

昭和三十三年十月十五日印刷

編集者 福岡昆虫学会

印刷者 藤次郎

印刷所 秀巧社印刷株式会社

Vol. 38, Pars 4

MUSHI

30. 15. X. 1964

Published by the Fukuoka Entomological Society, c/o Entomological Laboratory,
Faculty of Agriculture, Kyushu University, Fukuoka

STONEFLY AND MAYFLY NYMPHS FROM THE CAVES
OF OKINOERABU, ONE OF THE RYUKYU ISLANDS*

By Teizi Kawai†

The specimens upon which the present paper is based have come from the collection made by Dr. Shun-Ichi Uéno and Mr. Yoshinobu Morimoto in the caves of Okinoerabu, one of the Ryukyu Islands, in the summer of 1958. The specimens in four vials consist of seven small and young nymphs, which belong to one genus of Plecoptera and three genera of two families of Ephemeroptera. I should like to reserve the specific identification of them, because of very small and young nymphs.

It is my pleasure to thank Dr. Shun-Ichi Uéno and Mr. Yoshinobu Morimoto for their kindness in placing their collection at my disposal for study.

Nemoura sp. (sp. No. 104)

Two very young nymphs.

Length of body

1.2 mm

1.1 mm

Length of cercus

— (broken off)

0.6 mm

Body somewhat tapering posteriorly. General colour pale yellowish brown. Head rounded, a little wider than pronotum, widest across the small compound eyes, without ocelli and markings (Pl. I, fig. 1). Mouth-parts typical to those of the genus *Nemoura*. Antenna broken off its tip, but basal joints provided on distal margin with minute bristles which decrease in length towards distal joints (Pl. I, fig. 3). Without gills on cervical region.

Pronotum quadrate, narrowed behind, angles not rounded. Mesonotum larger than metanotum and smaller than pronotum. Wing pads not developed. No markings. Legs rather stout, covered with bristles and hairs. Hind leg the longest and fore leg the shortest. Each femur (Pl. I, figs. 2, 2a, 2b, 2c) fringed with a group of minute bristles at middle of posterior margin; each tibia with

* Contribution No. 43 from the Spelaeological Society of Japan; Biospeological Results of the Ryukyu Expedition 1958 of Kyoto University, No. 6.

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minute bristles scattered on anterior and posterior margins; with three tarsal segments, the second the shortest and the third longer than first and second together, each tarsal segment without a row of hairs; claw of each leg strong and pointed (Pl. I, fig. 2d).

Abdomen cylindrical, tapering posteriorly (Pl. I, fig. 1). Each tergum covered with small bristles and a row of hairs located on hind margin (Pl. I, fig. 4). Cercus broken off its tip; somewhat moniliform, increasing in length in distal joints; basal joints cylindrical; hind margin of cercal joints with sharp strong bristles which increase in length towards distal joints (Pl. I, fig. 6).

Locality: Tamina-no-hô Cave at Tamina, China-chô, Isl. of Okinoerabu, 6-VIII-1958, S. Uéno and Y. Morimoto leg.

Caenis sp.

One nymph, body length 3 mm, caudal filaments 2 mm.

Body small and delicate, widest across the wing pad (Pl. II, fig. 1). General colour brown; abdomen, appendages and antennae paler than the other parts.

Head wider than pronotum, with remarkable brown markings on central and occipital regions; compound eyes small, situated on lateral side, somewhat projected laterally (Pl. II, fig. 1); with three crescent-shaped ocelli, posterior two of which are close to compound eyes and the distance between which is about four times as far as that between posterior one and inner margin of compound eye. Antennae very slender, weak, and about two-thirds (2 mm) as long as body, basal two segments thicker than others.

Pronotum quadrate, anterior margin a little wider than the posterior, both margins concave, antero-lateral angles a little projected forward, dark on middle and on almost lateral sides (Pl. II, fig. 1).

