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Mayflies (Ephemeroptera) from Thailand

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Through the kindness of Drs. Kunio Iwata and Kimio Yoshikawa, the writer had the opportunity of studying a small collection of aquatic insects from Thailand in 1961. The specimens consisted of nymphs (larvae) and fell into three genera belonging to three families of Ephemeroptera.

The writer's grateful thanks are due to Drs. Iwata and Yoshikawa for placing the collection at his disposal and for useful information regarding the localities. He also wishes to thank Prof. Matsunae Tsuda of the Nara Women's University for his guidance and to Dr. Teizi Kawai of the same university for valuable suggestions.

List of the species according to taxonomic arrangement

Family Potamanthidae

Genus *Potamanthus* PICTET

1. *Potamanthus* sp. TPA Nymph
One nymph: Chanta Buri, 20 June, 1961.

Family Leptophlebiidae

Genus *Choroterpes* EATON

2. *Choroterpes* sp. TCA Nymph
One nymph: Chanta Buri, 20 June, 1961.

Family Ephemerellidae

Genus *Ephemerella* WALSH

3. *Ephemerella* sp. TEA Nymphs
Two nymphs: Chanta Buri, 20 June, 1961.
4. *Ephemerella* sp. TEB Nymph
One nymph: Chanta Buri, 20 June 1961.

DESCRIPTIONS AND NOTES OF THE SPECIES

1. *Potamanthus* sp. TPA

Length of body 9.2 mm, caudal filaments 5.7 mm. General colour dark brown, legs and caudal filaments paler brown. Body elongated and cylindrical (Fig. 1).

Head rounded (Fig. 2), frontal margin emarginated, with two rows of short bristles, lateral margins somewhat expanded.

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Labrum (Fig. 3) quadrangular, twice as wide as its length, slightly emarginate in the median part of anterior margin, on the antero-lateral margin with a row of many long bristles, and inside the apical margin a row of smaller bristles which run parallel to the lateral margin. There are seven or nine long bristles near the outer side of the posterior portion (Fig. 3). Outermost canine of the mandible is conspicuously large, strong, spinous and hairy, projecting forward from the mouth and visible from above (Figs. 2, 4, 5); the projection nearly as long as head, the outer base bearing stiff hairs and small spines, with inner margin one; prostheca well developed in both mandibles, each with a group of bristles on inner margin. Molar surface of both mandibles well developed, the apical margin of the molar with pectinat spines (Fig. 4a).

Maxillal palp rather slender (Fig. 6), proximal joint with a series of long bristles on the outer and the inner margin respectively, outer and inner margin of second joints fringed with long setae; terminal joint beset thickly with long bristles; galea-lacinia much shorter than maxillal palp, its apical margin with two large spines and two short spines, two rows of bristles on the outer side and feathered bristles on the inner side (Fig. 6a).

Labial palpus 3-pointed (Fig. 7), bearing bristles on each side, terminal or the third joint with two rows of short spines on the inner margin (Fig. 7a) and with a group of bristles on the apical margin. Glossae very small; paraglossae large (Fig. 7).

Pronotum wider than head, quadrangular, anterior margin emarginated, lateral margin nearly straight, dorsum arched.

