

## Supplementary Notes on the Blepharoceridae of Japan

By

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*With Plates I-III*

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Since the publication, in 1931, of my paper on the Blepharoceridae of Japan, many additional members of this family have been added to my collection. After carefully identifying these materials I found not a few new and interesting forms worth recording. Herein will be mentioned three which are new species from Taiwan (Formosa), while the others are remarkable representatives of the subfamilies *Blepharocerinae* BEZZI and *Paltostominae* EDWARDS from Japan.

I desire to express herewith my sincere thanks to Professor TAMUJI KAWAMURA of the Kyoto Imperial University for his kind help and supervision throughout this work. I am also very much indebted to Dr. M. UÉNO of the Ôtsu Hydrobiological Station for his generosity in favouring me with invaluable materials which he collected in mountain streams of Taiwan, and to Dr. F. W. EDWARDS of the British Museum, Prof. Dr. J. KOMÁREK and Dr. A. VIMMER of the Prague University for favouring me with copies of their important articles, and to Dr. D. MIYADI of the Seto Marine Biological Station for his kindness in supplying me with much useful literature.

Genus *BIBIOCEPHALA* OSTEN-SACKEN (1874).

*Bibliocephala infuscata* MATSUMURA (1916).

The males on the wing of this species which had been lacking in my collections were fortunately obtained in great numbers in August, 1935. Since my former description of the imagos was somewhat imperfect, I shall give here a full account of the male. It is

interesting to find that this remarkable species is one of the most generalized members of the subfamily *Blepharocerinae* BEZZI, and resembles, to a certain extent, the subfamily *Edwardsininae* EDWARDS in the characteristics of the imagos as well as in the larvae and the pupae.

*Male* (15 specimens). Length of body ca. 12 mm.; wing ca. 11 mm.; antenna ca. 2 mm.

*Head* (Fig. 1) transverse, black, densely covered with black long bristles. Eyes holoptic, bisected and densely pubescent; upper parts with large, blackish brown facets entirely contiguous to each other on the vertex, four times as wide as the lower parts which can not be seen from the dorsal view; lower parts with small black facets broadly separated from each other by clypeus and gena, and together with the frontal upper parts have long, slender, black hairs besides the normal pubescence. Ocelli yellowish, ocellar protuberance black with black setae. Antennae rather short, brownish black, fifteen-jointed; first scapal joint thick, slightly longer than broad; second joint pear-shaped, densely setaceous; flagella pubescent and shortly setaceous, the joints a bit longer than broad, except the first one which is nearly twice as long as broad and the last one which is apically narrowed. Clypeus black, with black bristles; labrum black, bare, and together with the former slightly longer than the vertical height of the head. Mandibles absent. Maxillary palpi five-jointed, the joints tapering apically; first four joints blackish with black setae, and the apex of each slightly swollen, of which the third is longest and the fourth scarcely two thirds the length of the preceding one; last joint obscure pale, club-shaped, one and one-half times as long as the fourth, with slender short hairs. Labium setaceous, brownish yellow; labial palpi with short bristles, fused with each other laterally, the apex blunted and slightly beyond the apex of the labrum.

*Thorax*: Pronotum rudimentary, black, mainly glabrous, but the lateral margins have black bristles. Mesonotum conspicuous, black with grayish silvery luster, every part of which is setaceous. Metanotum very rudimentary, black and nearly glabrous. Pleurae mainly brownish black, except for the yellowish base of the wings and spiracles.

*Wings* (Fig. 2): Broad, the membrane nearly subhyaline, but with remarkable smoky tint except for the whitish net-like markings around the secondary venation, veins brownish black. Macrotrichia

short, confined on the wing margins and  $R_1$ . Microtrichia rather large and dense, fully distinguished in low magnification ( $\times 50$  or  $80$ ), under a high magnification ( $\times 300$  or  $500$ ) the hairs very distinctly seen as apically curved, rather short spinelets. *Venation*: Sc rather distinct, ending slightly beyond the base of  $R_2$ ; Rs slightly longer than r-m;  $R_2$  conspicuous, more than four times as long as the Rs, running nearly parallel to  $R_1$ ;  $R_{3+4+5}$  subequal to the basal deflection of  $R_5$ ;  $R_{3+4}$  and  $R_5$  nearly parallel, apically divergent, of which the former slightly curved forwards and the latter nearly straight; r-m longer than twice the basal deflection of  $R_5$ ; so-called m-cu sinuous, slightly shorter than r-m; basal deflection of  $Cu_1$  very short, one fourth the m-cu. Posterior wing margin slightly chitinized with a blackish spot at the concave corner, and the area from the corner to the wing base fairly broadened. Halteres blackish, shortly setaceous, stems yellowish brown.

*Legs* measured as follows:—

	Femora	Tibiae	Tarsi
Fore-legs	3.5 mm.	4.0 mm.	5.5 mm.
Mid-legs	5.0 mm.	4.5 mm.	4.5 mm.
Hind-legs	7.5 mm.	6.5 mm.	6.0 mm.

Coxae, trochanters and the proximal three fourths of the femora brownish yellow, the remaining parts brownish black. Trochanters of fore-legs elongated, nearly thrice as long as broad. Tibial spurs 1. 2. 2., very stout and densely setaceous, of which the paired ones are respectively subequal in size. Tarsal joints (Fig. 3) with the flexor surface more densely covered by short, fine hairs than the other side; the last joints slightly curved, fairly longer than the fourth in each leg. Claws stout, rather strongly curved apically, devoid of denticles, but densely and minutely pubescent on the proximal two thirds, and the proximal one third with short bristles on the dorsal surface. Empodia rudimentary.

*Abdomen* slender. Tergites brownish black, except rather lighter margins of each segment, densely covered with rather short black bristles. Sternites brownish yellow, sparsely setaceous. Seventh tergite rather lightly coloured. Eighth segment much reduced. *Hypopygium* (Figs. 4, 5): Dorsal-plate rather large, slightly crumpled, setaceous and brownish black; posterior surface smooth and black, except whitish lateral margins. Ventral-plate slightly longer

than broad, broadened posteriorly, posterior margin slightly undulated; mainly brownish black, and setaceous on the lateral margins. Guard-plate bilobed, the lobes slightly elongated semicircular, scarcely half as long as the basal breadth of the plate, brownish black with slender dense setae; the ventral part of this plate brownish with a few apical setae. Claspers spoon-like, apically broadened and deeply concave forwards, mainly blackish and densely setaceous; partly bilobed dorso-ventrally near the apex, of which the dorsal lobe is smaller, with a semicircular cleft on the anterior margin. Tenth sternite rather strongly convex posteriorly, pubescent and brownish. Parameres glabrous, brownish black, apical part of which is strongly curved ventrally.

*Locality and date*: Rapid of snow-melting-water, at the foot of Mt. Kasagadake, in the Prov. of Hida; collected on 5/VIII/35.

Genus PHILORUS KELLOGG (1903).

*Philorus sikokuensis* KITAKAMI (1931).