Mouth-parts are shown in Plate II, figs. 2, 2a, 3 and 3a. Maxillary palp longer than lacinia (Pl. II, fig. 3); last palpal joint slender, covered with hairs; galealacinia terminated into two pointed teeth (Pl. II, fig. 3a). Labrum (Pl. II, fig. 4) quadrangular, wider than long, anterior margin rounded, concave at middle, and provided with hairs. Mandibles (Pl. II, fig. 2) not slender, canine bears four pointed teeth (Pl. II, fig. 2a), of which the innermost is the largest and more pointed at tip.

Abdomen tapering posteriorly, two brown markings situated on each side of four hind segments. First pair of gills (Pl. II, fig. 5) markedly reduced, rod-like simple filament. Second pair of gills (Pl. II, fig. 6) very large, covering completely the remaining four pairs of gills; quadrate in form, fringed with long soft hairs on margin, and on postero-lateral corner present small bristles which have rounded tip. From the third to sixth gills smaller, delicate, thin and membranous lamellae, first two gills (Pl. II, fig. 7) rounded triangular and others quadrate-oblong in shape, and fringed with long branched respiratory filaments.

Legs slender, covered with hairs and bristles; in fore leg (Pl. III, fig. 1), several very small bristles of round tips scattered on dorsal and posterior sides of femur, about two-thirds before (Pl. III, fig. 1a); a row of small bristles of

pointed tips located on anterior margin of tibia; distal end bears two spine-like bristles, one of which is hairy and the other hairless (Pl. III, fig. 1b); tarsus nearly as long as tibia, covered with hairs; in mid leg (Pl. III, fig. 2), present very small bristles of rounded tips, hairs and fine soft hairs scattered on dorsal surface of femur; very small pointed bristles and fine soft hairs scattered on dorsal side of tibia; tarsus nearly as long as tibia, fringed along inner side with a row of small pointed bristles, distal two of which are hairy, and others hairless (Pl. III, fig. 2a); in hind leg (Pl. III, fig. 3), a row of small bristles of round tips arranged along anterior and posterior margins of femur; tibia covered with soft hairs and fringed with a row of small sharp bristles on posterior margin near distal end; tarsus nearly three-fourths as long as tibia, fringed with a row of small pointed hairy bristles on anterior margin, with a row of minute pointed spines arranged on inner side of them (Pl. III, fig. 3a), and covered with fine soft hairs. Claw of each leg slender and strongly pointed, and without teeth on inner margin. Three caudal filaments; fringed with minute setae and hairs.

Locality: Tamina-no-hô Cave at Tamina, China-chô, Is. of Okinoerabu, 7-VIII-1958, S. Uéno and Y. Morimoto leg.

Baetis sp.

Three young nymphs: body length of the largest specimens 3.8 mm.

Length of body	Length of caudal filaments (tip lacking)
3.8 mm	ca. 0.2 mm
3.2 mm	ca. 0.5 mm
2.1 mm	ca. 0.1 mm

Body spindle-shaped, translucent and without markings.

Head nearly as wide as pronotum, directed downwards; antennae short and slender.

Labrum (Pl. IV, fig. 3) quadrangular, wider than long, with a median notch on rounded anterior margin; just inside the anterior margin there is a row of numerous bristles. Mandibles (Pl. IV, fig. 1) robust and nearly pyramidal in shape, canine bearing seven teeth. Paraglossae of labium (Pl. IV, fig. 1) extend a little beyond tip of glossae; outer margin of paraglossa fringed with a row of hairs. Labial palp three-jointed, second produced into a blunt process on its inner distal corner; last joint round, with minute bristles.

Legs rather long and slender; fore femur (Pl. IV, figs. 4, 5, 6) shorter than either of mid and hind femora. Along outer margin of each femur and tibia, there is a row of stout bristles (Pl. IV, fig. 6b); a row of very short stout bristles present on outer margin of each tarsus. Three minute feathered setae located on distal end of hind tibia. Claw of leg (Pl. IV, figs. 4a, 5a, 6a) pointed, bearing 10-18 teeth on inner margin.

Abdomen cylindrical, narrowed behind and somewhat depressed. Gills present on both lateral from first to seventh segments; all of them simple, oblong oval, nearly equal in size; tracheation indistinct.

Three caudal filaments; the outers are fringed with hairs on inner side only, while the middle is fringed with hairs on both sides.