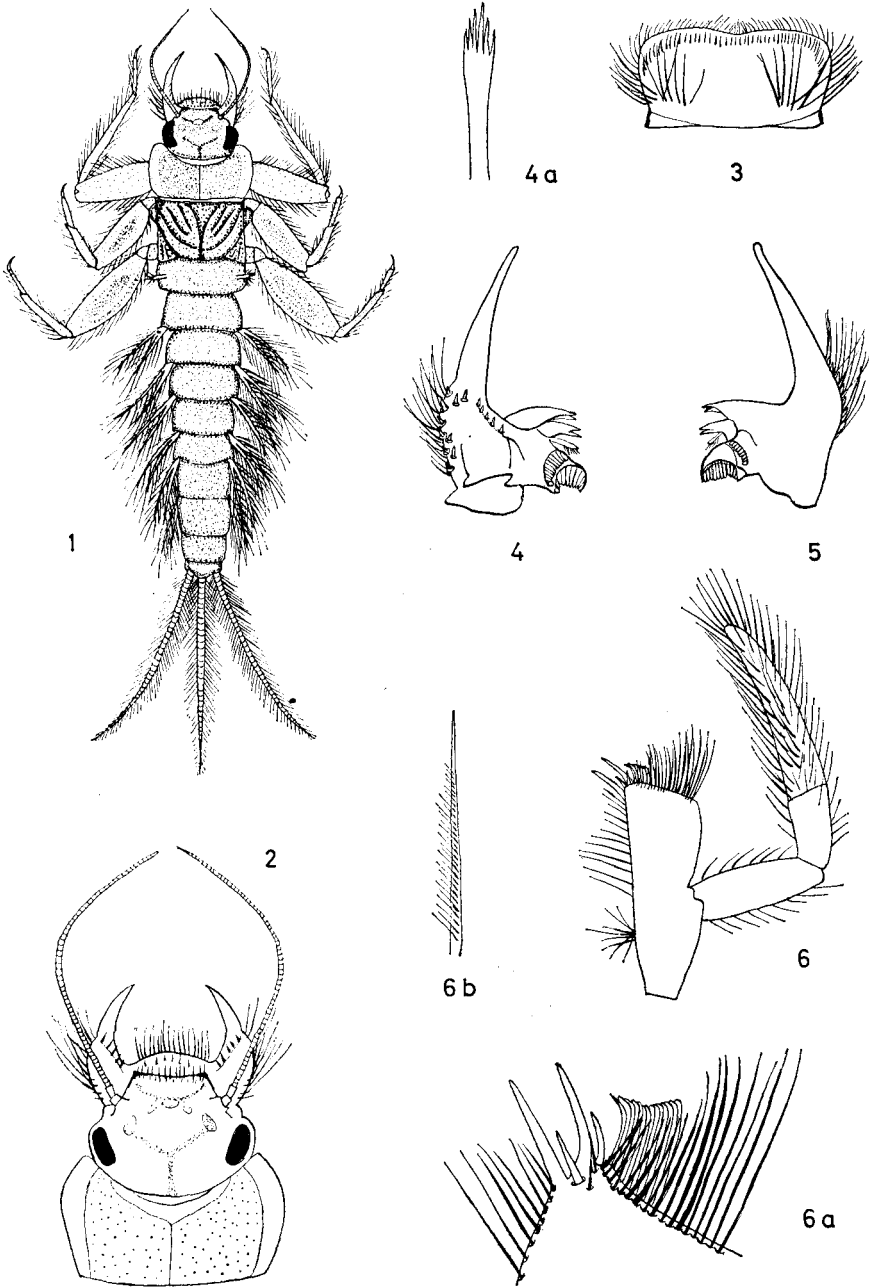
Abdominal segments uniformly dark brown. Seven pairs of gills present on segments 1—7th, 1st gill rudimentary (Fig. 8); 2—7th gills paired, each division slender and pointed, margin fringed with long hairs (Fig. 9). Three caudal filaments; the median one $5/4$ as long as the outer ones, fringed with long-hairs on both sides.

Legs comparatively robust and brownish in colour; each segment with a series of long bristles on the outer and the inner margin respectively, distal end of the tarsus provided with clustered hairs and short spines; tarsal claw smooth (Fig. 10a).

Remarks This nymph resembles the nymphs of the Korean species *Potamanthus* sp. nb. (Imanishi 1940) and of the Formosan species *Potamathus* sp.; the differences between them are as follows:

Outermost canine of mandibles

<i>Potamanthus</i> sp. nb	The projection twice as long as head
<i>Potamanthus</i> sp.	The projection about half as long as head
<i>Potamanthus</i> sp. TPA	The projection nearly as long as head



Figs. 1-6 *Potamanthus* sp. TPA

1: dorsal view of the nymph. 2: head and pronotum. 3: labrum.
 4: right mandible. 4a: part of molar. 5: left mandible. 6: maxilla.
 6a: tip of galea-lacinia. 6b: inner margin of galea-lacinia.