The description of imagos which was lacking in my original paper, as well as some additional notes on the immature forms and habits will be herein supplemented.

*Male* (48 specimens): Length of body about 6.5 mm.; wing about 8.5 mm. *Female* (20 specimens): Length of body about 7.5 mm.; wing about 9.5 mm.

*Head* (Fig. 6) transverse. Vertex and frons dark brown, sparsely setaceous; tempora and occiput brownish black, rather densely setaceous. Ocelli blackish brown, ocellar protuberance black. Eyes very large, holoptic, bisected and densely pubescent in both sexes; upper parts with large brown facets nearly contiguous on the vertex and twice broader than the lower parts with small black facets, of which the latter are fairly well projected laterally. Antennae thin and short, setaceous all over, fifteen-jointed in both sexes; first scapal joint yellowish brown, distal one blackish brown and apically swollen; flagella thin, obscure yellowish brown, the joints ellipsoidal or slightly longer than broad throughout, except the elongated proximal one which is three times longer than broad. *Mouth-parts*: Clypeus blackish brown with black setae; labrum yellowish brown, glabrous, and together with the clypeus nearly one and one-half as long as the vertical height of the head in the female, in the male much shorter. Mandibles present in the female only, rather broad saw-like, with many fine denticles on the inner margin, slightly

longer than the labrum. Maxillary palpi five-jointed, very long and slightly longer than the antennae, yellowish with black setae; second to fourth joints subequal in length, but the third slightly and the fourth much swollen apically; last joint slender, narrowed in the middle, two and one-half times as long as the preceding one in both sexes. Labium brownish yellow; labial palpi yellowish, short and rounded, apically setaceous, the tip very slightly beyond the apex of labrum

*Thorax*: Mesonotum conspicuous, blackish brown with normal stripes and sutures which are sparsely and shortly setaceous; post-scutellum rather densely setaceous; pleurae blackish brown, except yellowish base of wings. Pronotum and metanotum rudimentary, glabrous and blackish brown.

*Wings* (Fig. 7) large and broad, the membrane subhyaline, but tinted slightly brown, costal cell opaque, veins dark brown. Macrotrichia short, dense on the wing margins and  $R_1$ , but on other veins more or less sparse. Microtrichia very minute, but rather dense. *Venation*: Sc rudimentary, ending slightly beyond the base of  $R_s$ ; basal deflection of  $R_s$  short and slightly sinuous, the straight part of which rather long, nearly four times as long as the former or thrice the r-m;  $R_{2+3}$  slightly longer than one and one-half times the straight part of  $R_s$ , very slightly curved anteriorly;  $R_{4+5}$  long, more than twice the straight part of  $R_s$ , slightly curved posteriorly; r-m sinuous, slightly longer than the basal deflection of  $R_s$ ; so-called m-cu sinuous, much shorter than r-m; basal deflection of  $Cu_1$  very short, one third the m-cu; incomplete  $M_3$  rather long; An faint, but complete. Posterior wing margin with a chitinized spot at the concave corner. Halteres pale with short black setae, stems pale.

*Legs*: Fore- and mid-legs very narrow and slender, hind-legs rather thick. Measurements in the male as follows:—

	Femora	Tibiae	Tarsi
Fore-legs	5.5 mm.	5.0 mm.	5.0 mm.
Mid-legs	5.5 mm.	4.5 mm.	4.5 mm.
Hind-legs	7.0 mm.	6.0 mm.	4.0 mm.

Coxae, trochanters and the proximal part of the femora yellowish pale, remaining parts blackish brown, but hind-legs slightly lighter. Femora cylindrical, slightly and gradually thickened apically. Tibiae and tarsi with the flexor surface more densely setaceous than the

other side in fore- and mid-legs. A pair of tibial spurs present on hind-legs only, which are different in sizes, setaceous and very finely pubescent. Last tarsal joint (Fig. 8) slightly curved, nearly as long as the fourth joint in fore- and mid-legs, in hind-legs much longer than the fourth. Claws of each leg apically curved and pointed, with many fine, pale, rather long hairs on the proximal half, distal half bare and well chitinized.

*Abdomen*: Tergites rather densely covered by black, short setae, mainly blackish brown. Lateral membrane nearly pale and bare. Sternites setaceous and dark brown, gradually reduced and lighter anteriorly. Eighth segment much reduced. *Male hypopygium* (Figs. 9, 10): Dorsal-plate small, transverse, concave posteriorly, mainly blackish brown with long blackish bristles. Ventral-plate large, posterior margin concave, blackish brown and no setae, except setaceous dorsal parts. Guard-plate small, bilobed, but the lobes shorter than one third the basal breadth of the plate, brownish black and setaceous on the posterior margins; ventral part of this plate slightly chitinized with a few apical bristles. Claspers bilobed dorso-ventrally from the base; dorsal lobe rather small, furcated before and behind from the middle, blackish brown with black setae, posterior branch of which is slender and longer than the anterior one. Ventral lobe of claspers large, conspicuously broadened apically, the stem of which is blackish brown, but the apical enlargement of which is mainly directed anteriorly, yellowish pale, setaceous and minutely pubescent. Tenth sternite conically convex posteriorly, pale and glabrous. Parameres blackish, bare, nearly boot-like.

*Female hypopygium* (Fig. 11): Eighth segment with the tergite very much reduced, but the sternite conspicuous, with a small cleft on the median posterior margin, setaceous and blackish except whitish median anterior surface and lateral margins. Ninth tergite dully concave posteriorly, with long bristles on the posterior margin, mainly dark brown, except the pale posterior margin. Ninth sternite finely pubescent; anterior part of which is very small, circular, dark brown; posterior part rather broad, yellowish, with a small cleft on the median posterior margin; lateral lobes yellowish and inconspicuous. Tenth tergite bilobed laterally by a longitudinal black stripe which touches the anterior transverse stripe in a T-shape; each lobe pale, pubescent and with many short, stiff, brownish bristles arising from cylindrical papillae, except glabrous median posterior part lined by a slight, oblique stripe rising from the middle of the longi-

tudinal stripe. Cerci short and thick, scarcely as long as the basal breadth of the segment, brownish yellow with fine, brownish setae all over; distal end of which is free, blunted, pale with four or five short bristles arising from cylindrical papillae.

*Larva. Fourth instar* (full-grown) (8 specimens). Length of body about 7.7 mm. (immature specimens 4.8 mm.); breadth (except claws and feelers) about 2.2 mm. Dorsal integument dark yellowish brown, except rather lighter first and second body-segments and the marginal parts of other segments. Antennae subequally three-jointed, 1/4 or 1/5 the length of the first body-segment; black except whitish base of second joint and the bounding parts of the second and third joints. First body-segment transverse. Thoracic spot ill-defined, but the usual area somewhat darker. Thorns or warts on the dorsal side blunted and conical. Rudiments of caudal appendages moderately chitinized, brownish black on the ventral side.

