

## On the Blepharoceridae of Formosa, with a Note on *Apistomyia uenoi* (KITAKAMI)

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*With Two Plates and Two Text-figures*

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Three species of the Blepharoceridae have been recorded from Formosa, namely *Philorus taiwanensis* KITAKAMI (1937), *Blepharocera taiwanica* KITAKAMI (1937) and *Blepharocera uenoi* KITAKAMI (1937). The latter two species were represented by numerous larvae of the fourth stage taken from the stomach of a Salmonoid fish. During my trip to the mountainous parts of Formosa in July 1938 I was able to collect a good number of imagos, pupae and larvae of this family in several stages, so that their complete life history can be recorded herewith. Besides these specimens a new species of the genus *Apistomyia* was detected, which will be described below under the name *Apistomyia nigra*. A fragment of pupal case apparently belonging to the genus *Philorus* could not be identified with *Philorus taiwanensis*. I take this to be new, but in the present paper it will be called *Philorus* sp., since that specimen was not good enough for diagnostic examination. Besides these new species, the materials temporarily ascribed to *Blepharocera taiwanica* reveal certain morphological deviations according to the locality from which they come; and the characteristics are so distinct that each of them should be considered a local variety.

In addition to such descriptions and the supplementary note on the Formosan species, a brief note on *Apistomyia uenoi* (KITAKAMI), whose habitat is known to range from Honsyû, Sikoku and Kyûsyû as far as to Yakushima Island, will be added for comparison with the new species.

### 1. *Philorus taiwanensis* KITAKAMI (1937)

KITAKAMI, 1937: p. 122-124.

The following descriptions of the female and the larvae of the first and second stages are now given for the first time.

*Male* (2 specimens extracted from pupa). Trochanters of forelegs about thrice as long as broad. Anterior branch of the dorsal lobe of claspers nearly straight, with a row of black spiny bristles at the anterior margin.

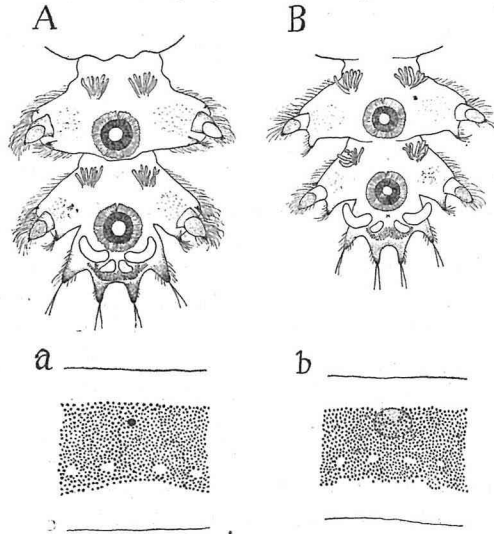
*Female* (a single specimen taken out from pupa). Head (fig. 1). Eyes separated and bisected as in the male. Upper divisions with large brownish facets slightly larger than those of the male, and slightly broader than the lower divisions with small blackish facets in dorsal aspect. Occiput rather densely setaceous. Antennae 15-jointed, slightly shorter than in the male, rather densely setaceous. Flagellar joints except the first slightly longer than broad, nearly ellipsoidal, last joint smallest. Clypeus rather densely setaceous and together with the labrum more than 1.5 times the height of head. Mandibles stout and long, with many denticles on inner margins. Last joint of maxillary palpi pale, sparsely setaceous, about twice as long as the fourth. Thorax, wings, legs and abdomen nearly as in male. Hypopygium: median lobe of ninth sternite with a small cleft at the posterior margin. Cerci thick, slightly shorter than the basal breadth of the segment.

*Pupa* (13 specimens and several exuviae). Male pupa usually 5.5 mm. in length, 3.3 mm. in breadth; female pupa usually 5.8×3.5 mm. Dorsal integument blackish brown with yellowish nuance in Arisan specimens, but in original specimens more lightly colored. Microgranules very minute, blackish brown, conically pointed. Leg-sacs ending in the same file.

*Larva* (numerous specimens). *Fourth instar*. Full-grown larva 7-8 mm. in length, ca. 2 mm. in breadth. Immature specimens after moulting 3.5-4 mm. Dorsal integument blackish brown throughout in Heisyana specimens, though in other localities more lightly colored. Second and third antennal segments rather indistinctly articulated. Thorns stout and sharp, about thrice as long as their basal diameter, and lateral ones slightly curved dorsally. Thorn of the feeler also stout, subequal to the distal portion of feeler and slightly curved dorsally.

*Third instar*. Length 2.2-4.8 mm. Thorns slightly more than twice as long as their basal diameter. Thorn of the feeler also stout.

*Second instar* (10 specimens). Length 1.0-2.9 mm. Body slender, neck pieces conspicuous. Dorsal integument obscure brownish pale, ventral

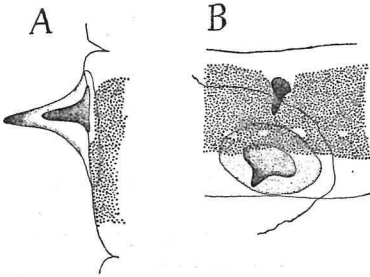


Text-figure 1. Full-grown larvae of *Bepharocera taiwanica*; A, a specimen from Mt. Arisan; last three body-segments, ventral view  $\times 12$ . a, do, third body-segment, dorsal view  $\times 25$ . B, a specimen from Hukamidu-onsen; last three body-segments, ventral view  $\times 12$ . b, do, third body-segment, dorsal view  $\times 25$ .

whitish. Antennae unequally 2-jointed, distal joint nearly thrice the proximal one. Thorns usually 1.5 times as long as their basal diameter. Thorn of the feeler shorter than the distal portion of feeler. Lateral appendages of seventh segment with a small thorn on the dorsal side. Caudal margin semicircular, slightly chitinized. Segmental gill-tufts with a unique slender filament directed anteriorly.

