mexico, also Cerro Tancitaro, Michoacan, Mexico, 8 July. *M. mexicana* Bks. 1899 is a synonym.

*Meleoma titschacki* Navas 1928 described from San Jose, Costa Rica, I have not seen.

*Meleoma dolicharthra* Navas 1914 (*Chrysopa*), I have not seen; it was described from Guatemala.

*Gonzaga torquata* Navas 1913

From Trinidad River, Panama, 2 March, and Alajuela River, Panama, 9 April.

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CUTANEOUS MYIASIS DUE TO *CUTEREBRA*  
IN MASSACHUSETTS

BY J. BEQUAERT

Museum of Comparative Zoölogy, Cambridge, Mass.

The Tumor Diagnosis Service of the Harvard Medical School recently referred to me a large maggot said to have been removed from the human skin. It was readily recognized as a bot-fly larva of the genus *Cuterebra*. As there appears to be no previous record of a bot of this type causing cutaneous myiasis in man, some further inquiry was made about this case.

Dr. Rene B. LeClair, of Ware, Massachusetts, who sent in the specimen, upon my request gave the following information with kind permission to use it in print. The maggot was extracted by Dr. LeClair in September, 1945, from the skin of a male resident of Ware. It was located about two inches below the right nipple in what was thought at first to be a furoncle. The posterior spiracles of the maggot showed, however, like a "black head" through an opening in the center of the swelling. The maggot was fully alive after removal. As now preserved in alcohol, it is 15 mm. long, 8 mm. wide and 6 mm. thick. The patient's living conditions are described as of a very low order, as he is more often drunk than sober. This may give a clue as to how the unusual infection was acquired.

The genus *Cuterebra* is restricted to the New World, where it is represented by many species attacking a variety of wild mammalian hosts and occasionally certain domestic animals.<sup>1</sup> Three species are definitely known to occur in New England, and more particularly in Massachusetts. While the specific larval characters of most species are as yet imperfectly known, this is fortunately not the case for our three local species. These may be readily separated by means of the descriptions and figures recently published by E. F. Knipling and A. L. Brody (1940, *Jl. of Parasitology*, XXVI, pp. 33-43, 2 Pls.). The human maggot of Ware shows all the characteristic features of

<sup>1</sup> The generic name *Cuterebra* is here used in the broad sense, to include *Bogeria* and several other groups which have been separated from it in recent years.

the third instar of *Cuterebra buccata* (Fabricius) and I do not hesitate in referring it to this species. The posterior spiracular plates are shaped as in Knipling and Brody's Pl. I, fig. 2; while the spines, which cover the body fairly uniformly, are as shown in their Pl. II, fig. 9, with simple, sharp, moderately long, slanting points. The normal larval hosts of *C. buccata* are wild and domestic rabbits, in which animals the mature third instar maggot reaches 26 to 32 mm. in length, so that the larva removed from man was about half-grown.

In tropical America the maggot of the genus *Dermatobia*, a relative of *Cuterebra*, common in many types of mammals, has often been observed attacking man. A careful canvassing of the literature has, however, failed to disclose a previous case of human cutaneous myiasis due to *Cuterebra* either in North or in South America. F. C. Bishopp (1942, Proc. Ent. Soc. Washington, XLIV, p. 15) reported that a first instar maggot of an unidentified species of *Cuterebra* was removed from the nostrils of a person in Arlington Co., Virginia. This human case was also discussed by R. G. Beachley and F. C. Bishopp (1942, Virginia Med. Monthly, LXIX, pp. 41-42).

## NOTES ON MAINE COLEOPTERA FOR 1945

BY C. A. FROST  
Framingham, Mass.

From the large piles of white pine planks at a saw-mill near South Paris, Me. the following rather uncommon species were taken: *Buprestis sulcicollis* Lec., *B. striata* var. *impedita* Say, three *Xylotrechus frosti* Van Dyke, four *Acanthocinus pusillus* Kby., a few *Chrysobothris harrisi* Hentz., *Monochammus titillator* Say, *M. confusor* Kby., *Enoclerus nigrifrons* Say, and many *Pissodes approximatus* Hopks. The very abundant species were: *Monochammus scutellatus* Say, *Chrysobothris dentipes* Germ., *C. scabripennis* Cast., *Enoclerus nigripes* Say, *Ips pini* Say and *Pityogenes hopkinsi* Sw. *Dendroctonus valens* Lec. and *Thanasimus dubius* Fab. were only occasional. On the under side of the scattered slabs and bits of boards were dozens of *Hylobius pales* Boh. which were also noted flying and one a captive of an *Asilid*. The time was from June 21 to July 6. Coleoptera have not been so abundant on lumber and logs since 1909 to 1912.

*Podapion gallicola* Riley. One specimen was taken either on the lumber or beaten from a red pine near the piles. I first took this species on June 29, 1930, at Wayland, Mass. by beating *Pinus rigidus* and have never taken it since in Mass.

*Platysoma*. Four specimens of an unknown species were taken at Paris, either on the under sides of the slabs or under white pine bark. It is related to *basale* Lec. but it is slimmer than the type and has the mesosternal marginal groove entire in front.

*Eros humeralis* Fab. A large colony of what appears to be this species was found under the bark of an old pine stump. They lack the usual yellowish humeral vittæ.

*Orchestes canus* Horn. The first record for this species from Maine is July 4, 1945. Four specimens have been taken at Framingham, Mass. and vicinity.



## SOME NEW OR LITTLE KNOWN SOUTHERN SPIDERS

BY ELIZABETH B. BRYANT

Museum of Comparative Zoölogy

At the Museum of Comparative Zoölogy within the last two years many spiders have been received from Mr. George Nelson that were collected in Alabama and Florida. Among them were found the following species that are either new or known only from one sex. All are in the museum collection.

## FAMILY OONOPIDAE

Genus *Philesius* Simon 1893*Philesius vernalis* spec. nov.

Female. Length, 1.6 mm., ceph. 0.4 mm., abd. 1.2 mm.

*Cephalothorax* bright brown, moderately convex, slightly granulate with a minute hair from each pit, anterior margin less than half the greatest width; *eyes*, a.l.e. largest of the six, separated by less than a radius, posterior row about the same length as the anterior row, straight, p.m.e. surrounded by black, a very broad oval, touching on the long diameter and separated from p.l.e. by about a line, p.l.e. smaller than p.m.e.; *clypeus* less than a diameter of a.l.e.; *labium* triangular, almost as long as broad; *maxillæ* inclined over labium, tips almost touching; *sternum* triangular, about two-thirds as wide as long, truncate between IV coxæ, all coxæ globose; *abdomen* pale, elliptical, half as wide as long, four-fifths of dorsum covered by an orange colored scutum, punctate, with a minute hair from each pit, venter with an orange colored scutum, that covers the basal two-thirds, also punctate with a hair from each pit, spinnerets closely grouped and not surrounded by a chitinous ring; *legs* paler than cephalothorax, no spines and very few hairs; *epigynum*, area swollen but showing no structure.

Holotype, ♀ Florida; Sebastian, March 1944, (Nelson).

The genus *Philesius* was based by Simon on a single species known from both male and female from St. Vincent. *Philesius marmoratus* the genotype, is much larger than *P. vernalis*. The genus is separated from *Gamasomorpha* which is widely dis-

tributed, by the ventral scutum shorter than the dorsal, and no chitinous ring about the spinnerets.

FAMILY PISAURIDÆ

Genus *Thanatidius* Simon 1898

*Thanatidius tenuis* (Hentz)

Figures 1, 6

*Thomisus ? tenuis* Hentz, 1847, p. 449, pl. 23, fig. 12; reprint, 1875, p. 82, pl. 10, fig. 12. "♀ Alabama."

*Thanatidius tenuis* Bishop, 1924, p. 18.

Male. Length, 14.6 mm., ceph. 5.5 mm. long, 4.0 mm. wide, an. margin, 2.0 mm., abd. 10.2 mm. long, 2.5 mm. wide at base, I leg. 42 mm. long.

*Cephalothorax* pale yellow, with a pair of narrow parallel darker stripes from p.m.e. to posterior margin, sparsely covered with short hairs, flat, thoracic groove very long and shallow, sides rounded and abruptly narrowed at region of posterior eye row to half the greatest width, an oblique row of bristles between lateral eyes and margin; *eyes* apparently in four rows, anterior row strongly procurved, eyes subequal, a.m.e. separated by slightly more than a diameter and from a.l.e. by fully two diameters, posterior row strongly recurved, slightly longer than anterior row, p.m.e. subequal with a.m.e., separated by fully two diameters, p.l.e. largest of the eight, slightly raised and directed backward, lateral eyes separated by about as much space as between p.l.e.; *quadrangle* of median eyes higher than wide and wider behind than in front; *clypeus* below a.l.e. less than a radius of a.l.e., a row of long bristles on margin of clypeus; *mandibles* vertical, pale, few long bristles near median margin, fang groove rather short, lower margin with three subequal teeth; *labium* white, longer than wide; *maxillæ* white, fully twice as long as labium, sides parallel; *sternum* white, flat, almost as wide as long, (4.0 : 4.5), with a few short bristles; *abdomen* a pale reddish-brown, very narrow, ending in a point above spinnerets, base bilobed, on sides a few dark dots, each bearing a short bristle, venter pale; *legs*, 1-2-4-3, all very long and slender; spines, I pair, patella, lateral, 2, tibia, ventral, 2-2-2-2-2, apical pair short, metatarsus, ventral, 2-2-2-2, all spines very long but not overlapping as in female; *palpus*, pale, not as long as cephalothorax, tibia longer than patella, but tibia

plus patella not as long as femur, tibia and patella each with a long dorsal spine, tibial apophysis very near distal end, a black, thin leaf-like projection, best seen in a lateral view, palpal organ very similar to *Thanatidius dubius* (Hentz), figured by Bishop and Crosby, 1936.

Allotype, ♂ Alabama; Silver Hill, July 1945, (Nelson); Additional specimens, ♀ Alabama; Silver Hill, July 1945, (Nelson); ♂ Alabama; Silver Hill, June 1945, (Krob).

The genus was based by Simon on *Thomisus* ? *dubius* Hentz and *Thomisus* ? *tenuis* Hentz, but as Bishop noted in 1924, unfortunately, Simon had a specimen of *Tetragonophthalma undulata* Keyserling instead of either of the two Hentz species. Bishop also erred in the number of ventral spines on the first and second tibiae. There are five pairs of ventral spines with the apical pair very short. In the female, the spines are long and over-lapping but in the male, the legs are so much longer that the spines do not over-lap. In 1924, Bishop in the revision of the Pisauridæ described females of *Thanatidius tenuis* from Georgia, Florida and Louisiana.

#### FAMILY OXYOPIDÆ

Genus *Oxyopes* Latreille 1804

*Oxyopes nelsoni* spec. nov.

Figures 5, 7

Male. Length, 5.0 mm., ceph. 2.4 mm. long, 1.6 mm. wide, abd. 2.5 mm. long.

*Cephalothorax* yellowish, with wide slightly converging lateral dark stripes from p.l.e. to posterior margin, median area with vague dark marks, eyes surrounded by wide black rings, clypeus black, cephalothorax very high, widest between third coxæ, gradually narrowed anteriorly, thoracic groove long and faint, thoracic portion falls abruptly from groove; *eyes*, anterior row strongly recurved, a.m.e. very small, separated by a diameter, a.l.e. about twice the diameter of a.m.e. and separated from them by more than two diameters, posterior row longer than anterior, strongly procurved, eyes subequal and equidistant; *quadrangle* formed by a.l.e. and p.m.e. slightly wider in front and higher than wide; *clypeus* not as high as quadrangle of median eyes, slightly convex; *mandibles* dark, vertical, cone-shaped, fang groove very short; *labium* brown at tip,

longer than wide; *maxillæ* one and a half times as long as labium, outer half black, narrow; *sternum* pale, with vague elongate dark marks opposite coxæ, nearly as wide as long, (3.0 : 3.5), ending in a sharp point between fourth coxæ; *abdomen* almost black with middle area paler, widest at base and tapering to width of spinnerets at tip, venter black; *legs* pale with a narrow ventral black stripe on femora, posterior femora with a ventral line of black dots parallel to black line, spines long and black, few trichobothria on ventral surface of femora near base; *palpus* black, not as long as cephalothorax, tibia slightly longer than patella, with a very large spatulate process with two small marginal chitinized teeth near base on ventral side, no chitinized lobe on base of cymbium to interlock with tibial process, cymbium covered with black hairs, almost as wide as long, (4:5), ending in a very slender tip.

Female. Length, 6.0 mm., ceph. 2.5 mm. long, 1.6 mm. wide, abd. 2.8 mm. long.

*Cephalothorax* same as in male, but clypeus pale with two dark lines from a.m.e. that continues the length of the mandibles; *eyes* same as in male but surrounding black rings narrower and area between eyes covered with short white hairs; *abdomen* with a wide median pale stripe, sides black, venter pale with two parallel dark stripes; *legs* same as in male, trichobothria very prominent on ventral surface of femora near base; *epigynum* with a wide hairy median lobe, with a rounded tip that does not reach fold, each side are chitinized areas which partly surround the transverse openings, anterior to openings but below surface are dark sacs.

Holotype, ♀ Florida; Sebastian, 1-8 April 1944, (Nelson).

Allotype, ♂ Florida; Sebastian, 1-8 April 1944, (Nelson).

Paratype, ♂ Florida; Sebastian, 1-8 April 1944, (Nelson).

In 1902, F. O. P.—Cambridge described in the Biol. Centr.-Amer., vol. 2, p. 344, *Oxyopes tibialis* from Guatemala. The description is very brief and the clypeus is described with "fine black line on each side that crossing the clypeus and running down the mandibles, and a narrow black line running down the anterior side of the femora of all four pairs of legs." The tibia of the palpus is figured with "a long conspicuous process beneath it, strongly and concavospatulate at the apex." The female of *Oxyopes nelsoni* has the black lines on the clypeus and mandibles, and the black lines on the femora but the tibial



process on the male palpus is much larger than is figured for *O. tibialis* and has two small teeth near the base and lacks the process on the cymbium.

Through the courtesy of Dr. H. Dietrich of Cornell University, I have been able to examine the holotype female and the allotype male of *Oxyopes aglossus* Chamberlin from Billy's Island, Okefenokee Swamp, Georgia, collected by Dr. C. R. Crosby, June 1912. Figures (8, 10) are now given for comparison of the epigynum and palpus of this species. Both differ from *O. nelsoni*. The epigynum of *O. aglossus* is very distinct. The median lobe has a truncate tip and below is a darkened transverse band that apparently connects the two sacs beneath the surface. The tibial apophysis of the male palpus does not project at right angles as far from the tibia as is shown in the original figure and on the ventral side there is a rather slender branch with an anterior tooth that is set at right angles to the tibia. The original figure was from the dorsal side and shows only the process and the interlocking process on the cymbium. It is not impossible that the figure was drawn from another specimen and may be another species.

#### FAMILY THERIDIIDÆ

##### Genus *Emertonella* gen. nov.

*Cephalothorax* low and flat, as wide as long, thoracic groove very short; *eyes*, both rows recurved, a.m.e. largest of the eight, lateral eyes touching; *quadrangle* of median eyes wider than long; *clypeus* higher than quadrangle; *mandibles* vertical and weak; *labium* wider than long; *sternum* as wide as long, prolonged between fourth coxæ in a truncate lobe; *abdomen* oval, dorsum thickened, venter with a large epigastric scutum that surrounds the pedicel and a large infra-mammillary scutum, both can be seen from dorsal side; *legs*, 4-1-2-3, differing little in length; *palpus* with a short straight embolus, parallel to the conductor. Female unknown.

Genotype: *Emertonella emertoni* (Bryant).

The genus *Emertonella* differs from the genus *Histagonia* Simon, 1894, by the sternum extending between the posterior coxæ, by a faint dorsal scutum and the well defined scutum around and anterior to the spinnerets; from the genus *Paidisca* Bishop and Crosby, 1926, by the faint dorsal scutum, by a large

ventral scutum that includes the spinnerets and the absence of a stridulating organ between the abdomen and the cephalothorax.

*Emertonella emertoni* (Bryant)

*Euryopis emertoni* Bryant, 1933, p. 1, fig. 1. "♂ Georgia; Thompson's Mills, (Allard), Banks Coll."

*Euryopis spinigera* Emerton, 1924, p. 143, figs. 4, a-d nec *Euryopis spinigera* O. P.—Cambridge, 1895, p. 146, pl. 19, fig. 2.

Male. Length, 1.8 mm., ceph. 0.7 mm., abd. 1.1 mm.

*Cephalothorax* low and flat, as wide as long, anterior margin very little narrowed, thoracic groove short, a group of short erect hairs arranged in a diamond pattern anterior to the groove; *eyes* heavily ringed with black, cover anterior margin, anterior row recurved, a.m.e. convex, largest of the eight, separated by less than a diameter, almost touching a.l.e., posterior row very slightly recurved, lateral eyes touching, p.m.e. separated by about a diameter and from p.l.e. by a radius; *quadrangle* wider than long, wider in front than behind; *clypeus* higher than quadrangle; *mandibles* vertical and weak; *labium* wider than long; *maxillæ* twice as long as labium and inclined; *sternum* pale, as wide as long, convex, tip prolonged between coxæ as a truncate lobe; a row of hairs about margin directed inward; *abdomen* pale gray, the color ending abruptly on the sides, oval, more than half as wide as long, (5.0 : 7.0), with many long stiff hairs, each from a dark granule, two pairs of muscle spots, venter almost covered by an epigastric and inframammillary scuta, the anterior margin of the former can be seen on the dorsum and extends to the middle of the venter, the inframammillary scutum almost reaches the middle of the venter and dorsally covers the constricted tip of the abdomen, several small chitinized spots on sides and between the two large ventral scuta, posterior half of the venter with numerous long hairs, each from a pit, hairs not as long as those on the dorsum; *legs*, 4-1-2-3, pale, with distal joints darker, no spines and few hairs, a tarsal comb on IV tarsus of six stiff bristles; *palpus* not as long as cephalothorax, pale, with terminal joint much darker, patella and tibia short and broad, terminal joint broad, embolus at tip, a short straight spine, parallel to the large conductor.

This species was briefly described and figured by J. H. Emerton in 1924, as *Euryopis spinigera* O. P.—Cambridge, 1895.

Emerton examined three specimens, all males from widely separated localities, Chatham, Massachusetts, Charleston, South Carolina, and Riverhead, Long Island, New York. The first two specimens are in the Emerton Collection and the last in the C. I. Crosby Collection at Ithaca. Within a few years, the species has been found in Alabama and Oklahoma. A careful examination shows several characters that were not mentioned in the Emerton description.

*Emertonella emertoni* differs from the genus *Euryopsis* by the very short thoracic groove, the two large ventral scuta, the numerous long stiff hairs on the dorsum. The two pairs of muscle spots on the dorsum are very conspicuous in this species.

FAMILY ARGIOPIDÆ

Genus *Theridiosoma* O. P.—Cambridge 1879

*Theridiosoma nelsoni* spec. nov.

Figure 4

Female. Length, 1.5 mm., ceph. 0.6 mm., abd. 1.0 mm.

*Cephalothorax* pale, head high; *eyes* about cover anterior margin, each eye heavily ringed with black, anterior row recurved, eyes subequal, a.m.e. diurnal, touching, posterior row procurved, p.m.e. largest of the eight, angular, touching, lateral eyes subequal and touching; *quadrangle* higher than wide and wider behind than in front; *clypeus* about as high as quadrangle; *mandibles* pale, vertical; *sternum* pale, dark about margins, not quite as wide as long, tip very broad and continued between the fourth coxæ as a broad lobe, convex, with many dark hairs; *abdomen* pale, with a narrow transverse silvery band about the middle that is broken on median line, oval, base high and extending over cephalothorax, a few short hairs on dorsum, venter pale gray; *legs* short and varying little in length, pale with rows of dark hairs; *epigynum*, area convex and slightly protruding from the venter, anterior margin very long, with area below very narrow, a broad median septum with dark areas each side.

Holotype, ♀ Alabama; Alexander City, 1-14 August 1944, (Nelson).

*Theridiosoma nelsoni* is much smaller than the two other species found in the United States. *Theridiosoma radiosum* McCook is found abundantly in the eastern part of the United

States. The p.m.e. do not touch, the abdomen is covered with a brown net work and the epigynum has a large chitinized hood that protrudes from the venter and shows a triangular opening below. *Theridiosoma argentatum* Keyserling was described from an immature male from Georgia. The cephalothorax is 0.8 mm. long and the abdomen, 2.2 mm. long, with silvery spots and a brown net work, this is shown in the figure of the entire spider but the figure of the eyes is undoubtedly wrong as the a.m.e. are the largest and neither the anterior or the posterior median eyes touch.

*Theridiosoma nelsoni* is probably the species figured by Dr. Archer, 1941, p. 18, pl. 1, fig. 4, as *Theridiosoma argentatum*. He describes it in life as "a minute spider — a red abdomen with a conspicuous transverse band across the middle. The red fades to greyish in alcohol." Unfortunately he gives no measurements but mentions several places in Alabama where it is found. The figure of the epigynum agrees fairly well with *Theridiosoma nelsoni*.

FAMILY GNAPHOSIDÆ

Genus *Sergiolus* Simon 1891

*Sergiolus meretrix* Chamberlin

Figure 3

*Sergiolus meretrix* Chamberlin, 1922, p. 153. "♂ North Carolina; Raleigh."

*Sergiolus meretrix* Kaston, 1945, p. 4, figs. 13, 22-24.

Female. Length, 5.3 mm., ceph. 2.5 mm. long, 1.5 mm. wide, abd. 3.0 mm. long, 1.5 mm. wide.

*Cephalothorax* yellow with scattered long dark hairs, moderately convex, anterior margin narrowed to about one-third greatest width, thoracic groove very short and faint at posterior third; *eyes* cover middle two-thirds of anterior margin, anterior row straight, eyes subequal and equidistant, a.m.e. diurnal, separated by about a diameter, posterior row longer than anterior row, recurved, eyes subequal, p.m.e. little nearer to p.l.e. than to each other; *quadrangle* narrower in front and higher than wide; *clypeus* narrow, about equals diameter of a.m.e.; *mandibles* yellow, with many long black bristles, vertical, cone-shaped; *labium* yellow, longer than wide, tip pointed; *maxillæ* yellow, twice as long as labium, strongly impressed, tips trun-



cate and black; *sternum* pale yellow with many black hairs, convex, three-fifths as wide as long, fourth coxæ separated by half a diameter; *abdomen* oval, black with three transverse bands of white hairs, the basal band widest and broken at the middle, the median and distal bands narrower and connected at the ends, venter black with a vague U-shaped stripe, spinnerets long, ventral pair widely separated; *legs*, 4-1-3-2, a darker yellow than the cephalothorax, no dark rings, very few spines, I and II tibiæ, dorsal, 0, ventral, 1 at tip, I and II metatarsi, dorsal, 0, ventral, 1 at base, III tibia with a dorsal median spine, IV tibia, no dorsal median spine; *epigynum*, area wider than long, a pair of transverse oval depressions with heavily chitinized margins, each with two pits, near the slender septum, one pit above the other.

Male. Length, 4.5 mm., ceph. 2.2 mm., abd. 2.3 mm. (Type).

*Cephalothorax* more slender than in the female; *eyes*, *mouth parts* and *sternum* as in the female; *abdomen* has been rubbed so that the white hairs on the basal band and the middle of the median band have disappeared, as well as the black hairs that cover the rest of the dorsum, showing a wide distinct scutum from the base to the white band near the tip, the posterior margin truncate, venter gray with wide pale lateral stripes; *legs*, I pair missing, III tibia with a strong dorsal median spine, IV tibia, no dorsal median spine; *palpus* shorter than cephalothorax, patella and tibia about as long as the diameter of the joint, tibial apophysis as long as the diameter of tibia, narrowing rather abruptly with the margins of the distal half parallel, with a recurved hook at the tip.

Holotype, ♂ North Carolina; Raleigh, (Brimley).

Allotype, ♀ Alabama; Alexander City, 1-14 August 1944, (Nelson).

Additional specimen, ♂ Alabama; Silver Hill, September 1945, (Nelson).

*Sergiolus meretrix* Chamberlin is separated from *S. variatus* (Hentz), found in the same area, by the broader transverse bands of white hairs on the abdomen and by the secondary characters. In the male of *S. meretrix* the scutum almost covers the dorsum, the tibial apophysis of the palpus is more slender and the sides of the distal half are almost parallel; in *S. variatus* the scutum covers about one-half the dorsum and the sides of the tibial apophysis are not parallel. The difference is as

great between the females of the two species, in *S. meretrix* the median septum of the epigynum is very narrow and the depressed areas are elongate, while in *S. variegatus* the septum is much wider and the depressions are nearly circular. Unfortunately, the specimen of *S. variegatus* figured by Mr. Emerton, 1890, pl. 4, fig. 1, probably lacks more than one moult of being adult.

FAMILY CLUBIONIDÆ

Genus *Clubiona* Latreille 1804

*Clubiona procteri* Gertsch

Figure 9

*Clubiona procteri* Gertsch, 1941, p. 10, figs. 17, 18. "♂ Indian Town, Florida, 28 March 1938."

Female. Length, 4.5 mm.

*Cephalothorax* typical; eyes seen from above, anterior row slightly recurved, eyes equidistant and subequal, posterior row slightly longer than anterior, eyes subequal, p.m.e. separated by fully two diameters and from p.l.e. by more than a diameter; quadrangle of median eyes narrower in front and wider than high; clypeus very narrow, less than a radius of a.m.e.; mandibles pale brown, geniculate, lower margin of fang groove with two teeth; epigynum, chitinized area longer than wide, posterior margin deeply notched, openings oblique, area between convex, spermatheca in anterior portion of area, separated by less than a diameter.

Allotype, ♀ Alabama; Silver Hill, July 1945 (Nelson). Additional specimens, ♂ Alabama; Silver Hill, July 1945, (Nelson). ♂ North Carolina; Raleigh, 5-10 June 1943, (Brimley). ♂ Florida; Wabasco, 25 April 1944, (Nelson).

FAMILY SALTICIDÆ

Genus *Habronattus* F. O. P.—Cambridge 1901

*Habronattus trimaculatus* spec. nov.

