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I

NOTES ON CUBAN AND OTHER WEST INDIAN
PSAMMOCHARIDAE

By NATHAN BANKS

NOTES ON CUBAN FULGOROID HOMOPTERA

By J. G. MYERS

IMPERIAL BUREAU OF ENTOMOLOGY



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NOTES ON CUBAN FULGOROID HOMOPTERA¹

BY

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Imperial Bureau of Entomology

(With 15 figures)

THE material on which the present notes are based was collected in the neighborhood of Soledad, Santa Clara, Cuba, during part of the dry season of 1925, while I enjoyed the privilege of a Harvard Atkins Fellowship at the Soledad Tropical Laboratory. Ecological observations on the species affecting sugarcane were published earlier (Myers, 1926), when I made a more detailed acknowledgment of the assistance received in many quarters.

In order to avoid undue bulk, the present paper is devoted almost entirely to taxonomy. The Fulgoroid Homoptera of Cuba, though small and obscure in comparison with the mainland fauna of the Neotropics, are second to none in ethological interest; but their taxonomy has been greatly neglected in favor of that of the more striking and highly colored forms. It is probable that island endemism is very high in the Greater Antilles, as Muir has suggested, but this can be elucidated only by a much more critical study of all the species, based on dissection of the male genitalia.

It will be noticed that most of the interesting new forms herein described were collected in the virgin forest of the mountains, especially at the Mina Carlota, Trinidad Mountains, where we were enabled to work through the kind hospitality of the manager, Mr. Gaspari, of Cienfuegos.

DERBIDAE

Phaciocephalus cubanus Myers, 1926. (Ethology, pp. 91, 92.) The material from Jamaica which Van Duzee (1907, p. 36) referred to *Lamenia uhleri* Ball, may very probably be this species.

Cedusa santaclara sp. n. Figure 1. Vertex considerably wider than long, with sides and anterior margin somewhat elevated; base barely emarginate, — very widely and angularly so, — wider than apex, so that shape is roughly trapezoidal. Frons dumb-bell shaped, the sides greatly raised, making the narrow middle portion trough-like; a median longitudinal ridge distinct, continuing on to clypeus, apical third widest and parallel-sided. Clypeus triangular, narrower than widest part of frons. Genal ridge low, depressed between antennal trough and lateral carina of frons. Transverse carina between vertex and frons evident.

¹ No. 3. Studies from the Biological Laboratory in Cuba (Atkins Foundation), of the Harvard Institute for Tropical Biology and Medicine.

Pronotum nearly as long as vertex, with three longitudinal carinae. Mesonotum with disc raised and apex depressed, with three longitudinal carinae, the outer ones diverging slightly at their extremities.

Tegmina shining, the veins elevated. Last ventral segment long, truncate, its apical margin sinuate, slightly produced in middle. Genital styles long, wide and flat, evenly paddle-shaped with unusually long inwardly directed tooth as shown in fig. 1.

Color: eyes pale magenta; vertex and pronotum unicolorous shining stramineous, mesonotum shining fuscous. Beneath, pale brownish, legs and styles paler. Tegmina uniform smoky fuscous.

Length: male, 2.3 mm., tegmen 3.3 mm., length to tip of closed tegmen, 4 mm.

Described from two males.

Holotype: Mina Carlota, Trinidad Mts., Cuba, 19. iii. 1925. No. 635.

Paratype: Mountains east of Soledad, Cuba, 10. ii. 1925. No. 618.

Holotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15966; paratype in my collection.

This species runs in McAtee's key (1924, p. 180) to the *californica-cedusa* group, but differs in the male genitalia, which are nearest to those of *praecox* (Van Duz.).

CIXIIDAE

Oliarus franciscanus (Stål). Some ecological observations upon this common species are given in Myers, 1926, pp. 84-86.

Oliarus atkinsae sp. n. Figures 2, 3. Male: vertex one and a half times as long as wide at base; areolets comparatively short, reaching less than one third from apex; median carina of frons forking at two thirds of distance from frontal ocellus to vertex. In tegmen, Cu forking very slightly basad of Sc + R. Genital styles very stout and broad, each with a curved, inner spine arising from the base of the blade; apical edge of blade very minutely serrulate. Aedeagus complex, as figured. Median tooth of pygophor simple, acute.

Color chocolate brown; lateral carinae of vertex, especially in middle portion, marked with white. A conspicuous oblique white splash on each side of clypeus at suture. Legs lighter brown, very indistinctly banded with darker and with paler. Pronotum generally paler, with a dark mark on each side of disc and one on lateral margin. Mesonotum unicolorous; tegulae slightly more castaneous. Abdomen brown, the segments edged with paler. Tegmina entirely hyaline, costa and stigma fuscous, the latter narrowly white proximally; veins white with alternate stretches of black, especially apically, and with long black macrotrichia. Apex of cell Cu^{1b} black. Granulations small, concolorous with the parts of the veins — white or black — on which they lie.

Length to tip of tegmen, 8.5 mm., tegmen, 7 mm.

Described from one male, mountains east of Soledad, Cuba, 10. ii. 1925. No. 619. On tree-trunk in virgin forest.

Holotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15971.

I dedicate this species to Mrs. E. F. Atkins, to whom every visitor to Soledad owes so much.

It seems nearest to *O. aridus* Ball, 1902 (*breviceps* Fowl.), but differs in the much longer vertex and in the male genitalia; also its white facial marks are on the base of the clypeus, and not on the frons. *O. pinicolus* Osborn (1926, p. 355), recently described from Cuba, seems a smaller species, with a longer vertex and differently shaped male genital styles. It is associated with the Cuban pine (*Pinus cubensis* Griseb.).

Mnemosyne cubana Stål, 1866. It is hoped to publish separately notes on the life-history and interesting myrmecophilous habits of this large species, which is distinct from *M. planiceps* (Fabr.) with which Fowler considered it synonymous. *M. cubana* differs in the structure of the male genitalia and in coloration.

Myndus crudus Van Duzee, 1907. The life-history of this very common species is unknown, but a few ecological observations were published in Myers, 1926, pp. 86, 87.