*First instar* (2 specimens) (fig. 2). Length 0.8-1.2 mm. Body slender, neck-pieces distinct. Dorsal integument obscure brownish pale, ventral white. Antennae jointless, more than thrice as long as broad, apically with a few short, stiff, pale bristles. Anterior margin of first body-segment setaceous. A pair of transverse rows of thornlets present on the first seven abdominal segments. Thorax with three similar rows, but the third row only rudimentary. In place of the feeler and claw is present a conspicuous lateral lobe, which is conical and set with a few thornlets, a very long bristle and

a tuft of short bristles. The long bristle is fully 1/2 to 2/3 as long as the breadth of segment; the tuft is composed of several dissimilar stiff bristles directed postero-ventrally. Seventh abdominal segment with a pair of lateral appendages, set apically with a very long bristle directed posteriorly. Caudal margin semicircular, with a few short setae. No segmental gill-tuft. Suckers small.



Text-figure 2. A full-grown larva of *Blepharocera uenoi*; A, third body-segment, lateral view  $\times 25$ . B, do, dorsal view (the cuticle partly removed)  $\times 25$ .

Localities and data of collection as in the following table:

| Date         | Locality             | Altitude | Data  | W.t.(C.) | Collector |
|--------------|----------------------|----------|---|----------|-----------|
| 24. VII, '35 | Matumine (Tai tyû)   | 2,400 m. | Pupa ( $\delta$ ), Larva (iv, iii)              | 12°-13°  | Uéno      |
| 29. VII, '38 | Sinboku (Mt. Arisan) | 2,100 m. | Larva (ii)                                      | 13°      | Kita-kami |
| ,,           | First Switch (,,)    | 1,800 m. | Larva (iv, iii, ii, i)                          | 14°      | ,,        |
| ,,           | Heisyana (,,)        | 1,700 m. | Pupa ( $\delta\sigma$ ), Larva (iv, iii, ii, i) | 16°      | ,,        |

## 2. *Philorus* sp.

A fragment of pupal case was obtained at Sinboku, Mt. Arisan, on July 29, 1938, in company with the second instar of the above-mentioned species. It consists of the second to the last abdominal segments, measuring c. 4.1 mm. in length and 4.3 mm. in width on the third abdominal segment, so that the pupa may be assumed to be c. 7 mm. in full length,

and hence much larger than *Phylorus taiwanensis*. The microgranules on the tergite are also very numerous and dense. Judging from these facts the pupa seems to belong to a different species whose life cycle is of a monogenerative winter-type.

### 3. *Blepharocera taiwanica* KITAKAMI (1937)

KITAKAMI, 1937; p. 124-125.

This species was previously described merely from the study of fourth-stage larvae, so that the following description of imagos, pupae and larvae of immature stages are new records. Description will begin with the specimens from Rotyen-kei, since their fourth instar agrees fairly well with the original specimens.

*Male* (4 specimens, of which one was extracted from pupa). Body c. 4.5 mm.; wing c. 4.4 mm., breadth c. 1.6 mm. A small specimen measuring: body 3.2 mm., wing 3.7 mm.

Head (fig. 3) transverse. Eyes separated from each other by ocellar protuberance, pubescent, divided. Upper divisions small, brownish, the facets very slightly larger than those of blackish lower divisions. Ocelli pale, ocellar protuberance blackish. Occiput and gena with short black bristles. Antennae 15-jointed, slender and long, measuring c. 1.7 mm. First scapal joint subspherical, second fig-shaped, sparsely setaceous. Flagella more slender than scape, dark yellowish, densely pubescent throughout, but with no bristles. First flagellar joint more than twice as long as broad, proximal half slightly narrow and light. Succeeding joints cylindrical, slightly tapering apically, about twice as long as broad. Last joint ellipsoidal, slightly thicker and shorter than the penultimate, with a few short setae apically. Clypeus dark brown, sparsely setaceous. Labrum short, together with the clypeus slightly longer than the height of head. Mandibles absent. Blades of maxilla slender. Maxillary-palpi 5-jointed, second to fourth joints subequal, about twice as long as broad; last joint pale, slender, 2.5 times as long as the fourth.

Thorax. Mesonotum blackish brown, very sparsely setaceous except for the postscutellum. Wings (fig. 4) broad, membrane subhyaline, except for opaque costal cell and somewhat smoky apical area. Macrotrichia on wing margins,  $R_1$  and radial branches. Microtrichia dense, but minute. *Sc* rudimentary, scarcely attaining the base of *Rs*. *Rs* thrice as long as the base of  $R_{4+5}$ , and more than 1.5 times the *r-m*. Halteres well developed.

|          | Femora  | Tibiae  | Tarsi   |
|----------|---------|---------|---------|
| Forelegs | 2.1 mm. | 2.3 mm. | 3.3 mm. |
| Midlegs  | 2.5 mm. | 2.3 mm. | 3.4 mm. |
| Hindlegs | 3.6 mm. | 3.0 mm. | 2.6 mm. |

Legs slender, dark brown, hind pairs somewhat lighter and more than twice as thick as the others. In a larger specimen measuring as mentioned.

Trochanters in forelegs about thrice, in midlegs twice, in hindlegs 1.5 times as long as broad. Tibial spurs 0.01; slender and delicate, sparsely setaceous, nearly 1.5 times the tibial diameter. First tarsal joint in fore- and midlegs about as long as succeeding three joints together, in hindlegs slightly longer than the rest of tarsi. Last joint nearly cylindrical, subequal to the fourth in fore- and midlegs, in hindlegs definitely longer than the fourth. Claws (figs. 5, 6) small, especially in hind tarsi; mainly microscopically setaceous, with a few stout bristles near the base. Empodia rudimentary.

Abdomen dark brown, ventral lighter. Tergites rather densely covered by short black setae; sternites sparsely setaceous. Hypopygium (figs. 7, 8). Ninth tergite transverse, sparsely setaceous. Tenth tergite black, slightly bilobed, densely setaceous. Ninth sternite longer than broad, posterior margin concave, dorsal portion densely setaceous. Dorsal lobe of claspers black, densely setaceous; ventral lobe broadened apically, membranous and glabrous. Dorsal dististyles slender, heavily chitinized.