Figure 11

Male. Length, 4.0 mm., ceph. 2.1 mm. long, 1.5 mm. wide, abd. 2.0 mm. long.

Cephalic plate black, with three pale spots, median spot largest, lateral spots elongate, posterior margin of the darkened area deeply emarginate, a posterior median black spemark

that reaches line of dorsal eyes, area each side bright yellow, a wide lateral dark spot each side, margins yellow, a fringe of long dark hairs above anterior eye row, widest between second pair of legs, sides almost parallel, cephalic portion high, thoracic falling abruptly on posterior two-fifths; *eyes*, anterior row straight by upper margins, a.l.e. about half a diameter of a.m.e., eyes of second row very small, and nearer first than third row, eyes of third row on margin, eye area occupies about one-third of carapace; *quadrangle* as wide behind as in front; *abdomen* black with a narrow pale basal band that extends on sides, a narrow median pale stripe which does not reach either end of abdomen, and two short oblique pale bars from the sides that extend only a short distance on the dorsum, a pair of widely separated white dots above the spinnerets, venter pale with three dark stripes; *legs*, 3-4-1-2, pale, with distal joints darker, third leg not modified and no fringes on first pair, spines, I pair, patella, prolateral, 1, tibia, ventral, 2 distal, followed by 1 prolateral, 1-1 retrolateral, metatarsus, ventral, 2-2, twice the diameter of the joint, II pair, spines same as on I pair but smaller, III pair, femur, ventral, at distal end, short prolateral and retrolateral rows of long stiff bristles, (may be trichobothria), no ventral median spine on tibia; *palpus*, femur pale, tibial apophysis a very slender black spur with tip constricted in an out turned hook, palpal organ typical, with inner process starting about the middle and ending about half way on the side, outer process starting on side above the tibial apophysis, following the contour of the cavity and ending at the tip, more slender than the inner process.

Holotype, ♂ Florida; Sebastian, 1-7 April 1944, (Nelson).

The type and an immature male and female were collected at Sebastian, Florida in April by Mr. Nelson, probably by beating. All have the same markings. The species is related to *Habronattus delectus* (Peckham), known only from the type material of two males and a female found at Austin, Texas. It is separated from that species by the slightly larger size, darker legs, different spining of the first tibia and the tibial apophysis of the male palpus. Both have the three spots of white hairs in the eye area, a rather unusual character in this genus, but the posterior margin of the dark area between the dorsal eyes of *H. delectus* is transverse, while in *H. trimaculatus* it is deeply emarginate, and the tibial apophysis of *delectus* is broadly trun-

cate. It is separated from *H. tachypoda* Chamberlin and Ivie, 1944, found at Briar Creek, near Sylvania, Georgia, by the three white spots on the ocular area, the lack of modified hairs and bristles on the first tarsus, and the tibial apophysis.

Genus *Marpissa* C. Koch 1846

*Marpissa rupicola* (Hentz)

Figure 2

*Attus rupicola* Hentz, 1846, p. 357, pl. 21, fig. 14; reprint, 1875, p. 61, pl. 8, fig. 14. "♀ Alabama, September."

Female. Length, 10.5 mm., ceph. 4.5 mm. long, 3.5 mm. wide, abd. 6.0 mm. long, 3.5 mm. wide.

*Cephalothorax* darkest about the eyes, two converging dark stripes from p.m.e. to posterior margin, with area between pale, quite flat, sides rounded, widest between second and third coxæ, thoracic groove distinct; *eyes*, first row covers entire anterior margin, strongly recurved, a.m.e. almost touching and twice the diameter of a.l.e., eyes of second row slightly nearer first than third row, eyes of third row subequal with a.l.e., but convex; *quadrangle* same width in front as behind, a long bristle below each p.l.e.; *clypeus* about wanting below a.m.e.; *mandibles* brown, with many long white hairs, vertical, not swollen, fang groove short, upper margin with two teeth, one nearer base of fang larger, lower margin with one tooth, fang short with a thick base; *labium* more than twice as long as wide; *maxillæ* brown, almost twice as long as labium, tip widened; *sternum* about two-thirds as wide as long, narrower than labium at anterior end and ending in a rounded point in front of the fourth coxæ, widest between second and third coxæ; *abdomen* oval, quite hairy, dorsum flat, with a pale median stripe less than one-third the width of the abdomen, the pale stripe abruptly widened before the middle, the distal half bordered by dark stripes, a pair of small white dots above the spinnerets, sides mottled with dark, venter pale with dark dots; *legs*, 4-3-1-2, anterior pairs slightly enlarged, pale with ends of joints darker, spines, I pair, patella, 1 small prolateral, tibia, dorsal, 0, ventral, 2-2-2, distal, median and basal, spines of prolateral row larger, prolateral, 1-1, retrolateral, 0, metatarsus, dorsal, 0, ventral, 2-2, lateral, 0, II pair same as I pair, posterior pairs with many spines; *epigynum* large, chitinized area longer than



wide, a strongly chitinized excavate lateral openings on anterior half, a median raised ridge on posterior half sloping to depression on each side, the depressions separated by about a diameter.

Neotype, ♀ Alabama; Silver Hill, July 1945, (Nelson).

Hentz had both male and female of this species but he figures the female only. He states that it was found in cavities of limestone rocks on the margin of a river and describes it as rufous and hairy. The figure shows the median pale stripe on the dorsum much narrower than in *undata*, (*familiarius* Hentz), found about houses. Mr. Peckham examined the specimens identified by Mr. Banks as *rupicola* from Ithaca, New York and Falls Church, Virginia, and found them to be only color varieties of *undata*. On examining these specimens, the epigynum proves to be the typical *undata*. It was Mr. Banks who first recognized this specimen as *rupicola* Hentz.

*Marpissa melanura* F. O. P.—Cambridge described from a female from Guatemala City, (Biol. Centr.-Amer., 1901, 2 : 251, pl. 22, fig. 7), also has excavations on the sides of the epigynum but the pale median stripe on the dorsum is quite broad and it has no indications of the pale cross bars near the spinnerets. This species has been placed by Peckham as a synonym of *M. californica* (Peckham).

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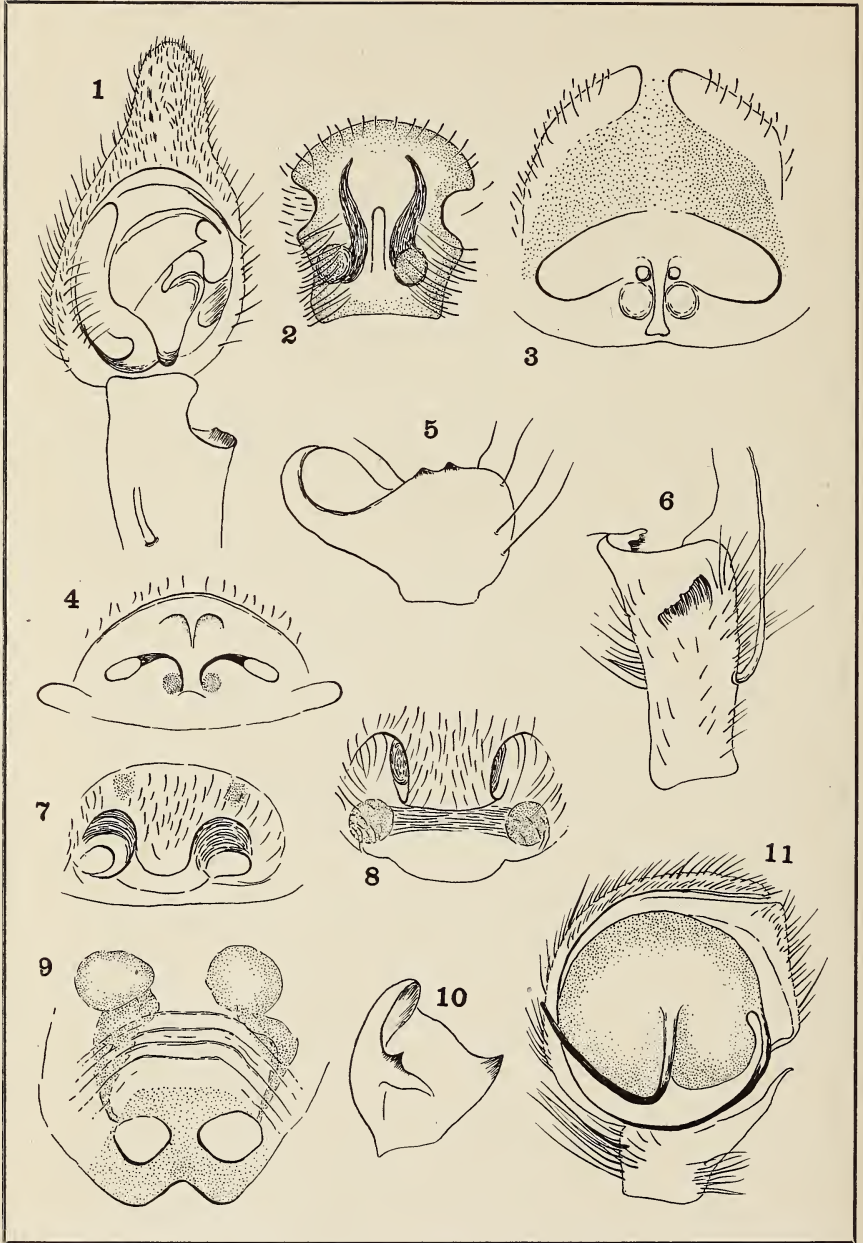
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## EXPLANATION OF PLATE 15

- Fig. 1. *Thanatidius tenuis* (Hentz), left palpus, ventral.  
Fig. 2. *Marpissa rupicola* (Hentz), epigynum.  
Fig. 3. *Sergiulus meretrix* Chamb., epigynum.  
Fig. 4. *Theridiosoma nelsoni* spec. nov., epigynum.  
Fig. 5. *Oxyopes nelsoni* spec. nov., tibia of left palpus, ventral.  
Fig. 6. *Thanatidius tenuis* (Hentz), tibia of left palpus, lateral.  
Fig. 7. *Oxyopes nelsoni* spec. nov., epigynum.  
Fig. 8. *Oxyopes aglossus* Chamb., epigynum.  
Fig. 9. *Clubiona procteri* Gertsch, epigynum.  
Fig. 10. *Oxyopes aglossus* Chamb., tibia of left palpus, ventral.  
Fig. 11. *Habronattus trimaculatus* spec. nov., left palpus, ventral.



BRYANT — SOUTHERN SPIDERS

A THIRD SPECIES OF *ECHINARGUS* NABOKOV  
(LYCAENIDAE, LEPIDOPTERA)

BY V. NABOKOV

Museum of Comparative Zoölogy

Since discussing the neotropical *Plebejinae* (Mar.–June, 1945 [publ. 26–X.1945] *Psyche* 52: 1–61), I have examined a male of "*Lycaena*" *martha* Dognin 1887 (*Le Naturaliste* 9: 190, fig. 5) kindly loaned to me by Prof. Wm. T. M. Forbes. The species proves to belong to my genus *Echinargus* and structurally is beautifully intermediate between *isola* and the Trinidad species. The specimen is labeled "Huacapistana, Rio Tarma, Peru, 1–3–VI–1920, [leg.] T. M. Forbes," coll. Cornell U.

Measurements (in mm.): aedeagus 0.79, suprazonal portion 0.3, subzonal 0.49, with breadth (lateral view) 0.1; penis 0.67; furca 0.5; sagum 0.52 (see description).  $\frac{\text{Vertical}}{\text{Horizontal}}$  extension of

uncus; forearm  $\frac{0.26}{0.04}$ , humerulus  $\frac{0.06}{0.19}$ , shoulder  $\frac{0.16}{0.08}$ , lobe  $\frac{0.24}{0.07}$ . Valve 0.87, with breadth 0.39.

Sagum intermediate between *isola* and the Trinidad species: smaller than in the former, with an "unfilled" portion in the ventral margin as in the Trin. sp., and larger than in the latter, with the "unfilled" portion much less pronounced and armed with teeth as in *isola*; if measured as in the case of the Trin. sp. (*l.c.*:30) then ZD = 0.52, PD = 0.4, and ZP = 0.45, the jutting "lower portion" being only 0.16 (i.e. about twice shorter than in the Trinidad species) along its "upper" margin, and some of the teeth (the medial ones) with which the side ZD is set (about a dozen in all) reaching almost 0.1 in length.

I take this occasion to note that in *Pseudothecla faga* Dognin the rudimentary sagum (*l.c.*:11) clings to the furca and is armed with numerous minute teeth averaging 0.014 in length. (A certain roughness suggesting rudimentary teeth is also apparent under a  $\times 360$  magnification in the small sagum lobe of *Hemiargus hanno*).





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# PSYCHE

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## PARTURITION IN PERIPATUS

BY PETER R. MORRISON

Biological Laboratories, Harvard University,  
Cambridge, Massachusetts

Despite numerous and extensive studies on the habits and life history of various of the Onychophora,<sup>1-5</sup> with the exception of Steel<sup>4</sup> who reported no details, there appear to have been no observations on parturition in this group. This is perhaps not surprising when one considers their retiring nature and strong negatively phototropic reactions which make difficult even the observation of the more ordinary activities such as ecdysis and feeding. Since their viviparous mode of reproduction is one of their more unusual characteristics, observations on parturition are of interest.

These peripatus were secured on Barro Colorado Island, C. Z., through the great kindness of Mr. James Zetek. They were taken in September of 1941 and these observations were made in Cambridge about a month later. During the interim they were kept in moist forest debris but were not given additional suitable food. The large female in which successful parturition was observed had an extended length of 60 mm, had 33 pairs of legs and was uniformly colored a rich red-brown. It was *Epiperipatus brasiliensis vagans* Brues,<sup>6</sup> for which the Island is the type locality. Twenty three days previously she had given birth to a single young and another was found just before these observations were made.

<sup>1</sup> Manton, S. M., Ann. Mag. Nat. Hist., (11) 1:515-528 (1938).

<sup>2</sup> Holliday, R. A., Ann. Natal Mus., 10:237-244 (1942).

<sup>3</sup> Andrews, E. A., Quart. Rev. Biol., 8:155-163 (1933).

<sup>4</sup> Steel, T., Proc. Linnean Soc. New South Wales, 21:94-104 (1896).

<sup>5</sup> Sedgwick, A., Quart. Jour. Micr. Sci., 28:431-493 (1887).

<sup>6</sup> Brues, C. T., Psyche, 32:159-165 (1925).



When first noticed only 4 mm of the young was visible but by 15 minutes later, 16 mm or more than half of its length had emerged. Another 15 minutes sufficed for the young to completely free itself so that the entire process must have required little more than half an hour. During this time the female held

TABLE 1

8:45 A.M.	.....	4 mm.	free
9:00	.....	16 "	"
9:05	.....	20 "	"
9:10	.....	24 "	"
9:15	.....	Completely free	
9:17	.....	White mass extruded	
9:45	.....	Mass consumed by young	

the posterior part of her body (that portion bearing the last 5 pairs of legs) raised at an angle of about  $60^\circ$ . She made no movements and no contraction or peristaltic action could be seen. The young on the other hand made active efforts to free itself and apparently maintained a constant tension. The portion of its body which had just emerged (6 mm) was very pale, almost white, and was separated from the rest of the body by a dark band (2 mm). These bands presumably represented extended and contracted regions respectively. The young was closely followed by a drop of white, cloudy, viscous liquid 1.5 to 2.0 mm in diameter. Manton (*loc. cit.*) states that in *Peripatoides* the cast egg membrane, the peritrophic membrane and the cast integument are evacuated after birth but no structure could be seen in this material. The mass was completely eaten by the young in half an hour. After parturition the mother showed no interest in the young even casually walking over it. However, neither did she attempt to harm or consume the young, either at this time or on succeeding days although she had been without food for the better part of a month.

With a length of half that of the mother the young appear large but their combined weight was less than 15 per cent of hers. In contrast to the adult which was uniformly colored a rich red-brown, the young showed a lighter red-violet-brown with pinker head, legs and underside. This difference in color appears to be characteristic in *peripatus*.

An unsuccessful parturition was observed in a smaller individual of another species.<sup>7</sup> Here the young was apparently injured and died when only one fourth extruded. In this case strong contractions of the posterior portion of the female's body were observed but she was unable to complete parturition more

TABLE 2

	Pairs of legs	Weight in mg.	LENGTH IN MM.	
			Contracted	Extended
Adult	33	786	50	60
Young #1	33	48	23	33
Young #2	34	54	24	31

than half way. Forceps delivery was resorted to in an attempt to save the adult, but unsuccessfully since she died about 12 hours later. It may well be that this failure was occasioned by placing the animal under observation since the smaller species was characteristically much more active and upset when removed from shelter. The larger species was much more tolerant of observation and for this reason may be particularly suitable material for studies on this group.

<sup>7</sup>This animal, also from Barro Colorado Island, was one of several *Oroperipatus corradi*. It had a contracted length of 36 mm and was a light chocolate color with a lighter under side and with darker legs and a dark, median dorsal stripe 0.3 mm wide.

ATHYSANUS ARGENTATUS FABR. IN  
NEW ENGLAND. (HOMOPTERA)

BY NATHAN BANKS  
Holliston, Mass.

Soon after moving to Holliston over twenty years ago I found in my backyard (part of the abandoned "fox-hole" of a glacier) numerous specimens of a large leaf-hopper, and every year since I have taken specimens. It was not in the Hemiptera of Connecticut, nor in Osborn's papers on the Maine and New York Jassidae. Six or eight years ago, being in Washington I spoke to Mr. Oman about it, and he thought it might be a species he had taken the year before near Mt. Washington. Specimens sent him he identified as a European species, *Athysanus argentatus* Fabr., the type of the genus. It occurs where the grass is dense and chiefly near the beginning of the swamp, not in pastures, orchards, or gardens where the economic entomologist would have taken it long ago.

In a trip across Maine from the White Mountains to Bangor I found it in the Pinkham Notch, and at various places in Maine, rather abundant near the Belgrade Lakes. Mr. Moore of Quebec, has shown me a specimen from Peakes Island, Maine, and recently I have seen a few specimens from the Plymouth area of Massachusetts.

It is a pale species, and when fresh the folded wings are silvery white as far each side as the first brown streak in the cells, except that the commissure, claval suture, and first claval vein are brown. There are three brown streaks through the cells and a short one in the fork of medius. The costa is convex, thickened and usually ivory-white. The wing is rather slender, no angle at end of claval suture, so that the brown of the commissure continues straight out and around tip to end of medius; the three apical cross-veins are near each other, there is no second cross-vein. On the head there is a curved black line from eye to eye, the vertex extending somewhat in front of it, more so in middle than elsewhere. The frons shows eight or nine transverse slightly curved lines of pale brown or

dark gray each side. There is usually a black mark at base of antenna, and another just above it. The pronotum on hind part is finely, transversely striate; there is a brown line each side, not reaching front, and a short line in front of wing-base. The scutellum has three dark lines, usually visible beneath the pronotum. The abdomen has three black streaks, above and beneath, the median one with irregular edges, the lateral ones situate before margin.

The hind tibiae have a black streak with adjoining dots below; the mid and front femora have a brown line above and another shorter just below it on the front.

This insect is one of several spiders and insects found in my swamp, or near it, that are holarctic; two of the spiders like *Athysanus*, had not been known from Massachusetts until found here by Mr. Emerton and myself, and like the *Athysanus* occur in swampy places in North Europe. These forms following the retreat of the glacier became trapped in certain pockets where conditions were favorable for them. All of these forms are mature in early summer, while the several southern forms that I find here are mature only in late summer.



DESCRIPTIONS OF THREE NEW NEOTROPICAL SPECIES OF *CHRYSOPS* (DIPTERA, TABANIDÆ)<sup>1</sup>

BY JOSEPH C. BEQUAERT

Museum of Comparative Zoology, Cambridge, Mass.

*Chrysops zayasi*, new species (Figs. 1-3)

*Female*. — Medium-sized, of the group of *C. incisa* Macquart and closely related to *C. frazari* Williston.

Frons about as wide as high, mostly grey pollinose; ocellar area moderately raised, extensive, denuded shiny black and narrowly connected medially with a shiny black upper margin of the callus; frontal callus low, yellowish-brown, separated from the eyes by narrow pollinose orbits. Fronto-clypeus shiny honey-yellow, except for the grey pollinose narrow inner orbits and upper half of cheeks; facial pits yellow; upper lateral areas (above the pits) moderately swollen, not conical. Antennae entirely black, sparsely black-haired, slender, slightly longer than fore femora; segment 1 about one and one-third times the length of 2; 3 slightly longer than 1 + 2; 1 and 2 cylindrical, scarcely swollen, but 1 slightly thicker than 2, particularly seen from above. Palpi honey-yellow. Thorax black; mesonotum with four greyish pollinose longitudinal stripes: one on each side, above the base of the wing, very wide, continuous; a median pair narrow, broadly interrupted before the scutellum, connected anteriorly with the lateral stripes. Scutellum mostly shiny brownish-yellow. Pleura with two broad, yellowish-grey pollinose longitudinal stripes, the upper one interrupted medially. Legs mostly pale yellowish-brown; trochanters, tips of femora and of tibiae, and tarsi more or less infuscated to black; coxae partly grey pollinose; tibiae not widened. Wings hyaline, with dark markings similar to those of *C. incisa*: apical spot well defined as a narrow, continuous stripe along costa, ending at apex of wing and filling in the entire marginal cell; cross-

<sup>1</sup> Published by a grant from the Museum of Comparative Zoology at Harvard College.

band covering entire 4th posterior (which is narrower at apex than usual) and basal third of 5th posterior cell, continued to the margin along the upper side of the anal cell (which is closed at the apex); no hyaline spot in first submarginal cell in holotype and one paratype (the other paratype has small, drop-line hyaline spots in the distal extension of the cross-band in the first submarginal cell, in the discal cell, and in the apical spot at the tip of the first submarginal cell; this is no doubt an abnormal condition; in every other respect the specimen agrees with the holotype); cross-band abruptly extended in the first submarginal cell, but ending far from the fork of the third vein; basal cells hyaline except for extreme bases and apices. Halteres yellowish-brown, the knobs infuscated above. Abdomen black, with a dorsal pattern of yellowish, grey pollinose markings similar to that of *C. frazari*, but the sides of 1st tergite extensively yellowish; median mark of tergite 2 either hour-glass-shaped or divided into two triangles; ventrally two broad, yellowish, grey pollinose stripes, fused anteriorly to cover most of sternites 1 and 2.

Length (not including antennae), 7 to 7.5 mm.; of wing, 8 mm.

CUBA: Cienaga de Lanier, Isle of Pines, March 28, 1945 (Fernando de Zayas Collector); holotype and 1 paratype at M.C.Z. (No. 27434); 1 paratype deposited at the United States National Museum.

*C. zayasi* is very closely related to *C. frazari* of Hispaniola, a species as yet imperfectly known (see J. Bequaert, 1940, Rev. de Entomologia, XI, p. 282, fig. 1). At present it may be separated by the different shape and color of the antenna (in *frazari* segment 1 and 2 are more swollen and reddish-brown) and by the color of the frontal callus (black in *frazari*).

This interesting addition to the scant tabanid fauna of Cuba was received from Dr. S. C. Bruner, who kindly presented the holotype and one of the paratypes to the Museum of Comparative Zoology.

#### *Chrysops renjifoi*, new species (Figs. 4-6)

*Female*.— Small, related to *C. latitibialis* Kröber and the species described below as *C. weberi*.

Frons very slightly higher than wide (appearing as wide as high in exact front view, as drawn in Fig. 5), mostly grey pol-

linose; ocellar area very little raised, denuded, shiny black, not extended downward; frontal callus low, black, transverse, with nearly straight sides which are separated from the eyes by narrow pollinose orbits. Fronto-clypeus shiny honey-yellow, with infuscated blotches; upper half of cheeks, very narrow inner orbits and entire outer orbits grey pollinose; facial pits yellow; upper lateral areas (above the pits) flattened convex, not conical. Antennae dirty-yellowish on segment 1, fuscous-brown to blackish on 2 and 3, very slender, much longer than fore femora; segment 1 about one and one-third times the length of 2; 3 scarcely longer than 1, its basal portion very little swollen; 1 and 2 cylindrical, not swollen, equally thick both from above and in profile. Palpi yellowish-brown. Thorax black, fairly shiny, lightly covered with grey pollinosity, which forms two narrow, continuous median lines on the dorsum and is more pronounced on the pleura and on the sides of the dorsum between the wings and the shoulders; no pleural stripes nor spots; scutellum shiny black. Legs mostly infuscated to black; much of fore femora, extreme tips of mid and hind femora, and entire hind tarsi dirty yellowish-white; all tibiae flattened convex, moderately widened. Wings fairly cloudy over most of the clearer areas, decidedly hyaline only in the two basal and the anal cells; darker markings as follows: costal and subcostal cells, very narrowly connected with the apical spot, which is poorly defined but fills in most of the apex of the wing; it is darkest close to the costa and fades gradually toward the 3d posterior cell; a very narrow, nearly hyaline streak divides it from the distal margin of the crossband, beginning well inside the marginal cell a short distance from the costa; cross-band with nearly straight distal edge, far from the fork of the third vein, divided at the hind margin by an ill-defined, semi-hyaline spot covering much of the 5th and the median portion of the 4th posterior cells; center of discal cell also somewhat paler; base of wing, extreme tips and bases of both basal cells and narrow upper margin of anal cell infuscated; stigma well defined, blackish-brown; anal cell broadly open at apex. Halteres black. Abdomen: 1st tergite yellowish-white, with a narrow black apical margin; 2d tergite yellowish-white over a little more than anterior half, the black hind portion extending forward along the sides; 1st and 2d sternites mostly pale yellowish; remainder of abdomen shiny black, without markings;

yellow of 1st and 2nd tergites slightly grey pollinose, the 1st on each side with a prominent yellowish pollinose spot; all tergites with a few, scattered, short white hairs.

Length (not including antennæ), 5 mm.; of wing, 5.8 to 6 mm.

COLOMBIA: Veneral, Rio Yurumanguí, Dept. Valle del Cauca, March 25, 1943 (Santiago Renjifo Salcedo Collector); holotype and 1 paratype at M.C.Z. (No. 27435).