Bothriocera signoreti Stål, 1864. The species of this genus need a thorough revision on the basis of large series from many localities, properly dissected. My series of dark *Bothriocera* from Cuba resemble *signoreti* as determined by Metcalf (specimens in M.C.Z.). The male genitalia agree also with Fowler's description. I therefore call this species *signoreti* provisionally, and figure the male genitalia (fig. 4) for ultimate recognition. There is either very great color variation from island to island, or many more species than we at present recognize.

The present form was common both at Soledad and in the Trinidad Mts. from February to May. Its life-history will be the subject of a further contribution. The nymph lives underground and has strong fossorial fore-legs like those of a cicada, thus presenting an interesting example of convergence.

Bothriocera venosa Fowler, 1904. This was compared with the type in the British Museum and showed only general agreement in markings, though apparently structurally similar. The type is a female. I figure the genitalia of the Cuban form for ultimate recognition (fig. 5). This form did not occur at Soledad, but in the mountains just to the east and at the Mina Carlota, Trinidad Mts., in March, though it was common in neither locality.

Cubana trinitatis sp. n. Female: vertex with the basal, lateral, apical, and subapical keels very sharp; the subapical at two thirds from base. Base widely angularly emarginate. Face long and narrow, disc both of frons and clypeus depressed on each side of the very strong median carina, which is interrupted only by the median ocellus. Lateral keels of frons and clypeus strongly elevated. Frons widest about two thirds from base. Clypeus tapering at first gradually and then suddenly to apex. Head with eyes slightly narrower than base of pronotum.

Pronotum very short, with a distinct median longitudinal keel. Mesonotum with three very distinct keels, the disc flattened between them, sloping steeply laterally to the pleura. Stigma of tegmen rugose; apical half of costal border of tegmen and whole of apical border round to apex of clavus thickened and cross-striated.

Color: dark walnut brown. Tegmina glassy, with the veins fuscous, interrupted

with paler apically; and the following fuscous markings — a spot followed by three curved bands on basal half of costal margin, the stigma itself, an irregular fascia across from stigma to apex of clavus, two narrow bands across apex of tegmen anteriorly, and a distinct round spot near anal angle.

Length, to apex of closed tegmina, 5.3 mm.; tegmen, 4.6 mm.

Described from one female, Mina Carlota, Trinidad Mts., Cuba, 19. iii. 1925. No. 635. From undergrowth in virgin forest.

Holotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15969.

This, the first Cuban species of the genus, is closely allied to the two species described by Uhler from St. Vincent. It has the general markings and size of *C. tortrix* Uhl. (1895), and the postero-apical tegminal spot of *C. irrorata* (1895). Muir has described yet another species of *Cubana* from the island of Rodriguez and one from Porto Rico (1924). Both he and Osborn (1926, p. 356) erroneously attribute Uhler's two species to Cuba. As a matter of fact, Uhler's pertinent remarks are as follows: "The generic name here given is derived from Cuba, on which island these insects were first taken" (1895, p. 62). This obviously refers only to the genus, and not necessarily to the two species which he goes on to describe from St. Vincent, for (p. 63) he says, "A closely related species was sent to me many years ago from the island of Cuba by Dr. John Gundlach." To this Cuban species, which is perhaps the one I have just described, Uhler never gave a published name. The five known species of the genus are therefore distributed as follows: 2 in St. Vincent, 1 in Porto Rico, 1 in Cuba and 1 in Rodriguez. It is evident that the West Indies are the headquarters.

ANTILLIXIUS New Genus

Vertex long and narrow, produced seven twelfths its length in front of the eyes, very deeply trough-like, with no median longitudinal carina, the lips of the trough contiguous all the way between the eyes. Head in profile sharply pointed. Frons very narrow and trough-like, with a distinct median longitudinal carina at least on apical half; median ocellus protuberant, red and conspicuous. Clypeus with strong median and lateral keels. Pronotum with well-marked median keel and at least two lateral ones, exclusive of the carinate margin. Mesonotum with three keels, all distinct. Hind tibiae without spines. In tegmen, Sc, R and M forming a long stalk. Veins almost free from granulations. Type species with 3 apical branches of R and 4 of M. Tegmen long and parallel-sided. Male genitalia of the typical Cixiid form (fig. 6).

Genotype, *Antillixius greyi* sp. n.

This genus recalls *Paroelidius*, described below, but is a true Cixiid in the narrowest sense, with male genitalia very like those of some species of *Andes* Stål. It is perhaps nearest allied to *Rhamphixius* Fowler, but differs abundantly. *Rhamphixius* has no carina down the middle of the face, and the head is laterally compressed with a truncate apex (instead of sharply pointed as in *Antillixius*), and is as deep at the apex as at the eyes, if not a little deeper. The tegmen is long, triangular, and its veins all strongly granulate, whereas in *Antillixius* they are

smooth. The vertex of *Rhamphixius* is produced at least two thirds its length in front of the eyes.

Antillixius greyi sp. n. (fig. 6). Male: vertex very long and narrow, produced a little more than half its length before the eyes; deeply trough-like, the lateral carinae almost closing the groove between the eyes; basal margin, across posterior margin of eyes and base of vertex, practically straight; apex of vertex truncate in dorsal view, sharp in lateral view. Frons extremely long, narrow and trough-like, with high, flanged lateral carinae; floor of trough in basal half filled with a roughened spongy-looking elevation, passing on apical half into a strong median longitudinal keel which continues distinct to the large and conspicuous median ocellus, where it abruptly, widely and shortly forks. Clypeus with lateral carinae almost evanescent; median fairly distinct. Rostrum reaching hind coxae.

Pronotum with a distinct median, and two weak lateral carinae; hind margin widely angularly emarginate. Mesonotum with three longitudinal keels distinct, and an incomplete impressed line cutting off apex as in a *Tropiduchid*. Tegmen long and narrow, with the veins practically smooth. M leaving Sc and R halfway between apex of basal cell and fork of Sc and R. Stigma very long. Cu¹ near and parallel to Cu², forked apically. Claval veins fusing just before middle of clavus, joining margin some distance from apex. Apical cells as follows: 1 Sc, 3 R and 4 M.