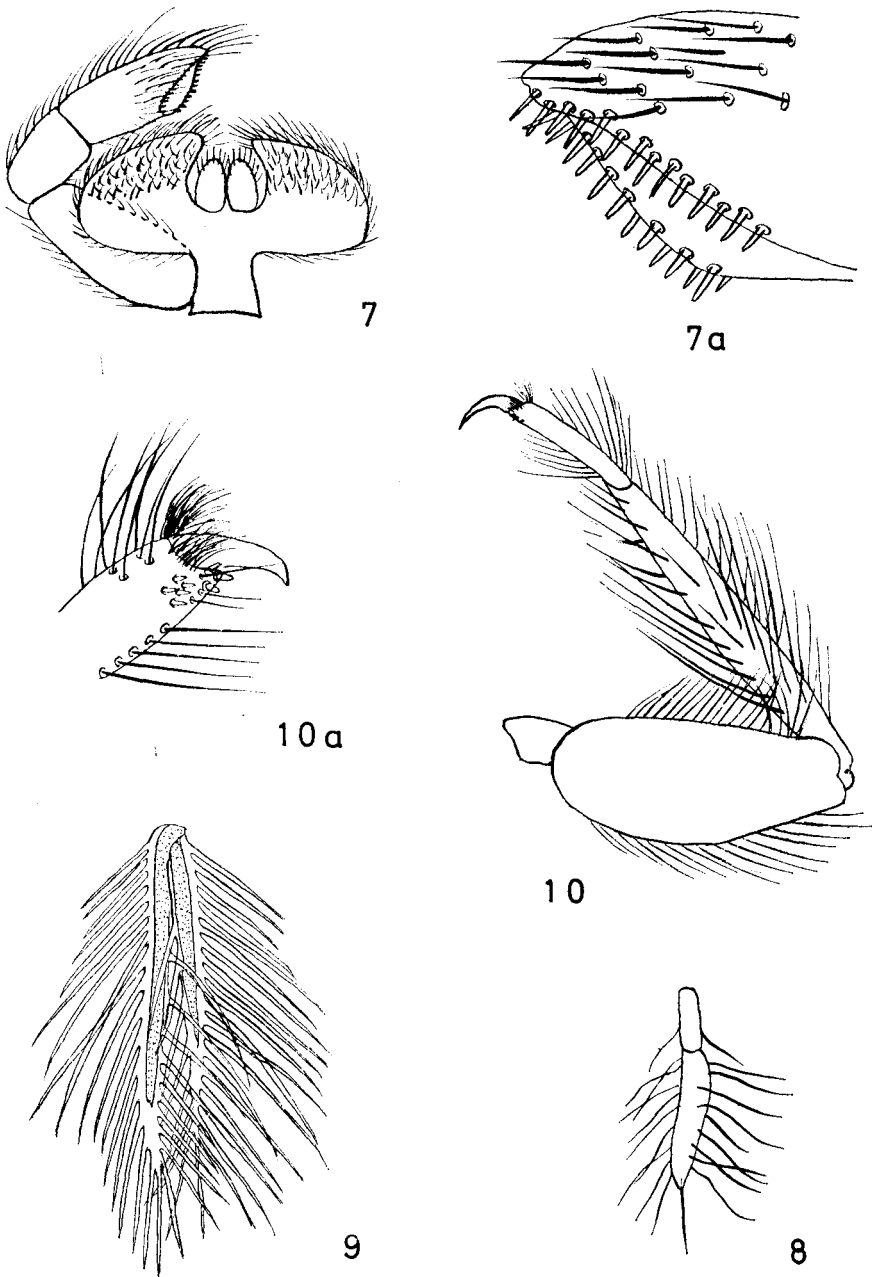


Fig. 7-10 *Potamanthus* sp. TPA
 7: labium. 7a: tip of labial palp. 8-9: gills 1,5 numbered from the front. 10: fore-leg. 10a: fore-claw.