Locality: Hyô-gusuku Cave at Kamihirakawa, China-chô, Is. of Okinoerabu, 5-VIII-1958, S. Uéno and Y. Morimoto leg.

Cloeon sp.

One nymph, body length 4.5 mm; length of caudal filaments 1.0mm (tip lacking).

Body elongated, cylindrical, tapering posteriorly, widest across mesothorax, and without markings. Head a little wider than prothorax; compound eyes small, situated on dorso-lateral side; antennae very slender, nearly half as long as body, 2.3mm. Labrum (Pl. V, fig. 5) quadrangular, wider than long, with a shallow median notch on rounded frontal margin; just inside frontal margin there is a row of numerous small bristles, and a group of minute bristles situated behind of notch. Mandibles (Pl. V, fig. 2) robust, canine bears two groups of teeth, of which the outer group is pointed and extends a little beyond the inner group. Maxillary palp (Pl. V, fig. 4) longer and slenderer than lacinia; distal joint slender and slightly narrowed distally. Inner margin of lacinia provided with a row of flat spines. Paraglossae (Pl. V, fig. 1) of labium extend beyond tip of glossae, both covered with hairs; tip of labial palp (Pl. V, fig. 1a) bears three long spines, and covered with sharply pointed bristles. Hypopharynx (Pl. V, fig. 3) covered with hairs on frontal margin; median and lateral lobes nearly equal in size.

Pronotum widened posteriorly, with nearly straight lateral margins.

Legs slender (Pl. VI, figs. 1, 2, 3), covered with hairs and bristles; fore leg the shortest and hind leg the longest; a row of small bristles of pointed tip arranged along anterior margin of each femur; tibia of fore leg about twice as long as fore femur; tibiae of other legs about one and half times as long as femora of other legs, fringed with a row of small pointed bristles on posterior margin of each tibia, fore tarsus nearly as long as fore tibia, tarsi of other legs shorter than tibiae, fringed with a row of small pointed bristles. Claw of each leg slender and strongly pointed, bearing more ten teeth on inner margin of basal half (Pl. VI, figs. 1a, 2a, 3a).

Abdomen cylindrical, gradually tapering backwards. Gills present on both lateral sides of segments from first to seventh; each gill (Pl. VI, figs. 4, 4a, 4b), double, except the last one (Pl. VI, fig. 4c), and third the largest. All gill lamellae similar in form, foliaceous and ovate, but nearly rounded in last lamella; tracheae plumately branched. Three caudal filaments slender, pale, tip lacking; outer filaments fringed with soft hairs on inner side only, but median fringed both sides with soft hairs.

Locality: Ukogawa Tame-ike at Kamishiro, China-chô, Is. of Okinoerabu, 2-VIII-1958, S. Uéno and Y. Morimoto leg.

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Explanation of Plates

Plate 1. *Nemoura* sp. (sp. No. 104)

Fig. 1. Dorsal view of nymph. Fig. 2. Fore leg; 2a, posterior margin of femur; 2b, mid leg; 2c, hind leg; 2d, claw of fore leg. Fig. 3. Basal joints of antenna. Fig. 4. Hind margin of eighth abdominal tergum. Fig. 5. Labium. Fig. 6. Basal joints of cercus.

Plates 2 and 3. *Caenis* sp.

Plate 2. Fig. 1. Dorsal view of head and thorax. Fig. 2. Mandible; 2a, canine area. Fig. 3. Maxilla; 3a, apical part of galea-lacinia. Fig. 4. Labrum. Fig. 5. First gill. Fig. 6. Second gill. Fig. 7. Fourth gill. Fig. 8. Fifth gill.

Plate 3. Fig. 1. Fore leg; 1a, posterior side of femur; 1b, distal end of tibia. Fig. 2. Mid leg; 2a, distal end of tarsus. Fig. 3. Hind leg; 3a, distal end of tarsus.

Plate 4. *Baetis* sp.