*Chrysops weberi*, new species (Figs. 7-8)

*Female*. — Small, related to *C. latitibialis* Kröber and *C. renjifoi*.

Frons about as wide as high, mostly yellow pollinose and with a few erect black hairs; ocellar area very little raised, extensively denuded, but not extended downward, shiny black with yellowish-brown occipital edge; frontal callus large, strongly swollen, yellowish-brown, barely separated from the eyes. Fronto-clypeus shiny honey-yellow, except for the grey pollinose narrow inner orbits and upper half of cheeks; facial pits yellow; upper lateral areas (above the pits) flattened convex, not conical. Antennæ yellowish-brown, paler on segment 1; terminal annuli of segment 3 somewhat more infuscated; very slender, much longer than fore femora; segment 1 scarcely longer than 2; 3 about one and one-half times the length of 1, its basal portion very little swollen, but decidedly thicker than 1; 1 and 2 cylindrical, not swollen, about equally thick both from above and in profile. Palpi yellowish-brown. Thorax black; dorsum with a median pair of broad, continuous, yellow pollinose spots between scutellum and wing and on antearlar callosity. Scutellum black, broadly dirty-yellowish along hind and lateral margins. Pleura with a number of disconnected yellow pollinose spots, not definitely forming stripes. Legs: coxæ and tibiæ strongly infuscated to blackish; femora and tarsi dirty-yellowish to brownish-yellow, the hind tarsi paler; all tibiæ flattened and moderately widened. Wings marked almost exactly as in *C. renjifoi*, the differences being too slight to justify a figure; the clearer, subhyaline spot near the hind margin of the cross-band is restricted to the middle of the 5th posterior cell; anal cell mostly hyaline. Halteres yellowish-brown. Abdomen: 1st tergite yellowish with a black apical margin; 2d



narrowly yellowish at base, but more broadly at the sides; remainder of tergites shiny black, with three longitudinal yellowish stripes, the median one broadest on the 2d tergite where it is connected with the yellow base; the lateral ones less distinct, more or less broken up and extending only over tergites 3 to 6; sternites mostly honey-yellow to fuscous.

Length (not including antennae), 6 mm.; of wing, 6.5 mm.

BRITISH GUIANA: Oronoque River, in latitude 2°42'N., July 31, 1936, a tributary of the New River in the Courantyne River drainage (N. A. Weber Collector); holotype at M.C.Z. (No. 27436). — COLOMBIA: Mitú, Terr. Vaupés, August, 1943 (P. Allen Collector); paratype at M.C.Z. (No. 27436a), somewhat mutilated (lacking antennal segment 3), but agreeing in every respect with the holotype.

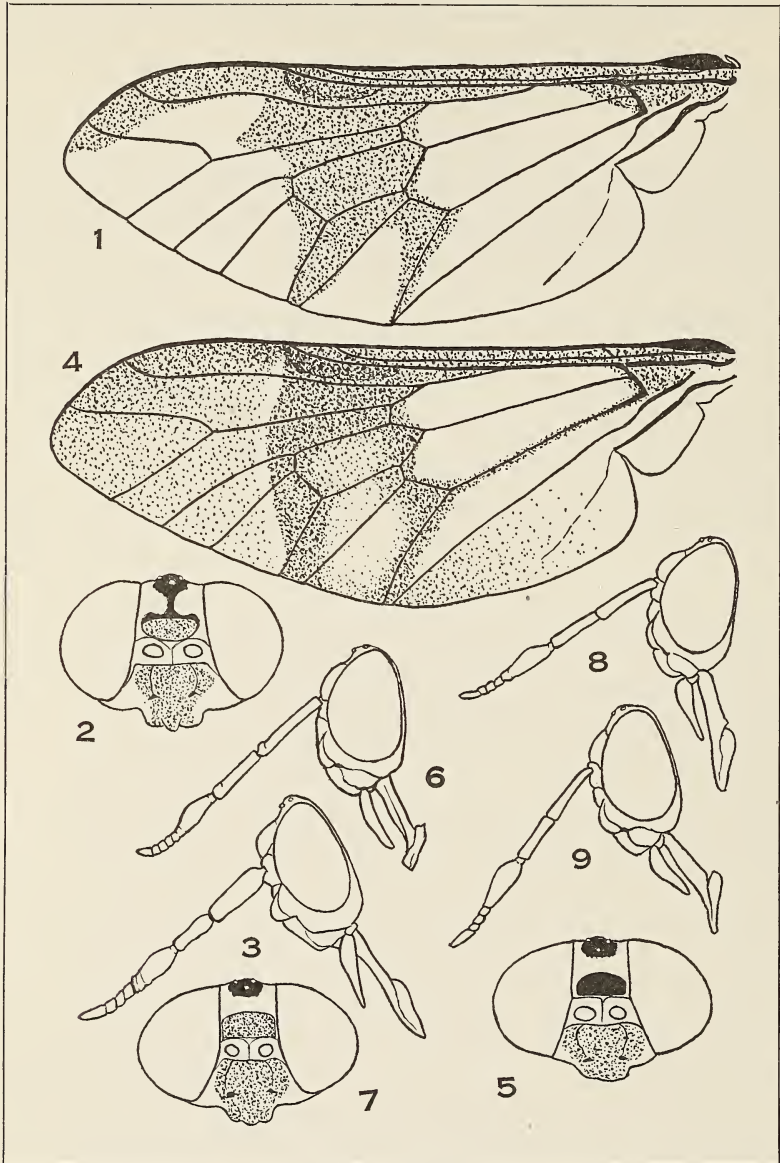
The foregoing two species have most of the structural characters (particularly the widened tibiae) and the wing pattern of *C. latitibialis* Kröber. These three species may be separated by the subjoined key. I have compared the holotype and only known specimen of *latitibialis*, from Kamakusa, British Guiana (M.C.Z. No. 27437).

1. Third antennal segment relatively short, scarcely longer than first, its basal portion very slightly widened. Frontal callus black. Mesopleura without spots. Hind femora mostly black. First abdominal tergite pale yellow with a narrow black apical margin; second tergite pale yellow over basal and black over apical half; remaining tergites black, without markings. .... *C. renjifoï*.  
Third antennal segment markedly longer than first. Frontal callus partly yellowish-brown. Mesopleura with pale pollinose spots. Hind femora mostly yellowish-brown. .... 2.
2. Third antennal segment about as long as combined first and second, its basal portion markedly swollen (Fig. 9). First and second abdominal tergites each with a narrow yellowish base, the yellow of the second somewhat extended backward in the middle; remaining tergites black, without markings. .... *C. latitibialis*.  
Third antennal segment much shorter than combined first and second, its basal portion scarcely swollen. First abdominal tergite pale yellowish with black apical margin; second tergite pale yellowish at base and on sides; re-

mainder of tergites<sup>o</sup> black with three yellowish stripes, the median one connected with the base of tergite 2, the lateral ones only on tergites 3 to 6. .... *C. weberi*.

## EXPLANATION OF PLATE I.

Figs. 1-3, *Chrysops zayasi* J. Bequaert, female: 1, wing; 2, head in front view; 3, head in profile. — Figs. 4-6, *Chrysops renjifo* J. Bequaert, female: 4, wing; 5, head in front view; 6, head in profile. — Figs. 7-8, *Chrysops weberi* J. Bequaert, female: 7, head in front view; 8, head in profile. — Fig. 9, *Chrysops latitibialis* Kröber, female, holotype, head in profile.



Bequaert — Chrysops

JUVENILE AND IMAGINAL LUMINESCENCE IN  
FIRE-FLIES (LAMPYRIDÆ)

BY CHARLES T. BRUES

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In spite of the extensive literature relating to luminous lampyrids very slight attention has been paid to those forms in which the light-producing organs of the adult beetle are greatly reduced in size and brilliance.

On June 15th the writer collected at Petersham, in central Massachusetts, a number of pupæ which were provided with luminous organs near the tip of the abdomen. In general appearance and in the size, form and position of these organs they resembled the pupæ of one of our common native fireflies, *Photuris pennsylvanica*, which appears abundantly every year at this locality later in the month of June. The pupæ were at the bottom of a pile of old boards that had been thrown into an open field some years ago and were rapidly undergoing final decay and dissolution. Altogether, 54 pupæ were secured and put by in the laboratory to follow the expected development of the imaginal light organs.

Some of these pupæ began to transform into beetles during the following night and their emergence continued for a period of a week. To our surprise, however, the eclosed adults were not *Photuris*, but another common lampyrid, *Lucidota atra* Fab. represented by individuals of both sexes.

It has been generally observed that the small larval pair of photogenic organs persist in the pupæ and may pass over into the adult, e.g., in *Photinus consanguineus* where the male retains the larval organs in addition to his much larger and separate imaginal one which is developed as a purely adult structure.

*Lucidota* belongs to a small group of related genera in which the imaginal photogenic organs are feeble and consist entirely of the remains of the precursory juvenile structures. To this group belongs also *Pyropyga*, a species of which (*P. fenestralis* Mels.) has been observed by Hess<sup>1</sup> to possess larval light organs which continue to function throughout the pupal period. He

<sup>1</sup> Biol. Bull., vol. 38, pp. 39-76 (1920).



noted that as the time for emergence of the beetle approaches the glow usually becomes very faint although rarely persisting for a brief period after emergence. Degeneration extends still further in another related genus *Ellychnia*, and in our common *E. corrusca* no adult luminescence is to be noted, at least in completely matured individuals. The larval organs persist in a degenerating condition in adult beetles as was shown by Williams.<sup>2</sup> Some recent workers do not recognize these several genera as distinct, grouping them all together as *Lucidota* which is the oldest name.

The question as to whether the adult photogenic organ in these species should be regarded as vestigial or whether it represents a stage preceding the development of the large and brilliant organ of *Photinus* is of considerable interest. Inasmuch as luminescence in these beetles has been generally thought to be a sexual manifestation which facilitates mating, we should be inclined to consider the reduced condition in *Lucidota* as vestigial. On the other hand, the fact that the large adult organ in the male of *Photinus* is without question a structure developed later and in addition to the persisting larval organs which pass over into the adult without loss of function, we must conclude that the pair of larval organs are phylogenetically older and that the imaginal organ is a more recent acquisition. What purpose the larval organs may serve is not clear. It has been suggested that they may enable the larvæ to recognize one another and it is known that these creatures are gregarious, although not to a high degree. We can hardly admit on this basis that luminous spots can play any real part in the ecology of the larval beetles. Aside from the complex morphology of the brilliant imaginal organs, the integument covering them is greatly modified by the complete loss of pigment. In *Lucidota* there is no indication of any such change as the ventral abdominal segments are fully blackened in conformity with the general very dark body color of the beetles, and the visibility of the persistent larval organs is effected only through the weakly pigmented, extrusible tip of the abdomen.

It is unfortunate that we do not know more concerning these less spectacular fireflies and the place that they occupy in the evolution of this most varied and remarkable group of luminous beetles.

<sup>2</sup> Journ. Morphol., vol. 28, pp. 145-207 (1916).

SUPPLEMENT TO THE BIBLIOGRAPHY OF THE DESCRIBED LIFE-HISTORIES OF THE RHOPALOCERA OF AMERICA NORTH OF MEXICO

By V. G. DETHIER  
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In the Bibliography of the Described Life-Histories of the Rhopalocera of America North of Mexico 1889-1937 (Davenport and Dethier, 1938) an attempt was made to bring up to date the section on Rhopalocera of the Bibliographical Catalogue of Henry Edwards (1889). During the eight years that have elapsed since the appearance of the former not a few new life histories have been described. Lacunae in the descriptions of previously known life histories have also been filled. It is felt that a supplement at this time may be of assistance to those engaged in this field of study. Accordingly the following list patterned after the 1938 bibliography is offered. McDunnough's (1938) check list, which was published after the appearance of the bibliography, is now followed.

For additional data on feeding habits the reader is referred to Comstock (1927), Wolcott (1936), Field (1938), and Hayward (1941).

*Papilio polydamas* L. Dethier, V. G. Psyche, 47(1): 22-23, 1940 (larva).

Food plant: *Aristolochia argyreoneuron*, *A. ringens*, *A. forckeli*, *A. redicula*, *A. saccata*, *A. tagala*, *A. fimbriata*, *A. brasiliensis*, *A. cymbifera*, *A. elegans*, *A. gigantea*, *A. grandiflora*, *A. glandulosa*, *A. hians*, *A. indica*, *A. Kaempferi*, *A. Roxburghiana*, *A. Ruiziana*, *A. trilobata*.

*P. ajax americanus* Koll. Brown, F. M. Bul. S. Calif. Acad. Sci., 38(3): 200-201, 1939 (larva, chrysalis).

Food plant: "white carrot."

*P. celadon* Luc. Dethier, V. G. Psyche, 47(1): 22, 1940 (egg).

*Phoebis sennae marcellina* Cram. Tilden, J. W. Pan.-Pac. Ent., 20: 117, 1944 (life history).

Food plant: *Cassia tomentosa*.

- P. agarithe* Bdv. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 123, 1941 (food plant).  
Food plant: *Pithecolobium dulce*.
- Eurema lisa* Bdv. & Lec. Dethier, V. G. Psyche, 47(1): 21-22, 1940 (larva).  
Food plant: *Mimosa pudica*.
- Nathalis iole* Bdv. Dethier, V. G. Psyche, 47(1): 19-21, 1940 (life history).  
Food plant: *Bidens leucantha*.
- Ascia monuste* L. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 123, 1941 (food plant).  
Food plant: *Cleome gynandra*, *Allium*.
- Danaus menippe* Hbn. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 122, 1941 (food plant).  
Food plant: *Asclepias curassavica*.
- D. berenice strigosa* Bates Dammers, C. M. Bul. S. Calif. Acad. Sci., 36(1): 23-24, pl. 10, 1937 (food plant).  
Food plant: *Philibertia heterophylla*, *Stapelia*.
- Argynnis nokomis* Edw. Comstock, J. A. Bul. S. Calif. Acad. Sci., 39(1): 76, 77, pl. 8, 1940 (egg).  
Food plant: *Viola*.
- A. leto* Behr Comstock, J. A. Bul. S. Calif. Acad. Sci., 39(1): 75-77, pl. 8, 1940 (egg, larva).  
Food plant: *Viola*.
- A. hydaspe viridicornis* Comst. Comstock, J. A. Bul. S. Calif. Acad. Sci., 39(1): 76, 77, pl. 8, 1940 (egg).  
Food plant: *Viola*.
- A. callippe comstocki* Gund. Comstock, J. A. Bul. S. Calif. Acad. Sci., 39(1): 76, 77, pl. 8, 1940 (egg).  
Food plant: *Viola*.
- Euphydryas chalcedona* Dbldy. & Hew. Dammers, C. M. Bul. S. Calif. Acad. Sci., 39(2): 123-125, 1940 (food plant).  
Food plant: *Scrophularia antirrhinoides* Benth., *Buddleia*.
- E. cooperi* Behr Doudoroff, M. Canad. Ent., 69(5): 117-118, 1937 (larva).
- E. gillettii* Barnes Comstock, J. A. Bul. S. Calif. Acad. Sci., 39(2): 111-113, pl. 20, 1940 (egg, larva).  
Food plant: *Lonicera involucrata* Banks.
- Junonia genoveva* Cram. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 20(1): 399, 1936 (larva, chrysalis).  
Food plant: *Valerianoides jamaicensis*.

- Anartia jatrophae* Joh. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 20(1): 399, 1936 (larva, chrysalis).  
Food plant: *Bacopa monniera*.
- Anartia jatrophae jamaicensis* Moesch. Dethier, V. G. Psyche, 48(2/3): 71-73, pls. 5-6, 1941 (egg, larva).  
Food plant: *Lippia*.
- Victorina steneles* L. Wolcott, G. N. Jour. Dept. Agric. Puerto Rico, 7(1): 1924 (larva, chrysalis).  
Food plant: *Blechnum brownnei*.
- Historis orion* Fabr. Smyth, E. G. Fourth Rept. Bd. Comm. Agri. Puerto Rico, 1914-15: 45-50, 1916 (larva, chrysalis).  
Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 20(1): 401, 1936 (larva, chrysalis).  
Food plant: *Cecropia peltata*.
- Eumaeus atala* Poey Dethier, V. G. Psyche, 48(2/3): 75, pl. 6, 1941 (larva, chrysalis).
- Mitoura spinetorum* Hew. Comstock, J. A. and Dammers, C. M. Bul. S. Calif. Acad. Sci., 37(1): 30-32, pls. 3-4, 1938 (life history).  
Food plant: *Arceuthobium campylopodum* Engelm.
- Leptotes theonus* Luc. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 123, 1941 (food plant).  
Food plant: *Crotalaria incana*.
- Hemiarigus hanno* Stoll. Dethier, V. G. Psyche, 47(1): 24, 1940( egg, larva). Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 123, 1941 (food plant).  
Food plant: *Mimosa pudica*, *Macroptilium lathyroides*.
- Polygonus amyntas* Fabr. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 20(1): 407, 1936 (larva). Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 124, 1941 (food plant).  
Dethier, V. G. Psyche, 49 (1/2): 5-6, 1942 (larva).  
Food plant: *Ichthyomethia piscipula*, *Lonchocarpus*, *Derris eliptica*.
- Proteides idas* Cram. Wolcott, G. N. Jour. Agri. Univ. Puerto Rico, 25(2): 124, 1941 (food plant).  
Food plant: *Derris eliptica*.
- Urbanus dorantes* Stoll. Dethier, V. G. Psyche, 49(1/2): 4-5, 1942 (egg, larva).  
Food plant: *Clitorea* and related genera.
- Cabares potrilla* Luc. Dethier, V. G. Psyche, 47(1): 24-25, pl. 3, 1940 (egg).



- Pyrgus syrictus* Fabr. Dethier, V. G. *Psyche*, 47(1): 24, pl. 3, 1940; 49(1/2): 6-7, 1942 (life history).  
Food plant: *Sida*.
- P. communis occidentalis* Skin. Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 43(1): 30-32, pl. 11, 1944 (life history).  
Food plant: *Sidalcea*.
- Achlyodes thraso* Hbn. Wolcott, G. N. *Jour. Dept. Puerto Rico*, 7(1): 1924 (larva, chrysalis).  
Food plant: *Citrus*, *Zanthoxylum monophyllum*.
- Ancyloxypha numitor* Fabr. Dethier, V. G. *Canad. Ent.*, 71: 118, 1939 (larva). Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 37(2): 74-77, pls. 18-20, 1938 (life history).  
Food plant: Grasses.
- Hesperia juba* Scud. Lindsey, A. W. *Denison Univ. Bul., Jour. Sci. Lab.*, 20: 121-125, pl. 16, 1923 (egg, larva).  
Food plant: Grasses.
- H. leonardus* Harr. Dethier, V. G. *Canad. Ent.*, 71: 118, 1939 (egg, larva).  
Food plant: Grasses.
- Polites verna* Edw. Dethier, V. G. *Canad. Ent.*, 71: 117-118, 1939 (egg, larva).  
Food plant: Grasses.
- P. manataaqua* Harr. Dethier, V. G. *Canad. Ent.*, 70: 255, 1938 (egg, larva). Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 40(2): 109-111, pls. 8-9, 1941 (larva).  
Food plant: Grasses.
- P. themistocles* Latr. Dethier, V. G. *Canad. Ent.*, 70: 255-256, 1938 (egg, larva). Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 41(1): 41-43, pl. 9, 1942 (larva, chrysalis).  
Food plant: Grasses.
- P. baracoa* Luc. Dethier, V. G. *Psyche*, 46(4): 148-149, pl. 9, 1939 (egg, larva).  
Food plant: Grasses.
- P. peckius* Kby. Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 38(3): 188-190, pl. 50, 1939 (life history).  
Food plant: Grasses.
- P. sabuleti* Bdv. Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 42(3): 128-131, pl. 13, 1943 (life history).  
Food plant: Grasses.

- P. mystic* Scud. Dethier, V. G. *Canad. Ent.*, 70: 256-257, 1938 (egg, larva). Dethier, V. G. *Bul. S. Calif. Acad. Sci.*, 39(2): 108-110, pl. 19, 1940 (larva, chrysalis).  
Food plant: Grasses.
- Catia ortho egeremet* Scud. Dethier, V. G. *Canad. Ent.*, 70: 257-258, 1938 (egg, larva).  
Food plant: Grasses.
- Poanes hobomok* Harr. Dethier, V. G. *Canad. Ent.*, 70: 258-259, 1938 (egg, larva).  
Food plant: Grasses.
- P. radians* Luc. Dethier, V. G. *Psyche*, 46(4): 150-151, pl. 9, 1939 (egg, larva).  
Food plant: Grasses.
- P. haitensis* Skin. Wolcott, G. N. *Jour. Dept. Agri. Puerto Rico*, 5(2): 1-47, 1921 (life history).  
Food plant: Sugar cane.
- Lerodea tripunctus* H.-S. Dethier, V. G. *Psyche*, 46(4): 151-152, pl. 9, 1939 (larva, chrysalis). Dethier, V. G. *Mem. Soc. Cubana Hist. Nat.*, 16(2): 167-176, pl. 26, 1942 (life history).  
Food plant: Grasses, sugar cane.
- Panoquina sylvicola* H.-S. Jones, T. H. and Wolcott, G. N. *Jour. Dept. Agri. Puerto Rico*, 6(1): 38-50, fig. 11, 1922 (life history). Wolcott, G. N. *Jour. Dept. Agri. Puerto Rico*, 6(1): 32-37, 1922 (larva, chrysalis). Wolcott, G. N. *Jour. Agri. Univ. Puerto Rico*, 20(1): 411, 1 fig., 1936 (larva). Dethier, V. G. *Psyche*, 46(4): 152-153, pl. 9, 1939 (egg, larva). Dethier, V. G. *Mem. Soc. Cubana Hist. Nat.*, 16(2): 167-176, pl. 26, 1942 (life history).  
Food plant: Grasses, sugar cane, bamboo, rice.
- P. nyctelius* Latr. Jones, T. H. and Wolcott, G. N. *Jour. Dept. Agri. Puerto Rico*, 6(1): 38-50, figs. 9, 15, 1922 (life history). Wolcott, G. N. *Jour. Dept. Agri. Puerto Rico*, 6(1): 32-37, 1922 (larva). Wolcott, G. N. *Jour. Agri. Univ. Puerto Rico*, 20(1): 410, 1 fig., 1936 (larva). Dethier, V. G. *Psyche*, 46(4): 153-154, pl. 9, 1939 (larva, chrysalis). Dethier, V. G. *Mem. Soc. Cubana Hist. Nat.*, 16(2): 167-176, pl. 26, 1942 (life history).  
Food plant: Grasses, sugar cane.

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*DICHELONYX CANADENSIS* HORN

BY C. A. FROST

Framingham, Mass.

In his monograph of this genus in the Trans. Am. Ent. Soc. Vol. XXVII, 1901, Mr. H. C. Fall writes, "This species is quite unknown to me nor do I know if there are any in collections besides the type." The only locality given in Leng's list is "Can." which is evidently the locality given by Horn in his description in 1876.

Specimens in my collection taken by me at Paris, Maine are dated: — June 17, 1912, July 15, 1913, June 10, 1925, June 30, 1932, July 6, 1933, and July 7, 1937. Some of them are labelled as swept from *Corylus rostrata*, or taken on the leaves of this plant where they were observed feeding. On June 22, 1945, while eating lunch in the shade of a large white pine on the edge of an open pasture, I noticed a couple of specimens on the grass stems in front of me. Later some unexplained desire to enter the dense shadows of the pines and hemlocks behind me was acted on. There I found this beetle flying over the forest floor in great numbers; they flew from one to three feet high frequently coming to rest on the ground or on fallen twigs and branches, for a few moments only in many cases; no copulation was observed. 106 specimens were taken and their numbers seemed to be but little diminished at the end of an hour, which

was between 1 and 3 P.M. On the following day some specimens were noticed; on the third day there were none to be seen, but for several days after occasional specimens were seen on the *Corylus* leaves about a quarter of a mile away.

## NOTES ON UNCOMMON COLEOPTERA

BY C. A. FROST  
Framingham, Mass.

*Melanotus tænicollis* Lec. Three specimens of this Elaterid have been taken in the past 45 years at Framingham. One specimen on June 1, 1912, one on June 27, 1915, by sweeping in a meadow, and one on June 2, 1945, near the railroad yards a few hundred yards from my home.

*Stenotarsus hispidus* Hbst. Four specimens have been taken in recent years near here. One by sweeping on Sept. 23, 1933, two on June 10, 1939, and one by sifting on April 1, 1944.

*Triplax macra* Lec. Three exactly typical specimens were taken at Paris, Me. on June 29, 1945, on fungi on dead poplar. One typical specimen from Prince Edward Co., Ont. collected by Brimley is at hand, and another labelled, "Zebulon, Ga. 4-14-38. P. W. Fattig" seems to be a typical specimen. Two other specimens which were named by others for me appear to be entirely different and maybe undescribed.

*Ephistemus apicalis* Lec. This minute beetle which is attached rather loosely to the family *Cryptophagidæ* in the list is recorded from N.Y.-Ind. They appear in very large numbers in old grass piles in the layer just below the dry top one here in Framingham. My specimens are labelled: Sherborn, Oct. 8, 1933, Framingham, Sept. 11, 1910, and Framingham, May 29, 1931, under dead musquash. Specimens of what appear to be this species are at hand from Mineral Springs, Ind. and from McMinnville, Ore., March 1, 1935 and May 20, 1941.

*Pachybrachys pubescens* Oliv. This species was not recorded east of Watkins, N. Y. by Fall in his monograph of the genus. On June 10, 1945, one specimen was taken on a red oak leaf at Natick, Mass. and another specimen escaped.



AFRICAN BEES OF THE GENUS ANTHOPHORA<sup>1</sup>

BY T. D. A. COCKERELL  
Boulder, Colorado

The bees recorded below were kindly sent by Dr. J. Bequaert and are in the Museum of Comparative Zoölogy.