*Pupa* (numerous specimens): Length of body 5.5—6.6 mm.; breadth 3.1—3.7 mm. Dorsal integument blackish brown with glittering luster, except rather light outer parts of prothorax and mesothorax. Lamellae of pupal horns rather large, fairly broadened apically, membraneous and obscurely yellowish, with a remarkable small notch on the outer margin of each first and second pair. Microgranulation of yellowish, subcircular granules very sparse, confined to the inner half of the second to the sixth or seventh abdominal segments only. Macrogranulation of brownish black granules, on the other hand, obvious as usual.

*Habits*: As for the life-cycle of this species, it is clear that the former opinion that this was a "supposedly polygeneric, summer-type" was incorrect, and it is now regarded as one of the members of a somewhat delayed, monogeneric winter-type. This decision is supported primarily by the following list of dates of collection, and secondarily, by the absence of this species at the same localities in Sikoku in August, 1933, also at Mt. Hira, near Kyoto on 29/VI/'34 and later on. On 19/V/'34, imagos of this species were abundant associating with many other imagos of the winter-type and many other immature forms of the summer-type.

Date	Locality	Data	Collector
22/III/1928	Tuzuro (Prov. Awa, Sikoku)	Larva (iv, iii, ii)	KITAKAMI
23/III/1928	Mt. Turugi (,,)	Larva (iv)	"
24/III/1928	Sugeoi (Iya, ,,)	Larva (iv, iii), Pupa	"

(Table continued)

Date	Locality	Data	Collector
24/III/1928	Kyodyo (Iya, Sikoku)	Larva (iv)	KITAKAMI
22/IV/1934	Mt. Hira (near Kyoto)	Larva (iv), Pupa	"
19/V /1934	"	♂, ♀, pupa	"
8/VI/1934	"	♀	"
8/VI/1935	"	♂	"
14/VI/1936	"	♀	"
4/IV/1936	Nati (Prov. Kii)	Larva (iv), pupa	"

***Philorus taiwanensis* sp. nov.**

*Male* (a single specimen). Extracted from a mature pupa. Length of body ca. 5.5 mm.

*Head* (Fig. 12) transverse. Eyes nearly holoptic, bisected and pubescent; upper parts with large blackish brown facets small, rather broadly separated from each other by ocellar protuberance and scarcely seen in frontal aspect; lower parts with small blackish facets broadly separated by frons and clypeus, about five times as broad as the upper parts. Antennae slender, slightly setaceous and pubescent, fifteen-jointed; first scapal joint thick and short, distal one pear-shaped and chitinized; first flagellar joint more than twice as long as broad, succeeding ones nearly twice as long as broad, but apically tapering and gradually become shorter, last one ellipsoidal. Clypeus slightly setaceous, and together with the glabrous labrum fairly longer than the vertical height of the head. Mandibles absent at least in male. Maxillae slender and simple. Maxillary palpi five-jointed, setaceous; third and fourth joints subequal in length and apically swollen; last joint slender and long, thrice as long as the preceding one. Labial palpi setaceous, slightly beyond the apex of the labrum.

*Thorax*: Mesonotum conspicuous, very sparsely setaceous, except rather dense posterior margin of the postscutellum. Metanotum rudimentary and glabrous.

*Wings* partly examined; membrane subhyaline; macrotrichia on the wing margins,  $R_1$  and the distal part of other veins; microtrichia minute, but rather dense;  $R_{2+3}$  about one and one-half times as long as the straight part of  $R_s$ .

*Legs*: Tibial spurs present in hind-legs only, of which one is stout and setaceous, the other very slender and short, about one third the former in length. Flexor surface of tarsal joints more



densely covered by fine setae than the other side. Last tarsal joints slightly curved, nearly one and one-half times as long as the fourth in fore- and mid-legs, in hind-legs fully twice as long as the fourth, but shorter than those of the other legs. Claws slender, apically curved and pointed, with many fine long hairs on the proximal half. Empodia rudimentary.

*Abdomen*: Tergites densely covered by short bristles. Sternites rather sparsely setaceous.

*Hypopygium* (Figs. 13, 14): Dorsal-plate very small, transverse, densely setaceous. Ventral-plate rather large, but much shorter than broad, posterior margin concave, with blackish bristles on the posterior surface. Guard-plate bi-lobed, already chitinized blackish brown, the lobes shorter than half of the basal breadth of the plate, with slender pale hairs. Claspers bi-lobed dorso-ventrally from the base; dorsal lobe smaller, furcated before and behind near the base, chitinized dark brown, with blackish bristles, the posterior branch of which is slender and long. Ventral lobe of claspers conspicuously broadened apically, and the apical enlargement which is mainly directed forwards pale, with a few bristles, and nearly contiguous with the posterior margin of the ventral-plate.

*Larva* (10 specimens). *Fourth instar* (full-grown) (Figs. 15, 16). Length 7—8 mm. (specimens after moulting 4 mm.); breadth ca. 2 mm. Body slender, neck-pieces conspicuous. Dorsal integument obscure yellowish brown throughout, ventral yellowish white. First body-segment transverse, nearly elliptic. Antennae subequally three-jointed, 1/4 the length of the first body-segment. Thoracic spot  $\infty$ -shaped and blackish. Six stout sharp thorns each on the first seven abdominal segments; eighth segment without thorns or warts. Feelers subequally dichotomized distally, the dorsal branch of which is sharp thorn-like. Claws rather thick and short. Last two body-segments distinct. Seventh abdominal segment with a pair of lateral appendages, which is dichotomized and resembling the feelers of preceding joints. Caudal margin semicircular with a crescent, chitin plate bristled. Segmental gill-tuft with five rather large filaments, of which three are directed anteriorly and two posteriorly. Anal gill filaments rather elongated. Suckers rather small.

*Third instar*. Length 3.5—4.5 mm. Body slender, neck-pieces conspicuous. Dorsal integument obscure yellowish brown, ventral yellowish. Antennae equally two-jointed. Six thorns on the first seven abdominal segments each. Feelers subequally dichotomized

distally, dorsal branch thorn-like. Lateral appendages on the seventh abdominal segment also dichotomized. Caudal margin slightly chitinized. Segmental gill-tuft with three filaments, of which two are directed anteriorly and one posteriorly.

*Pupa* (5 specimens) (Fig. 17). Length 4.9—5.6 mm.; breadth 2.9—3.5 mm. Body oval and flat, outer margin smooth. Dorsal integument obscure yellowish brown. Pupal horns rather large, bases of which are slightly separated. Each horn with four nearly semi-circular lamellae, which are delicately membraneous and distally subhyaline. First and fourth pairs of lamellae large, inner distal margins contiguous respectively; intermediate pairs of lamellae rather small, separated from each other. Head rather large, slightly elongated posteriorly. Microgranulation of very minute, blackish brown, chitin dots on the prothorax, median posterior half of mesothorax, most of the metathorax and whole abdomen, but very sparse on the prothorax. Pads small and subcircular. No residuum of segmental gill-tuft.

