

SOME PHILIPPINE AND MALAYSIAN MACHÆROTIDÆ
(CERCOPIOIDEA)

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Of Los Baños, Philippine Islands

FOUR PLATES

In a previous paper¹ an attempt was made to review the true machærotids of Malaysia and the Philippines. Without sufficient material it was impossible to include in that paper the allies of *Enderleinia*. In the seven years intervening, some remarkable relatives of *Enderleinia* have been found in the Philippines and considerable Australian material of the same group has come to hand, some collected by Mr. H. Peterson, and some loaned by the Australian Museum at Sydney and by the South Australian Museum at Adelaide.² This has made possible a rearrangement of the whole group. Certain genera previously supposed to be Cercopidæ s. str. (=Aphrophorinæ auctt.) have been found to be true machærotids. While the Australian species are still in more or less confusion, the relationships of the genera are now clear, and it is possible to recognize *Hindola* as the typical genus of its subfamily with various other genera grouped closely about it.

Both *Clastoptera* (Neotropical) and *Iba* (Palæotropical) present some striking resemblances to certain machærotids in their elongate scutella and tegminal venation and appendices. These genera are, however, as far from Machærotidæ as from Cercopidæ s. str. and should constitute a separate family. Besides, they are not tube-dwellers. No representative of the Machærotidæ is known from the Americas.

In the Cercopioidea, just as in the Jassoidea, there is in general a remarkable uniformity, even through series of types quite diverse otherwise, in the venation of the hind wings, in strong contrast with the high degree of modification in the venation of the tegmina. Therefore, where distinct departures occur in the wing venation, these are of great importance in taxonomy,

¹ Philip. Journ. Sci. 15 (1919) 67-78, pls. 1-3.

² The Australian material will be fully treated in a forthcoming paper.

as in the eupterygids, balcluthids, and machærotids. In other characters the machærotids present the greatest range of body structure in the Cercopioidea, but certain venational characters are highly uniform and diagnostic.

Superfamily CERCOPIOIDEA

Key to families.

*a*¹. Outer fork of radius in hind wings always present (sometimes broken at apex), thus forming a supernumerary (first) apical cell, the cubitus apically forked or simple; claval veins (if present) usually distant and without connecting cross vein; scutellum comparatively small and short (except in Clastopteridæ).

*b*¹. Pronotal margin between eyes usually straight or slightly arcuate; front commonly more or less swollen apically; supraantennal ridges thickened and lobate; pronotum commonly strongly enlarged and much broader than head, and with anterolateral margins usually as long as or longer than posterolateral.

Tomaspidæ (= *Cercopinæ* auctt., = *Rhinaulacinæ* auctt.).

*b*². Pronotal margin between eyes usually strongly arcuate or subangulate; front usually swollen basally, if at all; supraantennal ridges not lobate, or greatly thickened; pronotum never greatly enlarged and rarely much wider than head, the anterolateral margins usually much shorter than the posterolateral.

*c*¹. Clavus narrowly acute or subacute apically; corial appendix either a narrow continuous membranous margin or wanting, never bent inward beyond clavus to overlap at end of body; corial venation various, but never as in Clastopteridæ; scutellum usually much shorter than pronotum.

Cercopidæ s. str. (= *Aphrophorinæ* auctt., = *Ptyelinæ* auctt.).

*c*². Clavus obliquely truncate at apex; corial appendix divided into two very broad subequal portions, these at rest infolded at end of the short and broad body to overlap; fork of radius in wing forming a very short first apical cell considerably before apex; cubitus in wings not forked apically; corium with three apical cells and two (or less) subapicals; scutellum longer than pronotum.

Clastopteridæ (including *Ibaini*).

*a*². Outer fork of radius in wing always absent, therefore no supernumerary (first) apical cell; claval veins (when two) adnate at middle or with a connecting cross vein; scutellum as long as or longer than pronotum, either simply long acuminate, or greatly elevated posteriorly and with a strongly curved free apical spine projecting caudad *Machærotidæ*.

MACHÆROTIDÆ

Key to subfamilies.

*a*¹. Scutellum not raised apically or with free apical spinous appendage; anterolateral margins of pronotum always very short, far shorter than posterolateral margins, the hind margin always more or less

deeply emarginate; anterior margin of pronotum strongly extended between eyes; head never broader than anterior width of pronotum and never strongly roundly swollen in front of eyes, usually obtuse-angulate; cubitus in hind wing apically forked; four apical corial cells arranged obliquely or even transversely to long axis of corium, the third from within never pedicellate or strongly projecting beyond and apically bounding fourth (outer).

Hindoliinæ (= Enderleiniinæ).

*a*². Scutellum usually greatly raised apically, always with a free apical spinous appendage extended caudad; anterolateral margins of pronotum longer than posterolateral, the hind margin not or but very shallowly emarginate; anterior margin of pronotum but very slightly extended between eyes; head somewhat broader than anterior width of pronotum and strongly, usually roundly, swollen and extended in front of eyes; cubitus in hind wings not forked; four apical corial cells arranged nearly longitudinally (in line with long axis of tegmen), the third from within pedicellate and extending strongly beyond and apically bounding fourth (outer).

*b*¹. Form slender, body of scutellum high arched posteriorly with strong dorsal furrow; pronotum without laminately extended lateral angles; anterior margin of pronotum somewhat angulate between eyes Machærotinæ.

*c*¹. Frons not vertically produced; hind tibiæ without lateral spur.

Machærotini.

*c*². Frons vertically angularly produced to high above head; hind tibiæ with one lateral spur..... Sigmasonini.

*b*². Form very thick and stout; body of scutellum nearly flat and with dorsal furrow subobsolete; pronotum with lateral angles produced into high, thin, spreading laminæ; anterior margin of pronotum broadly, gently arcuate between eyes..... Maxudeinæ.

HINDOLIINÆ

Key to genera.

*a*¹. Clavus narrowly acute apically, its terminal appendix very small and narrow; body more elongate, not clastopteroid, the tegmina never bent inward beyond clavus (Hindolini).

*b*¹. Scutellum basally strongly convexly raised above highest part of pronotum; pronotum smooth, finely punctured; crown of head nearly vertical, the head very short and broadly rounded (profile) from base to apex; tegmen with numerous irregular cells occupying apical half; two claval veins adnate at middle.

Apomachærota Schmidt.

*b*². Scutellum basally never raised above highest part of pronotum; crown of head usually oblique; tegmen with three or four very regular apical cells and two or three anteapicals.

*c*¹. Claval veins separated and joined at middle only by a cross vein; scutellum with an elongate fossa.

*d*¹. Anteapical cells elongate and subequal in length; cubitus distant from claval suture throughout; both claval veins forked apically. (East Africa.)..... Neuromachærota Schmidt.

d^r. Anteapical cells broad, the second much shorter than the others; cubitus apically approximate to claval suture; claval veins simple; pronotum strongly transversely wrinkled; tegminal veins with scattered black granulations; head as wide as pronotum, the latter rather broadly arcuate-margined between eyes; scutellum shorter than pronotum. (Ceylon.)