2. *Choroterpes* sp. TCA

Length of body 9.4 mm, the legs and caudal filaments broken off (except left hind-leg). Yellowish brown (specimen in alcohol).

Body slender (Fig. 11). Head sub-flattened, widest at the line of anterior portion of eyes, general colour yellowish brown.

Labrum wider than long (Fig. 13), slightly emarginate in the median part of anterior margin, beset thickly with short curved bristles; a row of long bristles on antero-lateral margin, on the upper surface near the median with a long row of bristles.

Mandibles rather short and robust (Figs. 14, 15); canines rather short, the inner canine of the left mandible being longer than the outer one (Figs. 15a), both with three blunt projections at the tip; that of the right mandible just as long as the outer one (Fig. 14a), with one rather long spine-like process; prostheca well developed in both mandibles, each with a group of bristles on apical margin.

Maxillary palp more slender than galea-lacinia (Fig. 16), terminal joint beset thickly with long bristles (Fig. 16a), the apical margin of galea-lacinia bearing a terminal tooth (Fig. 16a), with a group of bristles on the outer margin and with a row of bristles on the inner margin.

Glossae of labium very small, conical, beset with long hairs on the apical margin; paraglossae large, six times as wide as glossae, fringed with long hairs on the apical margin; labial palp long and slender, apical two joints with hairs on each side, basal joint with a row of short hairs on the outer margin; each joint nearly the same length (Figs. 17, 17a).

Pronotum wider than head, quadrangular, a little widened anteriorly, anterior margin emarginate, lateral margins nearly straight, dorsum arched. Mesothorax arched dorsally (Fig. 11).

Legs palp brownish (Fig. 18); along the outer margin of femur with moderately long bristles and short stout spines (Fig. 18b); along the outer margin of tibia with a long bristle and inner margin of it with short stout spines on which many feathered bristles are arranged (Fig. 18a).

Claw bearing fourteen (in fore-leg) small teeth on the inner margin (Fig. 18c).

Abdominal segments uniformly yellowish brown. Three caudal filaments. Gills present on the abdominal segments 1st to 7th; those on the segments 2nd to 7th lamelliform, paired and each divided into 3 long linear branches at its tip, except the 7th with two branches (Figs. 20-22). The first pair of gills of the examined specimen lost on both sides.

Remarks This nymph is very closely related in its mouth-parts to that of *Choroterpes major* ULMER from the Sunda Islands, but the canine of right mandible is not forked but with blunt projections at its tip.