Fig. 1. Labium. Fig. 2. Mandible. Fig. 3. Labrum. Fig. 4. Mid leg; 4a, claw. Fig. 5. Fore leg; 5a, claw. Fig. 6. Hind leg; 6a, claw; 6b, outer margin of tibia; 6c, distal end of tibia.

Plates 5 and 6. *Cloeon* sp.

Plate 5. Fig. 1. Labium; 1a, tip of labial palp. Fig. 2. Mandible; 2a, canine area. Fig. 3. Hypopharynx. Fig. 4. Maxilla. Fig. 5. Labrum.

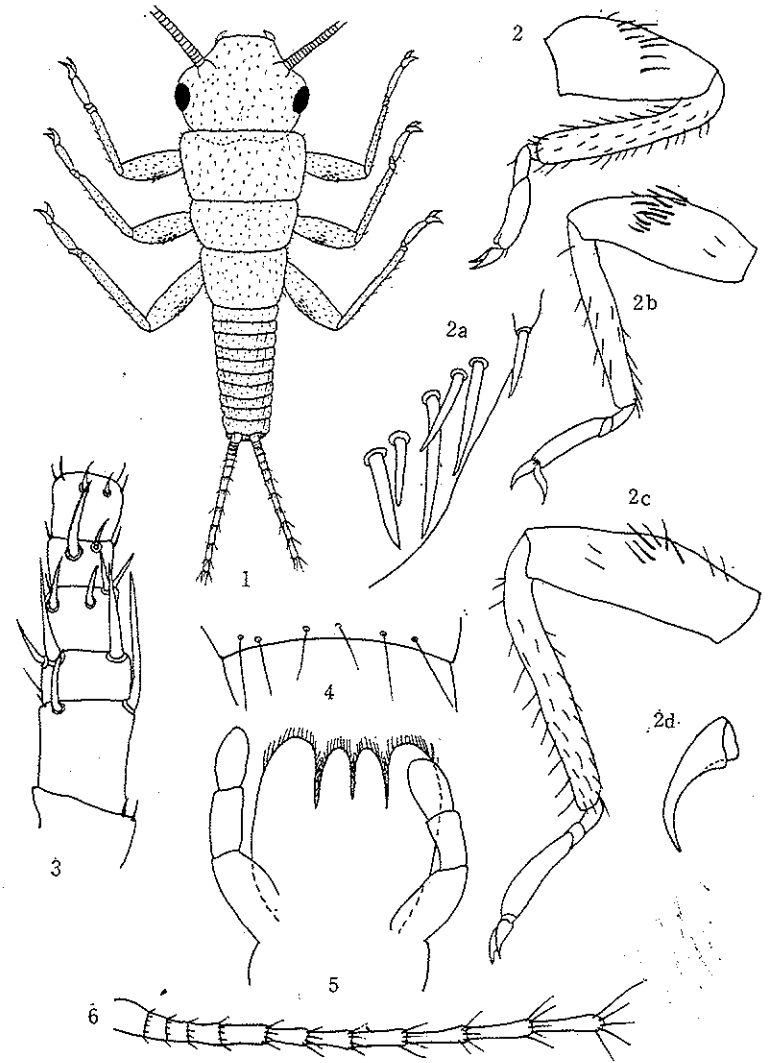
Plate 6. Fig. 1. Fore leg, 1a, claw. Fig. 2. Mid leg; 2a, claw. Fig. 3. Hind leg; 3a, claw. Fig. 4. First gill; 4a, third gill; 4b, fifth gill; 4c, seventh gill.