Machæropsis Melichar.

c^r. Claval veins always adnate for some distance at middle.

d^r. Scutellum longer than pronotum and apically with two high, longitudinal, raised edges, forming a large, deep fossa; hind tibia with two strong subapical spurs. (Togo.)

Enderleinia Schmidt.

d^r. Scutellum simple or with but slight discal depression; hind tibiae with but one subapical spur (though frequently also with a reduced subbasal spur.)

e^r. Cubitus lying for some distance at middle, on the claval suture, strongly curved, the base and apex distant from claval suture; corium with two subapical cells, second short; scutellum longer than pronotum; head a little more than half the width of pronotum. *Serreia* g. nov.

e^r. Cubitus distant from claval suture and nearly straight; corium with three anteapical cells, the middle hardly half the length of the other two; scutellum shorter than pronotum; head but slightly narrower than pronotum.

f. Scutellum with a large, shallow, subcircular depression occupying a large part of disk; crown, pronotum, and scutellum with very large, deep, crowded punctures; claval and part of corial veins with scattered dark granules, some of which near apex are bullate; all the veins strong and dark; crown (profile) lying in plane of anterior slope of pronotum and not at all depressed; hind tibia with a very large spur at middle. *Parahindola* g. nov.

f^r. Scutellum plane or slightly convex, smooth; hind tibial spur always nearer to apex than to base.

g^r. Body slenderer, not thickened and robust; head very little, if any, narrower than pronotum; surface of the largely subhyaline tegmina nearly plane, veins usually weak and indistinct, pronotum coarsely or finely punctured, and often with indications of transverse rugæ or wrinkles, but the puncturing usually predominant; sexes very similar.

Hindola Stål (= *Pectinariophyes* Kirkaldy = *Polytrichophyes* Schmidt = *Modiglianella* Schmidt = *Taihorina* Schumacher, = *Quinquatrus* Distant, = *Xenaia* Distant).

g^r. Body thick and robust; head appreciably narrower than pronotum, the latter strongly transversely wrinkled with more or less of intermingled punctures; surface of tegmina strongly irregular with deep depressions be-

tween the strong veins, the tegmina as a whole rather strongly convex; sexes strongly dimorphic.

Chaetophyes Schmidt.

a². Clavus broad apically, obliquely subtruncate, its terminal appendix short but broad; form of body rather strikingly clastopteroid, short and compact, the tegmina apically bent across apex of body behind clavus, and there overlapping; crown broadly rounded on to the strongly convex face (*Hindoloidesini*).

b¹. Veins scattered granulate on the subhyaline corium; crown almost vertical, very short, transverse; corium with three small apical cells; corial appendix not yet described or figured.

Polychaetophyes Kirkaldy.³

b². Veins not granulate, the discal veins very obscure except by transmitted light; crown oblique, more elongate; terminal corial appendix of great width with subparallel inner and outer margins, and reaching entirely across apex of tegmina; corium with apical cells entirely absent..... *Hindoloides* Distant.

Genus CONMACHÆROTA Schmidt

In a synopsis of the Malaysian species of the genus *Machærota* Burmeister⁴ the species were divided into two groups, the first comprising those with the claval vein apically forked (possibly two partly adnate claval veins) and the second those with the claval vein (single) simple. Between the writing of this paper and its publication, Schmidt⁵ separated the first group as a distinct genus under the name *Conmachærota*, with *notoceras* Schmidt as the type. Two new species of this group have recently been encountered in the Philippines, and their relation to the species previously discussed is given in the following key.

Key to species of the genus Conmachærota Schmidt.

a¹. Pronotum and scutellum in profile very broad, the narrow, basal portion of scutellum very short, basal portion of scutellum with a prominent yellow stripe on either side; length of crown much more than half the width between eyes; greatest profile width of scutellum into length of spine twice or a little more.

b¹. Scutellum in profile with greatest width much less than length; basal portion forming a distinct "neck;" its dorsal sulcus reaching about half the length of body of scutellum.

c¹. Females pale in color, males much darker; body densely fine pubescent; entire scutellum about twice as long as head and thorax together; crown anteriorly rather broadly rounded.

C. notoceras Schmidt.

³Possibly founded on males of *Hindola* or *Chaetophyes*, and may not belong to this tribe.

⁴Philip. Journ. Sci. 15 (1919) 69.

⁵Stett. Ent. Zeit. 79 (1918) 371.

- c. Female dark chocolate brown, same as males; body less densely pubescent; entire scutellum distinctly more than twice longer than head and thorax together; crown anteriorly subangulate at apex..... *C. mindanaensis* sp. nov.
- b. Scutellum in profile with greatest width about equal to length, basal portion not forming a distinct "neck;" its dorsal sulcus reaching about three-fourths of body of scutellum; crown anteriorly subangulate at apex..... *C. philippinensis* Baker.
- a. Pronotum and scutellum in profile very narrow, basal narrow portion of scutellum very long, this due to the strong flattening of both pronotum and scutellum; basal portion of scutellum without lateral yellow stripes; length of crown about half the width between eyes, anterior margin strongly subangulate; greatest profile width of scutellum into length of spine four times..... *C. attenuata* sp. nov.

CONMACHEROTA MINDANAENSIS sp. nov.

Female.—Length to end of abdomen, 4.75 millimeters; to end of spine, 7.5; length of spine alone, 3.5.

Color of body very deep chocolate brown, the body of scutellum much paler, the spine golden brown. Broad central band of front shining black. Pale yellow are five oblique lines on sides of front, curved lateral stripes on body of scutellum, its apical margin below spine, the usual dorsal spot at base of spine, entire basal segment of abdomen and remaining tergites at middle, and basal article of hind tarsus except extreme base and apex.

Sculpturation very similar to that of *philippinensis*, but the median carina of pronotum is strong throughout, strongest on middle third. Scutellar sulcus (fig. 6) broader and shallower than in *philippinensis*. Crown subangulate anteriorly (fig. 5). Diagnostic characters otherwise as stated in the key. Proportions in profile as in fig. 4.

Male.—Length to end of abdomen, 4 millimeters; to end of tegmina, 5; to end of spine, 6.5.

Colors same as in the female, differing in this respect from both *notoceras* and *philippinensis*.

Appears to be common in northern Mindanao, specimens coming from Surigao, Surigao Province, and from Iligan, Lanao Province (*Baker*).

CONMACHEROTA ATTENUATA sp. nov.

Male.—Length to end of abdomen, 3.5 millimeters; to end of tegmina, 5; to end of spine, 6.5.

Color very deep chocolate brown, body of scutellum not paler, the spine golden brown. Frons yellow with dark oblique stripes on sides; only the apex of crown (extreme base of frons) shining

black. Sides of body of scutellum entirely without yellow stripes, but area of sulcus paler, and hind margin narrowly yellowish. Lateral margins of pronotum very narrowly yellowish. Fore and middle legs pale fulvous. Hind basitarsus, except extreme base and apex, yellow. Abdomen without yellow markings except on basal tergite. Venation on apical half of tegmina darker than in either *notoceras*, *philippinensis*, or *mindanaensis*.