*Anthophora regalis*, new species

♀. Length about 14 mm.; very robust, black, the abdominal tergites 1 and 4 having broad bands of brilliant purple; hair of head and thorax mixed greenish and black, on thorax beneath and on cheeks white, the occiput with a fringe of bright green hairs, with longer black hairs behind them; face markings yellowish-white; clypeus with a reversed T, the stem slender, but broadening before the arms, which do not reach lateral borders; supraclypeal area with a small triangular mark; labrum broad, with laterobasal black spots and a narrow black margin, apical part of labrum brownish; mandibles broadly pale at base; flagellum obscurely brownish beneath; tegulæ black; wings rather dilute fuliginous; front and middle legs with pale pubescence, hind legs with black, except a sharply defined pubescent band along the whole length of hind tibia behind; descending face of first tergite with pale hair; fifth tergite with a large transverse bilobed patch of grey hair, but otherwise with black hair.

CAMEROONS: Metet (*G. Schwab*).

Related to *A. expleta* Vachal, but that has the bands pale blue becoming white laterally. *A. vivida* Smith, type ♀, has the hind tibiæ all black, but a variety has a tuft of white at apex behind; *A. vivida* has emerald green bands, and no band on first tergite.

*Anthophora armata* Friese

KENYA: Taveta (*A. Loveridge*). ♂.

*Anthophora torrida* F. Smith

TANGANYIKA TERRITORY: Kilosa, Dec. 11, 1920 (*A. Loveridge*). KENYA: Mombasa (*G. M. Allen* and *G. Brooks*). LIBERIA: Monrovia, July (*J. Bequaert*).

These are females. I have examined Smith's type.

<sup>1</sup>Published by a grant from the Museum of Comparative Zoology at Harvard College.

*Anthophora katangensis* CockerellCAMEROONS: Metet (*G. Schwab*). ♂.*Anthophora flavicollis loveridgei*, new subspecies

♀. Exactly the size and aspect of *A. flavicollis* Gerst., with the thorax red-haired above, and the abdomen entirely black, but with no band of red hair beneath the wings, and the thorax broadly black-haired in front as far back as the red tegulæ. The statement that the abdomen is all black must be qualified by reference to the apical fringe of white hair, which is as in *A. flavicollis*. It is broadly interrupted in the middle. The clypeal mark, broadened at lower end, is white. A second specimen has the black on anterior part of thorax less developed, taking the form of two lobes, but continuous along the margin in front.

TANGANYIKA TERRITORY: Kilosa, January 7, 1922 (*A. Loveridge*).*Anthophora flavicollis* GerstaeckerBELGIAN CONGO: Village of Malela (Chief Kansende), 5° 40' S., 23° 45' E. (*J. Bequaert*).*Anthophora africana* FrieseTANGANYIKA TERRITORY: Kilosa, April 4, 1922 (*A. Loveridge*).*Anthophora cincta* FabriciusLIBERIA: Gondalahun (*J. Bequaert*).*Anthophora centralis* CockerellCAMEROONS: Metet (*G. Schwab*).*Anthophora ugandae* Meade-WaldoCAMEROONS: Metet (*G. Schwab*).*Anthophora advena* F. SmithTANGANYIKA TERRITORY: Kilosa, ♀, January 7, 1922; ♂, April 14, 1922 (*A. Loveridge*). Also a female from ZANZIBAR (*C. Cooke*).*Anthophora advenula* CockerellCAMEROONS: Metet (*G. Schwab*).Very like *A. triangulifera* Ckll., but easily distinguished by the form of the labrum.*Anthophora adveniformis*, new species

♂. Length about 16.5 mm.; robust; black, the thorax above covered with bright red hair; the abdomen with no light hair

on first three tergites, but fourth (except at base), fifth and sixth covered with greyish-white hair, and long white hair at side of fifth and sixth; middle and hind legs with black hair, anterior tibiae and tarsi on front with white hair; tegulae red; wings dilute fuliginous. Scape all black, flagellum long. Face broad, face-markings orange, consisting of a long transverse supraclypeal mark, pointed at each end, a band on each side next to clypeus, a reversed T-shaped mark on clypeus, the stem with the end very slender, reaching top of clypeus, but the lower end greatly broadened (with a keel in middle), the lateral arms short; labrum orange, the apical margin dark and the basal spots small; mandibles pale at base; cheeks with long pure white hair. The anterior part of thorax has long white hair below.

CAMEROONS: Metet (*G. Schwab*).

It looks exactly like a female *A. advena* Smith, but the face marks at once distinguish it, and it is very different from male *A. advena*. It is closely allied to *A. albocaudata* Dours, but is more robust, with different face-markings.

*Anthophora plumipes* (Fabricius)

CAPE PROVINCE: Willowmore, January 1, 1904 (*H. Brauns*).

According to Dalle Torre's Catalogue this was said to come from India, which is impossible. F. Smith says it is in the Banks Collection at the British Museum. I presume that this is the actual type, and it should be examined and described in modern terms. I did not see it when working at the British Museum, as the Banks Collection is kept separate, and it did not occur to me to look for the type of *A. plumipes*. Dours treats *A. atrocincta* Lepeletier as a valid species, with *A. plumipes* as a synonym, in spite of the long priority of the latter. He gives Caffraria as the locality. However, Lepeletier described *A. atrocincta* from a male from Senegal, with white face-marks, and scape yellow in front. The South African form has a light mark on the male scape. Supposing that the South African bee could be distinguished, at least as a subspecies, from true *A. atrocincta*, I thought perhaps the name *A. domicola* Ckll., based on a bee from Benguella, might be applicable, but this is a smaller species, and the very short scape is entirely black.

Male *A. plumipes* from Tenke in the Katanga has only a small light mark on the scape, and the labrum is conspicuously

shorter than in the S. African form. Thus it seems probable that we should recognize several subspecies of this widely distributed bée, and that *atrocincta* Lep. is not applicable to any of those now before me. Which is the true or typical *A. plumipes* we do not know, but if the Fabricius type is found, that point can be settled. It is quite possible that the South African form (from Huguenot in the west to Zanzibar in the east) may need a new subspecific name.

#### *Anthophora spinicauda*, new species

♂. Length about 10 mm.; black, with the face-markings very pale yellow, including clypeus (with only a small spot on each side), narrow supraclypeal band, not angulate above, lateral marks filling space between clypeus and eye, sending a line a short distance up eye margin, stripe on scape, labrum and base of mandibles; face shining, but clypeus dull in middle; flagellum short for a male, very obscurely brownish beneath; hair of head and thorax above light fulvous, not mixed with black, of cheeks pure white, of sides of thorax greyish; wings slightly dusky; legs black, hair of middle and hind legs entirely black, but front femora with a long fringe of pure white hair; abdomen broad, covered with ferruginous hair, with an appearance of broad pallid bands; apex with a single median spine. The eyes are dark red.

TANGANYIKA TERRITORY: Morogoro, June 1 (*A. Loveridge*). Superficially like *A. vestita* Smith, but differing in the black hair of the legs and the apical spine of abdomen. By the black-haired middle and hind legs this resembles the much larger *A. africana* Friese. *A. vestitula* Ckll. was described from the female, with black hair on hind legs, but the hair of the thorax is quite differently coloured.

#### *Anthophora malelana*, new species

♀. Similar to *A. ogilviei* Ckll., the face marks as in the male of that species, but with the widely separated quadrate black marks not at all produced downward at inner apical corner; the apical yellow band of clypeus is very wide, and the lateral face marks slope downward from the upper end next to corner of clypeus, but on approaching the orbit, send a pointed projection upward; the labrum is very large, and the basal spots are pale; the scape is light red (a unique feature), with a small



yellow stripe on upper part; flagellum red beneath. Hair of head and thorax above pubescent; abdominal bands five, clear but rather dull white, not flavescent; the fifth band is thin, showing the black surface; hind tibiæ on under side with white hair, on which is a large black stripe, extending nearly the whole length; hind basitarsi with abundant black hair, and no light tuft. Face marks very pale yellow; wings dusky.

BELGIAN CONGO: Village of Malela (Chief Kasende), near the Lubilash River, 5° 40' S., 23° 45' E. (*J. Bequaert*).

DESCRIPTION OF *HABROCESTUM PARVULUM*  
(BANKS)<sup>1</sup>

SARAH E. JONES

Texas State College for Women

Discovery of a male *Habrocestum parvulum* (Banks) taken from William Trelease Woods, University of Illinois, on Sept. 25, 1939, and two females, taken on Sept. 16, 1944, and Jan. 14, 1945, led to examination of the specimens in the collection in the Museum of Comparative Zoölogy, Harvard University. The male holotype is redescribed, and the female is described for the first time.

Male. Length 3.25 mm.; ceph. 1.75 mm. long, 1.25 mm. wide; abd. 1.5 mm. long; *cephalothorax* brown, ocular area darker with a posterior median emargination in dark area; lighter band across thorax behind eyes, and radiating dark lines on thorax; margin black; clypeus brown, darker around eyes, where are short white hairs; white hairs above anterior eye row and scattered over cephalothorax, which is high, sloping slightly forward and strongly backward from hind third, widest behind last eyes, with sides almost parallel; *clypeus* sloping posteriorly, one-half as wide as anterior median eyes; *eyes*, ant. row bulging, slightly recurved by posterior margins, medians almost twice the diameter of laterals, second row slightly nearer hind row, which is narrower than thorax; quadrangle one-fourth wider than long, narrower behind, occupying less than one-half of cephalothorax; *sternum* pale, longer than wide, with coxæ I separated by more than width of labium, coxæ IV contiguous; *labium* pale, as long as wide; mandibles reddish, paler below, with one tooth on lower fang groove, none above; *abdomen* cream, with narrow oblique black lines laterally, leaving a pale line bordering abdomen anteriorly and passing back laterally to hind third of abdomen; on dorsum are three pairs of light spots, the first two confluent; posteriorly are four light cross-bars and a light spot above the pale spinnerets; *venter* pale,

<sup>1</sup>Published by a grant from the Museum of Comparative Zoology at Harvard College.

with a median longitudinal band and a pair of crescentic lateral lines black; *legs* (removed from holotype, and described from male taken with female allotype) brown, first pair darker,

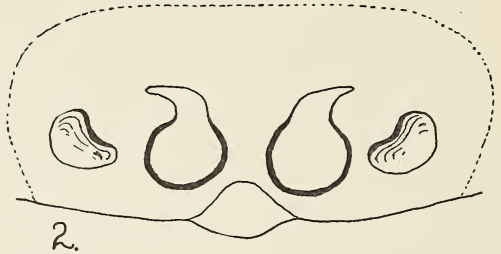
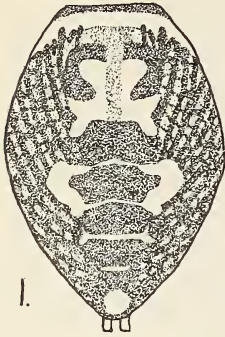


FIG. 1. Dorsum of male abdomen.

FIG. 2. Epigynum.

FIG. 3. Male palp, lateral view.

FIG. 4. Male palp, ventral view.

black on patella and tibia, with last two joints light, 4-3-1-2; spines, I pair, tibia, ventral, 2-2-2, prolateral, 1 distal, metatarsus, ventral, 2-2, twice the diameter of the joint; II pair, tibia, ventral, 1-2-2, prolateral, 1 distal, metatarsus as in I pair, no dorsal basal spine on last two pairs of tibiae; *palp* black, patella slightly longer than tibia, which is slightly longer than

wide, and longer dorsally than ventrally; apophysis short, hooked inward; embolus almost straight; bulb projecting ventrally and extending well over tibia.

Female. Length 3.5 mm.; ceph. 2.0 mm. long, 1.5 mm. wide; abd. 1.75 mm. long; *cephalothorax* colored as in male, but eye area black, transverse line behind eyes more distinct, and no radiating lines on thorax; hairs as in male, with also dark hairs above anterior eye row, longest between anterior eyes and below middle eye row; *eyes*, *sternum*, *labium*, and *mandibles* as in male; *abdomen* pale, mottled with black forming thin longitudinal lateral lines, dorsum with a large pair of light spots on anterior edge, two smaller pairs at mid-length, and four light cross-bars posteriorly; venter as in male; legs brown, 4-3-1-2, spines as in male; *palp* brown, outer two joints slightly swollen, with long stiff hairs ventrally and medially; *epigynum* with large median droplet-shaped spermathecae and smaller lateral vulval openings.

Holotype, Ithaca, N. Y. (N. Banks Collection). Allotype, Ithaca, N. Y., May 21, 1911. Coy Glen (N. Banks Collection). Taken with the allotype were one male and three immature specimens.

In the male from Illinois the cephalothoracic colors are more sharply contrasted than in the types. The male tibial apophysis is less blunt than in *H. pulex* (Hentz); the bulb protrudes as much posteriorly as in *pulex*, and much farther ventrally; and the embolus is less whorled than in *pulex*. The epigynum is distinctive in having the spermathecae medial to the vulval openings.



*CICINDELA FORMOSA GENEROSA* DEJ.

BY C. A. FROST  
Framingham, Mass.

Probably the most easterly locality for this variety at present known is in the large sand blow-out in Freeport, Me. known as the "Desert of Maine." Having no net with me on the visit to this place I was able to take but one specimen there on June 11, 1938. This locality is about 20 miles easterly and 34 miles southerly from the locality at Paris, Me. where it occurs. I also took specimens near the shore of Lake Webb in Weld, Me. on June 30, 1938. This place is about 34 miles north and a few miles easterly from Paris.

I have not seen any other records from Maine before or since I took it on the sand dunes back of the beach at Ogunquit on Sept. 17, 1903. This locality is about 100 miles south of Weld and 50 miles southwest of Freeport.

Weld, Me. is some 500 miles south of the locality in Canada where the variety *manitoba* Leng is found. Concerning this variety it may be well to point out that hasty statements based on insufficient material are of no great scientific value. In a fairly recent paper the author writes: — "This has always been considered a variety, but because of its restricted occurrence in the north it should be known as *Cicindela formosa* subspecies *manitoba*." Since I have specimens from Iowa, Nebraska and Kansas this statement has no weight. Moreover I have taken a specimen here in Framingham, Mass. which is almost an exact duplicate of a specimen from Manitoba labelled, "*manitoba* Leng, Topotypical." In mine the white area at the humeri is slightly narrower. My series of 94 specimens of *formosa* can be arranged to show in markings a nicely integrated series from the species to the varieties *generosa* and *manitoba*. Specimens occur not uncommonly here in New England which have a quite marked coppery color.

### SPECIAL A.A.A.S. MEETING

The Cambridge Entomological Club will hold a special meeting in conjunction with the meetings of the American Association for the Advancement of Science in Room 455, Biological Laboratories, Harvard University, at 8:00 P.M. on Thursday, December 26th.

The meeting will be addressed by Professor Clarence H. Kennedy of Ohio State University, whose subject will be: "The Child Labor of the Termites versus the Adult Labor of the Ant Society." An informal social gathering will follow. Visitors will be welcome.



## CAMBRIDGE ENTOMOLOGICAL CLUB

A regular meeting of the Club is held on the second Tuesday of each month (July, August and September excepted) at 8:00 p.m. in Room B-455, Biological Laboratories, Divinity Ave., Cambridge. Entomologists visiting Boston are cordially invited to attend.

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## CONTRIBUTIONS TO OUR KNOWLEDGE OF THE MYLABRIDAE, SEU BRUCHIDAE (COLEOPTERA) WITH ESPECIAL REFERENCE TO THE FAUNA OF NORTHEASTERN AMERICA

BY J. CHESTER BRADLEY  
Cornell University

*The family name.* — I concur with the wish expressed by Bridwell, 1946, that the International Commission may, by suspension of the rules, validate the use of *Bruchus* and *Bruchidae*. I am not however aware that they have been requested to do this, and even if they have been — I have quite recently urged Mr. Bridwell to submit the case to them — we can not anticipate a decision prior to its being reached.

### *Mylabris* Geoffroy

*Mylabris signaticornis* Gyll. in America. — There is a single (previously misdetermined) specimen of this species from the collection of Mr. Charles Liebeck and now contained in the Fall collection in the Museum of Comparative Zoology which bears labels indicating that it was found in lentils in Philadelphia, Pa. This is the fifth species of the genus to be recorded from the United States. It is a species of southern Europe, where it infests lentils and *Vicia monanthos*. One of these five species which has escaped record in the supplements to Leng's Catalogue is *M. lentis* Froelich, recorded in the New York State list of insects as infesting lentils in groceries in Buffalo and Ithaca; this species comes from the Crimea and Caucasus and attacks only lentils. As has been pointed out to me, both of the species are accidental importations of adults that would be unable to establish their progeny in dried lentils, and therefore are under no likelihood of becoming established.

### *Gibbobruchus* Pic

*Gibbobruchus mimus* (Say) Bridwell, 1946. — Leng's reference of Horn's group II of *Bruchus* to *Pseudopachymerus* Pic



is not correct. The type of this genus, and of *Caryedes* Hummel (*brasiliensis* Thunb. or its synonym *faldermanni* Manh.) is not congeneric with *mimus* Say, although showing certain points of relationship. *Mimus* belongs to *Gibbobruchus* Pic (as has been pointed out by Bridwell '46, p. 54, after these notes were written and submitted to him), and is quite similar to both *speculifer* Gyll. the type and *polycoccus* Fahr. the other originally included species, with both of which I have compared it. The following characters and distinctions may be noted:

Head not elongate, the antennal sockets practically contiguous to the mandibles; antennae not flabellate; pronotum strongly narrowed anteriorly, immarginate, its sides strongly expanding to the acute hind angles, its hind margin with a pronounced median lobe, its surface with a median longitudinal strongly elevated ridge (less strongly elevated in *mimus* than in the other two species) which bears a weak longitudinal median sulcus, and a somewhat stronger transverse, median depression, the lateral depressions as in *Caryedes*, but correspondingly more pronounced, the enclosed tubercle weaker; hind femora strongly incrassate, their width equal to  $\frac{1}{2}$  their length, the inferior surface finely bicarinate, the inner edge with a spine-like tooth near its apical third, followed by 4 acute teeth about  $\frac{1}{2}$  as long, not set in a notch, the outer edge denticulate from about its basal third to the apex; hind tibiae as in *Caryedes*; pygidium nearly vertical, in the  $\delta$  with a large apical glabrous area, (in *polycoccus* this is bituberculate), in the  $\sigma$  densely pubescent throughout. This description applies equally to all three species, except as noted.

#### *Caryedes* Hum.

Head elongate, the antennal sockets removed from the base of the mandibles by the length of the first antennal segment; antennae not flabellate; pronotum strongly narrowed anteriorly and produced into a short neck, immarginate, its sides strongly expanding to the acute hind angles, its hind margin with five undulations, its surface with a broad, longitudinal, slightly raised area, of uniformly even surface, bordered on each side by a depression which extends to the side and hind angle, but surrounds a well-marked tubercle; hind femora strongly incrassate, their breadth equal to 0.4 of their length, the inferior surface not bicarinate, its inner margin with a long preapical

spine-like tooth, preceded by a notch and this in turn by 2 or 3 minute, semi-concealed spines, and followed by another notch bearing 2 blunt denticles; hind tibiae arcuate basally, clavate, ending in a spine that is as long as the tooth of the femur; pygidium, in the ♂, vertical, with most of the apical surface smooth and shiny, not strongly pubescent, and bearing a small median triangular elevation bordered by a narrowly V-shaped groove, in the ♀ densely pubescent and without the elevation.

Another species previously included in *Pseudopachymerus* is *arizonensis* Schaeffer, but this possesses characters so distinctive that it requires generic separation. I had drawn up and submitted to Mr. Bridwell, for his criticism, a description of such a genus, dedicated to him in recognition of the considerable amount of discriminating work that he has done in this family, but he preferred to name it himself, which is of course his privilege. The description that he published is, however, so brief, that it may not be amiss to publish here the description that I had prepared, along with a key to related genera, some of which are purely Neotropical.

#### Neltumius Bridwell, 1946

Head short, the antennal sockets very close to the base of the mandibles, antennae reaching approximately to the base of the elytra, gradually thickened from the third segment, with symmetrical segments and therefore not serrate, or with segments slightly produced on the outer side so that they are sub-serrate. Pronotum short, gibbous, tapered anteriorly, immarginate laterally and without lateral teeth, the sides (from a dorsal view) diverging strongly posteriorly to the acute hind angles, the posterior margin with a pronounced median lobe and usually weakly indicated lateral undulation; the surface much as in *Gibbobruchus*, with a median longitudinal swelling, most sharply differentiated in the type, in which it is crossed medially by a strong transverse depression, that in the other species is barely indicated, there is also a weak longitudinal furrow, more or less accentuated by white scales, the depressions to the sides of the median ridge enclose a weak tubercle, more strongly developed in *Gibbobruchus*; prosternum triangular between the coxae which are contiguous; elytra short, exposing the pygidium; pygidium moderately inclined to nearly vertical, its apex rounded, its surface even, without grooves or tubercles, densely

pubescent in the ♀, but some individuals, evidently males, with an apical thinly pubescent area. Hind femora not incrassate, the width equal to almost  $\frac{1}{3}$  of the length, the inner surface flat, the under surface somewhat flattened, with a weak carina on the inner margin that bears a single denticle before the apex; hind tibiae carinate externally, the apex with two equal short teeth (one a little longer in *texanus*). Surface of pronotum and elytra densely covered with appressed pubescence, mottled white and brown.

This genus seems to be most nearly related to *Gibbobruchus*.

#### Species

*Neltumius arizonensis* (Schaeffer), genotype.

*Neltumius gibbothorax* (Schaeffer), new comb.

*Neltumius texanus* (Schaeffer), new comb.

#### Key to genera with longitudinal pronotal elevation.

1. Hind femora incrassate, with a strong inferior preapical tooth followed by spines or denticles . . . . . (2)  
Hind femora slender, simple except for one small inferior tooth or spine (N. Amer.) . . . . . *Neltumius*
2. Antennal sockets distant from base of mandibles by the length of the first or second antennal segment . . . . . (3)  
Antennal sockets practically contiguous to mandibles. (N. and S. Amer.) . . . . . *Gibbobruchus* Pic
3. Pronotal ridge strongly elevated; antennae of male pectinate . . . . . *Falsobruchus* Pic  
Pronotal ridge broad and barely elevated; antennae not pectinate . . . . . *Caryedes* Hummel

#### *Callosobruchus* Pic

Recent authors place *chinensis* L. and *maculatus* Fabr. in *Callosobruchus* (Cf. Bridwell '29, p. 40, '32, p. 104, Baeckmann '29, p. 160, and Herford '35, p. 5) a fact which has escaped the compilers of the third and fourth supplements to Leng's Catalogue, as has also the fact pointed out by Bridwell that the correct name for *quadrimaculatus* F. is *maculatus* F.

#### *Megacerus* Fahraeus

The species of this genus of which the habits are known infest the seeds of *Convolvulaceae*. Bridwell (1929, p. 112) has des-

ignated *Bruchus coryphæ* Oliv. genotype of the synonymous or possibly subgeneric group *Pachybruchus* Pic, and has also transferred to *Megacerus* *B. discoideus* Say, *B. impiger* Horn, and *B. crenatus* Schf. (nec Thunberg) the name of which he has changed to *schaefferianus* Bridw. Since all of these facts, including the recording of *Megacerus* as a North American genus have escaped the attention of the compilers of the supplements to Leng's Catalogue, they are here repeated.

*Megacerus* Fahreus 1839 is not entered either in Neave's *Nomenclator zoologicus* or in the *Nomenclator animalium generum et subgenerum* of the Prussian Academy of Sciences in Berlin.

*Megacerus arenarius* (Wolc.) new comb. — I have seen no specimen of *Bruchus arenarius* Wolcott, but since it was described as a member of Horn's group IV, to which the species of *Megacerus* belong, it also may be transferred to that genus, pending a fuller knowledge of the species. This action is justified by the fact that it certainly is not a *Bruchus*, that some disposition should be made of it, and that it in all probability is a *Megacerus*.

#### Bruchidius Schilsky

The status of this genus has been discussed by Bridwell, 1899, p 41. Reopening the question in 1946, p. 53, he finds it "advisable" to establish a tribe *Bruchidiini* for the Old World genera and another, *Acanthoscelidini* for the Nearctic and Neotropical genera. However he considers it "premature to attempt a diagnosis" of these tribes. He states that aedeagal distinctions exist, but not what they are. The present writer hopes to be pardoned if he finds it a somewhat unscientific procedure to erect taxonomic groups until one is prepared to differentiate them, and present the evidence for believing them distinct, in order that others may examine and evaluate it. To him it is premature to recognize, or for their sponsor to have proposed the tribes.

The matter is not without zoogeographical importance for it our Nearctic *Bruchidius* (for which at least in part Bridwell has erected the genus *Sennius*) are not offshoots of the European group, but come from a different stock, then the matter is of considerable interest. Nevertheless it remains to be proven.

An adequate differentiation between *Bruchidius* and *Acan-*



thoscelides *s. l.* (probably including all or most of Bridwell's recent segregates of that genus) has been given by Herford, 1935.

Bruchinus Schilsky 1905, cited by Bridwell as a synonym or possible subgenus of Bruchidius, is not recorded either in Neave's Nomenclator or that of the Prussian Academy of Sciences in Berlin.

In erecting the Palearctic genus *Sparteus* (1946, p. 55) Bridwell has not compared it with *Bruchidius*, which is the nearest relative of the group to which he intended the name to apply. It does not seem that it can be accorded higher status than that of a subgenus of *Bruchidius*, at least until adequate reason for so doing is pointed out.

Bridwell designated *villosus* Fabr. type of *Sparteus*. But Hoffman, 1945, p. 83, indicated that the species which Bridwell really meant, and which has passed as *villosus* Fabr., is *fasciatus* Ol., 1795, Ent., v. 4, p. 20. He pointed out that *villosus* Fabr. is a Spermophagus. Schilsky saw the Fabrician types in Kiel, and found this to be the case. *Sparteus* Bridwell therefore is a synonym of *Spermophagus*, unless action is taken by the International Commission on Zoological Nomenclature to change the genotype to the species that Bridwell unquestionably meant.