昭和三十九年十月十五日印刷
昭和三十九年十月十五日發行

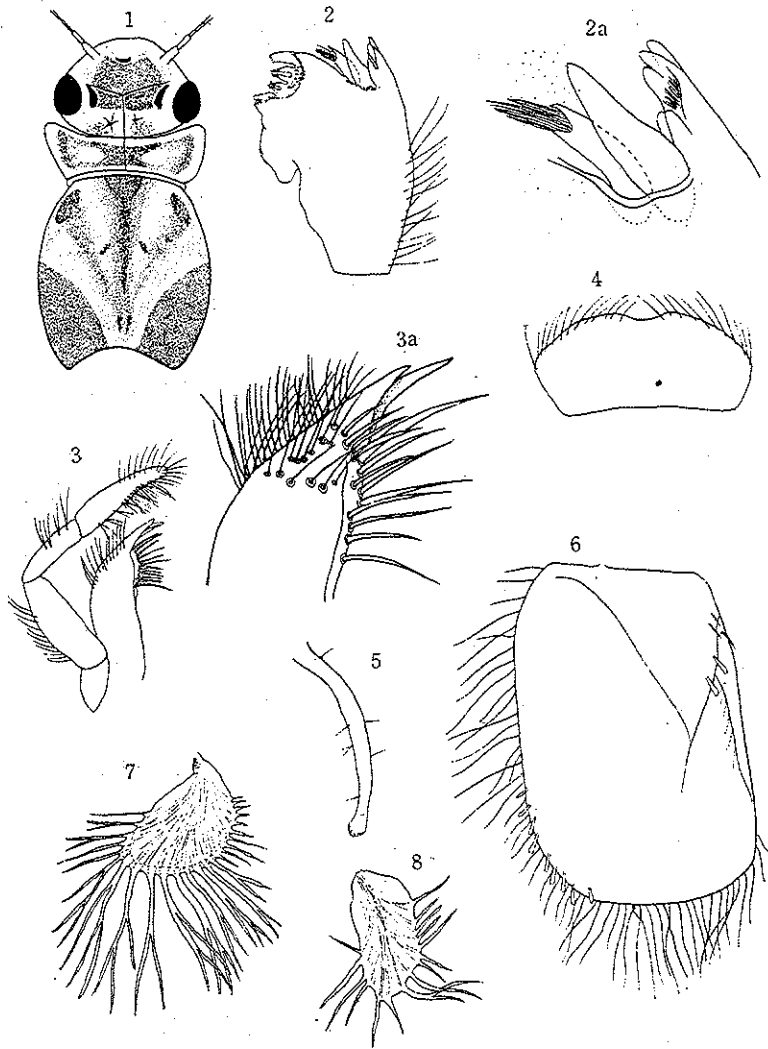
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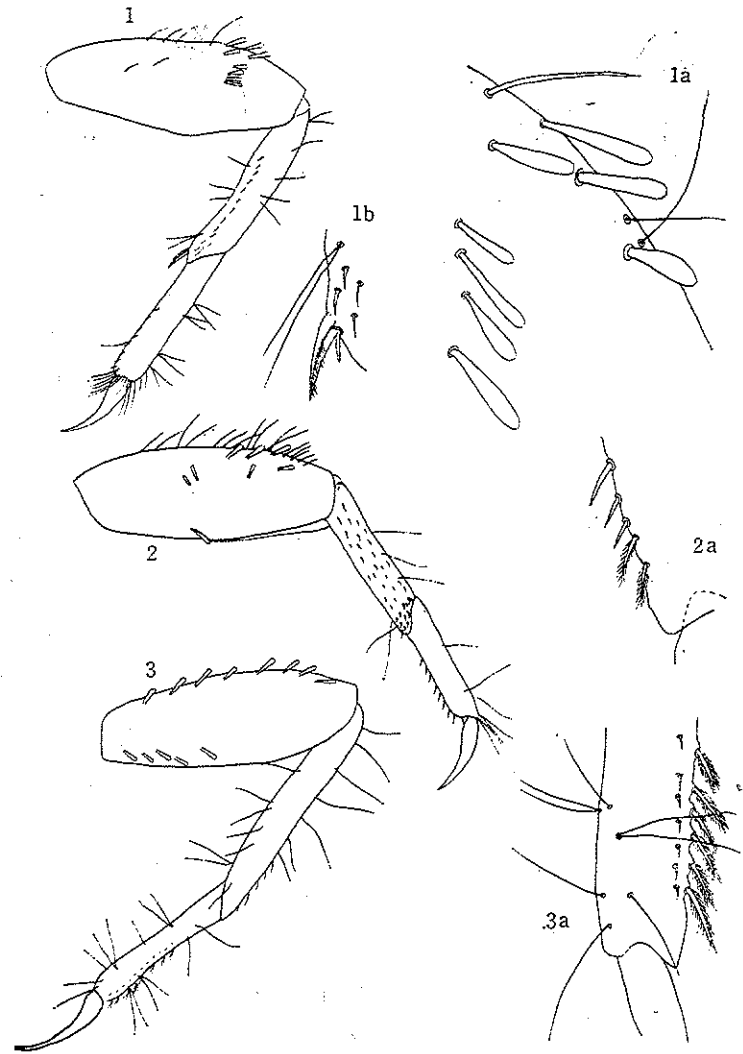