*Female* (3 specimens, of which one was extracted from pupa). Body c. 4.8 mm., wing c. 5.3 mm.

Head (fig. 9) transverse. Eyes separated and divided. Upper divisions rudimentary, margins of which unfacetted, facetted area subequal to ocellar protuberance. Facets of upper division brownish, even smaller than those of blackish lower divisions. Ocelli large, nearly pale. Antennae slender and short, c. 1 mm., dark brown, 15-jointed. Flagella more slender than scape, rather densely setaceous throughout, tapering apically; penultimate joint shorter than broad and tending to fuse with the last. Last joint pale, 1.5 times as long as broad, but not much thicker than the others. Labrum rather short. Mandibles entirely reduced. Blades of maxilla slender. Last joint of maxillary palpi pale, 2.5 times as long as the fourth. Mesonotum light yellowish brown, sparsely setaceous. Wings as in male. Legs measuring as follows in a specimen:

|          | Femora  | Tibiae  | Tarsi   |
|----------|---------|---------|---------|
| Forelegs | 2.2 mm. | 1.7 mm. | 2.3 mm. |
| Midlegs  | 2.5 mm. | 1.8 mm. | 2.0 mm. |
| Hindlegs | 3.3 mm. | 2.7 mm. | 2.5 mm. |

Fore trochanters more than thrice as long as broad. Tibial spurs as in male. Tarsal joints obliquely articulated; last joint nearly cylindrical, more than 1.5 times as long as the fourth in each leg. Claws (fig. 10) thick and short, strongly curved, nearly glabrous. Abdomen thickened, dark brown, with very short black setae. Hypopygium (fig. 11). Eighth sternite

concave posteriorly. Median lobe of ninth sternite anteriorly chitinized, posteriorly with a pair of flat processes. Cerci slender, densely setaceous, nearly as long as the basal breadth of the segment. Ninth tergite slightly concave posteriorly, with long bristles. Tenth tergite pale, with short stiff bristles arising from papillae.

*Pupa* (18 specimens and several exuviae) (fig. 12). Male pupa: length 3.7-4 mm.; breadth 1.7-2 mm. Female pupa: length 4.4-5.6 mm.; breadth 2.2-3 mm. Body elliptic, convex dorsally, outer margin undulated. Dorsal side blackish brown. Respiratory horns nearly erect, the bases broadly separated, but the apices nearly contiguous. Each horn with four, closely set, subsimilar, flat, bluntly pointed, black lamellae, of which second and third lamellae slightly smaller and delicate. Mesothorax without granulation, median area of which slightly crumpled. Thick granulation of minute, black, circular, flat granules on most of the metathorax and whole of the abdomen. Boundary of second and third abdominal segments partly ungranulated, and the granules of caudal segment very minute. Adhesive pads elliptic. Residua of segmental gill-tufts of larva preserved.

*Larva. Fourth instar* (a single specimen still immature) (fig. 13). Length c. 3.7 mm., breadth c. 1.1 mm. Neck-pieces obvious. Dorsal side obscure brownish yellow; ventral yellowish pale, with very short brownish setae. Antennae subequally 2-jointed,  $1/3$  the first body-segment, articular portions of both joints pale. No chitin warts on the dorsal side, but the usual area somewhat lighter. Claws thick, densely setaceous, about 1.5 times as long as their basal diameter. Posterior feeler of the sixth segment rather small, slightly longer than its basal diameter. Rudiments of anterior feeler scarcely developed. Lateral appendages of seventh segment about 1.5 times as long as their basal diameter. Caudal appendages rather short. Segmental gill-tufts with seven white, slender, short filaments directed anteriorly. Anal gill large. Suckers large.

*Third instar* (3 specimens). Length 2.1-3 mm. Neck-pieces obvious. Dorsal side obscure brownish yellow; ventral yellowish pale, nearly glabrous. Antennae 2-jointed, distal joint slightly longer and thicker. A dark spot on the dorsal side of first five abdominal segments. Claws longer than their basal diameter, densely setaceous. Posterior feelers distinct in posterior body-segments. Caudal appendages scarcely as long as their basal diameter, well chitinized. Segmental gill-tufts with four filaments; additional three filaments of next stage often detected under the skin.

*Second instar* (2 specimens). Length 1.7-2.5 mm. Body slender, neck-pieces obvious. Dorsal side obscure yellowish, sparsely setaceous; ventral yellowish pale, glabrous. First body segment subcircular. Antennae unequally 2-jointed, distal joint much longer and thicker, pointed apically. Dorso-median area of each segment slightly darker. Claws sparsely setaceous. Feelers reduced, represented by a few short bristles. Caudal appendages rudimentary. Gill-tufts with a unique filament directed anteriorly.

Localities and data of collection of the species:

| Date         | Locality             | Altitude | Data                              | W. t. | Collector |
|--------------|----------------------|----------|-----------------------------------|-------|-----------|
| 22. VII, '35 | Sirasetu (Taityû)    | 2,000 m. | Larva (iv)                        | 15°C  | UÉNO      |
| 24. VII, '38 | Taroko Canyon        | 150 m.   | Pupa                              | 19°   | KITAKAMI  |
| "            | Rotyen-kei (,,)      | 200 m.   | ♂♀, Pupa, Larva<br>(iv, iii, ii)  | 22°   | "         |
| 25. VII, '38 | Hukamidu-onsen (,,)  | 760 m.   | Pupa, Larva (iv, iii)             | 18°   | "         |
| 26. VII, '38 | Rotyen-kei (,,)      | 200 m.   | ♂                                 |       | "         |
| 29. VII, '38 | Sinboku (Mt. Arisan) | 2,100 m. | Pupa (♂♀), Larva<br>(iv, iii, ii) | 13°   | "         |

## 3a. Specimens from Mt. Arisan

*Male* (2 specimens extracted from pupa). Differs from the Rotyen-kei specimens in the characteristics of antennae: flagellar joints fully as thick as the scape, and the last joint smaller than the penultimate (fig. 14). Antennae c. 2 mm. Ocelli brownish. Wings c. 5 mm., breadth c. 2.1 mm. Anal lobe fairly well developed. Last tarsal joint nearly as long as the fourth in each leg. Hypopygium (figs. 15, 16).