Dr. W. T. M. Forbes has bred *B. fasciatus* Ol. in numbers from the seeds of Scotch broom (*Cytisus scoparius*) at Woods Hole, Mass. The specimens were determined by Mr. L. J. Bottimer in 1931. This is a common species of southern Europe, not previously recorded from North America, unless record has escaped my attention. *Cytisus* and *Spartium* are both cited as hosts, and although these are separate genera, I am unable to state whether or not the terms have been used synonymously in this connection. Four specimens of the same beetle are in the Fall collection, taken on Nantucket Island in 1920, 1926, and 1927, so that the beetle is evidently well established. These specimens are labelled "*cisti* Fabr." but this should be *cisti* Payk., which is a synonym of *fasciatus*.

It is interesting to note that Mr. Bridwell in allocating *Sparteus* to his tribe Bruchidiini (see above), apparently because it is Palearctic, was obliged to make an exception of it, including it in his key with "Acanthoscelidini."

## Stator Bridwell, 1946

*Bruchus pruininus* Horn has been transferred to *Bruchidius* by Herford (1935, p. 17) but that fact was overlooked by Blackwelder in compiling the Fourth supplement to Leng's Catalogue. It has now been made type of *Stator* Bridwell, 1946, p. 55.

## Sennius Bridwell, 1946

The following species, described in *Bruchus* and recorded from the northeastern United States, should be listed in *Sennius*:

*Sennius bivulneratus* (Horn) new comb.

*Sennius cruentatus* (Horn) genotype.

*Sennius nigrinus* (Horn) new comb.

I have examined the type of each of these species.

## Acanthoscelides Schilsky

Bridwell (1929, p. 42) has characterized this genus. One character mentioned by him, namely, the carinate front, is not of generic significance, as already pointed out by Bottimer (1935, p. 129). It had seemed to me that *macrocerus* Horn, and those species related to *flavicornis* Sharp represent two sub-generic segregates, and in the manuscript that I submitted to Mr. Bridwell I had erected such. Mr. Bridwell, perhaps inspired by my attempts to straighten matters out, has gone further, and erected genera not only for these two groups, but for several others that would formerly have fallen under *Acanthoscelides*. He may be right, but perhaps some of his groups would be more suitable as subgenera, especially *Mimosestes*, and *Algarobius*.

The result of this breaking up of *Acanthoscelides* is to leave our North American fauna disrupted, so far as the generic allocation of species is concerned, and it is necessary to rebuild it.

*Bruchus obtectus* Say is the genotype of *Acanthoscelides* (see Bridwell, 1929, p. 42, and 1932, p. 104); this, the economically important beanweevil, originally American, has become cosmopolitan through commerce. Its transfer to *Acanthoscelides*, and the record of the latter as a valid North American genus escaped the attention of the compilers of the second and third supplements to Leng's Catalogue.

Bottimer has described *A. tenuis* from the eastern United

States (1935, p. 127). This did not escape the attention of the compiler of the fourth supplement, who recorded it as a *Bruchus*, not an *Acanthoscelides*. The compiler, as a taxonomist, has a perfect right to consider *tenuis* a *Bruchus* and *Acanthoscelides* an invalid genus, but as a cataloguer it seems quite unpardonable for him to record the species in a genus in which it was not described, and to make no mention of the genus in which it was described.

In the same paper, pp. 128 and 129, Bottimer refers the following species to *Acanthoscelides*, namely: *A. atomus* (Fall), *A. alboscuteatus* (Horn), *A. seminulum* Horn. No record of these transfers appears in the fourth supplement to Leng's Catalogue.

In all probability all species belonging to Horn's groups VI, VII, VIII, and IX, as well as those for which Fall erected the group VIIIA belong to *Acanthoscelides*, *s. l., i. e.*, as the genus was understood prior to Bridwell's 1946 paper.

*List of Species of Acanthoscelides and Segregate Genera  
Recorded from the Northeastern United States*

The numbers preceding the species are those used in Leng's Catalogue, p. 305-306, and indicate the bibliographic references as there given.

**Acanthoscelides Schilsky**

16203. *A. pectoralis* (Horn) new comb.  
 16205. *A. floridae* (Horn) new comb. Probably equals 16233,  
*horni* Pic = *exiguus* Horn  
 16206. *A. innotatus* (Pic) new comb. *s. collata* 320 1931  
 16210. *A. obsoletus* (Say) new comb.  
 16211. *A. longistilus* (Horn) new comb.  
 16218. *A. alboscuteatus* (Horn) Bott.  
 ——— *A. tenuis* Bott.  
 16221. *A. obtectus* (Say).  
 16227. *A. perforatus* (Horn) new comb.  
 16231. *A. calvus* (Horn) new comb. *confusus* by Bridwell 1946  
 16232. *A. fraterculus* (Horn) new comb. *confusus*  
                     Althaeus Bridwell, 1946  
 16222. *A. hibisci* (Oliv.), genotype.  
                     Stylanthus Bridwell, 1946  
 16240. *S. macrocerus* (Horn), genotype.

**Abutiloneus** Bridwell, 194616243. *A. seminulum* (Horn).16244. *A. atomus* (Fall).**Abutiloneus** Bridwell

The differentiation of *Abutiloneus* from *Sparteus* in Bridwell's 1946 key is not entirely satisfactory. *Sparteus villosus* may have a minute angulation on the inner margin of the hind tibiae, as stated by Bridwell but it may also have two denticles, and sometimes apparently none. A specimen in the Fall collection determined as *flavicornis* Sharp from San Diego, Texas, collected by E. A. Schwarz and evidently of the lot referred to by Schaeffer in 1907, has denticles or granulations under the femora, and species that I have considered congeneric have each 2 small equal denticles. Neither does the length of the elytral striae entirely serve, as there is considerable difference among these species in that regard. One can say however of *Sparteus* that striae 3 and 6 are equally long, approach one another at apex and are much longer than 4 and 5, 6 curving in close to the apex of 5, but than in *Abutiloneus* this is not the case, though approached in *atomus* Fall.

**Merobruchus** Bridwell, 1946

*Merobruchus major* (Fall) new combination. The type of this species shows clearly that it is a *Merobruchus*.

\* \* \*

In the foregoing paragraphs attention has been drawn to a number of genera and generic transfers that should have been recorded in the supplements to Leng's Catalogue. While the cataloguers cannot be excused for their omission, it is only fair to lay a considerable portion of the blame upon the authors involved, for in many instances the transfers have been made in a way that failed to direct attention to them, or to the fact that North American insects were involved. In one instance generic transfers of North American species were made, and thereby a genus added to the North American fauna in a paper the title of which indicated only that it dealt with the occurrence of a beetle in Hawaii. If authors could train themselves to bear in mind the difficulties encountered by bibliographers and cataloguers, fewer such omissions would occur.



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## SOUTHERN PIERIDS IN NEW ENGLAND

It might be worth placing on record, as a feature of the warm autumn of 1946, that not only was *Eurema lisa* Boisd. and Lec. abundant throughout the fall along the railway line near Wellesley, Mass., but that the very rare visitors, *Eurema nicippe* Cramer and *Phæbis sennæ eubule* Poey (one specimen of each), were seen by the author of this note on October 17th in the streets of Cambridge, Mass.

— V. NABOKOV

SOME FOSSIL DIPTERA FROM FLORISSANT,  
COLORADO

BY A. L. MELANDER

Riverside, California

Florissant, near Pike's Peak, Colorado, is a minor hamlet as towns go, but it is internationally renowned because of the multitude of Tertiary fossils that have been discovered near by. The small bluffs of laminated shale are being dug open piecemeal, to disclose layer upon layer of reminders of the living things of that region as they existed some twenty million years ago. The shale strata consist of solidified fine volcanic ash, blown out from adjacent volcanoes in Miocene times, with outbursts of poisonous gases to overwhelm the insects and other life of that time. Many of the fossils are perfectly preserved, but the majority of the soft-bodied Diptera are tantalizingly incomplete. Here or there a specimen is discovered with enough of its taxonomic parts in good condition, so that it can be classified as accurately as a pinned recent fly. It is my privilege to announce some remarkable finds in this article.

*Silvius merychippi* (Cockerell) (Tabanidae)

Allotype, male. I purchased at the Museum at the Florissant fossil beds a beautiful specimen of what is unquestionably the species described by Professor Cockerell as *Tabanus merychippi*. The neurulation of both wings is perfect and shows the maculations and course of the veins as originally described for the female. The abdomen, however, is not marked with the obscure median stripe, but is evidently uniformly testaceous. The shape of the first and fourth posterior cells indicate the genus *Silvius* rather than *Tabanus*. The broad yellow body and large size suggests the modern *Silvius gigantulus*, though the wings are like those of *S. pollinosus*. There is no angulation nor spur on the branch of the third vein, the wing, even with the markings, being like Figure 16, page 152, of Curran's Manual of North American Diptera.

*Leptogaster prior*, n. sp. (Asilidae)

(Plate II, Fig. 1)

Length 12 mm., length of wing 7 mm. Evidently a fuscous species, the comparatively stout abdomen indicating a female. Palpi not preserved; proboscis two-thirds the head-height. Lower part of pleura together with the mesonotum and metanotum darker than the upper pleura. Abdominal tergites darker than their sternites. Legs not annulate, but base of femora paler fuscous, outer part of hind femora and of hind tibia dark; hind tibiae enlarged distally, their pubescence plainly discernible in the specimen. Wings narrow and hyaline, the neuration well preserved, second vein arising before discal cell, fork of third vein arising beyond discal cell and continuing with only slight curve to wing-tip, the anterior side of the discal cell evidently angulate at the fork of the fourth and intercalary veins, fourth posterior cell petiolate.

A single specimen from the R. D. Lacoë collection, accession series number 38131, belonging to the United States National Museum. *Leptogaster* differs from other Asilidae by its slender form, limited chaetotaxy, reduced anal angle of the wing, long claws and vestigial pulvilli. The shape of the second posterior cell is also distinctive, extending over the discal cell and pointed at its proximal end. *Leptogaster* bears much the relation to the other Asilidae that the slender-bodied Systropinae do to the other Bombyliidae. The modern *Systropus* is elongate, nearly bare, long-legged, with anal angle and alulae of the wings reduced, and thus differs markedly from the stout furry bee-flies. Although the extreme in *Systropus* has not been found in the Tertiaries, Professor Cockerell has made known several other of the nearly bare and slender Bombyliidae and has commented on their comparative abundance in early times.

Compared with some thirty recent species of *Leptogaster* in my collection, the Florissant specimen agrees exactly with *flavipes* Loew, in every detail of neuration, coloration and size. *Flavipes* is one of the commonest of the living Leptogasters and is widely distributed from Colorado to the Atlantic seaboard. Were the lives of the two not separated by the millions of years of time I would have placed the fossil with the living species. This is the species mentioned by Professor Cockerell in the *Entomologist*, 1913, page 214, and by Doctor James in the *Journal*

of Palaentology, 1939, page 42, as occurring, but not described, in the Florissant beds. There is a species of *Leptogaster* described from the Tertiary formation of Kroatia, but *prior* is the first extinct species to be found in America.

*Asilus curculionis*, n. sp. (Asilidae)

(Plate II, Fig. 2)

Legs rather short, unicolorous, apparently red, tarsi gradually darker toward the tip, with uniform short rather coarse but not crowded dark brown pubescence; front femur with a row of eight long slender black bristles along its flexor edge; front metatarsus comparatively long, its sole with short stiff black bristles. This joint lacks the end, but enough is present to show that it is not of the abbreviated type of *Echthistus*. Middle tibiae with three macrochaetae present on the extensor surface; hind femora with about six bristles below, none visible on the upper side. The inner surface of the hind tibia shows a denser pubescence, as in some modern species. This surface is provided with two stout bristles, a character which among the recent species is almost invariably correlated with a long arista. Unfortunately the head, which would have offered valuable generic characters, is wanting. Wing eleven millimeters long, clear hyaline, showing no darkening at the tip or posterior border, veins firm and dark, fourth vein much arched at basal third of second posterior cell, fourth posterior cell proximally pointed and merely touching the tip of second basal cell, anterior cross-vein placed a little beyond middle of discal cell. Body evidently darker than the legs, its macrochaetae black.

The right wing and the left hind leg are preserved to a remarkable degree. Remains of the thorax, the other wing, and parts of the legs are also visible on the stone, but are torn apart and more obscure. Modern robberflies readily macerate and their members easily dissociate if kept moist after death, and care must be taken if relaxing them lest they fall to pieces. From the neuriation the insect is most certainly to be included in the broad genus *Asilus*. Comparison with recent material shows limited but almost exact agreement with several of the species. The neuriation of *Asilus* in its broader sense is quite rigid. The smaller genera or subgenera into which *Asilus* has been segregated derive their characters scarcely at all from the wings. Color, character of the vestiture, and particularly the



structure of the genitalia are the points used to separate the adjacent subdivisions.

The species evidently closely resembles *Philonicus saxorum* James, but the wing-veins are much darker, the second submarginal cell distally is less bell-shaped, the first posterior cell is less constricted at the middle, and the fourth posterior cell is not pedunculate at its base. I have compared the fossil with over fifty species of the *Asilus* complex before me, which are distributed among fourteen of its twenty subgenera. From some of the groups, e.g., *Asilus* s.str., *Pampomerus*, *Tolmerus*, etc., the fossil can be at once isolated because of the nature of its vestiture and its neuration. Of the species before me it compares most favorably with *Heligmoneura*. The apparently red legs, the nature of their pubescence and bristles, and the hyaline wings are quite like the European *H. flavipes* Meigen. But the fossil shows a difference in having black bristles, longer front metatarsi and more arched second posterior cell. The Florissant specimen is probably a female for the bristles of the front femora are stronger than in the male of *Heligmoneura*, and there is none of the shaggy hairs underneath the front femora.

In size the fossil resembles our common *Tolmerus notatus*, but its bristles are much less evident and its legs are shorter. Although it does not belong to this division of *Asilus* it will be convenient to compare with *notatus*, inasmuch as Professors Cockerell and James have compared other fossil Asilidæ with this wide-spread recent form. The tip of the marginal cell is as in *notatus*, and therefore blunter than in *peritulus* or *amelanchieris*; the second submarginal cell is considerably shorter than in either *notatus* or Cockerell's species; the second posterior cell bulges as in *peritulus*; the anterior crossvein is as in *notatus*, but slightly beyond middle of the discal cell; the fourth posterior cell is as in *notatus* and *amelanchieris*.

The type bears the accession series number 38131, and is from the R. D. Lacoë collection of the National Museum. This beautiful fossil shows intermingled with the parts of the fly the remains of a beetle in part well preserved. From the robust body, strong clavate femora, broadened tarsi and the pitting and squamæ of the legs and body it appears that the beetle is a weevil, similar to *Phymatodes*. It is not unlikely that the *Asilus* was overwhelmed just after securing the weevil as its prey.

*Apolysis magister*, n. sp. (Bombyliidae)

(Plate II, Fig. 3)

Length 9 mm. A rather stout, apparently bare species whose generic position is indicated by the peculiar antennæ and open discal cell. Proboscis porrect, twice the depth of the head, palpi not preserved nor is the labella. Antennæ short, the first two joints globular, the first a little larger than the second and neither showing any hairs; third joint quadrate and blunt, widening below just before the middle, in length equal to the basal joints combined, bearing a minute style inserted just above the middle of its apex but not in a depression of the joint. Thorax large and domed. Abdomen large, conical, showing eight segments but the tip of the abdomen is not preserved, the individual segments posteriorly with narrow light-colored incisures. From the fulness of the abdomen it would seem that the fossil represents a gravid female. Legs slender, showing no bristles. Wings uniformly hyaline except that the marginal cell is darker; veins of the anterior portion well preserved, those of the hind part of the wing very faint and in part impossible to decipher. Two submarginal cells present, the second acute and long, the third vein forking opposite end of first vein with the branch terminating at wing-tip, third vein straight, anterior crossvein before middle of wing, discal cell open, confluent with the second posterior cell, three posterior cells present, the shape of the anal cell not recognizable. The species does not show a sign of the delicate scattered pubescence characteristic of the modern species.

Holotype and counter type: collected in 1906 by Cockerell, Wheeler and Rohwer, at Station 14 (See Bull. Am. Mus. Nat. Hist., XXIII, Art. IV.) and deposited in the American Museum of Natural History. Both halves of the stone show the fossil. Paratype: from the R. D. Lacoë collection in the National Museum, accession lot number 38575.

I have carefully looked for the posterior crossvein normally at the end of the discal cell, using the binocular microscope with every sort of lighting, without success; nor is there any angulation evident in the fourth and fifth longitudinal veins to indicate a crossvein. The species is therefore to be located in the genus *Apolysis*, which was erected by Loew for a South African species which is pictured in the Dipterenfauna Süd-

afrikas. There are now six more species recorded from South Africa and two palaeartic species from Europe and Siberia. Although up to the time of writing, the genus *Apolysis* has not been recognized as found in America, I have in press for publication in the Annals of the Entomological Society of America a tabulation of nine species, eight of which are new, which occur in Southern and Lower California.<sup>1</sup> The recent American species are small, ranging from 0.75 to 3 mm., hence the name selected for the large Tertiary species, *magister*, Latin, the leader of his tribe.

<sup>1</sup> Since published in vol. 39, no. 3, pp. 451–495.

#### DESCRIPTION OF PLATE II

Fig. 1, *Leptogaster prior*, n.sp. (×6); 2, *Asilus curculionis*, n.sp. (×4.4);  
3, *Apolysis magister*, n.sp. (×6)

#### THE GENOTYPE OF MIMETUS HENTZ

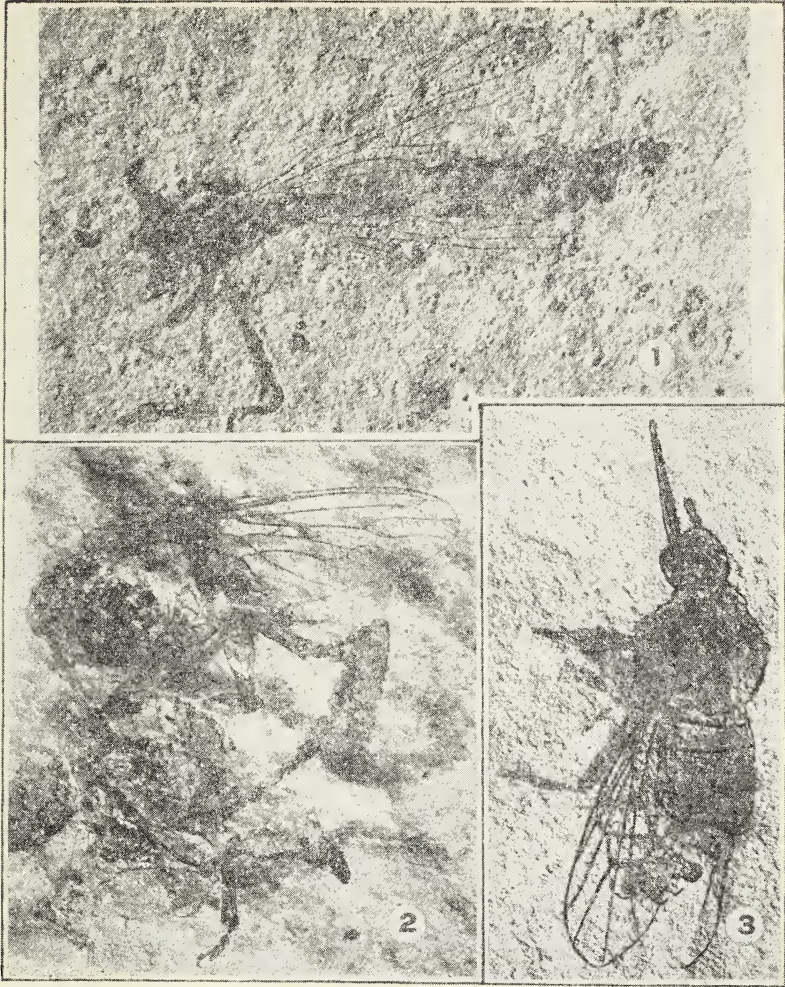
Some time ago, Mr. Banks called my attention to a curious mistake in the selection of the genotype of the genus *Mimetus* Hentz, a well known genus of spiders.

The genus of *Mimetus* was erected by Hentz in 1832, in an article "On North American Spiders" in Silliman's Journ. Sci. Arts, 21, pp. 99–152. The article is reprinted in the collected papers of Hentz in 1875, in the Occ. Pap. Boston Soc. Nat. Hist., vol. 2, pp. 1–15. This is the edition usually used. In the 1832 article, Hentz mentions but one species, *Mimetus syllepsicus* and of this he had only one specimen which he found in the web of *Eperia labyrinthea*.

In the paper of 1850, Journ. Boston Soc. Nat. Hist., pp. 18–35, Hentz redefines the genus and describes three species, *M. intersector*, *M. tuberosus* and *M. syllepsicus*. The first species, *M. intersector*, has been recognized as the genotype and the other two have been considered as synonyms. But by the generally accepted rules of taxonomy, the single species used at the time the genus was defined, automatically becomes the genotype, so if this rule is followed the genotype of *Mimetus* is *syllepsicus* Hentz.

— E. B. BRYANT





MELANDER — FOSSIL DIPTERA



DRAGONFLIES AS PREDATORY ENEMIES OF THE  
STABLE-FLY (*STOMOXYS CALCITRANS*)

BY CHARLES T. BRUES

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Two accounts have recently been published<sup>1</sup> of observations showing that dragonflies commonly capture stable-flies in considerable numbers. These relate to Florida Gulf beaches, and recall similar observations made by us some years ago at a second, far distant locality in northern Canada.

This was on the shores of Cedar Lake in northern Manitoba (Lat. 53° N) where we spent a part of the summer of 1936 with the primary purpose of collecting fossil insects contained in Cretaceous amber which occurs in quantity on one of the beaches bordering the western end of the lake.

The ever-present swarms of mosquitoes make the short summer season almost unbearable for man and beast alike and we had been warned that these would be supplemented from time to time by other small biting flies. From the description of this pest given us by the Indian who selected our camp site it appeared probable that it must be the stable-fly.

This surmise proved to be correct. A fortnight later when we returned to camp on the evening of July 5th from the beach where our collecting was done we were assailed by numbers of stable-flies which bit with the persistence that they exhibit whenever abundant, especially in the absence of other mammalian hosts. They were present in considerable numbers while the evening meal was being prepared and eaten, and we resigned ourselves to accepting them as camp mates for some time to come.

On the next evening they appeared in still greater abundance and the outlook grew more unpleasant. Shortly afterward, during the long twilight which persists for several hours at that

<sup>1</sup>Dove, W. E. and S. W. Simmons. Control of the Stablefly or "dog fly" Breeding in Shore Deposits of Bay Grass. Journ. Econ. Entom., vol. 28, pp. 582-589 (1942).

Wright, M. Dragonflies Predaceous on the Stablefly (*Stomoxys calcitrans*). Florida Entom., vol. 28, pp. 11-13; 31-32.

season, great numbers of dragonflies appeared in the air above the camp and within a few minutes the stable-flies had disappeared. Moreover they did not reappear during the several remaining weeks of our stay at Cedar Lake, although each evening numerous dragonflies were to be seen feeding in the air above us.

The dragonflies were not identified, but appeared to be a large species of *Æschnidæ* which appeared most abundantly at dusk, darting about in such numbers that we could occasionally hear the impact of their bodies as they collided in the air. Midges and mayflies are extremely abundant since there are endless opportunities for them to develop in the lake as well as in the spruce swamps and the other marshy areas characteristic of the region. Dragonflies are likewise a conspicuous element of the insect fauna just as they are along our southern Atlantic and Gulf coasts. The stable-fly population at Cedar Lake, however, cannot compare to the almost incredible numbers which regularly infest our southeastern beaches.

The stable-fly is undoubtedly an old world species, possibly native to India, but was reported to be abundant in Philadelphia as early as 1776, and appears at present to enjoy a distribution about as wide as that of any insect.

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#### POLYDRUSUS SERICEUS SCHALL.

This European species is listed in the Leng list as occurring in Indiana. In 1941 from May 25 to June 22 I took a number of them on poplar and again in Framingham in 1943 they were abundant on *Corylus americana*, poplar and maple near the same locality. This year (1945) they were again abundant especially on *Corylus* about June 10th. The European species of these green weevils are very numerous, or at least the names are, and the present species resembles many of them. Superficially they resemble large *Polydrusus impressifrons* Gyll., *Phyllobius pyri* L. and also the green form of *Scythropus elegans* Coup. *Phyllobius glaucus* Scop. is recorded from "Can." but probably this is a misidentification of *P. pyri* since the specimens from Mr. William Procter taken at Bar Harbor, Me., were first identified as *P. glaucus*.

— C. A. FROST

THE TABANIDÆ OF COLOMBIA (DIPTERA)<sup>1</sup>

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and

SANTIAGO RENJIFO-SALCEDO

Villavicencio, Colombia

The tabanid fauna of Colombia is rich and extremely varied. In the northwestern part it resembles that of the Republic of Panama, which is now well known through G. B. Fairchild's prolonged investigations. In the northeastern areas it is similar to that of the adjoining districts of Venezuela, a fauna which has recently been listed by A. Stone (1945). The fauna of the southwestern highlands has affinities with that of Ecuador. Finally many of the species of the great Amazonian rain forest extend into the southeastern territories.

At present, however, this vast country has been little investigated entomologically. Our preliminary list of definitely recorded species will probably be more than doubled by future discoveries. Indeed, our only purpose in publishing it is to incite to further collecting. The earliest records of Colombian tabanids by Macquart (1846 to 1855) were indefinite as to locality and some of his species are at present unrecognized. Schiner (1868), v. Röder (1886), and Ricardo (1902) added a few species. In recent years, Enderlein (1925), Szilády (1926), Dunn (1929), Kröber (1925 to 1940), and Antunes (1937) made more important additions.

The present enumeration includes all species recorded thus far from Colombia; but we have clearly indicated which of these we have not seen.<sup>2</sup> The asterisk, on the other hand, indicates the species of which we have studied specimens taken in Colombia. Material was seen from the Museum of Comparative

<sup>1</sup>Published with a grant from the Museum of Comparative Zoology at Harvard College.

<sup>2</sup>Entomologists should be warned not to trust always the locality record "Bogotá" so common in the literature. Often it means merely that the specimens were shipped from Bogotá to Europe, although they may have been collected in some other section of Colombia.

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The localities are grouped into the major political divisions (Departments and Intendencias), which are enumerated in alphabetical sequence.