This species is more closely related, especially in the characteristics of its imagos, to the above mentioned species, *Philorus siko-kuensis*, than to other species of the genus. On the other hand, it may be readily distinguished from the latter species by the characteristics of the eyes of its imagos, dorsal thorns and caudal margin of the larvae, respiratory lamellae and dorsal microgranulation of the pupae.

*Habits*: Supposedly monogeneric, hygropetric (partly submersed) winter-type.

*Locality*: Mountain region ca. 2400 m. high from the sea-level, in the Prov. of Taityu, Taiwan (Formosa).

*Collector and date*: Dr. M. UÉNO on 24/VII/'35.

Genus BLEPHAROCERA MACQUART (1843).

***Blepharocera taiwanica* sp. nov.**

*Larva* (5 specimens). *Fourth instar* (Figs. 18, 19). Length 5—6 mm.; breadth 1.7—2 mm. Body fairly flattened. First body-segment rather small, third and fourth broadest. Dorsal integument blackish brown, except lighter marginal parts of each segment, which are rather densely covered by long, slender, curved, whitish hairs. Ventral integument whitish, with short setae sparse. Antennae two-jointed, 1/3 or 1/4 the length of the first body-segment; distal joint thin and long, fully twice the proximal one in length. Thoracic

spot not yet fully developed, but the usual area darker. A single small, blunted, black chitin wart present, on each dorso-median part of second to fourth abdominal segments, but on the first and fifth segments very rudimentary. Claws thick and short, considerably chitinized; proximal part of which blackish brown, distal part yellowish. A rudimentary posterior feeler with dense setae present, at the lateral margin of second or third to sixth abdominal segments each; antero-lateral margin of each abdominal segment slightly prominent and densely setaceous, thus resembling a rudiment of anterior feeler. Last two body-segments distinct. Seventh abdominal segment slightly broadened posteriorly, with a pair of rather short conical appendages, which are distally chitinized and directed posteriorly. A pair of caudal appendages present, which are rather short conically and chitinized black, with a pair of apical bristles. Segmental gill-tufts all partly damaged, but the number of filaments presumably seven. Suckers rather large.

Described from the specimens taken out from the stomachs of a salmonoid fish, *Oncorhynchus formosanus*, so that all of them were damaged.

*Habits*: Supposedly monogeneric, submersed winter-type.

*Locality*: The upper stream of the Daikokei River, Taiwan (Formosa).

*Collector and date*: Dr. M. UÉNO on 22/VII/'35.

#### ***Blepharocera uenoi* sp. nov.**

*Larva* (11 specimens). *Fourth instar* (full-grown) (Figs. 20, 21). Length 5—7.5 mm.; breadth 2—2.6 mm. Body rather flattened. First body-segment rather small, third and fourth broadest. Dorsal integument blackish brown, except lighter marginal parts of each segment, which are rather sparsely setaceous. Ventral integument whitish and glabrous. Antennae two-jointed,  $1/4$  the length of the first body-segment; distal joint thin and long, nearly twice the proximal one in length. Thoracic spot V-shaped, very large and black. A single, large and sharp thorn present, on the dorso-median part of second to fourth abdominal segment each, but on the first and fifth segments very rudimentary; the base of each thorn slightly chitinized forming a large, transparent, glassy plate. Claws large and elongated, apically pointed, but slightly chitinized and yellowish pale. A rudimentary posterior feeler present, at the postero-lateral margin of each of the fourth to the sixth abdominal segments. The

feelers slightly setaceous, apically chitinized brown, and that of the sixth segment larger. Last two body-segments distinct. Seventh abdominal segment broadened posteriorly forming a pair of elongated, strongly chitinized, conical appendages with apical bristles. A pair of caudal appendages present, which are conically elongated in shape, blackly chitinized, and with a pair of apical bristles. Segmental gill-tuft with seven small white filaments. Suckers rather large.

Described from the specimens taken from the stomachs of a salmonoid fish, *Oncorhynchus formosanus*, so that they were all partly damaged.

*Habits*: Supposedly monogeneric, submersed winter-type.

*Locality*: The upper stream of the Daikokei River, Taiwan (Formosa); associated with the above mentioned species, *Blepharocera taiwanica* sp. nov.

*Collector and date*: Dr. M. UÉNO on 22/VII/'35.

Above mentioned two species of the genus *Blepharocera* show some differences from other members of the genus in having the rudiments of feelers, which display a limited resemblance to the closely related genus *Parablepharocera* KITAKAMI (1931).

Key to the larvae of Japanese *Blepharocera* and *Parablepharocera*.

- A<sub>1</sub> A pair of well developed feelers on the lateral side of each of the first six abdominal segments. Caudal appendages present; without thorns or warts on the dorsal side.
  - B<sub>1</sub> Posterior feeler similar to the anterior one, both strongly chitinized..... *Parablepharocera esakii* ALEXANDER.
  - B<sub>2</sub> Posterior feeler smaller than the anterior one, both slightly chitinized. .... *Parablepharocera shirakii* ALEXANDER.
- A<sub>2</sub> Feelers absent or very rudimentary.
  - B<sub>1</sub> A rudimentary posterior feeler on the lateral side of each of the third or fourth to the sixth abdominal segments. Caudal appendages present; with chitin thorns or warts on the dorsal side.
    - C<sub>1</sub> A chitin wart on the dorsal side of abdominal segment; claws thick and short....*Blepharocera taiwanica* sp. nov.
    - C<sub>2</sub> A sharp thorn on the dorsal side of abdominal segment; claws much elongated.....*Blepharocera uenoi* sp. nov.
  - B<sub>2</sub> Feelers absent. Caudal appendages absent; without thorns or warts on the dorsal side....*Blepharocera japonica* KITAKAMI.

Genus APISTOMYIA BIGOT (1862).

*Apistomyia uenoi* (KITAKAMI) (1931).

This species was in my original description named *Curupira uenoi* which naming was based upon the larvae belonging to the immature fourth instar, but the generic position of which was problematical. Since that time, imagos and an abundance of larvae and pupae in different stages have been obtained, and it has become clear that the former classification as to generic position was incorrect. It is interesting to find this species as a unique representative of the subfamily *Paltostominae* EDWARDS hitherto known in this country.

*Female* (15 specimens). Length of body 5.3—6 mm.; wing 6.2—7 mm.; proboscis 2.1—2.5 mm.

*Head* (Fig. 22): Vertex and frons rather broad, 1/3 the breadth of the head, glabrous and brownish black to black, except silvery marginal parts of the eyes. Tempora and occiput broad, nearly glabrous and blackish. Ocelli yellowish brown, ocellar protuberance brownish black. Eyes dichoptic, bisected and finely pubescent; upper parts with slightly larger brownish facets very small, 1/5 the height of eyes; lower parts with small blackish facets broad. Antennae very short, ten-jointed; first scapal joint nearly as long as broad, slightly setaceous and blackish brown; second joint largest of all, more than twice as long as the first one and conspicuously broadened apically, nearly glabrous and brownish black to black; flagella very thin and pubescent, the joints nearly as long as broad, except for a rather elongated first one and a much enlarged, ellipsoidal last one; second or third to fifth flagellar joints often partly fused.