Sculpturation very similar to that of *mindanaensis*. Scutellar sulcus (fig. 3) short and small, less than one-half length of body of scutellum. Crown (fig. 2) more strongly angulate anteriorly. Diagnostic characters otherwise as in synopsis above. The profile proportions (fig. 1) are unique in this group.

A single specimen from Zamboanga, Mindanao (*Baker*).

Genus *SERREIA* novum

Diagnostic characters as given in the synopsis above. In general form this genus resembles the robust and strongly humpbacked *Apomachærota* and its allies rather than the slenderer, cercopoid *Hindola* and allies. Of the latter it resembles *Chaetophyes* in having the surface of the tegmina very uneven, with a deep, sharply curved, longitudinal depression on base of corium, and the apical and subapical cells concave. The corial appendix is much larger and reaches nearer to apex of corium (fig. 11) than in *Hindola* or any of its near relatives. The hind femora are shallowly concave on lower surface, subequal in length to hind tarsi, and much shorter than their tibiæ; hind tarsi with first article (seen from above) subequal to remaining two together; hind tibiæ with subapical spur very stout, the basal minute. The rostrum slightly surpasses the middle coxæ.

This notable genus is dedicated to a notable man, Mons. Paul Serre, Consul of France, "citizen of the world," formerly resident of many tropical countries, now in Auckland, New Zealand. He is accomplished in agricultural science and takes an enthusiastic interest in all scientific endeavor. He is widely known for his thoroughgoing monographs on Havana tobacco and New Zealand hemp.

SERREIA NOTABILIS sp. nov.

Female.—Length to end of closed tegmina, 7 millimeters; width of head, 2; of pronotum, 3; length of tegmen, 5.75; width at end of clavus, 3.5.

Color deep chocolate brown, head, pronotum, and tegmina smooth and shining. Face and all below somewhat paler and with a yellowish cast; the slight convexity before apex of scutellum with a sordid yellowish transverse mark. Frons without oblique dark lateral arcs. Tegmen hyaline, the yellowish veins margined throughout middle of corium with minute brown dots, with two discal groups of such dots, the larger proximal one extending to costal margin, the distal smaller one at base of the antepical cell; the veins bordering apical cells broadly margined with very deep chocolate brown, cubital veins with several larger superposed brown dots. Corial appendix smoky at base and at apex. Clavus suffused with pale yellowish which narrowly invades corium, the inner apical fork of claval vein margined with minute brown dots.

Frons shining, minutely obscurely wrinkled with shallow, oblique lateral folds near base; loræ with scattered large punctures. Clypeus (fig. 10) strongly compressed apically, forming a high median ridge, the lateral surfaces of this portion concave and coarsely transversely wrinkled. Crown shining, but the surface very uneven due to low, coarse, indistinct wrinkles of no regular arrangement. In direct view vertical to crown (fig. 7), the length of crown is more than three-fourths width between eyes, the distance between ocelli is less than length of true vertex; exposed superior surface of front as long as greatest width. Pronotum (fig. 8) smooth and shining with obsolescent coarse transversal wrinkles and large scattered punctures; no median carina. Length of pronotum two-thirds of its width, the anterior margin evenly arcuate, the posterior shallowly emarginate. Scutellum (fig. 9) evenly convex, smooth and shining with scattered obsolescent punctures, lying in the general curve of pronotum, and with the apical profile margin bisinuate. Venation of tegmen and wing as shown in figs. 11 and 12. Clavus near apex with a large, round, strongly convex, concolorous bulla.

Male.—Length to end of closed tegmina, 5.5 millimeters; width of head, 1.5; of pronotum, 2.5; length of tegmen, 4.5; width at end of clavus, 2.5.

Color darker than in female, the scutellum piceous. Veins of tegmina darker, the brown margins of apical veins narrower, the claval bulla shining black. Face and all below black or

piceous, legs a little paler. Puncturation of pronotum and scutellum deeper and the latter with quite obvious coarse transverse wrinkles.

Two specimens of this remarkable insect were taken near Zamboanga, Mindanao, and fortunately represent the two sexes.

A single male specimen which must be referred here, at least until the corresponding female is known, was taken on Mount Maquiling in central Luzon. It differs in having the hind legs pale yellowish, and the claval bulla not conspicuously shining black. It may bear the varietal name *luzonensis*.

Genus **PARAHINDOLA** novum

Diagnostic characters as in above generic synopsis. No member of the *Hindola* group of species possesses the unique scutellar structure of *P. borneensis*, and none possesses the extremely coarse sculpturation uniformly covering crown, pronotum, and scutellum. The shallow scutellar depression is roundish and saucer-shaped, but has a thickly obtuse and little raised rim. The subobsolete median pronotal carina is more distinct near the anterior margin. There is a greater number of cross veins in the outer (radial) cell, the cubital vein is more strongly curved, and the corial appendix is much longer than in *Hindola*. Hind tibiæ with a very large and long spur inserted at middle, only a minute rudiment of the subbasal spur remaining. Basal article of hind tarsi as long as the two distal together.

While in all species of *Hindola* known to me the general plane of face is nearly horizontal and lies nearly in line with the long axis of the body, in *Parahindola* it is distinctly oblique to the axial line.

PARAHINDOLA BORNEENSIS sp. nov.

Female.—Length to end of closed tegmina, 6.5 millimeters; width of head, 2.5; of pronotum, 2.75; length of tegmen, 5; width at end of clavus, 2.

Color stramineous; front chocolate brown; femora except apex piceous, remainder of legs pale brownish, hind tibiæ yellowish. Abdomen pale yellowish basally. Tegmina with basal fourth pale bronzy brownish, remainder hyaline; claval and basal corial veins indistinct, remainder dark and distinct; claval and basal corial veins with scattering superposed dark brown

dots and a sparse row of such dots about the entire outer corial periphery; veins on apical half of corium more or less broadly margined with deep brown.

Front a little shining above, subopaque below, very gently convex, the surface microscopically crowded lacunose with some scattered indistinct punctures on median area. Subantennal portion of cheek thickly rugose, subocellar area transversely wrinkled, loræ coarsely punctured. Crown (fig. 13) like pronotum and scutellum, with very coarse deep and crowded irregular punctures. Interocellar distance nearly equal to twice length of true vertex, superior face of front (vertical view) much wider than long, and at a little less than half its length from base with a strongly raised, arcuate transverse ridge, the surface posterior to this having the large punctures grouped in deeper cavities. Pronotum with median carina distinct only on anterior fourth; length somewhat less than two-thirds width, anterior margin medially subangulate, posteriorly very obtuse angulately emarginate. Surface of scutellum in profile view (fig. 14) nearly plane and lying considerably below the posterior convexity of pronotum, the apex depressed before the acuminate tip. Length of scutellum little greater than that of pronotum. Venation of tegmen as shown in fig. 15, the wing venation normal for this group. Tegmen shining, the clavus and basal half of corium with large, scattering shallow punctures. The two large brown spots on the two middle apical veins are somewhat bullate and the veins appear to be somewhat bent within them (not shown in the figure).