#### KEY TO GENERA

1. Hind tibiæ with apical spurs. Subcosta always bare both above and below. Labella always with shiny sclerotized plates. Subepaulet bare, without macrotrichia. Subfamily *Pangoniinæ* ..... 2.
- Hind tibiæ without apical spurs. Subcosta generally hairy, at least with some hairs beneath. Subfamily *Tabaninæ* ..... 9.
2. First two antennal segments elongate, together often as long as or longer than third. Third antennal segment consisting of a long basal part (which sometimes shows superficial rings) and four terminal annuli. Proboscis short, seldom exceeding the height of the head ..... *Chrysops*.
- First two antennal segments short, seldom equalling together half the length of the third. Third antennal segment consisting of five to eight divisions. Proboscis often elongate ..... 3.
3. Third antennal segment consisting of a long basal part and four terminal annuli. Proboscis short. Wings



- extensively blackish. Eyes bare. All posterior cells open ..... *Hemichrysops*.
- Third antennal segment consisting of seven or eight divisions ..... 4.
4. Eyes bare. Face not produced nor snout-like. Proboscis moderately long. First posterior cell closed. Fork of third longitudinal vein generally with an appendix ..... *Esenbeckia*.
- Eyes hairy. Face more or less produced and snout-like. Proboscis often very long ..... 5.
5. Third antennal segment of seven divisions, the first six bearing long finger-like processes ..... 6.
- Third antennal segment without finger-like processes .. 7.
6. First divisions of third antennal segment bearing processes only on the dorsal side; basal process longer than the others ..... *Elaphella*.
- First divisions of third antennal segment with processes on both the dorsal and ventral sides; processes all about equally long ..... *Pityocera*.
7. First and fourth posterior cells closed and petiolate. Wings often with dark markings ..... *Scione*.
- First posterior cell closed or narrowly open, the fourth always open. Wings hyaline or smoky, never with prominent markings ..... 8.
8. Coxæ and femora slightly pilose or nearly bare ... *Fidena*.
- Coxæ and femora densely covered with long hairs. *Melpia*.
9. First antennal segment more or less elongate, not less than one-fourth of the length of the third segment. Subepaulet bare, without macrotrichia. Body without green metallic scales ..... 10.
- First antennal segment short, about as long as thick; if longer, the body bears some green metallic scales. Abdomen broad and short ..... 11.
10. Abdomen broad and short. Third antennal segment slender, never with a basal process or tooth, at most somewhat widened or slightly produced near the base ..... *Diachlorus*.
- Abdomen slender, narrow and long. Third antennal segment with or without a tooth or finger-shaped process near the base ..... *Acanthocera*.
11. First antennal segment greatly inflated. Palpi very

- slender. Subepaulet bare, without macrotrichia. Upper branch of third vein turned abruptly forward, joining the costa closer to the second vein than to the wing apex. Face much swollen at insertion of antennæ ..... *Bolbodimyia*.
- First antennal segment not inflated, normal ..... 12.
12. Base of third antennal segment with a long, slender, usually finger-shaped process reaching close to or even beyond the first terminal annulus ..... 13.
- Base of third antennal segment with or without dorsal angle or with a broad tooth which extends at most midway to the base of the first terminal annulus .... 16.
13. Subepaulet completely covered with macrotrichia. Fore tibiæ not inflated. Eyes bare ..... *Alliomma*.
- Subepaulet either bare or rarely with a few macrotrichia over a small area only ..... 14.
14. Body very stout, often densely hairy. At least fore tibiæ inflated, often strongly so; hind tibiæ densely fringed with long hairs. Eyes bare ..... *Stibasoma*.
- Body not especially stout nor hairy. Tibiæ not appreciably inflated, at most with a few scattered long hairs ..... 15.
15. Eyes pilose or pubescent in both sexes, the hairs sometimes short, scattered and easily overlooked. Labella small and compact, without shiny, sclerotized areas ..... *Dasychela*.
- Eyes bare in both sexes. Labella more or less sclerotized and shiny ..... *Dichelacera*.
16. All tibiæ strongly inflated ..... 17.
- Tibiæ normal. Palpi dull and hairy ..... 19.
17. Palpi normal, dull, hairy. Subcallus dull, pollinose. Basal division of third antennal segment scarcely longer than terminal annuli, with a strong, broad tooth. Subepaulet covered with macrotrichia. *Stigmatophthalmus*.
- Palpi flattened, shiny, bare. Subcallus denuded, shiny 18.
18. Third antennal segment with basal division long and wide, nearly four times as long as terminal annuli, provided with a very short, broad tooth. Subepaulet covered with macrotrichia. Body without metallic green scales ..... *Selasoma*.
- Third antennal segment with basal portion narrow, with-

- out tooth. Subepaulet bare, without macrotrichia. Body with some metallic green scales. . . . . *Lepiselaga*.
19. Subepaulet bare, without macrotrichia, rarely with a few macrotrichia either restricted to a small area or much more scattered than on the base of the costa. . . . . 20.
- Subepaulet wholly covered with appressed macrotrichia, like the base of the costa. Frontal callus present. Labella fleshy, without shiny, sclerotized areas. . . . . 25.
20. No frontal callus. Labella short, with sclerotized, smooth and shiny areas. Body green or greenish in life. . . . . *Chlorotabanus*.
- Frontal callus present. . . . . 21.
21. Third antennal segment of four divisions (only three well-marked annuli). Frons very broad; callus transverse, swollen, narrower than frons. Vertex of female with a small shiny area. Face with two deep, shiny pits. . . . . *Brachytabanus*.
- Third antennal segment of five divisions (four terminal annuli); if some are partly fused, either frontal callus as wide as frons, or vertex of female without shiny area, or face without deep, shiny pits. . . . . 22.
22. Eyes pilose or pubescent in both sexes. Frons relatively wide, less than five times as high as wide, with a broad callus. . . . . *Agelanius*.
- Eyes bare in both sexes. . . . . 23.
23. Vertex of female with a well-marked tubercle. Frons relatively narrow, at least five times as high as wide, with elongate callus. Labella fleshy or membranous, without shiny, sclerotized areas. . . . . *Stenotabanus*.
- Vertex of female without tubercle, rarely with a small flat, denuded area; in doubtful cases, frons much broader. . . . . 24.
24. Body unicolorous, more or less greenish or pale yellow in life. Frontal callus elongate. Labella with sclerotized, shiny areas. . . . . *Cryptotylus*.
- Body not greenish, usually with contrasting markings. Frontal callus as a rule wider than high and as wide as frons. Labella fleshy or membranous, without shiny, sclerotized areas. . . . . *Phæotabanus*.
25. Vertex of female with a more or less prominent, denuded tubercle, sometimes with traces of ocelli. Eyes bare or pilose. . . . . 26.

- Vertex of female without tubercle, flat. Eyes of female bare, of male either bare or pilose. . . . . *Tabanus*.
26. Vertex with at least traces of ocelli. Eyes in both sexes bare, unicolorous. Frons rather narrow. Scutellum covered with white or yellowish hairs. . . . . *Leucotabanus*.
- Vertex without even traces of ocelli. Eyes in both sexes pilose, pubescent or with a few scattered hairs; in life often with color bands in the female. Frons relatively broad. . . . . *Hybomitra*.

\*1. *Chrysops variegata* (Degeer). Synonyms: *Tabanus variegatus* Degeer, 1776; *Tabanus costatus* Fabricius, 1794; *Chrysops subfascipennis* Macquart, 1855.

Antioquia: near Medellín (N. Weber; also reported by Dunn, 1929); Porcecito, Río Porce (N. Weber).—Magdalena: Tucurínca (reported by Curran, 1928).—Meta: El Caibe (reported by Antunes, 1937); Villavicencio (J. Bequaert).—Putumayo: Puerto Limón (S. Renjifo); Mocoa (S. Renjifo).—Santander Sur: Puerto Olaya (J. Bequaert).—Valle del Cauca: Palmira (B. Losada S.); Hacienda La Carmelita, Río Frío (S. Renjifo).—Vaupés: between San José del Guaviare and Calamar (A. Gast. — Determined by G. Fairchild).—Ad. Lutz (1909) and Kröber (1925) reported this species from Colombia, without definite locality, as *C. costatus* and *C. costatus* var. *subfascipennis*.

\*2a. *Chrysops læta* Fabricius, 1805.

Amazonas: El Encanto (recorded by Kröber, 1925).—Antioquia: near Medellín (N. Weber); Porcecito, Río Porce (N. Weber).—Caquetá: Florencia (Rómulo Patiño).—Chocó: Andagoya (F. Otoyá. — Determined by G. Fairchild); Utría (J. Boshell. — Determined by G. Fairchild).—Meta: El Caibe (reported by Antunes, 1937); Restrepo (J. Bequaert); Villavicencio (M. Bates; J. Bequaert).—Putumayo: Puerto Limón (S. Renjifo).—Valle del Cauca: Sonso (S. Renjifo); Hacienda El Tablazo, Tuluá (S. Renjifo).—Kröber (1925) records *C. læta* also from Bogotá, but this locality is probably erroneous.

2b. *Chrysops læta* var. *nigroviolacea* Kröber, 1925.

Amazonas: Río Igara-Paraná (reported by Pechuman, 1937).—Not seen by us from Colombia.

\*3. *Chrysops leucospila* Wiedemann, 1828.

Boyacá: Muzo (J. Bequaert).—Meta: El Caibe (reported by Antunes, 1937); Villavicencio (M. Bates. — Determined by



G. Fairchild). — Vaupés: between San José del Guaviare and Calamar (A. Gast. — Determined by G. Fairchild). — First recorded from Colombia, without definite locality by Schiner (1868).

\*4. *Chrysops calogaster* Schiner, 1868.

Boyacá: Muzo (J. Bequaert). — Chocó: El Valle, Utría (J. Boshell. — Determined by G. Fairchild). — Cundimarca: Villeta (J. Bequaert). — Meta: Restrepo (J. Bequaert).

\*5. *Chrysops soror* Kröber, 1925.

Boyacá: Muzo (J. Bequaert).

6. *Chrysops melæna* Hine, 1925.

Santander Sur: Jazmín (reported by Dunn, 1929). — Not seen by us from Colombia.

7. *Chrysops incisa* Macquart, 1845.

Originally described from the temperate regions of New Grenada, which may have meant Colombia, this species has not yet been properly recognized; but possibly *C. auroguttata* Kröber is a synonym. — Not seen by us from Colombia.

8. *Chrysops auroguttata* Kröber, 1930.

One of the type-specimens of this species was from Colombia, without definite locality. It may, however, be a synonym of *C. incisa* Macquart. Most probably the specimen, supposedly from Bogotá, which Kröber recorded in 1925 as *C. incisa*, was what he later described as *C. auroguttata*. — Not seen by us from Colombia.

\*9. *Chrysops renjifo* J. Bequaert, 1946.

Valle del Cauca: Veneral, Río Yurumanguí (S. Renjifo), holotype and paratype of the species.

\*10. *Chrysops weberi* J. Bequaert, 1946.

Vaupés: Mitú (P. Allen), paratype of the species. The holotype is from British Guiana.

\*11. *Chrysops chiriquensis* Fairchild, 1939.

Magdalena: Cincinnati, Santa Marta region, one male (W. M. Mann. — U.S.N.M.).

This appears to be the undescribed male of *C. chiriquensis*, a species known thus far only from Panama. It agrees with the female in many characters, particularly in the shape of the antennæ and the presence of a median pollinose stripe on the fronto-clypeus (over the basal or upper half). The wing mark-

ings are similar also, but the basal cells are much more extensively black. The abdominal pattern is the same, but the yellow markings are slightly smaller. Length, 7 mm., of wing 7.5 mm. The fronto-clypeus is much swollen and divided by a deep median saddle.

12. *Hemichrysops fascipennis* Kröber, 1930.

The type specimen was from Colombia, without more definite locality. — Not seen by us.

\*13. *Esenbeckia chagresensis* Fairchild, 1942.

Magdalena: Río Frío (G. Salt), one of the paratypes of the species.

\*14. *Esenbeckia diaphana* (Schiner). Synonym: *Pangonia diaphana* Schiner, 1868.

Meta: Restrepo (J. Bequaert). — Putumayo: Puerto Limón (S. Renjifo); Urcusique (S. Renjifo); San Pedro (S. Renjifo). — Originally described from Colombia, without definite locality.

\*15. *Esenbeckia translucens* (Macquart). Synonym: *Pangonia translucens* Macquart, 1846.

Boyacá: Muzo (J. Bequaert).

\*16. *Esenbeckia prasiniventris* (Macquart). Synonyms: *Pangonia prasiniventris* Macquart, 1846; *Pangonia semiviridis* Ricardo, 1900.

Cundinamarca: Bogotá (B. Guevara A.). — Magdalena: Río Frío (G. Salt); Agua Dulce, San Lorenzo Mts. (M. A. Carriker). — Originally described from Colombia, without definite locality. Kröber's (1932c) locality La Guayra is in Venezuela, not Colombia.

17. *Esenbeckia tinctipennis* Kröber, 1931d.

Chocó: Condoto, type locality of the species. — Not seen by us.

18. *Esenbeckia subvaria* (Walker). Synonym: *Tabanus subvarius* Walker, 1848.

Kröber (1932c) described the male of this species from Colombia, without definite locality. — Not seen by us.

19. *Esenbeckia arcuata* (Williston). Synonym: *Pangonia arcuata* Williston, 1895.

Kröber (1932c) records a female of this species from Co-

lombia, without definite locality. — Not seen by us from Colombia.

\*20. *Esenbeckia illota* var. *osornoi* Fairchild, 1942.

Cundinamarca: Medina (J. V. Acuña). — Meta: Restrepo (J. Bequaert), paratype of the variety. — Santander Sur: Río Negro (J. V. Acuña).

*Pangonia ferruginea* Macquart, 1838 (not of Meigen, 1804), appears to be a synonym of one of the subspecies of *E. illota* Williston. Kröber's (1932c) *ferruginea*, from Venezuela, and Antunes' (1937) from Restrepo, were *E. illota* var. *osornoi*. Fairchild (1942) also records a specimen of the same form from Cristalina, Colombia (in Hine coll.), a locality unknown to us.

\*21. *Esenbeckia testaceiventris* (Macquart). Synonyms: *Pangonia testaceiventris* Macquart, 1848; *Esenbeckia sexmaculata* Enderlein, 1925.

Cundinamarca: Tapias Las Cruces, Bogotá, one of the types of *E. sexmaculata*. — Meta: Restrepo (J. Bequaert).

In addition we have seen a possibly undescribed species of *Esenbeckia* from Valle del Cauca: La Carmelita, Río Frío (S. Renjifo).

\*22. *Elaphella cervus* (Wiedemann). Synonym: *Pangonia cervus* Wiedemann, 1828.

Meta: Restrepo (J. Bequaert); Villavicencio (M. Bates. — Determined by G. Fairchild). — Putumayo: La Tagua Rómulo Patiño).

*Pityocera festæ* Giglio-Tos is fairly common in the Republic of Panama, but has not yet been taken in Colombia. As the type locality is in Darién, it may be expected to occur in Chocó.

\*23. *Fidena gracilis* (Kröber). Synonym: *Melpia gracilis* Kröber, 1930g.

Meta: Restrepo (J. Bequaert); Villavicencio (M. Bates). — Nariño: Pasto (B. Guevara A.). — Originally described from Chiriquí, which is in Panama, not Colombia.

\*24. *Fidena pubescens* (Ad. Lutz). Synonym: *Erephopsis pubescens* Ad. Lutz, 1909.

Putumayo: Puerto Asís (S. Renjifo).

25. *Fidena pyrausta* (Osten Sacken). Synonyms: *Pangonia pyrausta* Osten Sacken, 1886; *Melpia auricauda* Enderlein, 1925, according to Fairchild, 1941.

Boyacá: Muzo (type locality of *auricauda*). — Enderlein

seemingly records his *auricauda* also from Bogotá, but this is probably erroneous. Kröber (1930g) referred two females from the Magdalena River, Colombia, to *pyrausta*. — Not seen by us from Colombia.

26. *Fidena nigricorpus* Kröber, 1934. Synonym: *Melpia nigricans* Kröber, 1930g; not *Erephopsis nigricans* Ad. Lutz, 1909, now placed in *Melpia*.

Kröber's types of his *M. nigricans* came from Colombia (without definite locality) and Brazil. — Not seen by us.

27. *Fidena auribarba* (Enderlein). Synonym: *Melpia auribarba* Enderlein, 1925.

Enderlein described this species originally from Colombia, without definite locality ("Cordillera, tierra caliente"). He also described a *F. auribarba* var. *albibarba* (Enderlein, 1925) from Colombia ("Cordillera, tierra caliente"). — Not seen by us.

\*28. *Fidena aureopygia* Kröber, 1931a.

Chocó: Opogodó, type locality of the species. — Valle del Cauca: Aji, Río Naya (S. Renjifo).

29. *Fidena fulvosericea* Kröber, 1931a.

This species was described from "Darién, Colombia." The region known as Darién borders on the Gulf of Urabá and extends more in the present territory of Colombia than in the Republic of Panamá. — Not seen by us.

Kröber (1930c) records as *Sackenimyia analis* (Fabricius) two females from Colombia ("Cordillera, tierra caliente"). It is impossible to decide to which genus they may have belonged. The identity of Fabricius' *Pangonia analis* (1805) is not settled. What Ad. Lutz referred (doubtfully) to *analis* was a species of *Melpia* (= *Bombylopsis* Ad. Lutz), a genus not definitely known from Colombia.

Kröber (1933a) also mentions having seen a female of *Fidena sorbens* (Wiedemann), at the Berlin Museum, labelled as from the Cordillera of Colombia. He doubts, however, the correctness of the locality, which we feel is certainly erroneous. It is most unlikely that this species from southern Brazil and Paraguay would occur in Colombia.

30. *Fidena columbiensis* (Kröber). Synonym: *Melpia columbiensis* Kröber, 1930g.

Chocó: Condoto ("Upper Condosa" is no doubt a misspelling



of Río Condoto, as "Condota" was of Condoto), type locality of the species. — Not seen by us.

In addition we have seen from Colombia specimens of four species of *Fidena* thus far unrecognized from the descriptions. Some of these may be new.

\*31. *Scione aurulans* (Wiedemann). Synonyms: *Pangonia aurulans* Wiedemann, 1830; *Scione lurida* Enderlein, 1925.

Magdalena: Vista Nieve, San Lorenzo Mts. (M. A. Carriker); Cerro Quemado, San Lorenzo Mts. (M. C. Carriker). — One of the types of *Scione lurida* was from Colombia, without definite locality.

\*32. *Scione albifasciata* (Macquart). Synonym: *Pangonia albifasciata* Macquart, 1846.

Chocó: La Unión (W. A. Archer). — Magdalena: San Lorenzo Mts. (M. A. Carriker); northwestern Sierra Nevada de Santa Marta (P. Darlington). — Originally described from "New Grenada," which may have meant Colombia.

*S. albifasciata* is about the size of *S. distincta*, from which it differs mainly in the russet femora; the inner orbits of the female converge slightly toward the vertex.

\*33. *Scione distincta* (Schiner). Synonym: *Diclisia distincta* Schiner, 1868.

Cundinamarca: Medina, Upper Río Guacavía (J. V. Acuña). — Putumayo: Upper Río Putumayo (B. Guevara A.). — Kröber (1930*h*) reported this species from Colombia, without definite locality.

Smaller than *S. maculipennis* and with blackish femora, the inner orbits of the female decidedly converging toward the vertex; the divisions of the third antennal segment are not swollen.

\*34. *Scione maculipennis* (Schiner). Synonym: *Diclisia maculipennis* Schiner, 1868.

Chocó: La Unión (W. A. Archer). — Meta: Restrepo (J. Bequaert); Villavicencio (M. Bates. — Determined by G. Fairchild).

Kröber's (1930*h*) locality Guayaquil is in Ecuador, not Colombia. v. Röder (1886) recorded *S. maculipennis* from "Cerro Munchigne," Colombia, a locality unknown to us; and Ricardo (1902) reported it from Bogotá. It is not possible to refer these two records to one of the foregoing three species, which are so

closely allied that Fairchild (1942) regarded them all as one and the same. We believe, however, that they are distinct. *S. maculipennis* is larger than the other two, with russet femora, the divisions of the third antennal segment slightly swollen and somewhat bead-like, the wing markings better defined (the pale areas being decidedly yellowish), and the frons of the female nearly parallel-sided.

35. *Scione nigripes* (Kröber). Synonym: *Rhinotriclista nigripes* Kröber, 1930.

This species, originally described from "New Grenada," without definite locality, may have come from somewhere in Colombia. — Not seen by us.

36. *Scione obscurefemorata* Kröber, 1930*h*.

This species was originally described from Colombia, without definite locality ("Cordillera, tierra templada"). — Not seen by us.

37. *Scione rufescens* (Ricardo). Synonym: *Erephrosis rufescens* Ricardo, 1900.

Kröber (1930*h*) reported this species from Bogotá, Cundinamarca. — Not seen by us.

\*38. *Scione minor* (Macquart). Synonyms: *Pangonia minor* Macquart, 1847; *Scione aurea* Szilády, 1926.

Cundinamarca: Bosque Calderón, Bogotá (J. Bequaert); Monserrate, Bogotá (E. Osorno); Arrayan (E. Osorno); Bogotá (B. Guevara A.). — Meta: without more definite locality (B. Guevara A.). — Putumayo: Upper Río Putumayo (B. Guevara A.).

Macquart's *Pangonia incompleta* of 1850, from Colombia may have been this species, rather than his earlier *P. incompleta* of 1845.

\*39. *Scione punctata* Szilády, 1926. Synonym: *Rhinotriclista flavescens* Enderlein, 1930.

Magdalena: Sierra San Lorenzo (J. Ujhelyi, recorded by Szilády, 1926), the type locality; Vista Nieve, San Lorenzo Mountains (H. L. Viereck). — Kröber (1930*h*) reported *R. flavescens* from Colombia ("Cordillera"), without definite locality.

\*40. *Scione rufipes* (Kröber). Synonym: *Rhinotriclista rufipes* Kröber, 1940.

Meta: Restrepo (J. Bequaert).

41. *Scione minuta* Szilády, 1926.

Magdalena: Sierra San Lorenzo, the type locality. — Not seen by us.

42. *Scione incompleta* (Macquart). Synonym: *Pangonia incompleta* Macquart, 1845.

Originally described from Colombia (♂ ♀), without more definite locality. Not seen by us.

In addition we have seen from Colombia specimens of two species of *Scione*, as yet unrecognized.

\*43. *Lepiselaga crassipes* (Fabricius). Synonyms: *Hæmatopota crassipes* Fabricius, 1805; *Lepiselaga recta* Loew, 1869; *Tabanus lepidotus* Wiedemann, 1828. — The spelling *Lepidoselaga* Osten Sacken, 1876, is a superfluous emendation of *Lepiselaga* Macquart, 1838.

Caldas: La Dorada, Magdalena River (recorded by Dunn, 1929). — Chocó: Sautatá, Río Atrato (S. Renjifo). — Meta: Hacienda Yacuana near Villavicencio (E. Osorno). — Nariño: Río Patía (recorded by Dunn, 1929). — Santander Sur: Puerto Olaya (J. Bequaert); Barrancabermeja (J. V. Acuña). — Valle del Cauca: Puerto Merizalde, Río Naya (S. Renjifo); Cali, 3,260 ft. (Severo Quintero; E. I. Huntington; H. F. Schwarz). — The type locality of *L. recta* was New Grenada, which may have meant Colombia. We have seen Loew's types of *L. recta* at the Mus. Comp. Zoöl.

\*44. *Stibasoma fulvohirtum* (Wiedemann). Synonyms: *Tabanus fulvohirtus* Wiedemann, 1828; *Tabanus compactus* Walker, 1854.

Boyacá: Guaguaquí (S. Renjifo). — Meta: Villavicencio (M. Bates). — First recorded from Colombia, without definite locality, by Schiner (1868).

45. *Stibasoma chionostigma* (Osten Sacken). Synonyms: *Tabanus chionostigma* Osten Sacken, 1886; *Stibasoma pachycephalum* Bigot, 1892; *Stibasoma flavistigma* Hine, 1912.

Valle del Cauca: Buenaventura (recorded by Kröber, 1932, as *S. flavistigma*. Also collected by Rodriguez in August, 1942, according to G. Fairchild's identification). — Not seen by us from Colombia.

46. *Stigmatophthalmus lutzi* Surcouf, 1921, Gen. Insect., Tabanidæ, p. 54; 1923, Ann. Soc. Ent. France, XCI, (for 1922), pt. 3, p. 242 (♀).

This species was described from Santa Fé de Bogotá, first very briefly in 1921 and later (1923) more in detail. We have not seen it; but from the descriptions it appears to be extremely close to, or possibly even identical with the genotype, *S. altivagus* Ad. Lutz. We have seen two females of *S. altivagus*, from Brazil. The genus appears to be close to *Selasoma*, though readily separated by the characters given in the key. It differs from *Stibasoma*, which it resembles superficially, in the short antennal tooth. *S. lutzii* was omitted from Kröber's Catalogue of Neotropical Tabanidæ (1934).

47. *Selasoma tibiale* (Fabricius). Synonym: *Tabanus tibialis* Fabricius, 1805.

Meta: Villavicencio (M. Bates. — Determined by G. Fairchild). — Not seen by us from Colombia.

\*48. *Bolbodimyia bicolor* Bigot, 1892. Synonym: *Atylotus erythrocephalus* Bigot, 1892.

Boyacá: Muzo (J. Bequaert). — Meta: Restrepo (J. Bequaert); Retiro near Villavicencio (E. Osorno); Villavicencio (M. Bates. — Determined by G. Fairchild).

This species is extremely variable in color in the same locality. It may be completely black, with a black beard and black hairs on the pleura; or have the under side of the body, the entire head, most of the antennæ and tibiæ reddish, the beard and hairs on the pleura being also bright red. Some specimens are intermediate between these two extremes.

### Dichelacera Macquart

We follow G. Fairchild (1943a) in subordinating *Catachlorops* and *Psalidia* as subgenera to *Dichelacera*.