Male genitalia very small, the styles especially tiny, expanding apically and then suddenly narrowed into a finger-like apex, the stem abruptly bent. Aedeagus with at least two pairs of recurved hooks (fig. 6).

Color (alcohol specimen): pale stramineous, the carinae paler, lined with yellowish. Eyes and ocelli reddish. Legs pallid, concolorous. Tip of rostrum and apical spines of tarsal segments and of tibiae fuscous. Tegmina hyaline, immaculate, veins practically colorless, save extreme tips of apical veins, which are thickly fuscous. Stigma colorless.

Length: body about 6 mm. (from dissected example), tegmen, 7 mm.

Described from one male, Soledad, Cuba, 27. v. 1925, Dr. G. Salt.

Holotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15967.

I dedicate this interesting endemic species to Mr. R. M. Grey, Superintendent of the Harvard Botanical Garden in Cuba, and a mine of information on all branches of Cuban natural history.

KINNARIDAE

This family has been separated from the Cixiidae by Muir, though its members share with the Cixiidae the possession of a median ocellus. The chief differences lie in the VIth, VIIth, and VIIIth abdominal tergites, which are specialized in the female for wax production, and modified also in the male. The genitalia are, in the male, of the Meenoplid type, indicating that whether or not they be included in the same family as the more typical Cixiids, they are certainly not monophyletic with them.

Mr. F. Muir, to whom I am indebted for very great assistance and advice of every kind, in the study of Fulgoroid Homoptera, has indicated to me that the fol-

lowing genera should be placed in this family: *Kinnara* Distant, *Paramicrixia* Distant, *Eparmene* Fowler, *Prosotropis* Uhler, *Atopocixius* Muir, *Oeclidius* Van Duzee, and *Paroeclidius* Myers (described below). In addition I have just ascertained by examination of the genotype, that *Haplaxius* Fowler should also be placed here.

Oeclidius fuscus (Van Duzee), 1907. This was described from Jamaica as a *Brixia*, and removed to the present genus in 1923 (*Proc. Calif. Acad. Sci.* 4, XII, No. 11, p. 190). My two specimens from Soledad agree very well with the description, but are slightly smaller. They were taken in March (sweeping bushes) and June (G. Salt).

Oeclidius trinitatis sp. n. Male: vertex very narrow, parallel-sided or slightly narrower apically, produced about a quarter of its length before the eyes; at the eyes or barely in front of them is a very indistinct transverse carina; base acutely angularly emarginate; posterior margins of eyes extending much caudad of this, and a narrow knife-like production of pronotum extending forward into this gap. Vertex deeply trough-like. Frons extremely narrowed and deeply trough-like basally, expanding fairly widely to the clypeal suture; the lateral carinae strong and flange-like; no median longitudinal keel. Clypeus with lateral carinae almost evanescent, disc convex, with a median keel. Second segment of antenna hardly more than two fifths as thick as long, with about a dozen large, circular dark-ringed sensoria in facial view. Median ocellus not distinguishable. Rostrum reaching past base of pygophor (or, since abdomen may be shrivelled, to two thirds along hind femur).

Pronotum with a strong median longitudinal ridge produced forward into a knife edge, and flanked on each side by the sharply carinate fore border; a transverse dark keel-like mark on each side of disc; lateral margins strongly keeled; hind margin widely angularly emarginate. The three keels of mesonotum strong. Veins of tegmen without granulations. Stigmal cell large. Apical cells of tegmen as follows: 3 R and 4 M. Abdomen short. Genital styles short, broad and somewhat twisted apically (fig. 7). Aedeagus very short, hardly projecting from pygophor, stout cylindrical with a sudden acute point.

Color: vertex and pronotum, and undersurface, pallid, the carinae fuscous. Mesonotum and tibiae deeper yellowish brown, apex of former, paler; eyes, metanotum and pygophor deep chocolate brown, tip of metanotal scutellum whitish. Base of abdomen orange brown, apical half, deep reddish. Tegmina hyaline, pellucid, immaculate; veins black, stigma slightly smoky, a white spot on costa at base of stigma.

Length: body, 3 mm., tegmen, 4 mm.

Female similar in form and coloration, with genitalia deep chocolate brown, and a copious dorso-posterior waxy secretion.

Length: body, 3.5 mm., tegmen, 4.4 mm.

Described from 2 males and one female, Mina Carlota, Trinidad Mts., Cuba, March, 1925, from undergrowth of virgin forest and of a cafetal. Nos. 636, 643, 662.

Holotype male and Allotype female, Museum of Comparative Zoölogy, Cambridge, Mass., No. 15744. Paratype male in writer's collection.

This is more or less the size of *Oe. fulgida* (Van Duz.) but differs strikingly in color, which is all Van Duzee's description deals with.

Oeclidius hanabanillae sp. n. Vertex barely reaching fore border of eyes, but the head produced as frons about a quarter of total length of head in front of eyes; vertex three times as wide at the widely angularly emarginate base as at apex, where the transverse carina separating from frons is very distinct and reaches level of lateral carinae, which are strongly elevated. Eyes very large and rounded. Frons very long, deep and narrow in basal part, widening greatly to clypeal suture, with no signs of median keel. Median ocellus distinct, placed some distance (more than its own width) from suture. Clypeus long and very narrow, the basal convexity passing gradually into a knife-edged longitudinal keel to apex. Rostrum reaching pygophor, or almost to end of last femur. Antennae as in *Oe. trinitatis*.

Pronotum with strong median longitudinal ridge projecting like a tongue (less sharp than in preceding species) into the emargination of hind margin of vertex, which extends forward to a third the length of the eye. Anterior and lateral margins of pronotum strongly carinate. Mesonotum with the three keels distinct, the disc between flat; scutellum with an elevated but plane disc. Veins of tegmen without granulations. Stigmal cell large. Venation much as in *Oe. trinitatis*. Apical cells as follows: 3 R and 4 M. The stigmal cell is crossed obliquely by a line cutting off the actual stigma; this line being indistinct here and in the preceding species practically indistinguishable. Genital styles sickle-shaped, bristly, somewhat wider at base than at apex. Aedeagus with a strong dorsal gently curved apical spine and a smaller ventral apical one.