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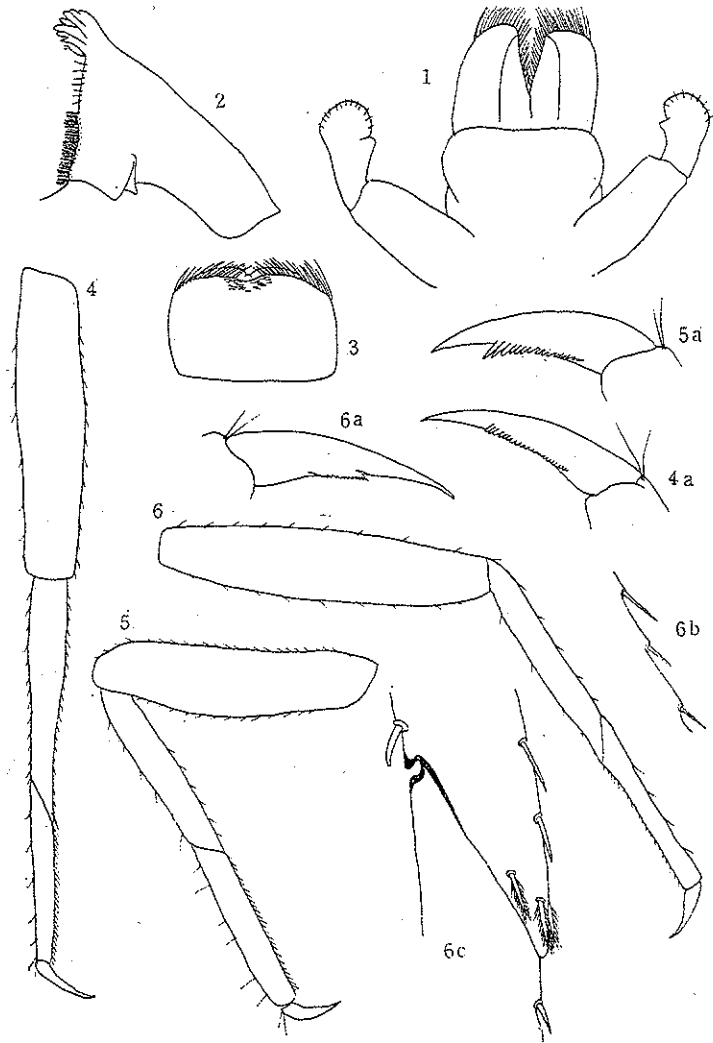
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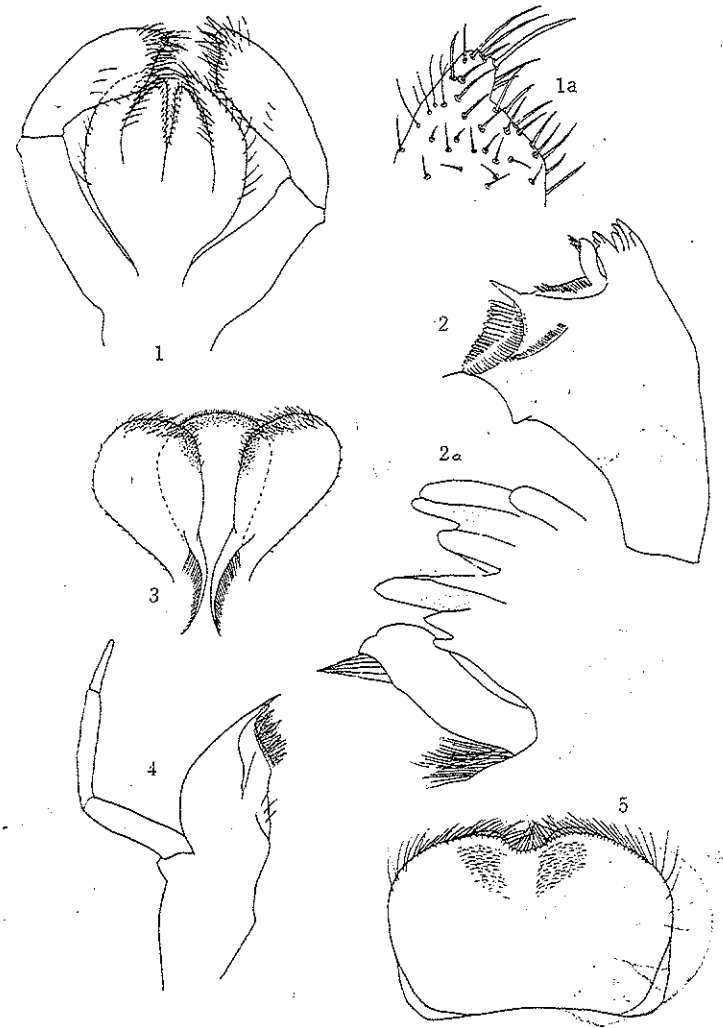