*Psalidia* Enderlein (1922) has as type, by original designation, *Tabanus furcatus* Wiedemann, 1828. This group was originally proposed, as a genus, for Neotropical Tabaninæ with a long, finger-shaped basal process on the third antennal segment and the first posterior cell closed and stalked before the margin of the wing. In the more complete diagnosis of 1925, Enderlein states that the eyes are bare. The closed or open first posterior cell is not a character of generic value in Tabaninæ. Only species with the subepaulet bare or with a few macrotrichia only should be included.



## KEY TO SUBGENERA

1. Labella large, about half the length of the proboscis, mostly soft and pollinose, but with a small, shiny, sclerotized area near the base. . . . Subgenus *Catachlorops*.  
 Labella small, hardly one-third of the length of the proboscis, mostly shiny and sclerotized . . . . . 2.
2. Frons narrow; callus not as wide as frons. Thorax and abdomen without transverse markings. Species generally 15 mm. or longer . . . . . Subgenus *Psalidia*.  
 Frons moderately to very broad; callus as wide as frons. Thorax and abdomen with prominent transverse markings. Species generally less than 12 mm. long. . . . . Subgenus *Dichelacera*, proper.

\*49. *Dichelacera (Dichelacera) analis* Hine, 1920. Synonym: *Dichelacera costaricensis* Kröber, 1931g.

Chocó: El Valle, Utría (J. Boshell). — Determined by G. Fairchild); Andagoya (F. Otoyá. — Determined by G. Fairchild); Condoto, one of the type localities of *D. costaricensis*. — Valle del Cauca: Puerto Merizalde, Río Naya (S. Renjifo).

\*50. *Dichelacera (Dichelacera) marginata* Macquart, 1847.

Chocó: Lloró (S. Renjifo); Río Cabi near Quibdó (S. Renjifo); Andagoya (D. Augustine; F. Otoyá). — Meta: Villavicencio (M. Bates. — Determined by G. Fairchild). — Santander Sur: Jazmín (recorded by Dunn, 1929). — Valle del Cauca: Quebrada San Joaquin near Buenaventura (S. Renjifo).

\*51. *Dichelacera (Dichelacera) regina* Fairchild, 1940.

Cauca: Río Micay (S. Renjifo). — Chocó: Istmina (S. Renjifo); Río Niquia (E. Osorno and J. Boshell). — Meta: Restrepo (J. Bequaert). — Valle del Cauca: Río Anchicaya, at Kilom. 87 on road from Cali to Buenaventura (S. Renjifo); Puerto Merizalde, Río Naya (S. Renjifo); Veneral, Río Yurumanguí (S. Renjifo).

*Dichelacera scapularis* Macquart (1847) was recorded by Dunn (1929) from La Dorada, Caldas. The identification appears to be open to question, as this species is known with certainty only from Mexico and the Republic of Honduras.

\*52. *Dichelacera (Dichelacera) submarginata* Ad. Lutz, 1915.

Meta: Villavicencio (M. Bates). — Putumayo: La Tagua (Rómulo Patiño).

53. *Dichelacera* (*Dichelacera*) *rufipennis* (Macquart). Synonym: *Tabanus rufipennis* Macquart, 1838.

This species was originally described from Brazil. In 1845, Macquart referred to it a female from New Grenada, which may have meant Colombia. Whether this specimen was conspecific with the type seems doubtful. — Not seen by us.

54. *Dichelacera* (?*Catachlorops*) *nigripalpis* (Macquart). Synonym: *Tabanus nigripalpis* Macquart, 1845.

This species was originally described without definite locality from "the temperate regions of New Grenada," which may have meant Colombia. The description is rather vague as to the shape of the antenna, the third segment having a "pointe assez forte." Kröber (1931), who never saw it, placed it tentatively in *Catachlorops*. — Not seen by us.

\*55. *Dichelacera* (*Catachlorops*) *testacea* Macquart, 1846.

Meta: Restrepo (J. Bequaert); Villavicencio (M. Bates). — Vaupés: between San José de Guaviare and Calamar (A. Gast). — Originally described from Colombia, without more definite locality.

56. *Dichelacera* (?*Catachlorops*) *quadrinaculata* (Macquart). Synonyms: *Tabanus quadrinaculatus* Macquart, 1845; *Tabanus pæcilopterus* Schiner, 1868.

*T. quadrinaculatus* was originally described without definite locality from "New Grenada," which may have meant Colombia. — Not seen by us.

\*57. *Dichelacera* (*Catachlorops*) *rufescens* (Fabricius). Synonym: *Tabanus rufescens* Fabricius, 1805.

Magdalena: Vista Nieve, Sierra Nevada de Santa Marta (H. Viereck).

\*58. *Dichelacera* (*Catachlorops*) *transposita* Walker, 1854.

Colima: La Brea (S. Renjifo). — Valle del Cauca: Puerto Merizalde, Río Naya (S. Renjifo). — This species was originally described from the "West Coast of America," which may possibly have been in Colombia.

\*59. *Dichelacera* (*Psalidia*) *vespertina*, new name. Synonym: *Tabanus elongatus* Macquart, 1846; not of Wiedemann, 1828.

Chocó: Río Niquiá (E. Osorno and J. Boshell). — Cundinamarca: Bogotá (B. Guevara. — This locality needs to be confirmed). — Meta: Villavicencio (G. Fairchild); Restrepo (J. Bequaert). — Valle del Cauca: La Carmelita, Río Frío (S.

Renjifo). — The species was originally described by Macquart from the temperate regions of “New Grenada,” which may have meant Colombia.

\*60. *Dichelacera* (*Psalidia*) *fulminea* (Hine). Synonyms: *Tabanus fulmineus* Hine, 1920; *Tabanus festivus* Hine, 1920, not of Wiedemann, 1828; *Psalidia ocellata* Enderlein, 1925; possibly also *Bellardia furcata* Bigot, 1892 (described without locality), which name is antedated in *Dichelacera* by *Dichelacera* (*Psalidia*) *furcata* (Wiedemann, 1828).

Boyacá: Muzo, the type locality of *Psalidia ocellata* (also collected by J. Bequaert and by A. Gast). — Enderlein’s additional locality “Bogotá” probably was only the place from which the specimen was shipped to Europe.

61. *Dichelacera* (*Psalidia*) *cinnamomea* (Schiner). Synonyms: *Tabanus cinnamomeus* Schiner, 1868; and, according to Kröber (1931), *Chelommia fibulata* Enderlein, 1922 and 1925. Schiner’s specific name is not duplicated by the earlier *Tabanus cinnamoneus* Doleschall, 1858, which is spelled otherwise.

Enderlein’s types of *C. fibulata* came from Colombia: Guayaabal (Valle del Cauca); Cartago (Valle del Cauca); and Alto do Muelas (?error for Alto de las Mulas; not located). — Not seen by us.

62. *Dichelacera* (?*Psalidia*) *peruviana* (Macquart). Synonym: *Tabanus peruvianus* Macquart, 1848.

Kröber (1931c) records this species from Colombia, without more definite locality. — Not seen by us.

#### *Dasychela* Enderlein, 1922

(*Di cladocera* Enderlein, 1922; not of Ad. Lutz, 1912)

The generic name *Di cladocera* was first proposed on p. 29 of an anonymous pamphlet published at Rio de Janeiro in 1909, with the title: “Instituto Oswaldo Cruz em Manguinhos, Rio de Janeiro.”<sup>1</sup> The author of the name was certainly Ad. Lutz, as he repeated this and other generic names proposed in the pamphlet in his later publications. No characters were mentioned in 1909, but the following seven described species were included: “*D. immaculata* Macquart, *D. furcata* Wiedemann

<sup>1</sup> Kröber’s (1940) statement that “Dr. Lutz established this genus in 1900, in Mem. Inst. Osw. Cruz, p. 29” is erroneous. Kröber’s method of determining the genotype by elimination is no longer the accepted procedure.

(*macrodonta* Macquart), *D. potato* Wiedemann, *D. guttipennis* Wiedemann, *D. macula (scutellata)* Macquart, *D. luctuosa* Macquart, *D. rufipennis* Macquart." As the genus was not defined in 1909, the rules of nomenclature might be interpreted so as to make the 1909 name a *nomen nudum*, notwithstanding the citation of several described species. The first valid use of *Dicladocera*, according to the prevailing rules, appears to be by Ad. Lutz in 1912 (Comm. Linhas Telegr. Estrat. Matto Grosso Amazonas, Anexo No. 5, Hist. Nat., Zool., Tabanideos, p. 4), when he described the new species *Dicladocera unicolor*. The correct genotype would then be *D. unicolor*, by monotypy, as Bequaert stated in 1924 (Psyche, XXXI, p. 28).

Enderlein in 1922 (Mitt. Zool. Mus. Berlin, X, pt. 2, p. 346) selected as genotype "*D. guttipennis* (Wiedemann, 1828)" = *Tabanus guttipennis* Wiedemann, 1828. Although this species was included by Ad. Lutz in 1909, it was not mentioned by him in 1912, when the generic name was first validly proposed. Unfortunately, from Lutz' description and figure his *D. unicolor* does not appear to be congeneric with *T. guttipennis*, as the eyes are presumably bare and the tooth of the third antennal segment is only moderately long. For this reason we feel impelled to discard *Dicladocera* for the group thus called by Enderlein. Kröber and Fairchild, and to use instead the name *Dasychela* Enderlein, 1922 (Mitt. Zool. Mus. Berlin, X, pt. 2, p. 380; monotypic for *D. limbativena* Enderlein, 1922). This name was dropped by Enderlein in 1925, as he then described *limbativena* as a species of *Dicladocera*.

*Dasychela* includes here all Neotropical Tabaninae with normal tibiae, a bare or almost bare subepaulet (sometimes with a narrow patch of a few macrotrichia near the middle), a long and often finger-shaped upper process near the base of the third antennal segment, and hairy or pubescent eyes (hairs sometimes short, scattered and easily overlooked). Enderlein at first (1922) placed his *Dicladocera* in the key as if the eyes were bare; but he corrected this error later (1925). The eyes are distinctly pubescent in *D. guttipennis*.

*Stypochela* Enderlein, 1922. This genus was originally proposed for a single species, *Stypochela bogotana* Enderlein, 1922. on the strength of the slender, narrow body and the presence of an appendix to the fork of the third longitudinal vein. These characters are scarcely of even subgeneric value. We should



have united *Stypochela* with *Dicladocera*, were it not that Kröber found the type of *S. bogotana* to have only three, instead of four, terminal annuli to the third antennal segment. The eyes are pubescent.

63. *Dasychela perplexa* (Walker). Synonym: *Tabanus perplexus* Walker, 1850.

This species was originally described from Colombia, without more definite locality. Kröber (1940) redescribed the type. — Not seen by us.

\*64. *Dasychela macula* (Macquart). Synonyms: *Tabanus macula* Macquart, 1845; *Tabanus auribarbis* Macquart, 1848; *Tabanus argyrophorus* Schiner, 1868; *Tabanus submacula* Walker, 1850.

Magdalena: northwestern Sierra Nevada de Santa Marta (P. Darlington); San Lorenzo Mts. (reported by Kröber, 1940). — Valle del Cauca: La Cumbre (Collector?). — *T. submacula* Walker was originally described from Colombia, without definite locality. Surcouf (1919) recorded *T. auribarbis* from the Valley of the Magdalena River.

Kröber (1940) includes also *Tabanus scutellatus* Macquart (1838) among the synonyms of *D. macula*. Specimens from southern Brazil, before us, agree perfectly with Macquart's description, but are very distinct from *D. macula*. Among other points, the eyes are completely bare, which places the species in the subgenus *Psalidia*. Moreover, what Ad. Lutz reported from southern Brazil as *D. macula*, appears to have been mostly, if not always, *D. scutellata* (Macquart).

65. *Dasychela acheronitens* (Kröber). Synonym: *Dicladocera acheronitens* Kröber, 1931g.

The original description was made partly on specimens from Colombia, without more definite locality. — Not seen by us from Colombia.

66. *Dasychela limbativena* Enderlein, 1922. Synonym: *Dicladocera limbativena* Enderlein, 1925.

The type locality of this species is given as "Colombia: Bogotá, Guayabal." This Guayabal is most probably in Valle del Cauca. Bogotá appears to be in this case merely the locality from which the specimen was shipped to Europe. — Not seen by us from Colombia; but we studied a female from Ecuador.

67. *Dasychela steinheili* (Enderlein). Synonym: *Di cladocera steinheili* Enderlein, 1925.

The type locality of this species is given as "Colombia: Bogotá, Quindin." This was evidently a misspelling of Quindío, a district in the northeastern corner of Valle del Cauca and the adjoining sections of Caldas and Tolima. — Not seen by us.

\*68. *Dasychela basirufa* (Walker). Synonyms: *Tabanus basirufus* Walker, 1850; *Di cladocera pallidetibia* Kröber, 1940.

Cundinamarca: Guasca (E. A. Chapin). — Originally described from Colombia, without more definite locality. The hairy eyes and long antennal tooth, curved downward, refer the species to *Dasychela*.

\*69. *Dasychela caloptera* (Schiner). Synonym: *Tabanus calopterus* Schiner, 1868.

Magdalena: Cincinnati, Santa Marta (W. M. Mann). — Kröber (1940) recorded this species from Colombia, without definite locality.

70. *Dasychela* (*Stypochela*) *bogotana* (Enderlein). Synonym: *Stypochela bogotana* Enderlein, 1922 and 1925.

This species was originally described with the following localities: "Columbien, Bogotá, Cartago und Las Pavas — Piodsaa Molar." Both Cartago and Las Pavas are in Valle del Cauca; the locality Bogotá is probably erroneous, being merely the place from which the specimens were shipped to Europe. — Not seen by us.

#### Alliomma Borgmeier, 1934

*Alliomma* was proposed by Borgmeier (1934, Rev. de Entomologia, IV, pt. 2, pp. 222, footnote, and 269), with *Ommallia thiemeana* Enderlein as type, for Kröber's *Ommallia* of 1931 (Rev. de Entomologia, I, pt. 3, p. 293). The type of Enderlein's genus *Ommallia* (1923) is *Ommallia viridis* Enderlein, a species not congeneric with *O. thiemeana* and now placed in *Cryptotylus*. The name *Alliomma* should be used for a group of species more closely related to the subgenus *Tabanus*, proper, than to *Dichelacera*. While these species agree with *Dichelacera* and *Dasychela* (= *Di cladocera* of most authors) in the long, finger-shaped extension of the base of the first antennal segment, they differ by the subepaulet completely covered with macrotrichia. The eyes are bare.

\*71. *Alliomma macquarti* (Schiner). Synonyms: *Tabanus macquarti* Schiner, 1868; *Tabanus ruber* Macquart, 1845, not of Thunberg, 1827; *Tabanus infuscatipennis* "Macquart" Surcouf, 1919, *Mesure Arc Equat. Méridien*, X, p. 230; *Tabanus indscriptus* "Schiner" Kröber, 1931e; *Gymnochela bigoti* Kröber, 1931, *Zoolog. Anzeiger*, XCVI, p. 50, fig. 1; not *Tabanus bigoti* Bellardi, 1859.

Boyacá: Muzo (J. Bequaert).—Meta: Restrepo (J. Bequaert; W. H. W. Komp); Villavicencio (J. Bequaert).—Putumayo: Puerto Limón (S. Renjifo).—Vaupés: Mitú (P. Allen).

The complicated synonymy of this species appears to be as follows: (1) Schiner described his *T. macquarti* from a female said to have come from Colombia and his description fits our specimens. He gave both *T. apicalis* Macquart and *T. rubidus* Macquart as doubtful synonyms; but neither of these species were Schiner's *macquarti* in our opinion. (2) Macquart gave Mexico as the locality of his *T. ruber*; but Surcouf (1919) states that the specimen at the Paris Museum, presumably the type of *ruber*, bears two labels one in Macquart's hand "Colombie"; the other "Brésil, Guérin-Méneville." Surcouf redescribed *ruber* from this specimen, for which he also found and published the manuscript name *infuscatipennis*. Our Colombian specimens agree with Surcouf's description. (3) Kröber described "*Gymnochela bigoti*" evidently from Schiner's type of *T. macquarti*, although he says that the specimen came from Venezuela. His description and figures fit the Colombian specimens which we call *macquarti*. Kröber was mistaken, we believe, in referring his specimen to *T. bigoti* Bellardi, which was a substitute name for *Tabanus apicalis* Macquart, 1847 (not of Wiedemann, 1828), Bellardi's description being based on Macquart's type. The true *bigoti* is a *Tabanus* with a short tooth on the third antennal segment, as described by Osten Sacken for the female in 1886 (*Biol. Centr. Amer., Dipt.*, I, p. 48). Osten Sacken was in error, however, when he cited as a synonym of his *bigoti*, *T. macquarti* Schiner, which has a very long antennal tooth. The true *T. bigoti* was correctly recognized by Fairchild (1943a, p. 442, figs. 4 and 5). (4) *Tabanus indscriptus* "Schiner" is a manuscript name which Kröber (1931e) found with the type of *T. macquarti*.

\*72. *Alliomma thiemeana* (Enderlein). Synonyms: *Ommallia thiemeana* Enderlein, 1925; *Ommallia interrupta* Enderlein, 1925.

Valle del Cauca: Cali (B. Losada. — U. S. N. M.). — Both *O. thiemeana* and *O. interrupta* were originally described from Colombia, without definite locality ("Cordillera, tierra caliente").

73. *Alliomma brevihamus* (Enderlein). Synonym: *Ommallia brevihamus* Enderlein, 1925.

Originally described from Colombia, without definite locality ("Cordillera, tierra caliente"). Not seen by us.

\*74. *Chlorotabanus inanis* (Fabricius). Synonym: *Tabanus inanis* Fabricius, 1787.

Meta: El Caibe (reported by Antunes, 1937); Villavicencio (M. Bates. — Determined by G. Fairchild); Restrepo (J. Bequaert). — Putumayo: Mocoa (S. Renjifo); Río Putumayo, between Itiquilla and Puerto Arana (S. Renjifo); La Tagua (Rómulo Patiño).

\*75. *Chlorotabanus mexicanus* (Linnaeus). Synonym: *Tabanus mexicanus* Linnaeus, 1767.

Antioquia: Murindó (reported by Dunn, 1929); Providencia (F. L. Gallego). — Cauca: Río Micay (S. Renjifo). — Chocó: along the Atrato River (reported by Dunn, 1929); Arquía (reported by Dunn, 1929); Andagoya (D. Augustine). — Reported from the Magdalena River by Kröber (1931f) and also taken there by M. Hertig.

\*76. *Cryptotylus unicolor* (Wiedemann). Synonym: *Tabanus unicolor* Wiedemann, 1828.

Meta: Hacienda Yacuana near Villavicencio (E. Osorno). — Reported from the Magdalena River by Kröber (1932c).

77. *Cryptotylus limonus* (Townsend). Synonyms: *Tabanus mexicanus* var. *limonus* Townsend, 1897; *Ommallia viridis* Enderlein, 1925.

Meta: Villavicencio (M. Bates. — Determined by G. Fairchild). — *O. viridis* was originally described from Colombia, without definite locality ("Cordillera, tierra caliente"). — Not seen by us from Colombia.

\*78. *Leucotabanus leucaspis* (Wiedemann). Synonym: *Tabanus leucaspis* Wiedemann, 1828.

Boyacá: Guaguaquí (S. Renjifo). — Meta: El Caibe (re-



ported by Antunes, 1937); Río Negro, 20 Kilom. south of Villavicencio (J. Bequaert); Restrepo (J. Bequaert; W. H. W. Komp); Villavicencio (M. Bates. — Determined by G. Fairchild). — Santander Sur: Río Negro (J. V. Acuña). — Valle del Cauca: Hacienda La Carmelita, Río Frío (S. Renjifo). — Vaupés: between San José del Guaviare and Calamar (A. Gast. — Determined by G. Fairchild).

\*79. *Leucotabanus flavinotum* (Kröber). Synonyms: *Tabanus nigri flavus* Kröber, 1931, not of Kröber, 1930; *Tabanus flavinotum* Kröber, 1934.

Boyacá: Muzo (J. Bequaert).

80. *Leucotabanus canithorax* Fairchild, 1941. Synonym: *Tabanus albicans* Macquart, 1845, not of Macquart, 1834 or 1838.

Magdalena: Sevilla (reported by Curran, 1928).

Macquart's *T. albicans* of 1845 was based on a male from Colombia, without more definite locality. Kröber (1929) described what he assumed to be the female, also from Colombia, without more definite locality. Fairchild (1941) doubts whether this female was actually conspecific with Macquart's male. — Not seen by us from Colombia.

\*81a. *Hybomitra quadripunctata* (Fabricius). Synonyms: *Tabanus quadripunctatus* Fabricius, 1805. *Tabanus punctipennis* Macquart, 1838; *Tabanus nigropunctatus* Bellardi, 1859.

Antioquia: Medellín, 1538 m. (E. A. Chapin; H. Daniel; F. L. Gallego). — Meta: Villavicencio (M. Bates. — Determined by G. Fairchild). — Valle del Cauca: Tres Esquinas, Habana, Buga (S. Renjifo); Buenaventura.

\*81b. *Hybomitra quadripunctata* var. *amabilis* Walker. Synonyms: *Tabanus amabilis* Walker, 1848; *Tabanus maculipennis* Macquart, 1834 and 1845, not of Wiedemann, 1828; *Hypopelma quadripunctata* aberr. *dasyphyrtina* Enderlein, 1925.

Meta: Restrepo (J. Bequaert; also reported by Antunes, 1937). — Enderlein (1925) reported the var. *amabilis* under the name *Dasyphyrtia maculipennis*, from Colombia, without definite locality ("Cordillera, tierra templada").

82. *Hybomitra* (?) *bogotana* (Enderlein). Synonym: *Dasyomyia bogotana* Enderlein, 1925.

Cundinamarca: Bogotá (Steinheil), the type locality of the species. As the type lacked the third antennal segment, the correct place of this species remains obscure. — Not seen by us.

\*83. *Hybomitra minos* (Schiner). Synonym: *Tabanus minos* Schiner, 1868.

Santander: Paramo del Almorzadero, 14,000 ft., one male (A. Gast).

The male which we refer to *H. minos* agrees with Schiner's (1868) and Kröber's (1940) descriptions of the female, except for purely sexual differences.

\*84. *Hybomitra indiorum*, new name. Synonym: *Tabanus rufiventris* Macquart, 1845; not of Fabricius, 1805, nor of Macquart, 1838.

Caquetá: Florencia (Rómulo Patiño).

This species was originally described as from Sante Fé de Bogotá. We believe we have recognized it in a series of females from Florencia, which agree well with the description. There are a few short hairs on the eyes and the frontal callus is of the elongate, broad type found in the other species of *Hybomitra*.

\*85. *Hybomitra rubiginipennis* (Macquart). Synonyms: *Tabanus rubiginipennis* Macquart, 1845; *Tabanus adustus* Walker, 1850.

Meta: Restrepo (J. Bequaert). — *H. rubiginipennis* was originally described from the temperate regions of "New Grenada," which may have meant Colombia. *T. adustus* was described from Colombia, without more definite locality. Kröber (1940), who synonymized these two species, included *rubiginipennis* in *Di cladocera*; but both he and Macquart figure the third antennal segment correctly with a short, though strong tooth. The eyes bear a few scattered short hairs, easily overlooked, which explains why neither Macquart nor Walker mentioned them.

\*86. *Phæotabanus (Aegialomyia) cinereus* (Wiedemann). Synonym: *Tabanus cinereus* Wiedemann, 1821.

Meta: Villavicencio, on a sandy river beach (G. Fairchild).

According to Dr. Fairchild, the eyes of the female are in life purple with two green cross-bands. The median purple streak is darker than the upper and lower corners.

The species seems to fit best in *Aegialomyia* Philip, a group which appears to be only subgenerically distinct from *Phæotabanus*.

\*87. *Brachytabanus longipennis* (Kröber). Synonym: *Stenotabanus longipennis* Kröber, 1930a.

Boyacá: Muzo (J. Bequaert). — Meta: Villavicencio (J. Bequaert). — Santander Sur: Bocas del Rosario, Río Magdalena, male taken at light (J. Bequaert). — Also taken by E. Osorno on the Upper Magdalena River, exact locality unknown.

\*88. *Stenotabanus obscurus* Kröber, 1930a.

Putumayo: Urcusique (S. Renjifo).

In life the eyes of the female are dark purple with two green cross-bands.

\*89. *Stenotabanus maculifrons* (Hine). Synonym: *Tabanus maculifrons* Hine, 1907.

Meta: Restrepo (reported by Antunes, 1937); Río Caney near Restrepo (J. Bequaert); Villavicencio (M. Bates. — Determined by G. Fairchild). — Also taken by E. Osorno on the Upper Magdalena River, exact locality unknown.

\*90. *Stenotabanus cajennensis* (Fabricius). Synonym: *Tabanus cajennensis* Fabricius, 1787.

Meta: region of Río Negro, south of Villavicencio (J. Bequaert). — Tolima: between Mediación and Ibagué, 1500 to 2500 m. (reported by Therese von Bayern, 1903. — The occurrence of this lowland species at such high altitude appears somewhat open to question).

\*91. *Stenotabanus pequeniensis* Fairchild, 1942e.

Meta: Restrepo (J. Bequaert), locality of some of the paratypes.

92. *Stenotabanus* (?) *detersus* (Walker). Synonym: *Tabanus detersus* Walker, 1850.

Originally described from Colombia, without more definite locality. Kröber (1930e) redescribed the type, but could not decide whether to place it in *Stenotabanus* or in *Macrocormus*. — Not seen by us.

\*93. *Agelanius columbianus* (Enderlein). Synonyms: *Archiplatius columbianus* Enderlein, 1925; *Dasybasis columbiana* Stone, 1944.

Cundinamarca: Monserrate near Bogotá, 3,000 m. (E. Osorno), male and female. — A female at the U. S. Nat. Mus. is merely labelled "Colombia." — Originally described from Colombia, without definite locality: "Cordillera, tierra templada."

\*94. *Agelanius osornoi* J. Bequaert, 1947. (See appendix to this paper).

Cundinamarca: Monserrate near Bogotá, 3,000 m. (Hernando Osorno), type locality of the species.