Color: vertex, pronotum including keels, tegulae and underparts pallid. Keels of vertex, the mesonotum, tibiae and tarsi deeper yellowish brown. Eyes, metanotum and dorsum of abdomen deep chocolate brown. Tegmina hyaline, pellucid, immaculate, veins black, stigma basally (about quarter) blackish, with a white spot on costa itself.

Length: body, 4 mm., tegmen, 6.1 mm.

Female: similar in form and coloration to the male. Length: body, 4.4 mm., tegmen, 6.6 mm.

Described from one male and two females, the former from Hanabanilla Falls, near Cumanayagua (April), and the latter taken by Dr. G. Salt at Soledad (May and June).

Holotype male and Allotype female in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15743. Paratype female in writer's collection.

This is a large and striking species, readily distinguished from any other.

PAROECLIDIUS New Genus

Vertex produced at least half its length in front of eyes; extremely narrow and deeply trough-like. Frons also deeply trough-like, narrow, without median keel. Clypeus with median keel. Median ocellus not conspicuous. Pronotum with a well-marked median keel and two distinct lateral ones, exclusive of the carinate margin. The three keels of mesonotum practically obsolete, the disc smooth and

flattened. Hind tibiae without spines. Sc, R and M forming a stalk. R with three, M with four apical branches. Cu¹ forked.

Genotype, *Paroeclidius luizi* sp. n.

Paroeclidius luizi sp. n. Female: vertex long, narrow, oblong, parallel-sided, produced half its length before the eyes; base angularly emarginate, apex truncate, disc deeply depressed and trough-like; apex of vertex coinciding with apex of head. Frons extremely long, almost parallel-sided, but widest at or in front of antennae, deeply trough-like with no median longitudinal carina; median ocellus distinct, bead-like. Clypeus long, very narrow, strongly medially ridged from suture to apex, where it is knife-like. Rostrum reaching second abdominal segment. Ridges of pronotum distinct; those of mesonotum very obscure. Apical cells of tegmen, 3 R and 4 M.

Color: Vertex trough black, carinae light yellow; frons dark apically but mostly pale yellowish, the ridges tipped narrowly with brown; clypeus black, basally paler; genae and lora blackish save a strip bordering frons, encircling antennae and filling sinuosity of eye; a broad black band from fore border of eye to apex of head. Disc of pronotum fuscous; keels, borders, and lateral areas pallid. Mesonotum deep shining chocolate; apex of scutellum and that of metanotum conspicuous ivory white. Tegulae pallid. Abdomen dark. Most of ventral surface and coxae pallid, the rest of the legs and the mesosternum and mesopleura marked with fuscous. Tegmina hyaline, glassy, the veins heavily fuscous; a white spot on costa at proximal end of stigma and another on hind border of tegmen at apex of clavus; apical half of stigma fumose, shining, proximal half piceous; apical margin and cross-veins r-m and m-cu slightly smoky.

Abdomen is so shrunk that length is given to apex of folded tegmen, 6.5 mm.; tegmen, 5 mm.

Holotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15970.

Described from one female, Mina Carlota, Trinidad Mts., Cuba, 21. iii. 1925; beaten from *Chamissoa altissima* H. B. K. I dedicate this interesting species to our obliging guide at the Mina Carlota, Sr. Alberto Luiz.

Eparmene cubana sp. n. Female: (figs. 9-11). Vertex longer than wide, widest at base, which is almost straight; median and lateral carinae strongly developed, running without a break in the curve on to the face; no transverse carinae; disc of vertex sloping to merge indistinguishably into the front. Front longer than wide, base a little more than half width at apex, sides roundly ampliate in apical half; lateral and median carinae distinct, continued on to clypeus less distinctly. Median ocellus not distinguishable. No subantennal process. Clypeus wide, disc flattened, median carina weak. In profile clypeus and apical half of frons flattened; vertex and proximal part of frons lying in an unbroken curve extending very little in front of eyes. Antennae short, first segment very short, second very slightly longer than broad. Eyes considerably emarginate along antero-ventral margin. Pronotum moderately long, hind margin extremely widely sinuately emarginate in middle, curving cephalad at sides; a median carina continuous with that of vertex and of mesonotum and two weak lateral ones on disc; a stronger pair of lateral carinae on lateral margin, continuous with that of tegulae. Meso-

notum strongly tricarinate; apical margin forming an equilateral triangle, depressed. Ovipositor incomplete. Wax secretion profuse.

Tegmina subparallel-sided, wider apically. Margins with distinct border all round, widening out at stigma and transversely minutely corrugated from stigma round apex to tip of clavus. Clavus not granulate. Costal cell wide. Sc and R joined to very near stigma, with their common base joined to M for one third of distance from tegmen base to stigma. Apical cells —3 R and 4 M. Claval vein joining margin before apex, forking considerably before middle, first claval vein extremely crooked.¹ Hind tibiae unarmed. Fore coxae simple, subparallel-sided.

Color: Vertex and antennae stramineous, the carinae fuscous, eyes dark. Face pallid, tinged with orange on each side before fronto-clypeal suture; lateral carinae fuscous, median carina paler apically. Pronotum stramineous, slightly yellower laterally. Mesonotum and tegulae deep ochraceous orange, whitish on sides and apex of scutellum. Dorsum of abdomen reddish orange. Venter and legs pallid, ultimate sternite black, also tips of tibiae and of tarsal segments. Tegmen shining, hyaline, base amber; nearly whole of clavus jet-black with four small white pruinose spots, one pair at one third, one spot between suture and first claval vein and other in claval fork; the second pair at two thirds, one on each side of fused claval vein. Posterior margin of clavus narrowly white. Fork of M from ScR stem marked slightly with fuscous. Stigma basally rather fuscous, with a wide brownish fumose transverse fascia extending to apex of clavus. Membrane crossed by a narrower oblique brownish streak from antero-apical to postero-basal corner. A wide brownish band bordering membrane from apex to apex of clavus. Hind wings hyaline, veins fine, in places dark. Anal area black. First two cells of wing filled with opaque white in basal half. Last sternite (female) rectangular, wider than long.

Length of body, 3.8 mm., of tegmen, 3.7 mm.