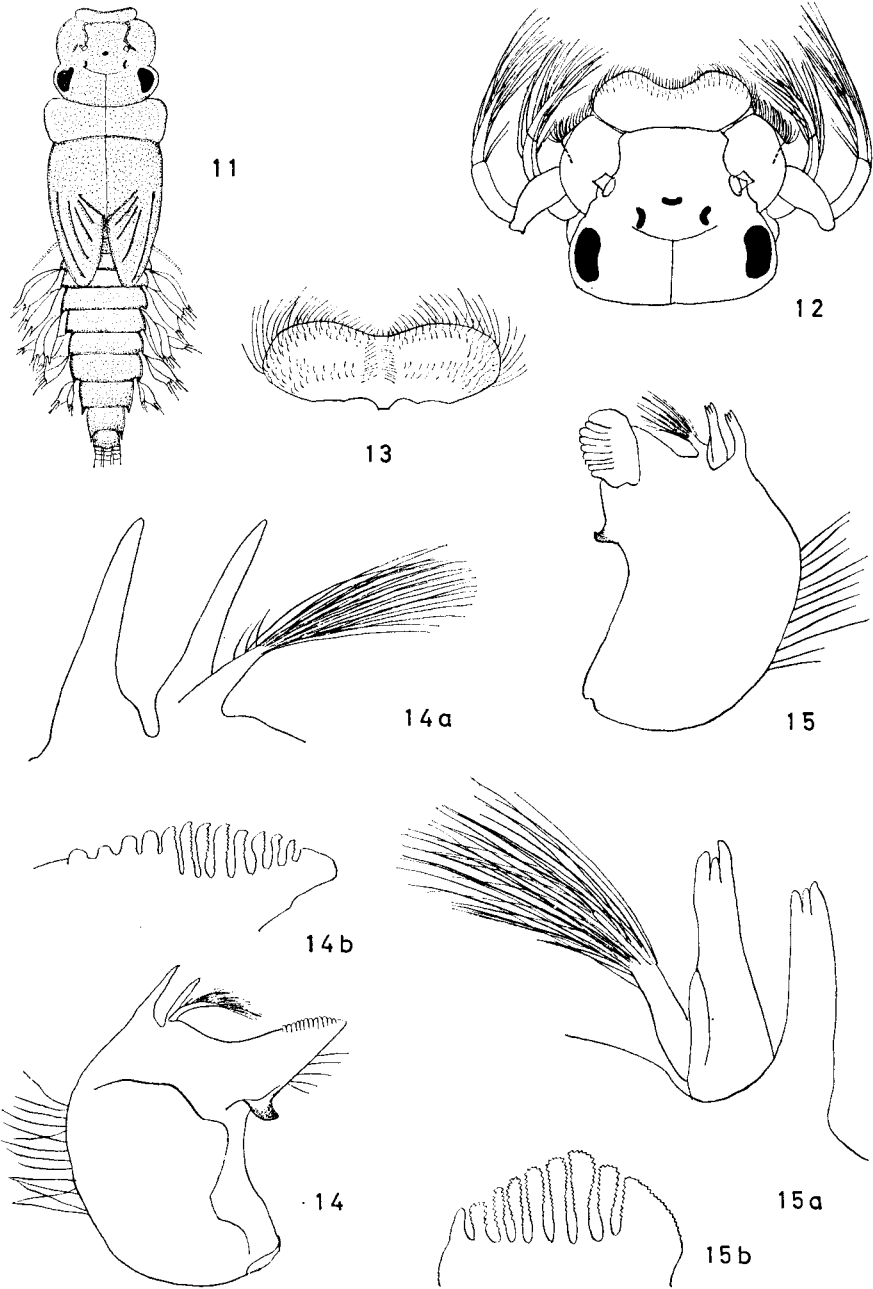
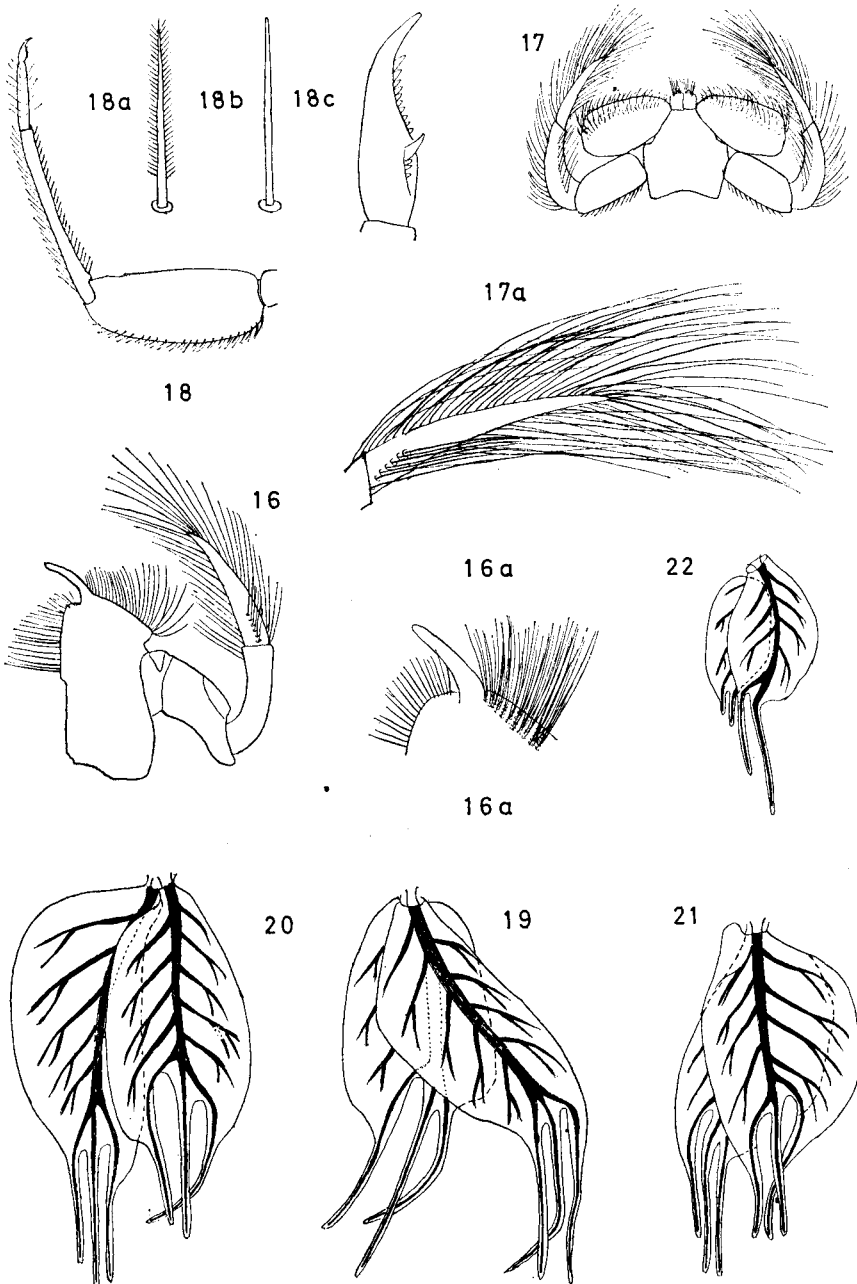