**Tabanus Linnaeus**

KEY TO SUBGENERA

1. Abdomen with one, two, or three pale longitudinal stripes or rows of contiguous or nearly contiguous spots. Wings hyaline or smoky, or faintly clouded along the veins. Eyes of female bare, green with two or three dark cross-bands in life; of male bare or hairy, with or without an area of larger facets. Subgenus *Neotabanus*. Abdomen usually without longitudinal stripes or rows of spots; if with rows of spots, the eyes of female unbanded or with only one band in life . . . . . 2.
2. Disk of scutellum with a conspicuous spot of black pubescence, more or less surrounded by a ring of white hairs. Eyes of female unbanded. Subgenus *Lophotabanus*. No spot of black pubescence on scutellum; sometimes a small prescutellar patch of black hairs . . . . . 3.
3. Wings prominently clouded or spotted with brown, seldom mostly black, as a rule with hyaline areas about the cross-veins. Frons usually very narrow, with ridge-like callus. Eyes of female unbanded . . . . . Subgenus *Philipotabanus*. Wings hyaline, smoky, entirely black, or spotted at the cross-veins; in doubtful cases frons otherwise . . . . . 4.
4. Relatively slender species. Third antennal segment not crescent-shaped, only slightly angular near the upper base. Upper branch of third longitudinal vein with a very long appendix . . . . . Subgenus *Macrocornus*. Stout species. Third antennal segment crescent-shaped, with a strong tooth near the upper base. Upper branch of third longitudinal vein normally without appendix. . . . . Subgenus *Tabanus*, proper.

\*95a. *Tabanus* (*Neotabanus*) *lineola* var. *carneus* Bellardi. Synonyms: *Tabanus carneus* Bellardi, 1859; *Tabanus appendiculatus* Hine, 1906.

Amazonas: Caucaya (S. Renjifo); Tarapacá (S. Renjifo). — Antioquia: near Porcecito, Río Porce (N. Weber); El Dos, Turbo (S. Renjifo); Micuro, Río Leon (S. Renjifo); Puerto Berrio (reported by Dunn, 1929). — Atlántico: Puerto Colombia (J. Bequaert); Calamar (J. Bequaert); Barranquilla (reported by Kröber, 1933b); Sabanilla (reported by Kröber,



1933*b*). — Boyacá: Muzo (J. Bequaert). — Chocó: Andagoya (D. Augustine); Sautatá (S. Renjifo). — Magdalena: Sevilla (G. Salt); Río Frío (G. Salt). — Meta: Restrepo (J. Bequaert); Villavicencio (J. Bequaert; M. Bates). — Putumayo: La Tagua (Rómulo Patiño). — Santander Sur: Bocas del Rosario (J. Bequaert); Puerto Wilches (reported by Dunn, 1929); Barranca (reported by Dunn, 1929); Barrancabermeja (J. Bequaert; also reported by Dunn, 1929). — Valle del Cauca: Hacienda La Brisa, Ginebra (S. Renjifo); Ginebra (S. Renjifo); Hacienda El Tablazo, Tuluá (S. Renjifo); Tres Esquinas, Habana, Buga (S. Renjifo); Guayabal, Río Cajambre (S. Renjifo); Hacienda La Carmelita, Río Frío (S. Renjifo); Hormiguero (H. F. Schwarz).

\*95*b*. *Tabanus* (*Neotabanus*) *lineola* var. *stenocephalus* Hine. Synonym: *Tabanus stenocephalus* Hine, 1906.

Meta: Villavicencio (M. Bates).

\*95*c*. *Tabanus* (*Neotabanus*) *lineola* var. *plangens* Walker. Synonym: *Tabanus plangens* Walker, 1854.

Amazonas: Tarapacá (S. Renjifo). — Boyacá: Casanare (L. Patiño-Camargo). — Chocó: Río Atrato (reported by Fairchild, 1942); north of the mouth of the Río Arquía, Río Atrato (reported by Kröber, 1933*b*). — Meta: Restrepo (J. Bequaert); Villavicencio (J. Bequaert). — Putumayo: San Pedro (S. Renjifo); Puerto Limón (S. Renjifo); La Tagua (Rómulo Patiño). — Valle del Cauca: Buenaventura (N. Weber). — Vaupés: between San José de Guaviare and Calamar (A. Gast. — Determined by G. Fairchild).

\*96. *Tabanus* (*Neotabanus*) *hookeri* Knab, 1915.

Magdalena: Santa Marta (J. H. Egbert). — Valle del Cauca: Cali, 3,260 ft. (H. F. Schwarz. — Reported by J. Bequaert, 1940).

\*97. *Tabanus* (*Neotabanus*) *fumatipennis* Kröber, 1933*b*.

Antioquia: El Dos, Turbo (S. Renjifo). — Meta: Villavicencio (M. Bates. — Determined by G. Fairchild). — Putumayo: Mocoa (S. Renjifo); San Pedro (S. Renjifo). — Valle del Cauca: Hacienda La Carmelita, Río Frío (S. Renjifo); Guayabal, Río Cajambre (S. Renjifo).

\*98. *Tabanus* (*Neotabanus*) *restrepoensis* Fairchild, 1942.

Meta: Restrepo (J. Bequaert), the type locality of the species; Villavicencio (M. Bates. — Determined by G. Fairchild).

99. *Tabanus* (*Neotabanus*) *lucidecallosus* Fairchild, 1942.

Meta: Restrepo (determined by G. Fairchild). — Not seen by us from Colombia.

\*100. *Tabanus* (*Neotabanus*) *cicur* Fairchild, 1942.

Meta: Restrepo (J. Bequaert; P. C. A. Antunes), the type locality of the species; La Unión, 12 Kilom. east of Restrepo (J. Bequaert).

\*101. *Tabanus* (*Neotabanus*) *amplifrons* Kröber, 1933*b*.

Meta: Villavicencio (M. Bates. — Determined by G. Fairchild); Restrepo (J. Bequaert). — Santander Sur: Puerto Olaya (J. Bequaert). — Vaupés: between San José del Guaviare and Calamar (A. Gast. — Determined by G. Fairchild).

\*102. *Tabanus* (*Neotabanus*) *columbus* Fairchild, 1942.

Magdalena: Ciénaga (G. Salt). — Vaupés: between San José del Guaviare and Calamar (A. Gast. — Determined by G. Fairchild).

\*103. *Tabanus* (*Neotabanus*) *stuppeus* Fairchild, 1942.

Meta: La Unión, 12 Kilom. east of Restrepo (J. Bequaert).

The foregoing two species are very poorly defined and we are inclined to regard them as one and the same. Our specimens were compared with the types.

\*104. *Tabanus* (*Neotabanus*) *angustivitta* Kröber. Synonym: *Tabanus dorsiger* var. *angustivitta* Kröber, 1929.

Meta: Villavicencio (M. Bates. — Determined by G. Fairchild); Restrepo (J. Bequaert, reported by G. Fairchild, 1942). — Valle del Cauca: Hacienda San José, Bugalagrande (S. Renjifo). — This species was reported from Colombia as *T. truquii* by J. Bequaert, 1940.

\*105. *Tabanus* (*Neotabanus*) *comitans* Wiedemann, 1828.

Meta: Restrepo (J. Bequaert).

106. *Tabanus* (*Neotabanus*) *colombensis* Macquart, 1845.

This species was originally described from Colombia, without definite locality. The abdomen was said to have two longitudinal yellowish-white stripes. — Not seen by us.<sup>1</sup>

\*107. *Tabanus* (*Tabanus*) *lividus* Walker, 1848. Synonym: *Tabanus viduus* Walker, 1850.

Amazonas: Leticia (S. Renjifo). — Boyacá: Muzo (J. Be-

<sup>1</sup> The *Tabanus trilineatus*, recorded by Curran (1928) from Sevilla (Magdalena) was no doubt one of the species of *Neotabanus* listed in this paper; but it is impossible to decide which species, without seeing the specimen.

quaert). — Meta: Villavicencio (M. Bates); Restrepo (J. Bequaert).

\*108. *Tabanus (Tabanus) alboater* Walker, 1850.

Vaupés: Mitú (P. Allen); between San José del Guaviare and Calamar (A. Gast).

\*109. *Tabanus (Tabanus) discus* Wiedemann, 1828.

Vaupés: Mitú (P. Allen).

\*110. *Tabanus (Tabanus) olivaceiventris* Macquart, 1847. Synonyms: *Tabanus imponens* Walker, 1857; *Atylotus pulverulentus* Bigot, 1892; *Tabanus coriarius* "Schiner" Kröber, 1929.

Magdalena: Río Frío (G. Salt). — We have seen a male of this species taken in Colombia, unfortunately without more definite locality. It is almost exactly like the female.

\*111. *Tabanus (Tabanus) importunus* Wiedemann, 1828; not of Macquart, 1847.

Magdalena: Aracataca (P. J. Darlington). — Meta: Restrepo (J. Bequaert); El Caibe, near Restrepo (reported by Antunes, 1937).

\*112. *Tabanus (Tabanus) ferriker* Walker, 1850. Synonym: *Tabanus druyvesteijni* Szilády, 1926.

Antioquia: Medellín Valley (F. L. Gallego). — Atlántico: Barranquilla (reported by Dunn, 1929). — Magdalena: Santa Marta (J. H. Egbert); Sevilla (G. Salt). — Meta: Restrepo (J. Bequaert). — Valle del Cauca: Hacienda La María, Buga (S. Renjifo).

\*113. *Tabanus* (? *Tabanus*) *hirtitibia* Walker, 1850.

Caquetá: Florencia (Rómulo Patiño). — Originally described from Colombia, without definite locality.

Although our specimen agrees well with Walker's description, it lacks the antennæ, which were also broken off in the type. It is possible that the third segment has a long, finger-shaped tooth, in which case the species may have to be transferred to *Alliomma*.

114. *Tabanus* (? *Tabanus*) *flavifacies* Macquart, 1845.

Originally described from Colombia, without more definite locality. The abdomen is described as black, with three rows of white triangular spots. The size (10½ French lines=23.7 mm.) is rather large for a *Neotabanus*, and it was more likely a true *Tabanus*. — Not seen by us.

115. *Tabanus* (*Lophotabanus*) *pseudoculus* Fairchild, 1942.

Boyacá (? or Caldas): Neira (L. Murillo). — Determined by G. Fairchild). — Not seen by us from Colombia.

\*116. *Tabanus* (*Lophotabanus*) *xipe* Kröber, 1934. Synonym: *Lophotabanus surinamensis* Kröber, 1929; not *Tabanus surinamensis* Macquart, 1838.

Chocó: Andagoya (A. Gast). — Meta: Restrepo (J. Bequaert; also reported by Antunes, 1937); Villavicencio (M. Bates).

117. *Tabanus* (*Lophotabanus*) *oculus* Walker, 1848. Synonyms: *Tabanus albo-notatus* Bellardi, 1859; *Tabanus oculatus* Dunn, 1929 (misspelling of *oculus*).

Santander Sur: Jazmín, between Puerto Wilches and Bucaramanga (reported by Dunn, 1929). — *T. oculus* was originally described in part from Colombia without more definite locality. — Not seen by us from Colombia.

After studying many specimens of this group from Yucatan, Honduras, Guatemala, Panama, Colombia, Venezuela, Trinidad, and Brazil, we have come to the conclusion that *T. albo-circulus* Hine and *T. xipe* Kröber will eventually be synonymized with *T. oculus*. *T. oculus* is used at present for specimens with the first posterior cell closed and stalked before the margin, a character which is not always of specific value in *Tabanus*.<sup>1</sup> Of the others, with open first posterior cell, the larger specimens are placed in *xipe*, while the smaller ones become *albocirculus*, a procedure which leaves the medium-sized ones in doubt. Specimens with the first posterior cell closed just at or near the margin, or barely open, must also be placed arbitrarily.

\*118. *Tabanus* (*Lophotabanus*) *pruinicorpus* Kröber, 1934. Synonym: *Lophotabanus pruinus* Kröber, 1929; not *Tabanus pruinus* Bigot, 1892.

Magdalena: Río Frío (G. Salt); Sevilla (G. Salt). — Kröber originally described his *L. pruinus* from Bolivia and Colombia (supposedly from Bogotá, a locality which is perhaps open to question).

<sup>1</sup>In the present paper the subgenus *Lophotabanus* Szilády (1926) includes *Bellardia Rondani* (1864) (not of Robineau-Desvoidy, 1863), a name later changed to *Bellaria* Strand (1928).



\*119. *Tabanus (Macrocormus) sorbillans* Wiedemann, 1828.

Boyacá: Casanare (L. Patiño). — Meta: Restrepo (J. Bequaert).

120. *Tabanus (Macrocormus) obscurigaster* Kröber, 1934. Synonym: *Macrocormus obscuriventris* Kröber, 1930; not *Tabanus obscuriventris* Kröber, 1929.

Chocó: Condoto, type locality of the species. — Not seen by us.

121. *Tabanus (Philipotabanus) fascipennis* Macquart, 1845.

Originally described from Brazil and "New Grenada," the latter possibly meaning Colombia. Kröber (1930f) reported it from Bogotá, but it seems rather doubtful that it was actually taken there. — Not seen by us.

\*122. *Tabanus (Philipotabanus) multiguttatus* Kröber, 1930f.

Cundinamarca: Bogotá, the type locality. — Magdalena: Sierra Lorenzo, at 8,500 ft. (H. Viereck). — Kröber gave also "New Grenada" and Ecuador as additional localities and placed the species in *Phæotabanus*.

\*123. *Tabanus (Philipotabanus) magnificus* Kröber, 1934. Synonym: *Phæotabanus formosus* Kröber, 1930f; not *Tabanus formosus* Walker, 1848.

Cauca: Río Micay (S. Renjifo). — Chocó: Istmina (S. Renjifo); Andagoya (D. Augustine); Río Cabí near Quibdó (S. Renjifo). — Valle del Cauca: Kilom. 87 on road from Cali to Buenaventura, at Río Anchicayá (S. Renjifo); Veneral, Río Yurumanguí (S. Renjifo); Puerto Merizalde, Río Naya (S. Renjifo); Quebrada San Joaquín near Buenaventura (S. Renjifo); Condoto (reported by Kröber, 1930f, as one of the type localities of his *P. formosus*); Utría (J. Boshell. — Determined by G. Fairchild); Río Nimiquía (J. Boshell. — Determined by G. Fairchild).

124. *Tabanus (?Philipotabanus) criton* Kröber, 1934. Synonym: *Phæotabanus columbianus* Kröber, 1931f; not *Archiplatius columbianus* Enderlein, 1925, now placed in *Tabanus*.

Cundinamarca: Fusugasuga, the type locality. — Not seen by us.

125. *Tabanus (?subgenus) simplex* Walker, 1850.

This species was originally described from Colombia, without definite locality. Kröber (1934) placed it doubtfully as a synonym of *Tabanus (Lophotabanus) biflocus* Hine, of Cuba. This

appears improbable, particularly as Walker did not mention a black spot on the scutellum. — Not seen by us.

Walker (1848) referred doubtfully to the North American *Tabanus lasiophthalmus* Macquart, a specimen collected in Colombia by Goudot. This identification was certainly erroneous and probably based on a specimen of *T. quadripunctatus* Fabricius.

\*126. *Diachlorus curvipes* (Fabricius). Synonym: *Hæmatopota curvipes* Fabricius, 1805.

Boyacá: Muzo (J. Bequaert; reported by Bequaert, 1944). — Valle del Cauca: Veneral, Río Yurumanguí (S. Renjifo).

Kröber (1928) reports *Diachlorus ferrugatus* (Fabricius) from Colombia, without definite locality; but this is certainly due to some error.

127. *Acanthocera albomarginata* (Kröber). Synonym: *Spheciogaster albomarginata* Kröber, 1930.

Chocó: Condoto, the type locality. — Not seen by us.

\*128. *Acanthocera formosa* Kröber, 1930d.

Meta: Restrepo (J. Bequaert. — Reported also by G. Fairchild, 1939).

\*129. *Acanthocera trigonifera* Schiner, 1868.

Cundinamarca: Bogotá (reported by Kröber, 1928). — Magdalena: Santa Marta (F. L. Gallego). — The occurrence of this species near Bogotá needs to be confirmed.

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## APPENDIX: A NEW *Agelanius* FROM COLOMBIA

BY JOSEPH C. BEQUAERT

### *Agelanius osornoi*, new species

*Female*. — Medium-sized, black. Frons of medium width, with a large dirty-yellowish basal callus and a velvety-black median spot. Dorsum of thorax with grayish-white longitudinal stripes, of abdomen with a median row of white triangles and lateral transverse white markings. Legs black with mostly pale tibiae. Wing with a characteristic pattern of blackish spots.

Head transverse, about twice as wide as high in front view, black, mostly covered with grayish-white pollinosity, which is more brownish at level of antennæ. Lower half of face, jowls and outer orbits with long white hairs, forming a conspicuous beard; upper part of face and subcallus with shorter hairs, mixed black and white. Frons about two and one-half times as long as wide at the subcallus, slightly narrowed toward vertex;

basal callus shiny, dirty-yellowish, touching the inner orbits, nearly twice as wide as high, rather abruptly extended upward into a median broad line, which is triangularly widened at the base and reaches to about mid-length of frons; middle third of frons with a large, dull, cordiform spot of velvety-black pollinosity, the broader lower end notched and divided by the smooth extension of the basal callus, the narrowed upper end jagged; remainder of frons and vertex gray pollinose, the velvety spot broadly separated from inner orbits; vertex flat, with a small brownish-pollinose median area; frons with many erect, black hairs, even on the shiny callus. Proboscis short, thick, with large, soft labella. (Antennæ and palpi broken off.) Eyes densely covered with erect grayish hairs. Thorax black, mostly covered with ashy-gray pollinosity, except dorsally over four broad, blackish, longitudinal stripes; of the five grayish-white stripes thus produced, one on each side is very broad and divided posteriorly (above the wing base) by a short blackish streak; three in the middle are much narrower; the median one linear, slightly widened behind where it stops at the posterior third; the two admedian ones reaching the scutellum where they unite with the lateral stripe on each side, but broadly interrupted beyond mid-length of the dorsum; scutellum mostly with blackish pollinosity, the hind margin broadly gray pollinose. Hairs of thorax long, dense and white beneath, dorsally long, sparse, mostly black with a mixture of white particularly near the sides and at the hind margin of the scutellum. Abdomen: integument black, with indefinite slightly brownish areas at the sides of the first tergite; ventrally almost wholly grayish pollinose, dorsally with dull, velvety-black pollinosity on which stand out conspicuous white pollinose markings as follows: a median triangle on the hind margin of tergites 2 to 6, largest on 3 and 4 where they are about as high as wide and reach the anterior margin of the tergite, slightly smaller on 2 and 5 where they occupy half or less of the length of the tergite (triangle of tergite 2 wider than long), very small on 6; a narrow streak at hind margin on each side of tergites 2 to 6 (widest on 2) extending to near the median triangle, from which it is, however, sharply divided; in addition a similar, but broader streak on each side at anterior margin of tergite 2, leaving about the median third free and not connected on the sides with the streak of the hind margin; venter with long, white hairs; tergites with shorter, mostly black hairs,

except on the pale areas where some of the hairs are silvery-white, particularly on the median triangles. Legs black, grayish pollinose, with long, grayish-white hairs except over the dark portions of tibiæ and on tarsi, where they are black; tibiæ of normal shape, pale dirty-yellowish over basal two-thirds to three-fourths, which bear silvery-white hairs. Wing without appendix at fork of third longitudinal vein; all posterior cells open at margin; nearly hyaline with conspicuous blackish spots as follows: medium-sized spot at base of first submarginal cell, extending over base of first posterior cell, extreme apex of first basal cell and slightly into discal cell; spot at lower apex of second basal cell, more extended over base of fourth and fifth posterior cells and less so into discal cell; fairly large area around cross-vein at apex of discal cell, from the first to the fourth posterior cells; spot below stigma on second longitudinal vein; small cloudy blotches before the tips of all longitudinal veins, some weaker than others; stigma blackish; squamæ clouded; veins black; halteres blackish; subepaulet bare.

Length, 11.5 mm.; of wing, 9 mm.

COLOMBIA: Monserrate near Bogotá, Dept. Cundinamarca, at about 3,000 m. above sea-level (Hernando Osorno Collection); holotype at Mus. Comp. Zool. (No. 27634).

*A. osornoi* is related to several species of *Agelanius* from the Andes of South America, such as *A. excelsus* (Surcouf), *A. montium* (Surcouf) and *A. columbianus* (Enderlein). It is, however, readily separated from these and other species known to me by the conspicuous pattern of white markings on the abdomen, the arrangement of spots and clouds in the wing, as well as the large velvety-pollinose spot on the middle of the frons. For this reason I am describing it as new, notwithstanding the lack of antennæ.

A NEW RECORD OF OXYAGRION (ZYGOPTERA)  
FROM NORTH AMERICA

BY KENNETH A. CHRISTIANSEN

Boston, Mass.

While examining a tray of unidentified damsel flies at the Harvard Museum of Comparative Zoology, I discovered a small male cœnagrionid of unusual coloration labelled "June 9, Beltsville, Maryland." The specimen had been collected by Mr. Nathan Banks on one of two trips in 1915 and 1916. I identified the insect as *Oxyagrion peterseni* Ris, and this identification was later confirmed by Dr. P. P. Calvert. On further inquiry Mr. Banks informed me that the damsel fly was captured in an open Sphagnum bog which had formed over a substratum of rock. To my knowledge the only other North American record of this tropical genus is the capture of *Oxyagrion rufulum* in northern California.<sup>1</sup> Needham apparently did not think that this record was sufficient reason for including the genus *Oxyagrion* in his "Handbook of the Dragonflies of North America."

I have compared the Maryland specimen of *O. peterseni* with the two paratypes in the collection of the Harvard Museum with the following results: The Maryland specimen is darker than the paratypes on the thoracic dorsum, and the femora of the former are lined with black whereas the legs of the paratypes are entirely yellow.<sup>2</sup> There are eight matched post-nodal cross-veins in the wings of the Maryland specimen and nine in the wings of the paratypes. In all other external features the specimens appear to be identical.

I have as yet no plausible explanation for this northern occurrence of the tropical genus; and further records are necessary to determine whether or not *Oxyagrion* is a true member of the North American odonate fauna.

<sup>1</sup> Muttkowski's Catalogue of the Odonata of North America, Bull. Wisc. Nat. Hist. Soc. No. 8, p. 53.

<sup>2</sup> These variations are probably due to age as the paratypes appear to be younger than the Maryland specimen.





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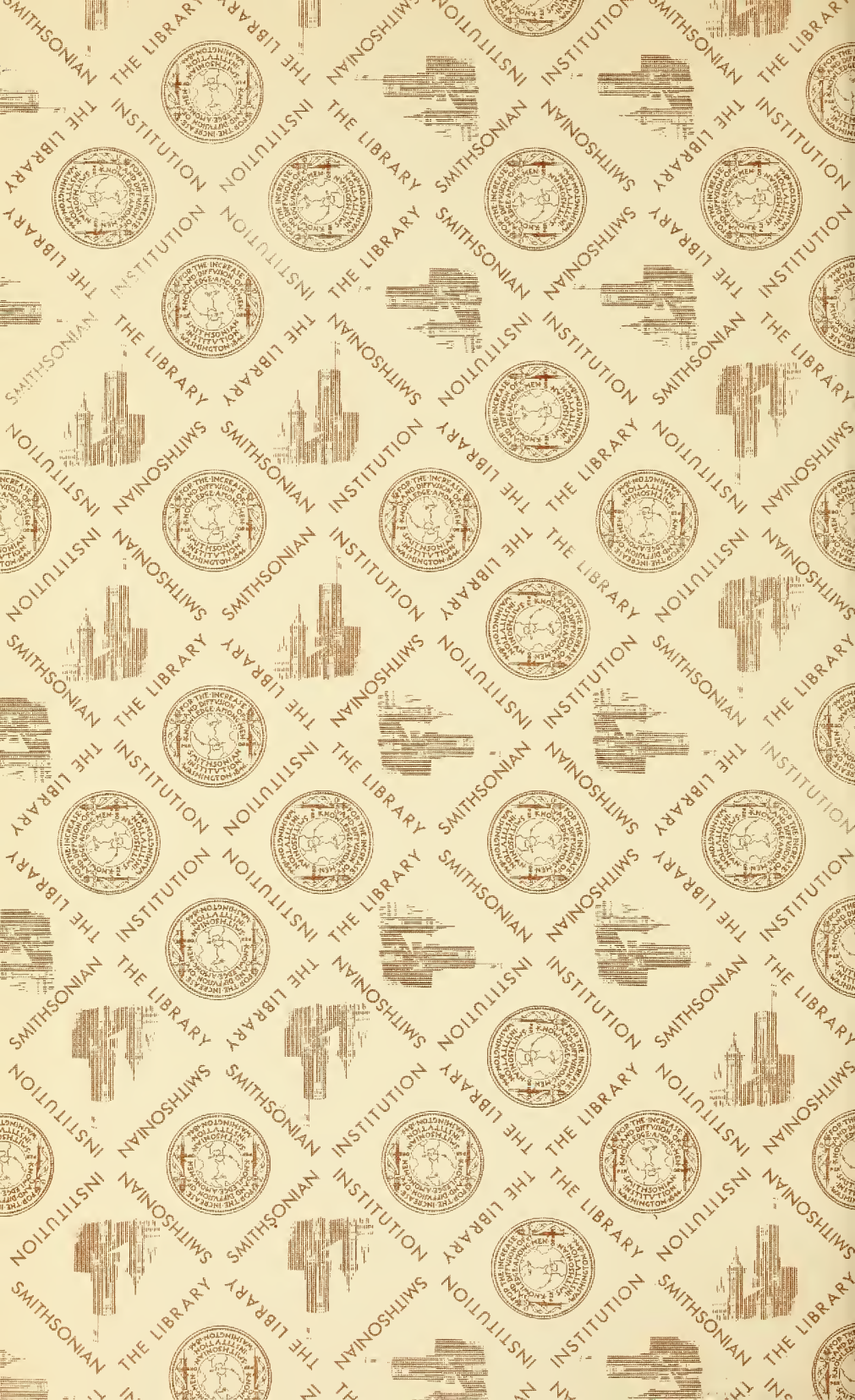
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