*Female* (a single specimen extracted from pupa). Antennae (fig. 17) slender and short, less than 1 mm.; last joint thicker and nearly twice as long as the penultimate.

*Pupa* (5 specimens and 3 exuviae). Male pupa: length 4.4-4.8 mm., breadth 2.2-2.3 mm. Female pupa: length c. 5 mm., breadth c. 2.5 mm.

*Larva. Fourth instar* (2 specimens) (Text-fig. 1, A, a). Full-grown larva 7.3 mm. in length, breadth except claws 2.2 mm. Immature specimen c. 6 mm. Dorsal side blackish brown or obscure brownish yellow, densely set with slender pale bristles; ventral white. Antennae 1/4 the first body-segment. Thoracic spot V-shaped, blackish. A small wart on the dorsal side of first four or five abdominal segments. Claws thick, not much elongated. Posterior feelers brownish, with pale bristles. Rudiments of anterior feeler with a few rather long bristles. Caudal appendages 1.5 times as long as their basal diameter.

*Third instar* (a single specimen) (fig. 18). Length 5.8 mm., width 1.4 mm. Warts on the dorsal side very small. Rudiments of anterior feeler scarcely persisting.

*Second instar* (3 specimens) (fig. 19). Length 1.7-2.5 mm. Warts on the dorsal side quite rudimentary, but usual area darker.

## 3b. Specimens from Hukamidu-onsen.

*Pupa* (a single exuvia). Length c. 4 mm., width c. 2 mm. Brownish black. Median anterior margin of first five abdominal segments partly ungranulated.

*Larva. Fourth instar* (5 specimens) (Text-fig. 1, B, b). Differs from those of other localities in having a glassy plate on the tergite, lightness of in-

tegument, conspicuousness of posterior feeler, etc. Length 5.7-6.5 mm.; width c. 2 mm., including claws c. 2.5 mm. Dorsal side obscure greyish pale, with yellowish nuance; full-grown larva somewhat blackish; ventral white. Antennae about 1/5 the first body-segment. Thoracic spot V-shaped. A transparent, light brownish, circular, glassy plate present at the dorsal side of first five abdominal segments; the plate having a small chitin tubercle at its center. Claws twice as long as their basal diameter. Posterior feelers rather conspicuous, directed postero-laterally. Rudiments of anterior feeler scarcely developed. Caudal appendages rather conspicuous.

*Third instar* (a single specimen). Length 4.7 mm., width 1.2 mm. Dorsal side obscure greyish with brownish nuance; ventral yellowish pale. A small dark spot on first four abdominal segments.

#### 4. *Blepharocera uenoi* KITAKAMI (1937)

KITAKAMI, 1937; p. 125-126.

Described from the larvae of fourth stage. A supplementary note will be given below.

A full-grown larva measuring: length 6.7 mm.; width 2.6 mm., including claws 3.5 mm. Thoracic spot very large, more than half the breadth of the segment. Thorns (Text-fig. 2, A, B) very stout, nearly twice as long as their basal diameter. Inserted in the thorn is a black inner thorn, which is nearly twice as long as its basal diameter, and about 1/2 the length of the outer thorn. Claws elongated, nearly 2.5 times as long as their basal diameter. Posterior feeler of sixth segment twice as long as its basal diameter, and about 1/3 the length of the claw. Caudal appendages twice as long as their basal diameter.

This species is readily distinguished from other forms of Formosan *Blepharocera* by its conspicuous thorns, huge thoracic spot, long claws and caudal appendages, sparsely set bristles, etc.

From the features revealed under the skin of the mature larva, the following may be assumed to be characteristics of the pupa. (1) Respiratory horns very large. (2) A black thorn present on the tergites of second to fourth abdominal segments. (3) Microgranules black, subcircular and flat; densely distributed on the metathorax and whole abdomen. (4) Median anterior margin of first five abdominal segments partly ungranulated.

Locality: Sirasetu (upper stream of the Daiko-kei River, Prov. of Taitû; altitude c. 2000 m.; water temperature c. 15° C).

Collector: Dr. M. Uéno (22. VII, '35).

#### 5. *Apistomyia nigra* sp. nov.

*Female* (2 specimens). Body 4.2-4.5 mm.; wing 5-5.3 mm., breadth 1.7-1.8 mm.; proboscis 1.7-1.9 mm.

Head (fig. 20) blackish. Eyes broadly separated from each other, divided. Upper divisions very small, 1/5 the height of eyes; facets large and yellowish brown, their diameter 1.5 times the small facet of lower divisions.



Lower divisions large, with small blackish facets ; several facets fringing the upper margin much lighter and brownish. Ocelli yellowish. Occiput blackish, very sparsely setaceous. Frons and vertex broad, blackish but partly silvery. Antennae 10-jointed, very short, brownish black, sparsely setaceous throughout. First scapal joint about as long as broad ; second largest of all, gradually swollen apically, apical diameter being more than twice the base. Flagella very thin, pubescent, joints much shorter than broad, except for the first and last. First flagellar joint 1.5 times as long as broad and about twice the second. Last joint ellipsoidal, without setae, slightly broader than preceding joints, nearly thrice as long as penultimate. Clypeus conspicuous, nearly glabrous, brownish black, but partly silvery. Labrum elongated, proximal two-thirds blackish, apical portion lighter. Mandibles slender, shorter than labrum, with many fine denticles. Hypopharynx slender, longer than mandibles, but slightly shorter than labrum. Blades of maxilla slightly curved, yellowish. Maxillary-palpi jointless, ellipsoidal, 1/3 as long as blades, black with several bristles. Labium much elongated, more than twice the height of head, usually separated from remaining mouth-parts. Basal part of labium black and setaceous, but its dorsal surface membranous and lighter, being 2-jointed ; proximal joint nearly as long as the blades of maxilla, distal joint about equal to labrum. Labial palpi much elongated, slightly longer than the basal part of labium, cylindrical, but apically tapering, tips pointed and slightly divergent, brownish black and very sparsely setaceous proximally.