*Mouth-parts* very much elongated. Clypeus conspicuous, glabrous and brownish black. Labrum conspicuous, barely as long as the antennae, blackish proximally, distally brownish yellow. Mandibles slender, shorter than labrum, but no denticles. Hypopharynx also slender and simple, slightly longer than mandibles, but shorter than labrum. Maxillae slender, yellowish, slightly longer than half the length of mandibles. Maxillary palpi jointless and very small, black with short, stout bristles. Labium very conspicuous, much elongated, brownish black to black, usually separated from remaining mouth-parts. Basal part of labium slightly longer than the clypeus and labrum combined, sparsely setaceous ventrally, dorsally mem-

braneous and yellowish; two-segmented, the proximal segment flat, the distal one longer and tubular in its apical half. Labial palpi also much elongated, cylindrical and tapering apically, the tips sharply pointed, nearly parallel in the proximal portion, slightly divergent in the apical portion.

*Thorax*: Mesonotum very conspicuous, and together with the pleurae brownish black, with some silver reflecting parts. Mesonotal stripes and sutures normal; mostly glabrous but the post-scutellum slightly setaceous postero-laterally. Pronotum and metanotum rudimentary and glabrous.

*Wings* (Fig. 23) rather narrow, the membrane nearly glassy, except for an opaque costal cell and a smoky dark spot on the wing apex. Macrotrichia very short, confined to the wing margins, on the radial veins absent. Microtrichia very minute and sparse, except rather dense smoky spot and wing margins; scarcely distinguished as a coarse punctation under a low magnification ( $\times 50$  or  $\times 80$ ), but distinctly seen as fine hairs under a high magnification ( $\times 300$ ).

*Venation*; Costa very stout and black; Sc much reduced, almost vanished;  $R_1$  stout and blackish, but apically somewhat atrophied;  $R_s$  simple, distally curved forwards, ending very close to the tip of  $R_1$ ; basal deflection of  $R_s$  rudimentary, so that the vein is apparently aligned with r-m; a smoky dark spot at the wing apex; M simple, distally curved downwards; Cu forked near the base, the tip of  $Cu_2$  somewhat abbreviated; An faint, distally abbreviated and not attaining the wing margin; basal part of the posterior wing margin slightly chitinized. Secondary venation distinct. Halteres well developed, obscure yellowish, stems yellowish.

*Legs* (Figs. 24, 25): Fore- and mid-legs short, hind-legs very long and slender, measured as follows:—

	Femora	Tibiae	Tarsi
Fore-legs	1.4 mm.	1.8 mm.	2.4 mm.
Mid-legs	1.6 mm.	1.7 mm.	2.1 mm.
Hind-legs	4.7 mm.	4.6 mm.	5.7 mm.

Coxae, trochanters and the proximal portion of femora obscure yellowish brown; remaining parts of fore- and mid-legs and the distal part of hind femora brownish black; hind tibiae and tarsi yellowish pale, except more or less blackish proximal one third of tibiae, distal end of first four, and whole fifth tarsal joints. Femora club-shaped,

but the hind ones much elongated, so that they are gradually apically thickened. A pair of tibial spurs present on hind-legs only, which are very stout and long, nearly subequal in size, black with minute pubescence. Stout and black spiny bristles present on the flexor surface of distal one-third of tibiae and all tarsal joints in fore- and mid-legs, of which those on the tibiae and first tarsal joints are conspicuous; those in hind-legs sparse, confined to the first three tarsal joints. Last tarsal joints one and one-half times as long as the fourth in fore- and mid-legs, in hind-legs moderately shorter than the fourth. Claws of each leg black, very finely setaceous, slightly curved apically, with usually seven small subsimilar denticles. Empodia rudimentary.

*Abdomen*: Tergites glabrous, blackish brown, antero-lateral portions of which are lighter and silvery reflecting. Lateral membranes very broad, pale or obscurely yellowish. Sternites longitudinal and narrow, nearly glabrous and obscure yellowish brown. Seventh sternite rather broad, blackish brown, with bristles on the posterior half.

*Hypopygium* (Fig. 26): Eighth tergite much reduced, but the sternite rather broad, posterior margin of which is concave triangularly, well chitinized and finely pubescent. Ninth tergite transverse quadrilateral, well chitinized, with stout and long bristles on the posterior margin. Ninth sternite small, basal part of which is nearly square, pointed posteriorly, well chitinized and finely pubescent; distal part bilobed, forming a pair of finger-like processes shortly setaceous or pubescent. Tenth segment bilobed laterally; dorsal parts nearly bivalve-shaped, chitinized and blackish in colour in the proximal portion, rather pale and membraneous in the distal portion, with short, stiff bristles arising from small papillae. Cerci one and one-half times as long as the basal breadth of the segment, densely setaceous from base to tip, distal one-third of which free or filamentous, pale, the tip with three, short, stiff bristles arising from small elongated papillae.

*Male* (4 specimens). The materials dissected from mature pupae. Length of body about 4—4.5 mm.; proboscis 2.4 mm.

*Head* (Fig. 27): Eyes very large, holoptic, bisected and finely pubescent; upper parts with large brown facets entirely contiguous to one another on the vertex; lower parts with small blackish facets separated from one another by clypeus; both subequal in frontal view, but the upper parts much larger, more than twice as wide as

the latter. Antennae and ocellar protuberance already blackish. Clypeus and labrum slightly setaceous. Mandibles absent. Remaining mouth-parts as in female, of which the maxillary palpi and labial palpi black and chitinized, and the latter in pupal case extending  $3/4$  the length of wing-sacs.

*Thorax, wings and legs* as in female, of which the mesonotum, costal vein, tibial spurs, tarsal joints, spiny bristles and claws are black and chitinized.

*Abdomen*: Seventh segment with blackish tergite which is sparsely setaceous at the hind margin; its sternite narrow, rather densely setaceous at the narrowest median posterior margin. Eighth segment with the tergite much reduced, but the sternite rather broad. *Hypopygium* (Figs. 28, 29): Dorsal-plate rather large, moderately elongated semicircular and sparsely setaceous, posterior margin dully convex and blackish. Ventral-plate large, longer than broad, posterior margin concave trapezoidally; glabrous and pale, except blackish median posterior portion and a pair of chitinized longitudinal parallel stripes. Guard-plate bilobed, the lobes nearly semicircular, blackish with dense setae; ventral part of which has a pair of rather stout bristles. Claspers rather simple, concave dorsally and ventrally convex, densely furnished with setae arising from small papillae. Tenth sternite conically convex posteriorly, very minutely pubescent. Parameres slender and glabrous.

*Larva* (numerous specimens). *Fourth instar* (fullgrown). The original description of the immature fourth instars will be supplemented.