Fig. 11-15 *Choroterpes* sp. TCA
11: dorsal view of the nymph. 12: head and pronotum. 13: labrum. 14: right mandible. 14a: canine area. 14b: molar surface. 15: left mandible. 15a: canine area. 15b: molar surface.

Figs. 16-22 *Choroterpes* sp. TCA

16: maxilla. 16a: tip of galea-lacinia. 17: labium. 17a: tip of labial palp. 18: fore-leg. 18a: short stout spine on inner margin of fore tibia. 18b: short stout spine on the outer margin of fore femur. 18c: fore-claw. 19-22: gills 2, 3, 5 and 7, numbered from the front.

3. *Ephemerella* sp. TEA

Length of body 11.2 mm, caudal filaments 7.9 mm. General colour brown, legs and caudal filaments brown.

Body somewhat arched dorsally, flattened ventrally, with rather flattened femora (Fig. 23). Head quadrangular, frontal margin somewhat expanded laterally.

Labrum wider than long, slightly emarginate in the median part of anterior margin, on the antero-lateral margin with a row of long bristles, on the upper surface with many short bristles (Fig. 24).

Mandibles rather and robust (Figs. 25, 26); canines rather short; the inner canine of the left mandible as long as the outer one (Fig. 25a), while in the right mandible the inner and outer canine equally long (Fig. 26a); prostheca well developed in both mandibles, a group of bristles on the inner margin.