Thorax. Mesonotum black, nearly glabrous, but together with pleurae partly silvery. Wings (fig. 21) rather narrow, membrane quite glassy, except for opaque costal cell and two smoky dark spots on the wing apex and anal lobe. Macrotrichia very short, confined to wing margins. Microtrichia very minute and sparse. Venation: Costa very stout, black, apparently divided into two, closely set veins on its distal two-thirds; Sc rudimentary, faintly persisting at the base of costal cell;  $R_1$  stout and blackish, but somewhat atrophied apically; Rs simple, distally curved upwards, ending very close to the tip of  $R_1$ , proximal and distal portions running very close to  $R_1$ , basal deflection rudimentary;  $r-m$  oblique, slightly sinuous, apparently aligned with Rs; M simple;  $Cu$  bifurcated near its base; An not attaining wing margin, basal portion faint. Dark spot at the wing apex subcircular, tinted blackish. Anal lobe right-angular, angular area tinted blackish. Posterior wing margin from the base to anal angle chitinized, blackish. Secondary venation distinct. Halteres brownish, glabrous.

|          | Femora  | Tibiae  | Tarsi   |
|----------|---------|---------|---------|
| Forelegs | 1.2 mm. | 1.7 mm. | 1.9 mm. |
| Midlegs  | 1.4 mm. | 1.5 mm. | 1.5 mm. |
| Hindlegs | 3.7 mm. | 3.6 mm. | 4.2 mm. |

Legs. Fore- and midlegs very short, hindlegs slender and long; measuring in a larger specimen as mentioned above.

Fore- and midlegs dark brown to blackish, except for yellowish brown mid-coxae and proximal 1/3 of femora. In hindlegs, distal 2/3 of femora, proximal 1/3 and tip of tibiae, tips of first four and whole fifth tarsal joints, blackish; remaining portions more or less light. Front trochanters twice as long as broad. Femora club-shaped; front pair slightly curved and thickened in distal 2/3, while hind pair thickened near the tip. Tibial spurs 0.0.2, stout and long, subequal in size, nearly twice the tibial diameter, black with minute pubescence. Black spiny bristles present on flexor surface of distal 1/3 of tibiae and all tarsal joints in fore- and midlegs, of which those of tibiae and first tarsal joints are remarkable; in hindlegs sparsely set, confined to first three tarsal joints. Last tarsal joints 1.5 times as long as the fourth in fore- and midlegs, in hindlegs fairly shorter than fourth. Claws (fig. 22) of each leg black, toothed and setaceous on proximal two-thirds; denticles are usually four or five, nearly similar in size. Empodia rudimentary.

Abdomen. Tergites blackish brown, except that the antero-lateral margins of each segment are silvery; very finely and sparsely pubescent. Lateral membrane broad, obscurely pale, very slightly crumpled longitudinally. Sternites very narrow, longitudinal, glabrous and obscure brownish. Seventh sternite transverse, sparsely setaceous and dark brown. Hypopygium (fig. 23) rather elongated. Eighth tergite small, blackish. Ninth tergite transverse, black, with long bristles posteriorly. Tenth segment laterally bilobed, distally set with short stiff bristles arising from papillae. Eighth sternite blackish, pubescent, deeply concave posteriorly. Anterior part of ninth sternite blackish, pubescent; posterior part with a deep cleft posteriorly, pubescent. Cerci elongated, 1.5 times as long as the basal breadth of segment, setaceous; apical 1/3 free, the tip with a few short stiff bristles arising from cylindrical papillae.

*Pupa* (3 specimens more or less damaged) (fig. 24). Length 3.1-3.5mm.; breadth 1.5-1.7 mm. Body rather elongated elliptic, strongly convex dorsally, outer margin undulated. Mesothorax highest and the third abdominal segment broadest. Dorsal side brownish black. Respiratory horns with four lamellae of different sizes. First and fourth pairs of lamellae contiguous, B-shaped, distal margins blackish. First lamella largest, semicircular, obliquely directed forwards; fourth lamella nearly erect. Second and third pairs of lamellae small, membranous and brown, closely set before and behind, entirely surrounded by the rest of lamellae. Second lamella M-shaped or apically bilobed and pointed, inner lobe larger. Third lamella sharply triangular or dagger-shaped, the base much shorter than that of the second, situated innermost. Head conspicuous, mainly faced forwards. Lateral margins of the head and prothorax slightly projected forwards. Microgranulations densely set on most of the anterior mesothorax, median half of posterior mesothorax, most of the metathorax and

whole of the abdomen. Granules minute, semispherical, brownish black. Macrogranulation rather inconspicuous. Four pairs of large adhesive pads on the third to sixth abdominal segments. Ventral margins of anterior mesothorax, seventh and last abdominal segments granulated. No residua of segmental gill-tuft.

*Larva. Fourth instar* (13 specimens) (figs. 25-28).

Nearly full-grown larva measuring: length c. 4.7 mm.; breadth c. 1.4 mm., including fulcra c. 2 mm. Immature specimen after moulting: length c. 3.5 mm., breadth c. 0.9 mm. Specimens from Mt. Arisan are somewhat larger measuring 4.5-5.3 mm. in length, though they are all still immature.