Caenis sp.
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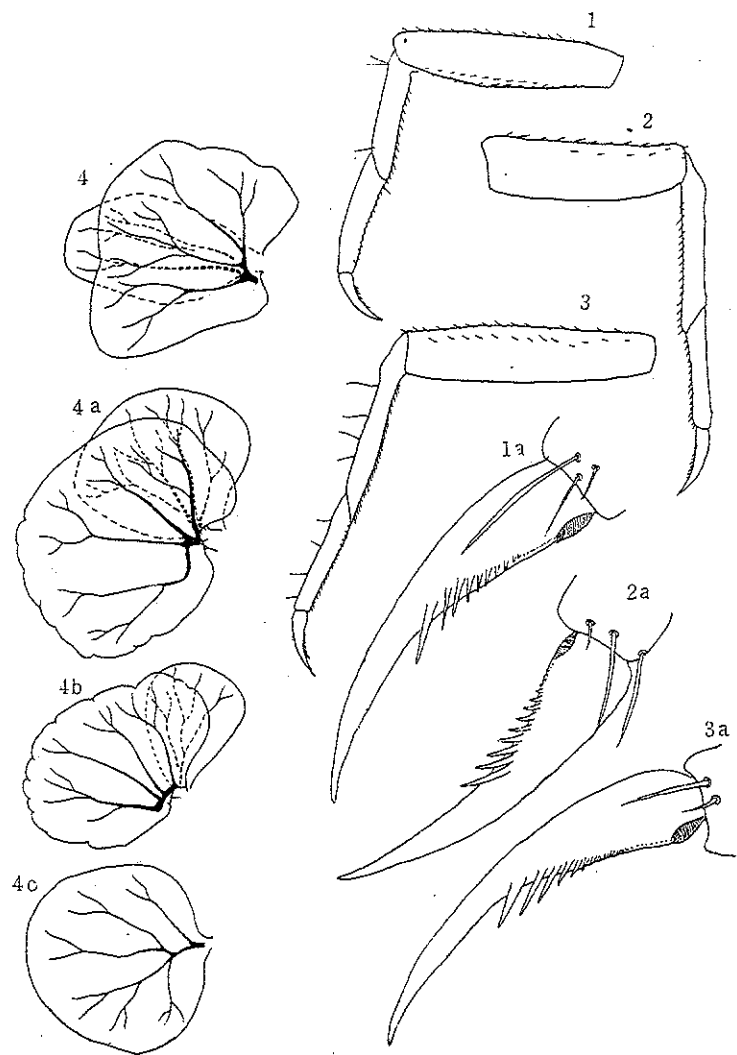
Caenis sp.



Baetis sp.



Cloeon sp.



Cloeon sp.