A single specimen taken at Sandakan, British North Borneo (Baker).

Genus HINDOLA Kirkaldy

Hindola was described by Stål⁶ as *Carystus* (praeocc.) and based upon *Ptyelus viridicans* Stål,⁷ a common species of Singapore. Later Spangberg⁸ described four species from Australia, none of which appears to be true *Hindola*. Never having seen true *Hindola*, Kirkaldy⁹ described *Pectinariophyes*, which is *Hindola*. *Polychætophyes* Kirkaldy is questionably a clastopteroid genus; but Kirkaldy referred to it a second species (*aequalior*) which evidently does not belong in it and

⁶ Berl. Ent. Zeit. 6 (1862) 303.

⁷ Ofv. Vet. Ak. Forh. 11 (1854) 251.

⁸ Ofv. Vet. Ak. Forh. 34 (1887).

⁹ Haw. Sugar Planters' Exp. Sta. Bull. 12 (1913) 10.

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Schmidt, without having seen this very insufficiently described species, bases on it his genus *Polytrichophyes*.¹⁰ This also may be *Hindola*. Later Schmidt,¹¹ who had not seen *Hindola*, described *Modiglianella* from Sumatra and not one of the supposedly diagnostic characters given but falls within the limits of specific characters in *Hindola*.

Schumacher¹² describes a genus *Taihorina*, based upon *T. geisha* from Formosa. The numerous characters mentioned in the generic descriptions all fall within the range of specific characters in *Hindola*, which was evidently unknown to this author. The species, however, appears to be a distinct one. Finally, Distant, who knew *Hindola viridicans* and had described several other species of the genus, described a new genus, *Quinquatrus*,¹³ based upon *Q. dohertyi* from Tenasserim and another, called *Xenaias*, based upon *X. notandus* from the Nilgiris. His figures present nothing distinctive, and it is certain that no diagnostic characters are given. These, therefore, must also be referred questionably to synonymy until the details of structure, especially venation, are made known.

We were fortunately able to collect in Singapore a series of the type species of *Hindola* and with this as a starting point have been able to make illuminating comparisons with Australian, Bornean, and Philippine species. In this study it was found that some of the characters previously used as of generic significance were not even of specific value, the degree of obliquity of the head sometimes differing considerably in the two sexes. Also there are sometimes considerable sexual differences in sculpture, as has been indicated in the description of the scutellum of *Serreia*, as well as in color. The basal spur of the hind tarsi varies greatly in size and is often nearly or quite obsolete, and may be present on one side and absent on the other in a single specimen. In describing the genus, Stål refers to the transversely depressed crown with fore and hind borders raised. Some of the Australian species show this equally well, but this has all gradations to a crown that is obliquely plane and with only the hind margin raised or with neither margin elevated. In all we find the same general pattern of venation in the perfectly plane, subhyaline, rarely colored tegmina, the

¹⁰ Stett. Ent. Zeit. 73 (1912) 173.

¹¹ Stett. Ent. Zeit. 79 (1918) 366.

¹² Mitt. Zool. Mus. Berlin 8 (1915) 84.

¹³ Fauna Brit. Ind. Rhyrch 6 (1916) 197.

veins usually decolorated and inconspicuous except by transmitted light. The scutellum is evenly convex and usually very lightly punctuate or wrinkled. In the type species the pronotum is thickly, obliquely punctate-rugose and in other species there are variable admixtures of punctures and rugæ. Even those that have a preponderance of punctures will be found usually to have well-defined wrinkles laterally. Genera cannot be based on these differences. There is the greatest need, for a proper understanding of this group and its various species, to have rearings made of good series of both males and females from the curious calcareous tubes which the nymphs inhabit, and it is hoped that these remarkable insects will receive the active attention of all Indo-Malayan and Australian entomologists. The tubes in this group are much smaller than are those of *Machærota* and are more easily overlooked, but they are abundant in many districts, as the collection of mature forms shows. The correct association of the sexes in each case will help a great deal toward the proper elucidation of the species and also of the genera.

HINDOLA VIRIDICANS Stål.

Anatomical details of this common Singapore species, the type of the genus, are given in figs. 16 to 21. There is an appreciable difference in the length of the crown and in its obliquity in the two sexes. While the head (fig. 16) is in this species distinctly narrower than the pronotum, it varies to nearly as wide in some other species. The description of Stål gives clearly the general characters of the species. The extent of reddish suffusion on crown, pronotum, and scutellum is very variable.

HINDOLA LUZONENSIS sp. nov.

Male.—Length to end of closed tegmina, 6.25 millimeters; width of head, 2; of pronotum, 2.25; length of tegmen, 5.25; width at end of clavus, 2.

Color olive green, crown reddish stramineous; face piceous, a median oval frontal dot on line of antennal insertions; clypeus sordid yellowish. Mid and fore legs pale brownish, hind legs sordid yellowish. Inner half of clavus olive green, outer half and entire corium evenly pale chocolate brown.

Frons gently convex, slightly swollen basally, microscopically transversely lacunose, lateral raised arcs obsolete, entire genæ and loræ thickly finely rugose. Crown (fig. 22) with very

uneven surface, rather strongly depressed along frontal suture, on lateral area, and on disk of superior portion of front; hind margin sharply raised but anterior margin not raised; all parts of surface of crown with very coarse, obtuse, irregular wrinkles; in vertical view (fig. 23) the crown is rather strongly angulate anteriorly, the interocellar distance is actually subequal to the length of the true vertex (not apparent on the curved surface as seen from above). Length of pronotum two-thirds of its width, anteriorly obtusely subangulate, posteriorly very obtuse angulately emarginate, its surface rather strongly transversely punctate wrinkled. Scutellum not quite as long as pronotum on median line, its surface very slightly convex and finely transversely wrinkled. Tegmina densely, coarsely, very uniformly punctate throughout, resembling in this character some of the Australian species.

A single fully mature male taken at Baguio, Benguet Sub-province, northern Luzon (*Baker*). Another male specimen, juvenile and pale in color throughout, but with the same structural characters, and evidently of this species, was taken at Imugan, Nueva Vizcaya Province, not a great distance from Baguio.

One of the most deeply colored of this group, and in this resembling certain *Chaetophyes*, but in form and structure a typical *Hindola*.

HINDOLA FULVA sp. nov.

Female.—Length to end of tegmina, 4.75 millimeters; width of head, 2; length of tegmen, 3.75; width at end of clavus, 1.75.

Color of crown, pronotum, and scutellum deep uniform fulvous; a narrow transverse arcuate stripe before apical margin of pronotum pale yellowish; all below with pleuræ, abdomen, and legs pale yellowish. Tegmina hyaline; basal half of clavus somewhat thickened callose and lemon yellow; clavus apically with a pale brownish commissural spot; numerous very scattered brownish dots occur on the veins, most numerous near and along costal margin, the two middle apical veins with larger brownish spots.