Body flattened, neck-pieces obvious. First body-segment slightly shorter than broad. Dorsal integument brownish black, except that the marginal area is lighter. Ventral side light yellowish brown, very sparsely set with short setae. Antennae black, about  $\frac{1}{3}$  as long as the first body-segment, subequally 2-jointed; proximal joint slightly thickened apically, 4 or 5 times as long as broad; second slender, with a few pale prominences at the tip, of which one is long. First six abdominal segments each with a pair of transverse rows of black nodules and blunted thornlets. Nodules are very closely set, forming a pair of black bands; in immature specimens somewhat pointed. Thornlets are confined to lateral area, being conical, usually 1.5 times as long as their basal diameter. On the apex of each thornlet is a pale stiff papilla-like bristle, which is more than  $\frac{1}{2}$  as long as the thornlet. Between the rows of nodules and thornlets is a third row of nodules rather irregularly and sparsely set; two intermediate rows are often seen in Arisan specimens. Thorax and last body-segment also usually with two rows of nodules sparsely set. Fulcra not much chitinised, densely set with long pale bristles at the distal dorsal surface. Last two body-segments rather distinct. Seventh abdominal segment with a pair of rudimentary fulcra. Caudal margin nearly semicircular, not chitinised, with several short bristles. Segmental gill-tufts each with five slender pale filaments, of which three are directed forward and two usually backward. Innermost two are usually longer than the rest, each with a constriction at the middle and then curved. Anal gill short. Suckers large,  $\frac{1}{3}$  or  $\frac{1}{4}$  the breadth of segment. Sucker and fulcra of the first body-segment smaller.

*Third instar* (8 specimens). Length 2.2-3.4 mm. Dorsal side blackish, ventral nearly pale and glabrous. Antennae black, subequally 2-jointed, joints more than thrice as long as broad. Thornlets very sparsely set. Fulcra nearly cylindrical, bristles rather sparse. Segmental gill-tufts with three filaments, of which two directed forward and one backward. Anteriorly directed inner filament constricted, but in Arisan specimens not constricted.

Localities and data of collection as in the following table.

Life cycle and mode of living: presumably polygenerative perennial-type; pupae and larvae are prevalent on the rocks where the water is rushing and spraying. The flight of the female is very active.

| Date         | Locality                   | Altitude | Data                     | W. t. | Collector |
|--------------|----------------------------|----------|--------------------------|-------|-----------|
| 24. VII, '38 | Rotyen-kei (Taroko Canyon) | 200 m.   | ♀, Pupa, Larva (iv, iii) | 22°C  | KITAKAMI  |
| 26. VII, '38 | "                          | "        | ♀                        |       | "         |
| 29. VII, '38 | Heisyana (Mt. Arisan)      | 1700 m.  | Larva (iv, iii)          | 16°   | "         |

The female of this species is readily distinguished from that of *Apistomyia uenoi* (KITAKAMI) by its small size, blackish coloration, the number of teeth of claws, quite glassy membrane of wings, presence of blackish area on the anal angle of wings, etc.

The pupa is also different in the small size, blackish coloration, blackish microgranules, etc.

The larva of fourth stage differs in its small size, long and slender antennae, presence of the intermediate row of nodules, form of thornlets, sparsely setaceous fulcra, long and slender filament of segmental gills, etc.

#### 6. *Apistomyia uenoi* (KITAKAMI) (1931).

*Curupira uenoi*; KITAKAMI, 1931; p. 103-104.

*Apistomyia uenoi*; KITAKAMI, 1937; p. 127-133.

Different stages of metamorphosis have already been described. Here will be given a short supplementary note, and some figures of larval stages lacking in my previous papers.

*Male* (dissected from pupa). Body c. 4-4.5 mm.; proboscis c. 2.4 mm. Eyes contiguous, divided. Facets of upper divisions large and brownish.

*Female*. Body 4.8-6.4 mm. Wing 5.8-7 mm., breadth 2-2.2 mm. Dark brown. Eyes separated, divided. Facets of upper divisions slightly larger and brownish. Mandibles very slender, denticles very fine. Claws of each leg usually with seven denticles. Wing membrane glassy, though very slightly tinted brownish. Dark spot at the wing apex brownish. Margins of anal lobe scarcely tinted brownish. Halteres nearly glabrous.

*Pupa*. Length 3.5-4.7 mm.; width 1.7-2.5 mm. Female pupa larger. Dorsal side usually dark brown. Microgranules blackish brown, though some on the abdomen yellowish.

*Larva. Fourth instar* (figs. 29-31). Full-grown larva 5.5-7 mm.; width 1.7-2.1 mm., including fulcra 2.3-3 mm. Immature forms after moulting 3.4-4 mm. Dorsal side dark brown, marginal area somewhat lighter. Antennae black, 1/5 the first body-segment; proximal joint slightly more than thrice, distal joint 4 times as long as broad. Thornlets are rather densely set, each consisting of a conical prominence and a sharp black spinelet, which is usually longer than the former (fig. 31). Caudal margin rather densely set with short spiny bristles. Segmental gill-tufts (fig. 30) with slender short filaments, of which innermost two are slightly longer, constricted beyond the middle and then curved.

*Third instar.* Length 1.6-3.4 mm. Proximal joint of antennae less than twice, distal joint more than thrice as long as broad. Filaments of segmental gill-tufts very small, 3 or 4 times as long as broad, without constriction.

*Second instar* (fig. 32). Length 0.8-1.5 mm. Proximal joint of antennae rudimentary, while distal joint thrice as long as broad. Filament of gill-tufts unique.

*First instar* (fig. 33). Length about 0.8 mm. Antennae jointless, 4 times as long as broad. Thornlets very sparse. Fulcra conspicuous, slightly tapering apically; set with a few minute thornlets, a long bristle and several short stiff setae. No segmental gill-tuft.