Described from one female, Soledad, Cuba, 13. iii. 1925 (J. G. M.). No. 622. On green shoots from base of cut stump of guasima (*Guazuma tomentosa*).

Holotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15968.

The position of this very striking species is somewhat obscure, so I have given a very full description. In Muir's key to the genera of the Cixiidae it runs to *Haplaxius* Fowler, with the genotype of which in the British Museum I have compared it. *Haplaxius*, however, has a distinct carina at apex of vertex, separating this sharply from the face. The Cuban insect differs from *Nymphocixia* Van Duzee in tegminal venation, in the vertex not produced back to any great extent over pronotum; in the indistinguishable median ocellus; in the pronotum not angularly emarginate behind and in the impunctate veins. Mr. Muir drew attention to its great resemblance to his genus *Atopocixius*, from Hayti. In *Atopocixius*, however, the general shape of the head is different, the vertex being considerably longer and narrower, passing less insensibly into the face. In *Atopocixius* also the three main keels of the pronotum pass straight from front to

¹ The claval venation is peculiar. There is an additional vein (?) running in a deep depression into the claval fork, and another, or a continuation of this, running parallel to the claval suture, which of course is concave, while the claval veins are strongly convex. The two additions are very weak and perhaps only folds.

rear, while in the present species the strong lateral ones diverge and run to the tegulae. Finally, a comparison with the type of *Eparmene pulchella* Fowler showed that my specimen was almost certainly congeneric. The structure of head and thorax is practically identical, but there are certain differences in venation. Thus *Eparmene* has three apical branches of M instead of four, and the third of these is fused with Cu^{1a}. But in the key to the genera of Cixiidae *Eparmene* is placed among the genera in which M does not form a common basal stalk with Sc and R, while the present species has a long and definite such common stem. A close examination of the type of *Eparmene pulchella* (the genotype) shows, however, that there is a very short Sc R M stem. We are therefore placing the Cuban species in *Eparmene*, while realizing that this genus, and *Haplaxius* Fowl., *Atopocixius* Muir, and *Prosotropis* Uhler are all very closely related Central American and Antillean forms.

DELPHACIDAE

For determinations in this difficult family I am indebted to Mr. F. Muir.

Copicerus irroratus (Swartz) 1802. Fairly common, Soledad, and Trinidad Mts., Cuba, February–March, 1925. The nymph was present on the same plants. Its antennae are as large in proportion as those of the adult, and very remarkable.

Saccharosydne saccharivora (Westw.) 1833.

Peregrinus maidis (Ashm.) 1890. I have considered points in the biology of these two species in Myers (1926, pp. 87, 88 and 88–91).

Euidella weedi (Van Duz.) 1907. One specimen, Soledad, 9. vi. 1925, G. Salt.

Delphacodes teapae (Fowl.) 1905. Common at Soledad during February, 1925.

Delphacodes havanensis (Crawf.) 1914. Soledad, February and April (G. Salt), 1925.

Delphacodes havanae (M. and G.) 1924. Common, Soledad, February and April, 1925. I give the following description of the hitherto unknown brachypterous form:

Head and antennae pale olivaceous brown, the face darker, with pale keels, and the eyes gray. Pronotum stramineous. Mesonotum olivaceous brown. Abdomen basally and apically yellowish; the rest, including ventral surface, blackish.

Tegmina reaching to end of pygophor, smoothly rounded apically, glassy, somewhat yellowish on costal margin; an irregular blackish area at base; apical third blackish except extreme margin which is sharply delimited in white.

Delphacodes nigripennis (Crawf.) 1914. Soledad, February, 1925.

Delphacodes andromeda (Van Duz.) 1907. Common, Soledad, February.

Delphacodes propinqua (Fieb.) 1866. Soledad, February.

Sogata furcifera (Horv.) 1899. One specimen, Soledad, February.

Megamelus sp. One female, Soledad, February.

DICTYOPHARIDAE

Dictyophara cubana Melichar, 1912. Two specimens agreeing very well with the description in Melichar's Monograph (p. 148), were taken at Soledad, one on the grass *Panicum maximum* Jacq. in February (No. 521) and the other in June (G. Salt).

On page 142 of the monograph Melichar uses the specific name, *cubana*, in the key; but on page 148, where the species is formally described, the name is given as *cubanensis*. The former seems preferable and has page priority.

TROPIDUCHIDAE

Neurotmeta sponso Guér., 1857. One specimen agreeing exactly with Guérin's description, taken at light, Soledad, Cuba, 24, vi. 1925 (G. Salt).

There has been extraordinary confusion regarding this species and *Remosa spinolae* (treated next). Guérin described *sponso* as *Fulgora (Pseudophana) sponso* (1857, p. 429), with the remark that it and *spinolae* (described on his previous page) which "pourrait bien son mâle," differed very greatly in venation from other members of the group. He accurately described these venational characteristics, which are those which to-day place both insects in the Tropiduchidae, or help to do so, instead of in the Dictyopharidae. Guérin then remarked, "N'y aurait-il pas là matière à la formation d'un genre? Si on se décidait à l'établir, nous proposerions pour lui le nom de *Neurotmeta*." Thus Van Duzee (*Cat. Hemipt. N. America*, p. 739) is clearly wrong in considering *sponso* the haplotype of *Neurotmeta* Guér., for both species were originally included, and of these *spinolae* has page priority. It is now, however, a question of fixing the genotype by subsequent designation, and for the sake of continuity in nomenclature, and to avoid still further confusion, I now select *sponso* as the type of *Neurotmeta*.

Melichar (*Abhandl. K. K. Zool.-bot. Ges.*, Wien, VII, 174, 1912) includes *Neurotmeta* with species *sponso* and *spinolae*, in the Dictyopharidae, but admits he does not know the genus. In 1915 (*Verhandl. naturf. Ver.*, Brun., LIII, 182) he treats the same insect (*sponso*) as a Tropiduchid, under the name of *Tangia sponso* Uhler!

Remosa spinolae (Guér.) 1857. Two specimens were taken agreeing exactly with the original description. One was swept from undergrowth of forest in the mountains just east of Soledad (No. 618, 10. iii. 1925) while the other was collected in a similar situation at the Mina Carlota, Trinidad Mts. (21. iii. 1925, G. Salt).