Length 5.5—7 mm. (immature forms after moulting 3.4—4 mm.); breadth (except claws) 1.7—2.1 mm., (including claws) 2.3—3 mm. Body strongly flattened. Dorsal integument blackish brown, ventral yellowish pale. First body-segment transverse, but the breadth of which is less than any of the second to fourth body-segments. Antennae subequally two-jointed,  $1/4$  or  $1/5$  the length of first body-segment. Thoracic spot rather ill-defined, but the usual area with a transverse, undulating, black band. First to sixth abdominal segments each with a pair of transverse, black, chitin bands on the median parts, and at the marginal parts many black thornlets. The chitin bands on the first segment short, and on the sixth segment unique. Ventral side of the distal half of the claw swollen and light brown.

*Third instar*: Length 1.6—3.4 mm. Body flat. Dorsal integument



blackish brown or brownish black, ventral pale. Antennae two-jointed and black, distal joint of which is fairly longer than the proximal one. Dorsal sides of the first to sixth abdominal segments each with a pair of transverse chitin bands at the median parts, and at the marginal parts a pair of rows of thornlets. Feelers absent. Claws conspicuous, distal part of which has many long bristles on the dorsal side, but the ventral side is bare, slightly swollen and light brown. Last two body-segments slightly separated. Seventh body-segment nearly semicircular, with a pair of small conical appendages apically bristled. Caudal margin with a few thornlets or bristles. Segmental gill-tuft with three slender filaments, of which two directed anteriorly and one posteriorly.

*Second instar*: Length 0.8—1.5 mm. Dorsal integument brownish black or blackish brown, ventral white. Antennae black and unequally two-jointed, distal joint twice or thrice as long as the proximal one. First to sixth abdominal segments each with a pair of transverse chitin bands and rows of thornlets on the dorsal side. Feelers absent. Claws conspicuous, but the bristles on the distal dorsal surface not very dense. Last two body-segments slightly separated. Seventh body-segment nearly semicircular, with a pair of small conical appendages apically bristled. Segmental gill-tuft with an unique small filament. Suckers large.

*First instar*: Length about 0.8 mm. Body slender. Dorsal integument obscure brownish yellow, ventral pale. Antennae jointless and slender, black with small prominences at the tip. Dorsal side of first six abdominal segments each with a pair of transverse bands of thornlets and a group of two or three thornlets. Feelers absent. Claws rather conspicuous, distal end of which with a pair of bristles and a few thornlets on the dorsal side, ventral side with pointed prominences. Seventh abdominal segment with a band of thornlets dorsally, and laterally with a pair of small conical prominences apically bristled. No segmental gill-tuft. Suckers normal.

*Pupa* (numerous specimens) (Figs. 30, 31). Length 3.5—4.7 mm.; breadth 1.7—2.5 mm. Body rather elongated elliptic, strongly convex dorsally, outer margin undulated. Dorsal integument blackish brown to brownish black. Pupal horns rudimentary, each with four lamellae of very different sizes. First and fourth pairs of lamellae entirely contiguous at the base and  $\omega$ -shaped, of which the first lamellae is the largest of all and nearly semicircular; both pairs of lamellae strongly chitinized, apically brownish black and no membraneous

parts. Second and third pairs of lamellae small, entirely surrounded by the first and fourth pairs; second lamellae M-shaped or apically bi-lobed and pointed, of which the inner lobe is longer; the third lamellae being smallest of all, sharply triangular and apically pointed; both pairs of lamellae very nearly situated before and behind, membranous and brown. Head very conspicuous, vertical, and mostly faced forwards. Thick granulation of rather large, nearly circular, blackish brown dots together with a few yellowish brown dots on the prothorax, median part of mesothorax, most parts of metathorax and whole abdomen. Median part of mesothorax upheaved dorsally and with the largest height. Third and fourth abdominal segments broadest of all. Four pairs of large, nearly calabash-shaped pads at the ventral side of third to sixth abdominal segments. Ventral side of the prothorax, seventh and last abdominal segments with granulation at the marginal parts, of which that of the last segment is very sparse. Wing-sacs very large, much elongated, reaching the posterior half of the sixth abdominal segment. No residuum of segmental gill-tuft.

*Localities* and data of collection as in the following table:—

Date	Locality	Data	Collector
17/X/1930	Nakabusa (Prov. of Sinano)	Larva (iv)	UÉNO
30/VIII/1933	Kubo (Iya, Sikoku)	Pupa	KITAKAMI
"	Kyodyo (,,)	Larva (iv)	"
"	Oiuti (,,)	Larva (iv), pupa	"
30/IX/1933	Mt. Hira (near Kyoto)	Larva (iv, iii, ii)	"
11/XI/1933	"	Larva (iv, iii, ii, i)	"
19/V/1934	"	Larva (iv, iii), pupa	"
8/VI/1934	"	Larva (iv, iii), pupa	"
29/VI/1934	"	♀, Larva (iv, iii)	"
29/VII/1934	"	Larva (iv, iii, ii, i)	"
10/VIII/1934	Gamada (Prov. of Hida)	Larva (iv), pupa	"
8/VI/1935	Mt. Hira (near Kyoto)	Larva (iv, iii), pupa	"
21/VII/1935	"	Pupal case	"
14/VI/1936	"	Larva (iv, iii), pupa	"
27/VI/1936	"	♀, Larva (iv, iii), pupa	"
4/IV/1936	Nati (Prov. of Kii)	Larva (iv, iii, ii)	"

Concerning the life cycle, this species is very different from other members of our Blepharocerids; and neither of the two categories of life cycle, the "winter-type" and the "summer-type," which were introduced in my foregoing paper, cover this case.

Accordingly, it seems reasonable that this species forms by itself a third category of the type of life cycle, to which I should like to give the name "perennial-type". In the perennial-type, postembryonal stages of metamorphosis, different larval stages are found throughout the year, so that it can be said that this is a mingled winter-and summer-type. Since the data are rather scanty, I can say but a little of the details of this type of life cycle but judging from the instances at Mt. Hira, it is doubtlessly true that (1) the pupation occurs in late spring, (2) the emergence in the middle of June, and (3) the larvae of different stages hibernate equally.

As for the problem of generation, I am not able to make out anything decidedly, but judging from a few data collected at Gamada and Nakabusa, as well as those in Sikoku, the assumption seems to be acceptable that it is monogeneric in high mountain districts but polygeneric in warmer districts.

Concerning the mode of living, this species belongs to the "submersed-type" rather than the "hygropetric-type", and is one of the typical rapid inhabitants having well developed suckers in the larval stage and four pairs of large adhesive pads in the pupa. The larvae and pupae are prevalent in peculiar portions of rapid streams where the water is always rushing and spraying, so that a collector in securing this species must experience more difficulties than for the other members of the family. Three females captured on the wing at Mt. Hira were very actively flying just above the whirling and boiling rapids, and seemed to be left-overs of the season's swarm.

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## Explanation of Plates.