Localities and data of collection since 1937 as follows:

| Date         | Locality                         | Altitude | Data                           | W. t. | Collector |
|--------------|----------------------------------|----------|--------------------------------|-------|-----------|
| 6. IV, '37   | Tarumidu(Gokanogyô,<br>Kyûsyû)   | 700 m.   | Larva (iv, iii, ii)            | 9°C   | KITAKAMI  |
| „            | Meganebasi ( „ )                 | 500 m.   | Larva (iv, iii)                |       | „         |
| „            | Kamiaredi ( „ )                  | 400 m.   | Pupa, Larva (iv, iii)          | 10°   | „         |
| 7. IV, '37   | Tôdi (Prov. Higo,<br>Kyûsyû)     | 300 m.   | Larva (iv)                     | 11°   | „         |
| 20. VI, '37  | Nyûzan (Nagawa,<br>Prov. Sinano) | 950 m.   | Pupa, Larva (iv)               | 11°   | „         |
| 21. VI, '37  | Simasima(Prov.Sinano)            | 800 m.   | Pupa                           | 10°   | „         |
| 17. VII, '37 | Anbô (Yaku-sima I.,<br>Kyûsyû)   | 200 m.   | Pupa (ex.), Larva<br>(iv, iii) | 20°   | „         |
| „            | Odati-dake ( „ )                 | 400 m.   | Pupa, Larva (iv)               |       | „         |
| „            | Kosugitani ( „ )                 | 600 m.   | Larva (iii)                    | 18°   | „         |
| 19. VII, '37 | Miazono (Prov. Higo,<br>Kyûsyû)  | 350 m.   | Larva (iv)                     | 20°   | „         |
| „            | Kamiaredi(Gokanogyô,<br>Kyûsyû)  | 400 m.   | Larva (iv, iii, ii)            | 19°   | „         |
| 20. VII, '37 | Tarumidu ( „ )                   | 700 m.   | Larva (iv, iii)                | 18°   | „         |
| 1. VIII, '37 | Nyûzan (Nagawa,<br>Prov. Sinano) | 950 m.   | Pupa, Larva (ii, i)            | 15°   | „         |
| 31 VIII, '37 | „                                | „        | Pupa, Larva (iii, ii,i)        | 13°   | „         |

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**Explanation of Plates**

**Plate I.**

*Philorus taiwanensis* KITAKAMI.

- Fig. 1. Head of female (extracted from pupa); dorsal view,  $\times 25$ .  
2. Larva, first instar; dorsal view,  $\times 40$ .

*Blepharocera taiwanica* KITAKAMI.

Specimens from Rotyen-kei

- Fig. 3. Head of male (intermediate flagellar joints omitted); dorsal view,  $\times 25$ .  
4. Wing of male,  $\times 25$ .  
5. Fore-tarsus of male,  $\times 150$ .  
6. Hind-tarsus of male,  $\times 150$ .  
7. Male hypopygium; dorsal view,  $\times 40$ .  
8. " ; ventral view,  $\times 40$ .  
9. Head of female, dorsal view,  $\times 25$ .  
10. Hind-tarsus of female,  $\times 150$ .  
11. Female hypopygium, ventral view,  $\times 40$ .  
12. Pupa (male), dorsal view,  $\times 12$ .  
13. Larva, fourth instar (immature), last three body-segments; ventral view,  $\times 25$ .

Specimens from Mt. Arisan.

- Fig. 14. Head of male (extracted from pupa), (intermediate flagellar joints omitted); dorsal view,  $\times 25$ .  
15. Male hypopygium (extracted from pupa); dorsal view,  $\times 40$ .  
16. " ; ventral view,  $\times 40$ .  
17. Antenna of female (extracted from pupa),  $\times 40$ .  
18. Larva, third instar, last two body-segments; ventral view  $\times 22$ .  
19. Second instar, last three body-segments; ventral view,  $\times 40$ .

**Plate II.**

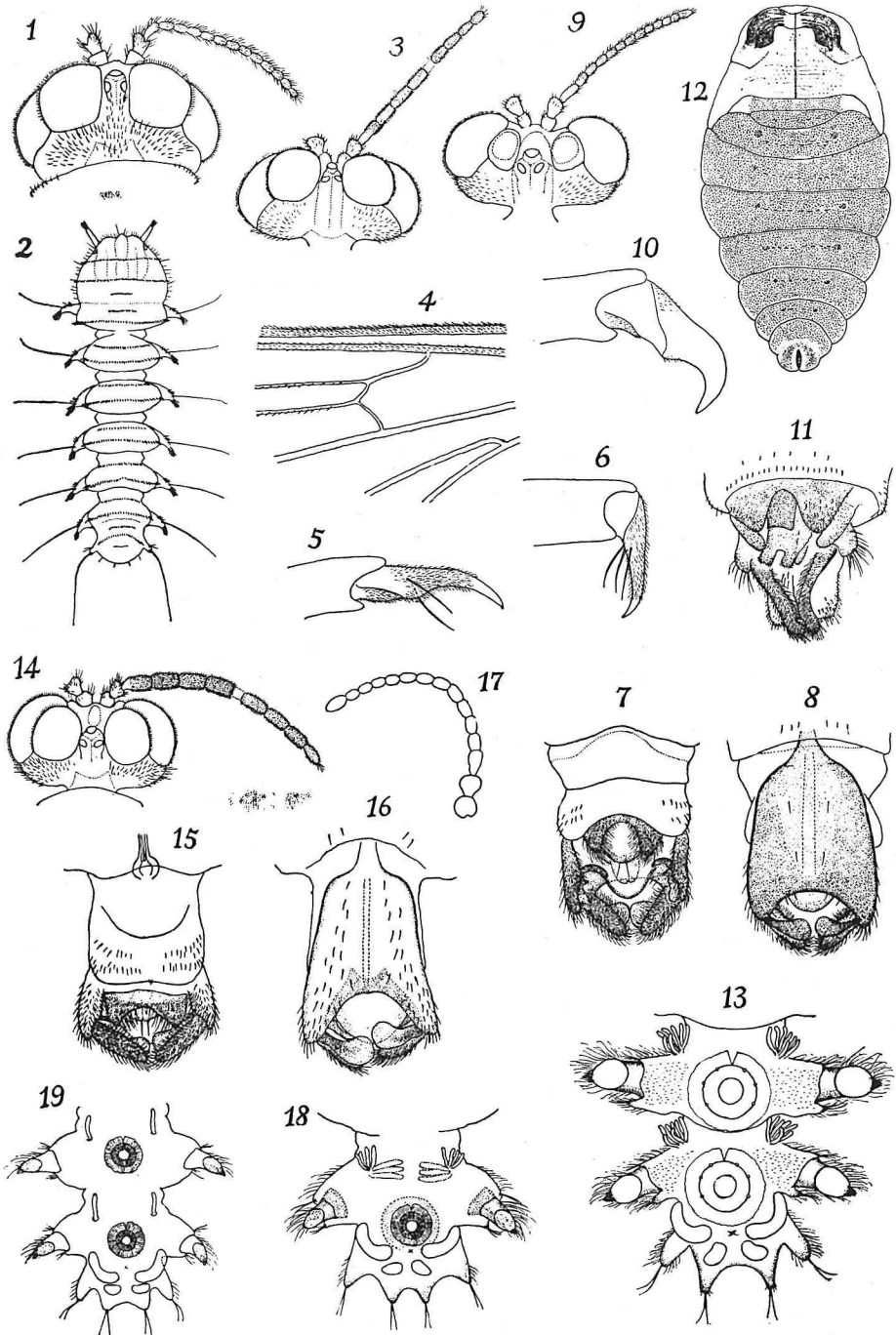
*Apistomyia nigra* sp. nov.