This species was described by Guérin as *Fulgora (Pseudophana?) spinolae* (1857, p. 428), but was included with *sponso* in his suggested new genus, *Neurotmeta*. As a matter of fact, the combination, *Fulgora spinolae*, as pointed out to me by Mr. W. E. China, was preoccupied by *F. spinolae* Westwood, 1842, for a Fulgorid in the strictest sense. That, however, does not affect the present status of the name.

Spinolae is certainly not congeneric with *Neurotmeta sponso*. Its nearest relative is undoubtedly *Remosa cultellator* (Walk.) with the type and one other speci-

men of which Mr. China and I have compared it in the British Museum. Walker's species was described from Santo Domingo, and reported also from Jamaica by Van Duzee (1907, p. 35) as *Tangia cultellator*. *Spinolae* may be provisionally referred to the genus *Remosa* Distant, of which *cultellator* is the type and only known species. It agrees with this in possessing a very narrow costal cell, a wide subcostal cell free from cross-veins, and in habitus. The chief differences are as follows: In *cultellator* in the tegmen, M forks first at five elevenths from base, in *spinolae* at one third; Cu¹ forks at one third from base on *cultellator*, and at considerably less than one third in the other. The whole surface of the tegmen in *cultellator* including the subcostal cell, is more or less granulate, while in the Cuban species it is smooth. None of these seem to me to constitute valid generic differences.

Osborn (1926, p. 354) records "*Dictyophara spinolae* (Auct. ?)" from Baraguá and Jobabo (Cuban localities), and a specimen from Boriato (Cuba) referred with some doubt to "*Dictyophara cultellator* Walk." Whether these are Dictyopharids or true Tropicuchids, and whether in the latter case, they represent either of the species I have just dealt with, I do not know.

ACHILIDAE

Catonia intricata Uhler, 1895. Two specimens were taken, agreeing well with Uhler's description. Both were swept from forest undergrowth, one in the mountains just east of Soledad (No. 618, 10. iii. 1925) and the other at Mina Carlota, Trinidad Mts. (No. 635, 19. iii. 1925). The species is thus probably associated with the virgin forest.

FULGORIDAE

Cyrpoptus sp. A few specimens were taken at Soledad in February, April, and June. This species stands in the collection of the Estación Experimental Agronomica, Santiago de las Vegas, Cuba, as "*Calyptoproctus obtusus*," and is probably also the insect listed by Osborn (1926, p. 355) as *Cyrpoptus obtusus* Uhler. I can find no description of this species, and strongly suspect that the above name is a manuscript name of Uhler, perhaps sent to Gundlach.

ACANALONIIDAE

Acanalonia servillei Spinola, 1839. Two specimens taken at light at Soledad, in June and a third in July (G. Salt).

Acanalonia sp. This small and plain species was much commoner than the preceding, and was collected on a variety of plants at Soledad during February and March. The genus is in urgent need of revision on structural characters. Without that this could only be described as another new species — a course I am loth to adopt.

ISSIDAE

Colpoptera carlota sp. n. (figs. 12, 13, 15). Male: vertex two and one third times as wide as medially long; straight truncate at apex, widely angularly excavate at base. Frons considerably longer than wide, widening apically, broadest at about one quarter from clypeus, to which it narrows suddenly, being narrower at extreme apex than at base. Pronotum slightly longer than vertex, strongly produced anteriorly, extremely narrow laterally and widely subangularly excavate posteriorly; disc greatly depressed but yet with signs of a longitudinal keel. Lateral carinae of pronotum follow hind margin of eyes about one fifth way round. Mesonotum normal for the genus. Costa of tegmen leaving margin about one fifth from base. Costal area much narrower than costal cell. Sc and R unbranched, their common stalk very short. M forks a little before middle. Cu¹ forks just before apex. As in *C. brunneus* Muir there is an emargination at apex of Cu as well as one in middle of anal area.

In lateral view lateral margin of pygophor almost straight, postero-dorsal margin sinuate. Anal segment very long, with a downward projection at one third and a much stronger one at apex; anus before middle. Genital styles large, subtriangular, outer margin deeply concave. Aedeagus with at least three pairs of apical recurved hooks (see figure).

Color: Brownish mottled with fuscous. Keels of vertex lighter. Disc of mesonotum very dark brown, paler laterally. Tegmen very dark brown with claval suture widely, stigma widely, a number of large spots on clavus, a large one near apex of tegmen and a series of smaller rounded spots round whole margin of tegmen, all paler. Long veins of corium heavily dark to level of stigma, then pale apically. Wings smoky with dark veins. Often the pale tegminal spots are obscure, except the stigma, and then the whole tegmen appears suffused with fuscous.

Length to tip of closed tegmen, 5 mm., tegmen, 4.4 mm.

Female in size and color resembles male.

Described from an abundant series, Mina Carlota, Trinidad Mts., March, 1925.

Holotype and Allotype in Museum of Comparative Zoölogy, Cambridge, Mass., No. 15742.

Paratypes in collections of British Museum and the writer.

This species differs from Muir's two Porto Rican species (*C. brunneus* and *C. maculifrons*, 1924) in the structure of the male genitalia (cf. figures) and from *C. rugosa* Van Duzee in the shape of the vertex (far less produced in *C. carlota*), in the presence of a spine on hind tibia and in darker coloration.

The pairing of *C. carlota* is interesting and affords a striking case of structural co-adaptation. A pair collected on 21st March remained in copula even after placing in alcohol. The female anal segment is long and narrow (fig. 13), quite unlike the male's and entirely destitute of processes; and it lies apically between the apposed genital styles of the male. The long axes of the two bodies are parallel, the bodies end to end, the ventral line of the female continuing the dorsal one of the male. The apical hook of the male's anal segment seems far the most efficient

grappling agent. The soft apex of the genital style seems to have more a tactile function.