Frons medially somewhat flattened, remainder gently convex; surface of front, genæ and loræ minutely, thickly, obscurely rugose. Entire surface of crown, pronotum, and scutellum thickly, deeply, but very minutely punctate-rugose, giving these surfaces a velvety appearance. Crown (fig. 26) somewhat depressed, most strongly in ocellocular area, somewhat concave in

profile, though the general plane is oblique in general line of slope of anterior part of pronotum; interocellar distance slightly greater than length of true vertex; superior face of front sharp margined around its strong obtuse angulate apex, its surface with a blunt thick median wrinkle and its middle crossed transversely by a similar but arcuate wrinkle. Head and pronotum proportionally very broad, the former slightly the narrower. Pronotum with a strong median carina on anterior half, its length but little more than half the width. The posterolateral margins rather strongly sinuate. Scutellum considerably longer than pronotum, its surface gently evenly convex, slightly depressed before apex. Subbasal hind tibial spur stronger than usual but not half the size of subapical. Venation of tegmen and wing (figs. 27 and 28) typically that of *Hindola*, but corial appendix somewhat longer.

Male.—Length to end of tegmen, 4.5 millimeters; width of head, 1.75; length of tegmen, 3.5; width at end of clavus, 1.5. Closely similar in all respects to the female.

This species is not uncommon in Singapore and it will be of the highest interest and importance to discover its tubes and to compare them with those of *Hindola viridicans*.

It was this and the following species that led me to doubt the feasibility or wisdom of attempting to divide the *Hindola* group into several genera on our present knowledge. These two species have longer crown, broader head and pronotum, and a more compact squat appearance than has the type of *Hindola*. They also possess brown-dotted tegmina. The sculpture is as distinctive in its way as is that of *Parahindola*, but in another direction.

The next species, *nitida*, very close to *fulva* in form and structure, has sculpturation of an entirely different type. On close comparison of all of the above characters that might be used for generic distinction they were found to exist in all degrees in the various species, and in all combinations. The description of the following species will illustrate this point.

HINDOLA NITIDA sp. nov.

Female.—Length to end of tegmina, 4.75 millimeters; width of head, 2; length of tegmen, 3.75; width at end of clavus, 2.

Color olive green, usually with an evanescent reddish suffusion invading more or less of crown, pronotum, and scutellum. Sternum and lower half of face piceous, shading on face into sordid yellowish on upper half. All femora, except extreme bases and

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apices, piceous, remainder of legs sordid yellowish. Tibial spurs as in *H. fulva*. Tegmina hyaline, extreme base and a narrow stripe extending from claval commissure before its apex to center of corium, pale brown; darker brownish dots occur on the veins as shown in fig. 31. Abdomen dark colored with the first tergite laterally conspicuously paler.

Frons very gently convex, smooth and shining, with slight, very indistinct, microscopical remnants of sculpturing; surface of clypeus, loræ and genæ thickly coarsely rugose. Crown (fig. 30) very similar to that of *H. fulva* but hind margin strongly raised, the superior frontal surface shorter for its breadth, with no transverse wrinkle, the median fold broader and more obscure. The pronotum (fig. 29) like that of *H. fulva* but median carina reduced to a remnant near anterior border, the surface shining, the sculpturing a delicate shallow transverse wrinkling with scattering punctures; this type of sculpturation is still more indistinct on the scutellum. Venation (fig. 31) closely similar to that of *H. fulva*.

Male.—Length to end of tegmina, 4 millimeters; width of head, 1.75; length of tegmen, 3.25; width at end of clavus, 1.5.

Very similar in all respects to the female, but in these specimens with the scutellum very strongly reddened.

This species was found to be not uncommon at Sandakan, British North Borneo (*Baker*). Differs from all other species in the short transverse brown stripe on clavus and inner half of corium.

Genus CHAETOPHYES Schmidt

This seems to represent a well-distinguished generic group. The body is very thick and stout and more "humpbacked" than in *Hindola*. The surface of tegmina is farther from uneven than in any *Hindola* and the width is greater in proportion to the length. The basal frontal suture is nearer to the ocelli (these being nearer to it than to base of head) a condition not noted in any *Hindola*. The interocellar distance is also proportionally less than the ocellocular. Form of crown, pronotum, and scutellum are indicated in figs. 32 and 33. The venation (figs. 34 and 35) is essentially that of *Hindola*. The cross vein in middle anteapical cell in fig. 34 is abnormal.

Several Walkerian species are to be referred here, and doubtless some of Spangberg's "*Hindolas*" belong here. One of the most marked characters of the genus lies in the strong dimor-

phism of the sexes. Schmidt described *Chaetophyes bicolor*¹⁴ from female specimens, while the smaller black males of the same species he described as *C. unicolor*. I have large series of these taken standing together on the same plant, the *bicolor* form all females, and the *unicolor* form all males. This species has apparently been redescribed by Hacker as *Polychætophyes perkinsi*.¹⁵ The acute clavus of the latter apparently excludes it from *Polychætophyes*. Walker seems, likewise, to have separated sexes of this group as distinct species.

Genus HINDOLOIDES Distant

Distant describes this genus¹⁶ with the species *H. indicans* from Calcutta, as a relative of *Hindola*, both of which he places among ptyeline cercopids. He does not remark its strong resemblance to *Clastoptera* nor the remarkable fact that the clavus is broadly truncate apically as in that genus. He speaks of three "apical cells" in corium, but apical cells are entirely absent (fig. 38), the cells present being the antepical cells of *Hindola*, the space of the apicals being occupied by the enormously developed corial appendix. The wing venation (fig. 39) is typically machaerotid. Outlines of crown, pronotum, and scutellum are given in figs. 36 and 37. The figures are prepared from Calcutta specimens.

Kirkaldy gave a very imperfect description of *Polychætophyes* and did not figure the venation, but he apparently noted and appreciated the importance of the extraordinary structure of the clavus. Recently Hacker¹⁷ described a species, *appendiculata*, his figure showing the same remarkable corial appendix that occurs in *Hindoloides*, but which Kirkaldy does not mention for *Polychætophyes*. In Hacker's figure it appears that true apical cells are present in the corium, and this may distinguish it from *Hindoloides*. Kirkaldy may have overlooked the broad appendix which at rest is folded closely under the apex of abdomen. This emphasizes the great need of clear figures illustrating *Polychætophyes serpulida* Kirkaldy, the type of the genus.

¹⁴ Stett. Ent. Zeit. 79 (1918) 367.

¹⁵ Mem. Queensl. Mus. 8 (1926) 246, fig. 6.

¹⁶ Ann. & Mag. Nat. Hist. 16 (1915) 506.

¹⁷ Mem. Queensl. Mus. 8² (1926) 247, fig. 1.

It is hoped that Indian entomologists will soon locate the calcareous tubes of *Hindoloides* and compare them with those of *Polychætophyes serpulida*, figured by both Hacker and Kirkaldy.