### Plate I.

#### *Bibiocephala infuscata* MATSUMURA

- Fig. 1. Head of male; frontal view,  $\times 15$ .  
 2. Wing of male,  $\times 7$ .  
 3. Hind tarsus of male,  $\times 27$ .  
 4. Male hypopygium; dorsal view,  $\times 30$ .  
 5. „ ; ventral view,  $\times 30$ .

#### *Philorus sikokuensis* KITAKAMI

- Fig. 6. Head of male; dorsal view,  $\times 30$ .  
 7. Wing of male,  $\times 8$ .  
 8. Hind tarsus of male,  $\times 42$ .  
 9. Male hypopygium; dorsal view,  $\times 35$ .  
 10. „ ; ventral view,  $\times 35$ .  
 11. Female hypopygium; ventral view,  $\times 35$ .

### Plate II.

#### *Philorus taiwanensis* sp. nov.

- Fig. 12. Head of male, dissected from pupa; dorsal view,  $\times 30$ .  
 13. Male hypopygium, „ ; dorsal view,  $\times 40$ .  
 14. „ ; ventral view,  $\times 40$ .

- Fig. 15. Fullgrown larva; dorsal view,  $\times 10$ .  
 16. „ ; last three body-segments; ventral view,  $\times 10$ .  
 17. Pupa; dorsal view,  $\times 10$ .

*Blepharocera taiwanica* sp. nov.

- Fig. 18. Fullgrown larva; dorsal view,  $\times 13$ .  
 19. „ ; last four body-segments; ventral view,  $\times 13$ .

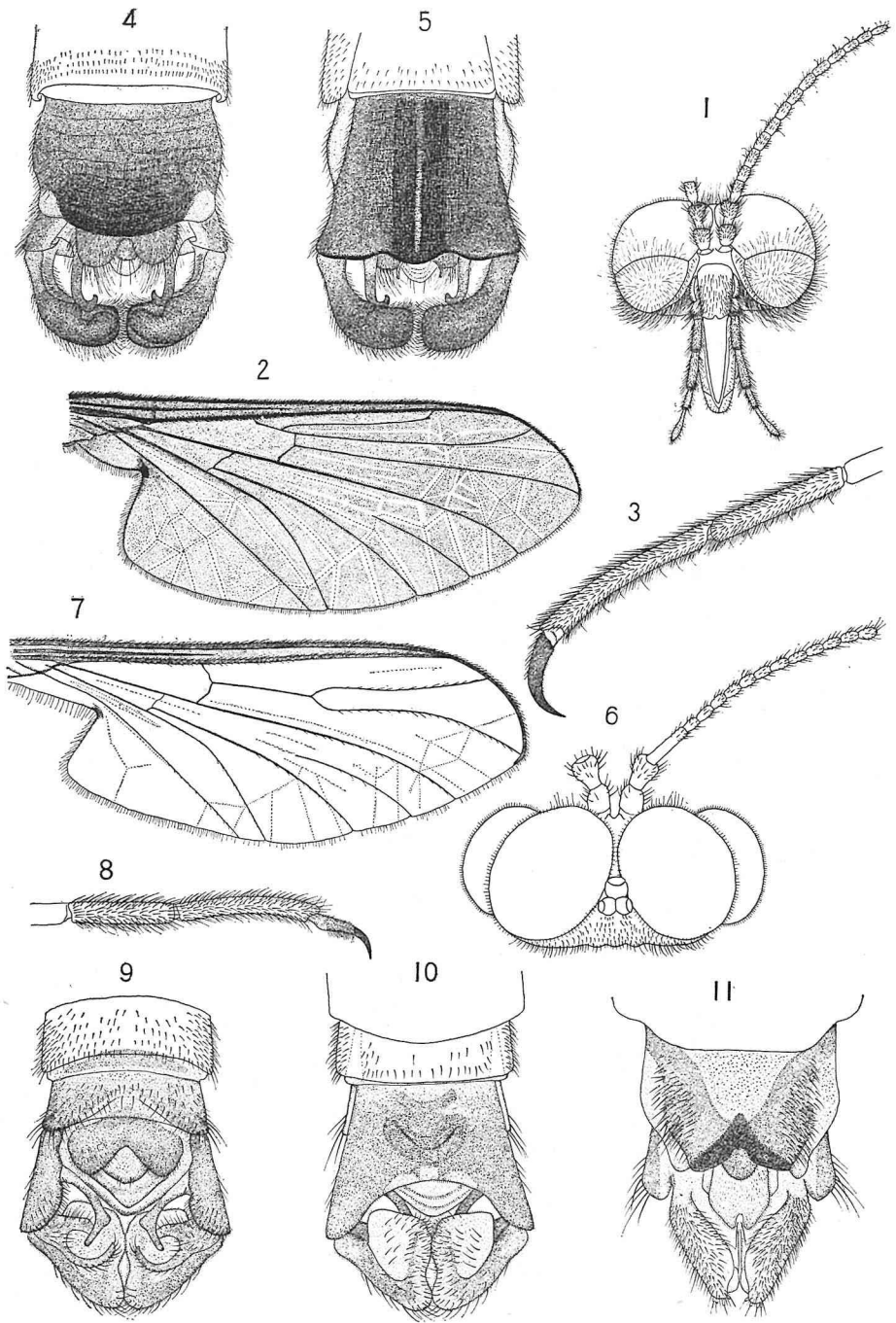
*Blepharocera uenoi* sp. nov.

- Fig. 20. Fullgrown larva; dorsal view,  $\times 10$ .  
 21. „ ; last four body-segments; ventral view,  $\times 10$ .