- Fig. 20. Head of female, lateral view,  $\times 25$ .  
21. Wing of female,  $\times 12$ .  
22. Hind-tarsus of female,  $\times 150$ .  
23. Female hypopygium, ventral view,  $\times 40$ .  
24. Pupa, dorsal view,  $\times 25$ .  
25. Larva, fourth instar (nearly full-grown); dorsal view,  $\times 12$ .  
26. " ; fifth body-segment, dorsal view,  $\times 25$ .  
27. " (immature); second body-segment, ventral view,  $\times 25$ .  
28. " (immature); last two body-segments, ventral view,  $\times 25$ .

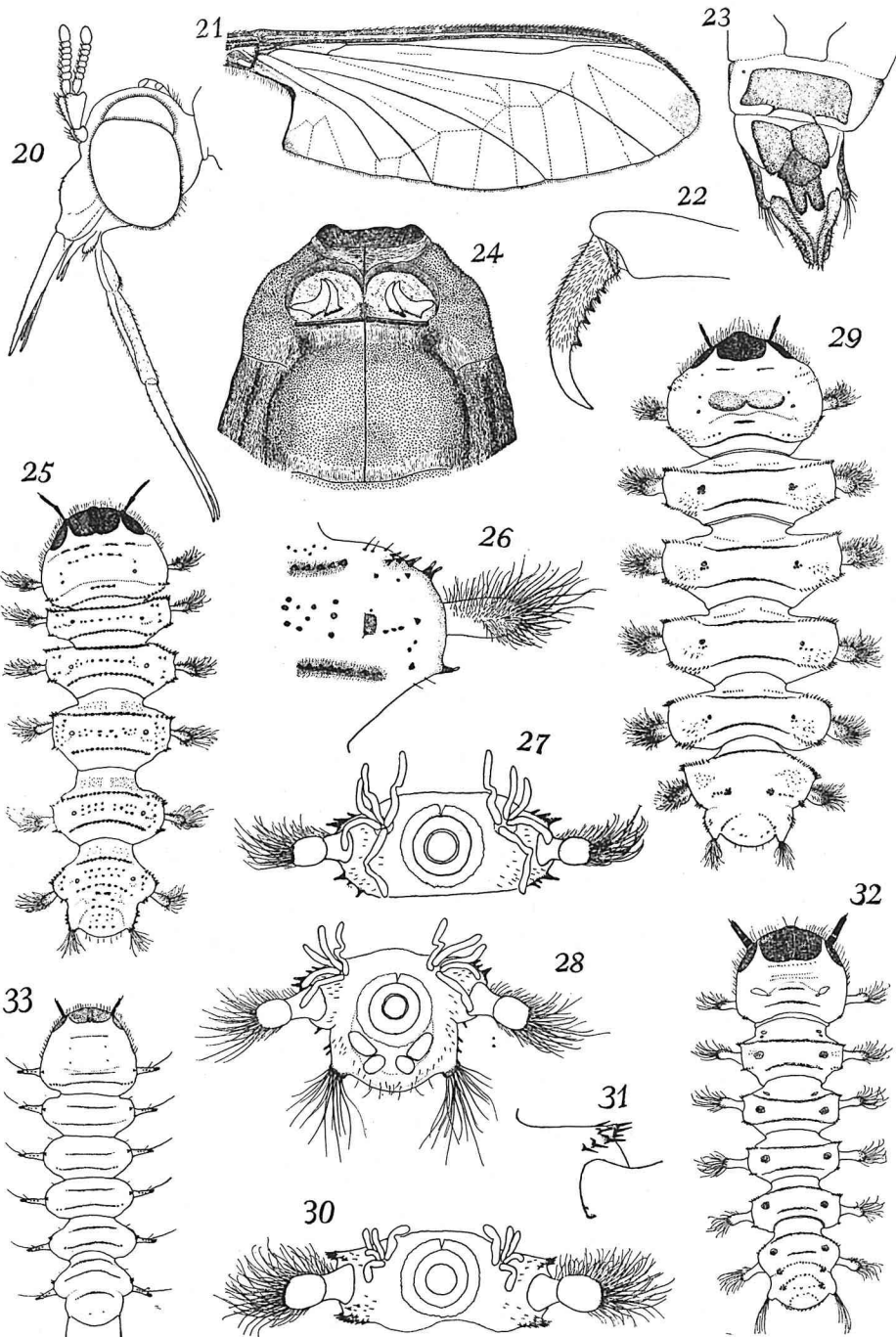
*Apistomyia uenoi* (KITAKAMI)

- Fig. 29. Larva, fourth instar (full-grown); dorsal view,  $\times 12$ .  
30. „ (immature); second body-segment, ventral view,  $\times 25$ .  
31. „ (immature); antero-lateral margin of sixth body-segment, ventral view,  
 $\times 40$ .  
32. Second instar, dorsal view,  $\times 40$ .  
33. First instar, dorsal view,  $\times 40$ .
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S. KITAKAMI del.



S. KITAKAMI del.