Hacker¹⁸ gives a very interesting account of the emergence of two of these remarkable tube-dwelling machærotids. His determination of the species, however, seems questionable as to *Polychætophyes*, the lower insect in his fig. 4 apparently being not of that genus at all, since it has an acute clavus. At any rate, *P. serpulida* of Hacker's figure and his later *P. appendiculata* have no near generic relationship. If Hacker's 1922 figure really represents *Polychætophyes*, then it seems possible that we are wrongly interpreting Kirkaldy's description of the clavus, in which case *Chætophyes* will be synonymous, and *Hindoloides* will stand quite by itself.

Some time after this paper was submitted for publication, Mr. W. E. China very kindly sent to me the accompanying illuminating figures (Plate 4) made directly from the types of *Quinquatrus* and *Xenaias*. These figures fully confirm my assignment of these two genera to *Hindola*. Distant's description of *Xenaias*¹⁹ is entirely made up of generalities applying to any member of this group. It is evident from Mr. China's figure that the minute basal spine was overlooked by Distant, since he described the posterior tibiæ as having only one spine; and this is a matter of no importance in this group, since the very weak basal spine may be present or absent in the same species. Mr. China remarks (in litt.) of *Xenaias notandus* Distant:

Pronotum strongly reticulately rugose, the reticulations fine and almost obsolete along the anterior margin and on vertex. Basal half of scutellum slightly concave, and rugose. Tegmina somewhat rugosely reticulate, extending about one-third their length beyond tip of abdomen; venation obscure, and variable in details.

To these points may be added the elongate form of tegmina with the very long antepical cells, elongate third apical cell of wing, and wider vertex with slightly more angulate apex. All of these characters well mark the species *notandus*, but none of them can serve as generic distinctions since they all

¹⁸ Mem. Queensl. Mus. 7⁴ (1922) 282, 480, 2 pls.

¹⁹ Fauna Brit. Ind. Rhynch. 6 (1916) 198.

fall within the limits of *Hindola* species. I have already shown the occurrence of great variety in sculpture and form in various combinations in *Hindola*.

Quinquatrus (Plate 4, fig. 1) is just as clearly *Hindola*, the general lineaments, like those of *Xenaias*, being unmistakably those of *Hindola*. Of *Q. dohertyi* Mr. China (in litt.) says:

Anterior two-thirds of pronotum obliquely rugosely wrinkled on each side of middle line; the posterior third almost smooth. Anterior margin and vertex much more strongly and irregularly rugose. Tegmen obscurely, coarsely punctate: veins of tegmen obscure, somewhat variable in detail.

Distant described the same pronotal sculpture as "thickly finely punctate," and punctures will doubtless be evident among the rugose wrinkles in certain lights, a character of great variety in *Hindola*. Distant's statement "pronotum about twice as broad as centrally long," is entirely incorrect, even according to his own figure. His statement "tegmina with three apical cells" is also incorrect; but the outer apical cell in this group is often indistinct. There is no character mentioned in connection with this species that can possibly be used for generic distinction and it must therefore be left in *Hindola*, in the neighborhood of *H. fulva* and *H. nitida*, described above, which it resembles.

The cases of *Xenaias* and *Quinquatrus* clearly illustrate the utter insufficiency which characterizes the descriptions of Distant's genera of Cercopioidea, as well as of Jassoidea. Such anatomical figures as those presented by Mr. China would make it readily possible to understand all of them and to place them properly among other described genera. As it is, they are an almost insuperable obstacle to the formation of any usable classification of Indian and Malayan forms. Mr. China's magnanimous willingness to supply figures, in this as well as other cases of the sort, is very highly appreciated and is of the greatest constructive utility.

Since I wrote the above, my attention has been called to the fact that the genus *Hindoloides* has been redescribed by Haupt²⁰ under the name "Weigoldella."

²⁰ Deutsch. Ent. Zeitsch. (1923) 299.

ILLUSTRATIONS

PLATE 1

- FIGS. 1 to 3. *Connachærota attenuata* sp. nov.; 1, profile of head, pronotum, and scutellum; 2, crown, vertical to its plane; 3, dorsum of body of scutellum.
- 4 to 6. *Connachærota mindanaensis* sp. nov.; 4, profile of head, pronotum, and scutellum; 5, crown, vertical to its plane; 6, dorsum of body of scutellum.
- 7 to 12. *Serreia notabilis* sp. nov.; 7, crown, vertical to its plane; 8, pronotum; 9, profile of head, pronotum, and scutellum; 10, sublateral view of head; 11, tegmen; 12, wing.

PLATE 2

- FIGS. 13 to 15. *Parahindola borneensis* sp. nov.; 13, dorsum of head, pronotum, and scutellum; 14, profile view of head, pronotum, and scutellum; 15, tegmen.
- 16 to 21. *Hindola viridicans* Stål; 16, dorsum of head, pronotum, and scutellum; 17, crown, vertical to its plane; 18, profile view of head and pronotum; 19, face; 20, tegmen; 21, wing.
- 22 to 24. *Hindola luzonensis* sp. nov.; 22, dorsum of head, pronotum, and scutellum; 23, crown, vertical to its plane; 24, tegmen.

PLATE 3

- FIGS. 25 to 28. *Hindola fulva* sp. nov.; 25, dorsum of head, pronotum, and scutellum; 26, crown, vertical to its plane; 27, tegmen; 28, wing.
- 29 to 31. *Hindola nitida* sp. nov.; 29, dorsum of head, pronotum, and scutellum; 30, crown, vertical to its plane; 31, tegmen.
- 32 to 35. *Chaetophyes bicolor* Schmidt; 32, dorsum of head, pronotum, and scutellum; 33, crown, vertical to its plane; 34, tegmen; 35, wing.
- 36 to 39. *Hindoloides indicus* Distant; 36, dorsum of head, pronotum, and scutellum; 37, crown, vertical to its plane; 38, tegmen; 39, wing.

PLATE 4

- FIG. 1. *Quinquatrus dohertyi* Distant, female. (Drawings by W. E. China, from the type specimen in the British Museum.)
2. *Xenaias notandus* Distant. (Drawings by W. E. China, from the type specimen in the British Museum.)