The nymphs of *C. carlota* were common on the food-plants with the imagines. They present many points of interest. I describe the final nymphal instar as follows:

Male: ultimate instar, length, 4 mm. (Abdomen somewhat extended, as approaching ecdysis.) Color: yellowish white speckled and streaked with fuscous. Frons somewhat longer than wide, widest at about three quarters, thence suddenly narrowing to the clypeus; brownish dappled with whitish; edge and centre carinate, and in addition a keel just within the edge, curving inward apically. A row of circular sensoria between this keel and the edge; none apparent on rest of face. Clypeus with a slight longitudinal carina on each side of disc. Antennae with the globular second segment not reaching beyond eyes. Eyes very large, reniform, very protuberant, grayish with a longitudinal row of whitish spots dorsally, another row anteriorly and another ventrally; and a whitish posterior margin. Vertex sharply differentiated by an obtusely angled anterior carina; posterior margin widely angularly excavate, keeled; sides straight, keeled, the postero-lateral angles very acute. Vertex marbled fuscous with a whitish median longitudinal mark, and two large but obscure circular sensoria — one on each side of disc.

Pronotum in dorsal view triangular, with the apex forward, sides slightly curved. Bordered laterally and anteriorly with four large circular sensoria on each side, and two behind. (In one specimen there are altogether four on one side and six on the other.) Mesonotum with seven and metanotum with four of these sensoria on each side of disc. Apparently none on tegminal and wing pads.

Segments I-III of abdomen greatly reduced and weakly chitinized, forming a waist apparent when ecdysis is at hand (as in figure). The IVth tergite is the first of normal extent, but like the preceding it bears none of the large circular sensoria, though some of the circular dappled markings simulate smaller ones. The Vth and VIth tergites have two on each side, and in addition what appears to be a group of small circular sensoria on the extreme lateral edge, looking laterally. A similar group appears on segment VII, an isolated small sensorium in a similar place on VIII and a group of three on IX situated on each side ventrally.

Ventrally, on each side of disc, segments V-VII bear on the otherwise immaculate surface a brown strongly chitinized fleck, which shows, under high magnification, a close transverse striation. I shall not hazard a guess as to the function of this strange structure.

Rostrum not reaching hind coxae. Legs short and stout, unarmed save the hind tibiae, which bear, exclusive of apical coronet, two strong, stout spines.

The variation, in nymphs of the same instar, and even in the two sides of one individual, in the number of such complex structures as the large circular sensoria is surely very remarkable.

FLATIDAE

Probably no family of the Auchenorrhyncha is in a worse confusion, taxonomically, than this. In the absence of actual types it becomes almost impossible to name with any degree of probable accuracy, an *Ormenis* or a *Flatoides* (auctt.). One sees in a number of reputable collections the same insect under widely different names. A radical revision, based on sound structural characters, is urgently required. A species of pruinose *Ormenis* was abundant at Soledad, and two or three others rather scarce. There were at least two species also, of *Flatoides*. I have been constrained to leave these alone, and append merely a few notes on insects of other genera.

Petrusina marginata (Brunnich) 1767. Very abundant, at Soledad in company with the Cercopid, *Lepyronia robusta* M. and B., on wayside herbage and coarse grasses, especially *Panicum maximum* Jacq. This is an unusual habitat for a Flatid, especially of the *Ormenis* group, in which it is placed, and the insect itself has a very Issid-like appearance. It agrees, however, exactly with the original description, and the male genitalia, as figured, resemble considerably those of *Petrusa pygmaea* (F.), which are illustrated by Muir (1924, pl. XII, fig. 8.).

Cyarda walkeri Metcalf, 1923. Common at Soledad, February-April, and less so at the Mina Carlota, Trinidad Mts., in March.

Cyarda melichari Van Duzee, 1907. This has been recorded from Cuba by Osborn (1926, p. 356). I did not see it in Cuba, but what I take to be this species was collected abundantly at Key West, Florida, 29. iv. 1925 by sweeping *Sporobolus indicus* and *Iresine vermicularis* on dry salt marsh.

In concluding these notes I should like to thank very heartily Mr. F. Muir and Mr. W. E. China for help and advice, in the placing of the species and in comparisons with types.