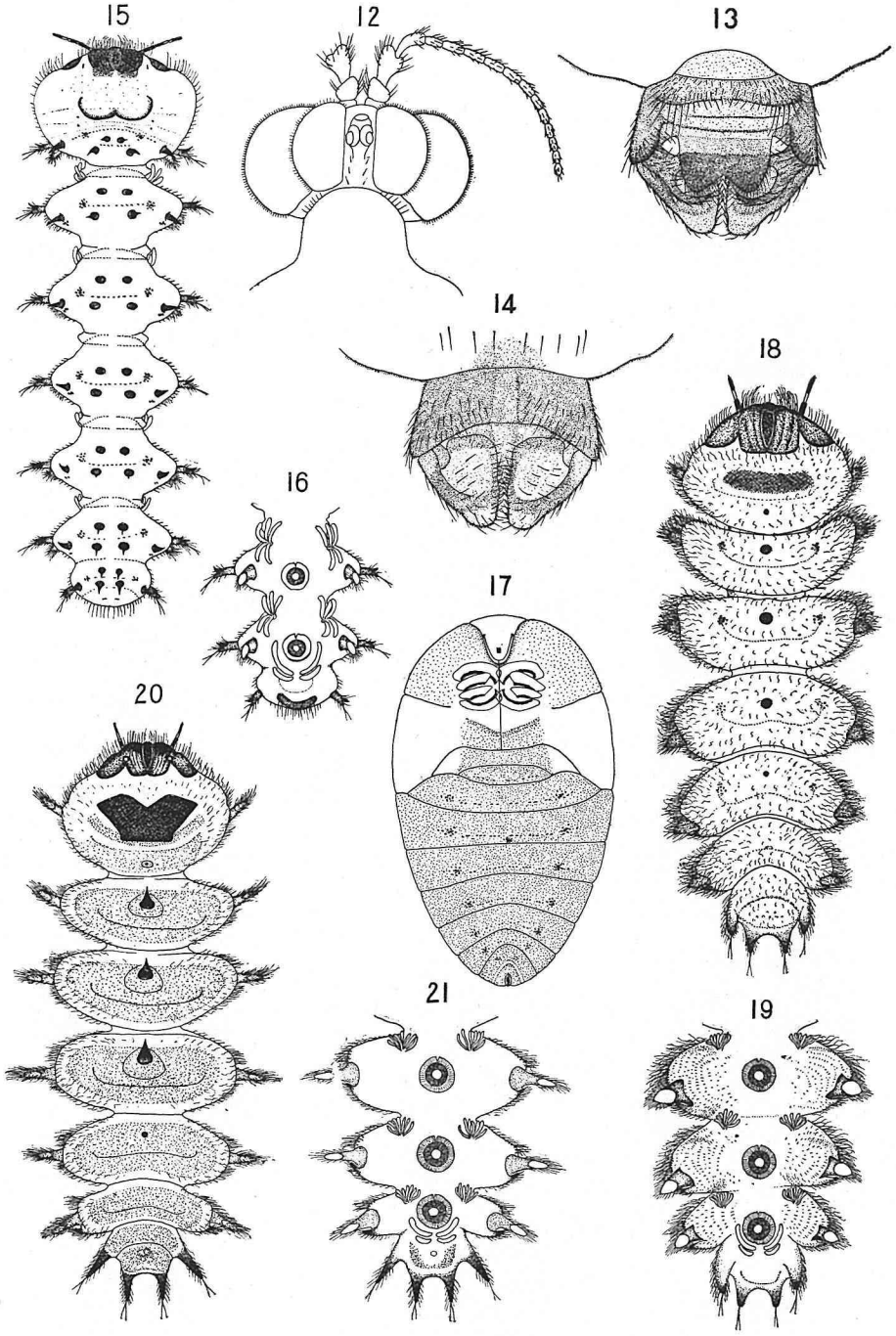
**Plate III.**

*Apistomyia uenoi* (KITAKAMI)

- Fig. 22. Head of female; lateral view,  $\times 25$ .  
 23. Wing of female,  $\times 10$ .  
 24. Hind tarsus of female,  $\times 50$ .  
 25. Middle tarsus of female,  $\times 50$ .  
 26. Female hypopygium; ventral view,  $\times 50$ .  
 27. Head of male, dissected from pupa; frontal view,  $\times 50$ .  
 28. Male hypopygium, „ ; dorsal view,  $\times 50$ .  
 29. „ ; ventral view,  $\times 50$ .  
 30. Pupa; dorsal view,  $\times 15$ .  
 31. „ ; ventral view,  $\times 15$ .
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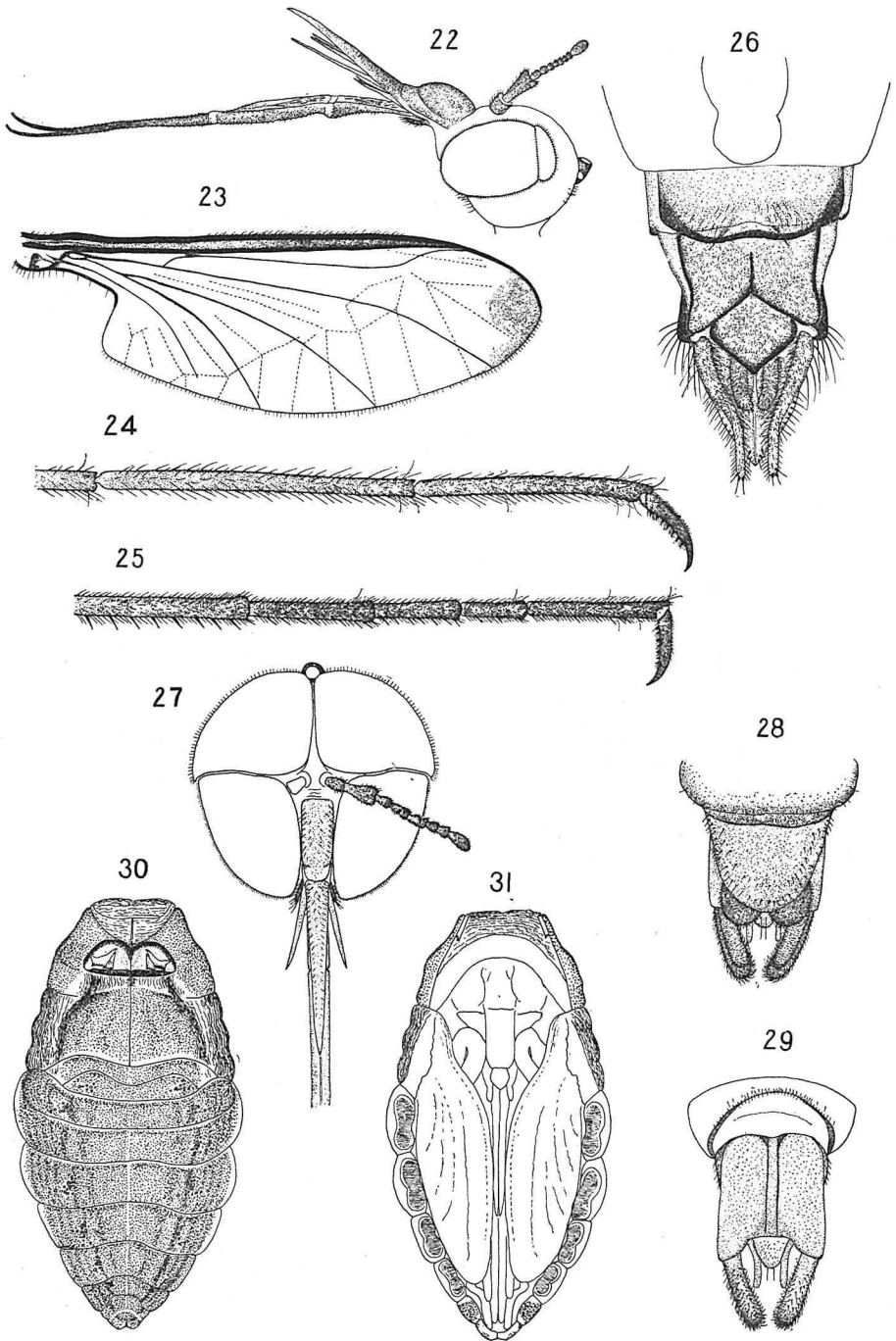


S. KITAKAMI del.



S. KITAKAMI del.





S. KITAKAMI del.