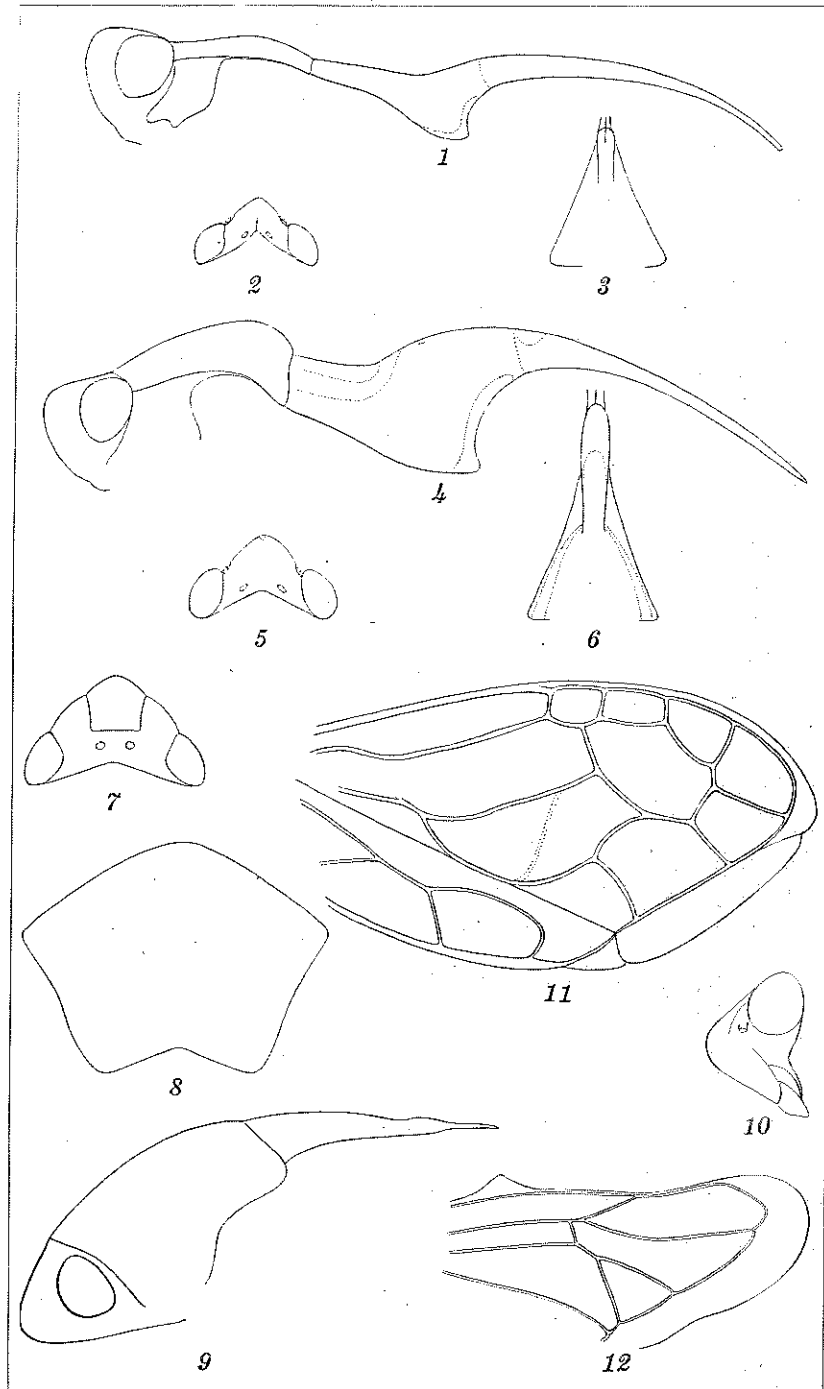


PLATE I.

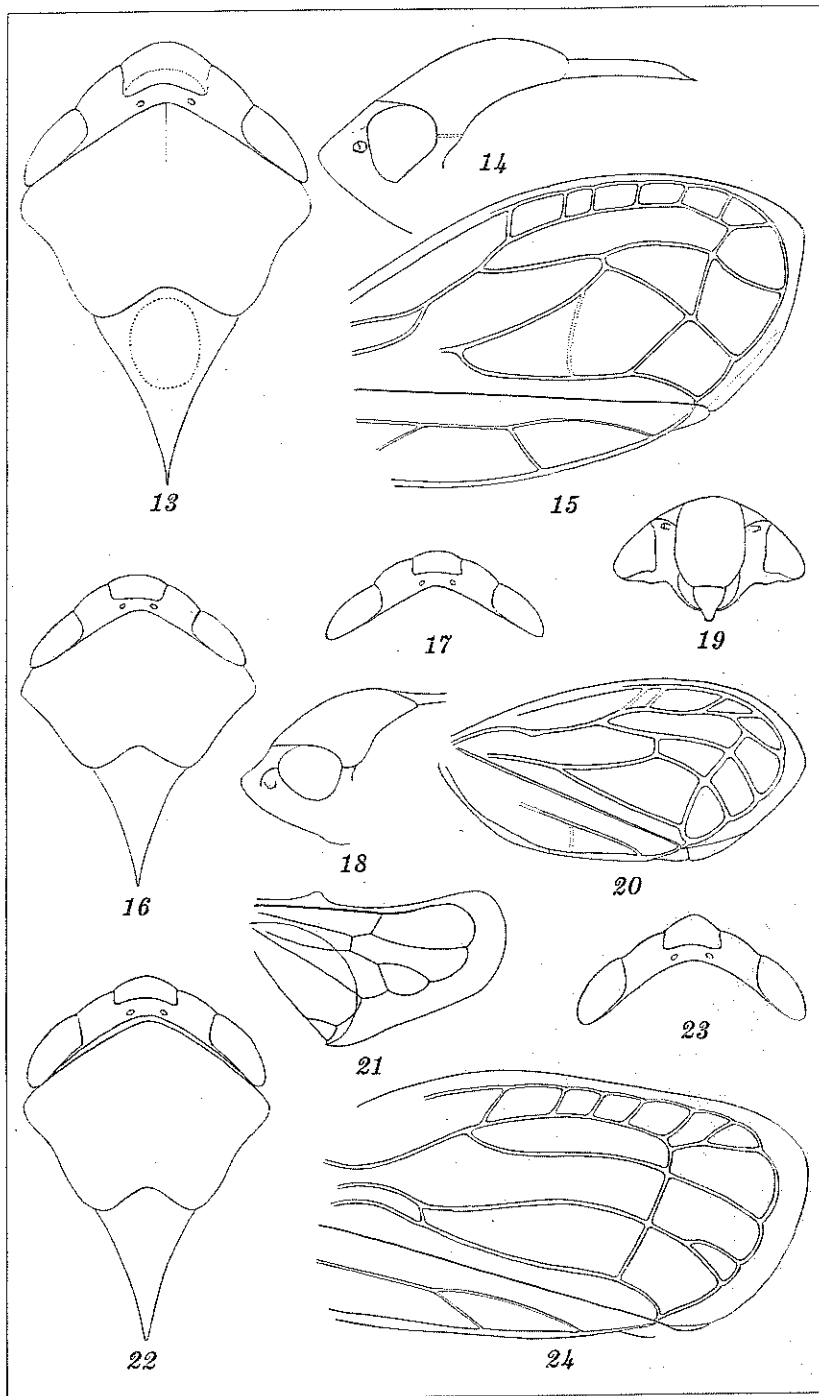


PLATE 2.