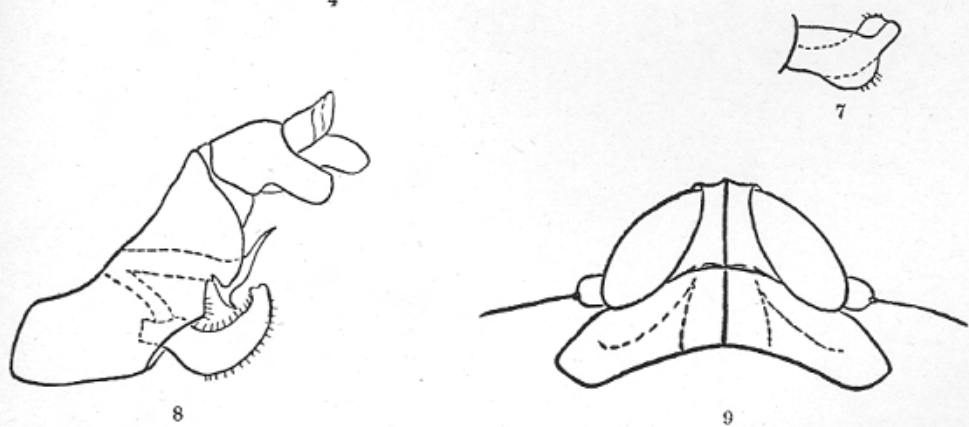
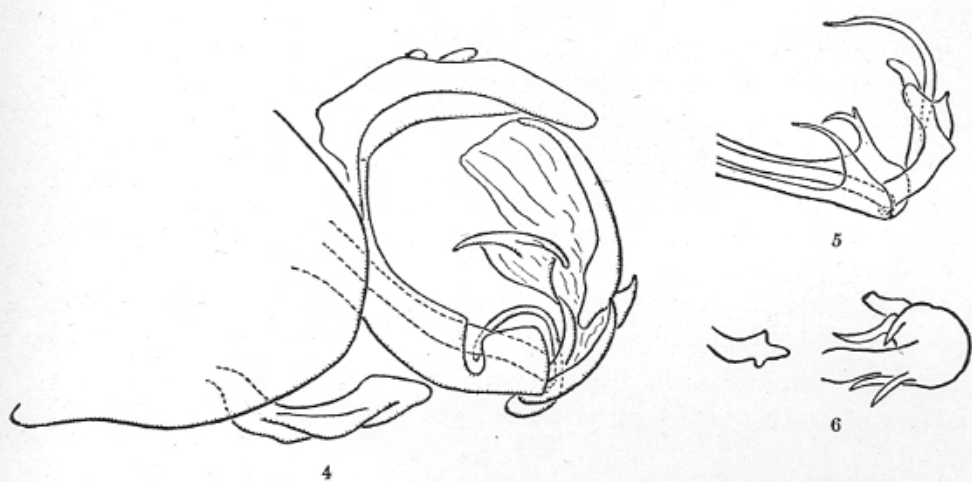
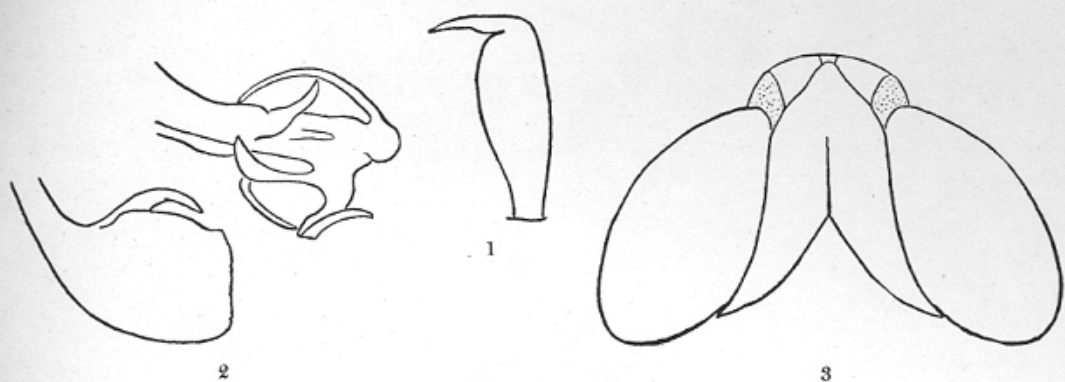
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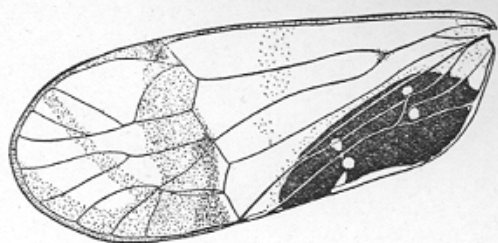
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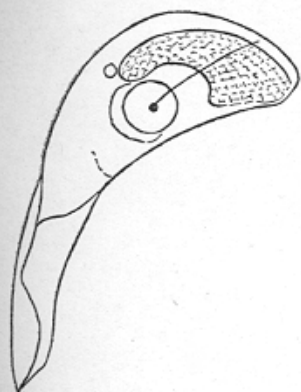
ILLUSTRATIONS

1. *Cedusa santaclara* sp. n. Ventral view right genital style, male.
2. *Oliarus atkinsae* sp. n. Outer view genital style, and lateral view of aedeagus.
3. *O. atkinsae* sp. n. Dorsal view of head.
4. *Bothriocera signoreti* Stål. Male genitalia.
5. *Bothriocera venosa* Fowl. Lateral view of aedeagus.
6. *Antillixius greyi* gen. et sp. n. Aedeagus and genital style.
7. *Oecliidius trinitatis* sp. n. Left genital style.
8. *Oecliidius hanabanillae* sp. n. Male genitalia.
9. *Eparmene cubana* sp. n. Head and pronotum.
10. *E. cubana*. Side view of head.
11. *E. cubana*. Tegmen.
12. *Colpoptera carlota* sp. n. Male genitalia and tip of genital style more highly magnified.
13. *C. carlota*. Copulation (drawn from alcohol material).
14. *Petrusina marginata* (Brunn.) Male genitalia.
15. *Colpoptera carlota*. Last nymphal instar.

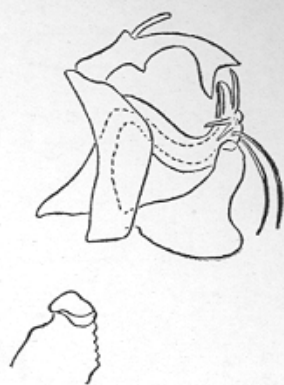




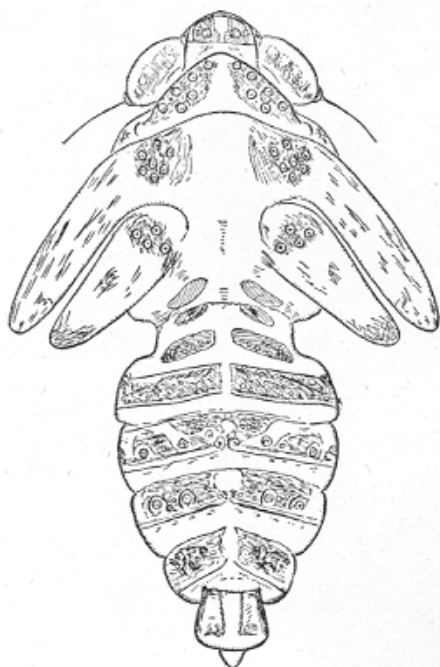
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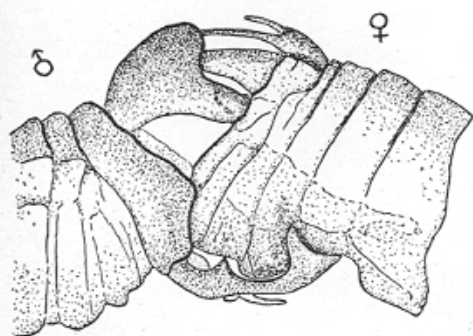
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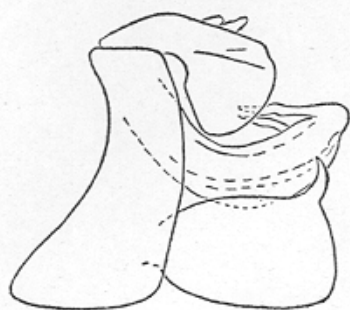
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