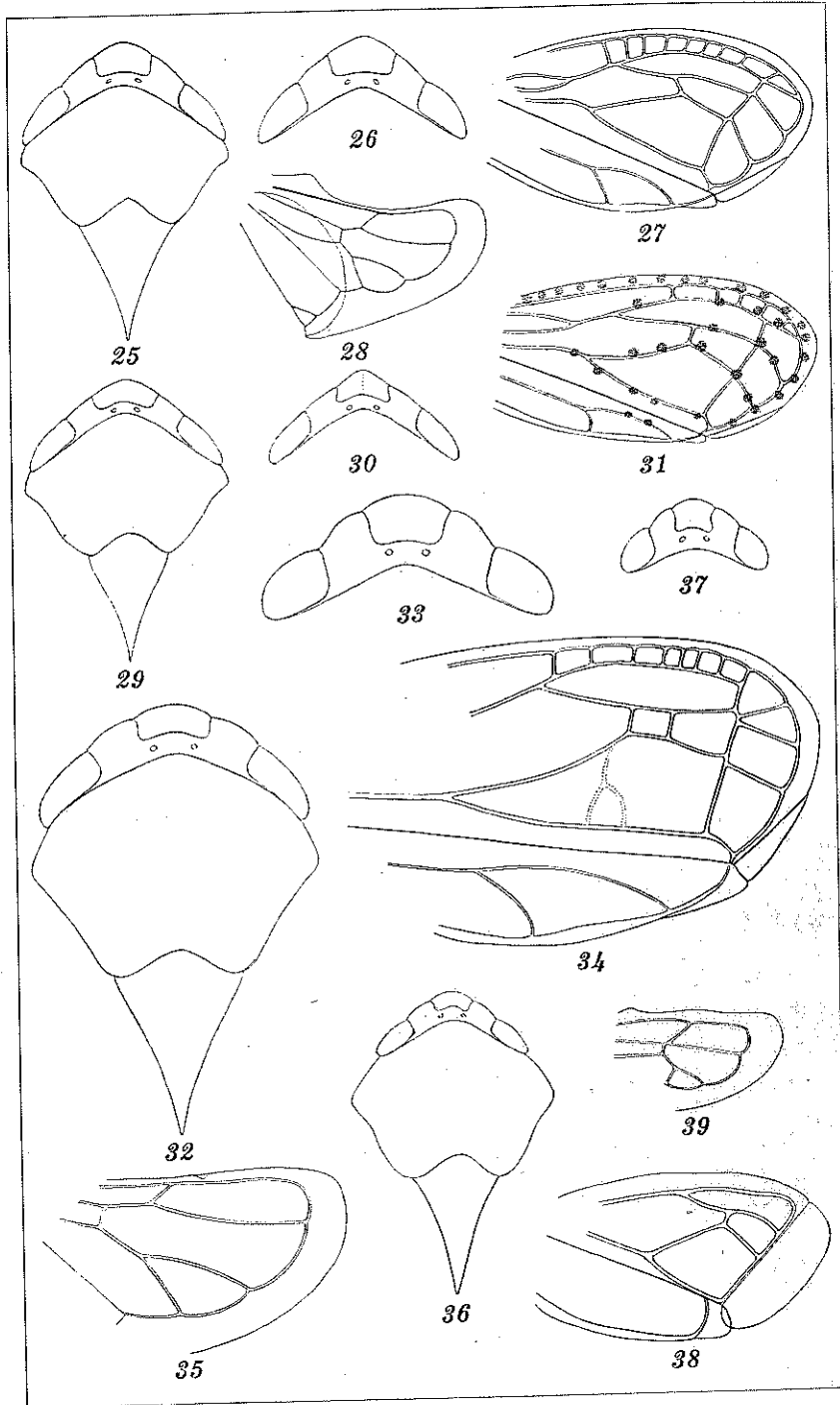


PLATE 3.

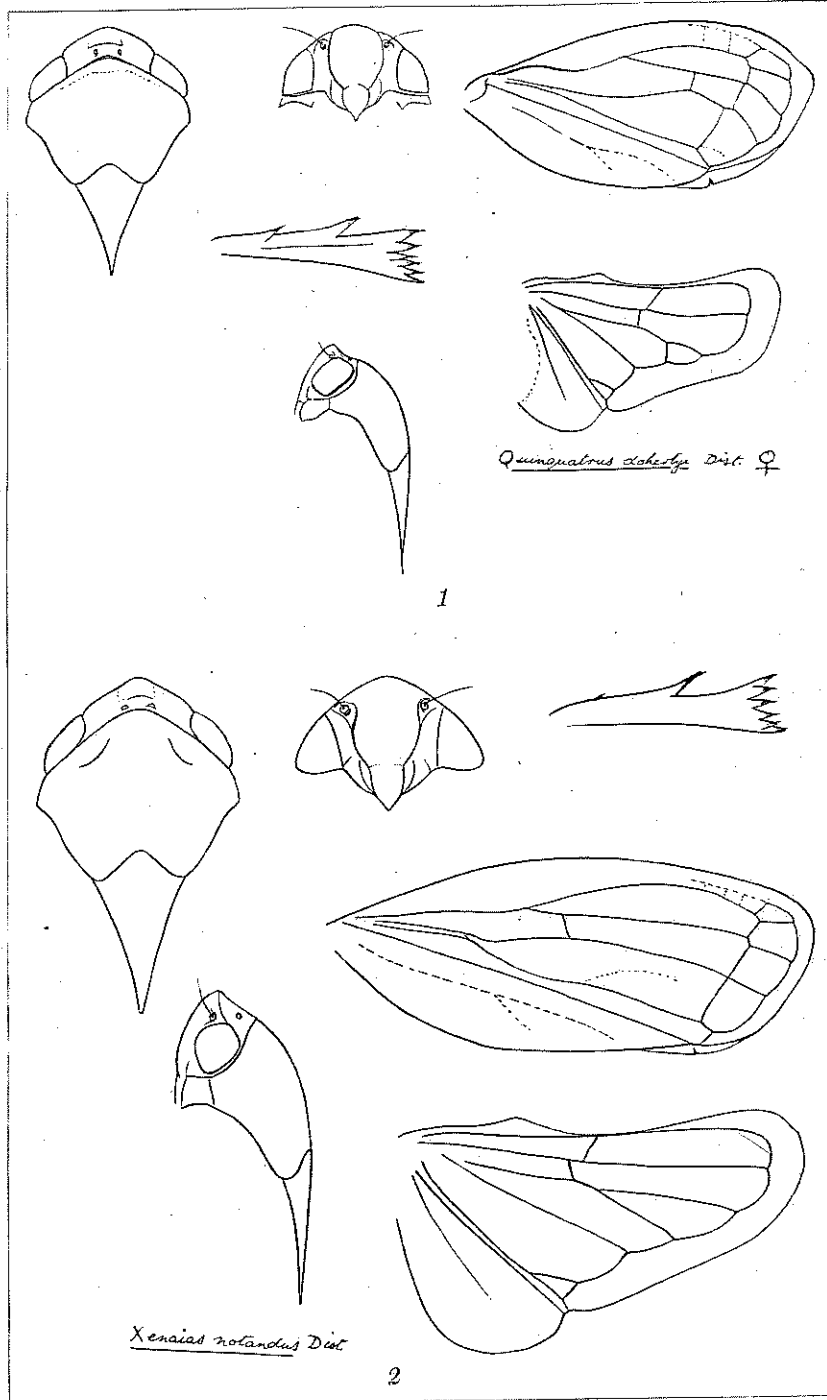


PLATE 4.