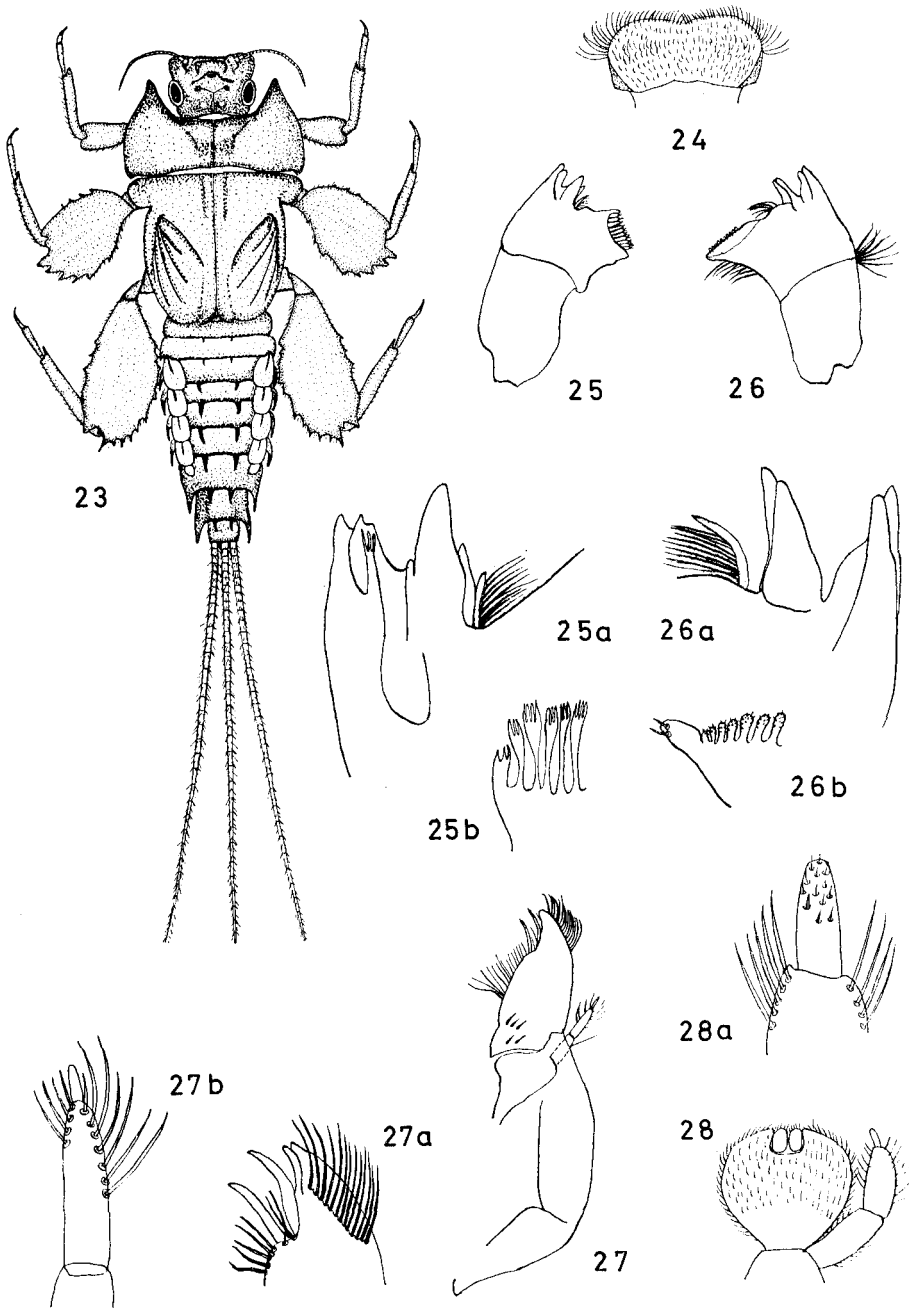
Apex of maxillae branched, with two terminal teeth on the inner apical margin (Figs. 27, 27a), a row of bristles on each of the outer and inner apical margin, maxillary palp very small, much shorter than galea-lacinia, third joint elongated conical; with four bristles on the inner margin and seven on the outer margin (Fig. 27b); terminal joint rudimentary.

Glossae and paraglossae of labium (Fig. 28) nearly equal in length, the latter being more than twice as wide as the former, labial palp relatively short and robust, bearing bristles on each side, terminal or the third joint rudimentary and conical; the arrangement of bristles on the terminal portion of palp is shown in Fig. 28a.

Pronotum wider than head, U-shaped (Fig. 23), antero-lateral angle of frontal margin projected forwards and pointed at the tip; its base nearly half as wide as the posterior margin of head, lateral margins nearly straight, dorsum arched. Mesothorax arched dorsally, with straight lateral margins and antero-lateral angles excised.

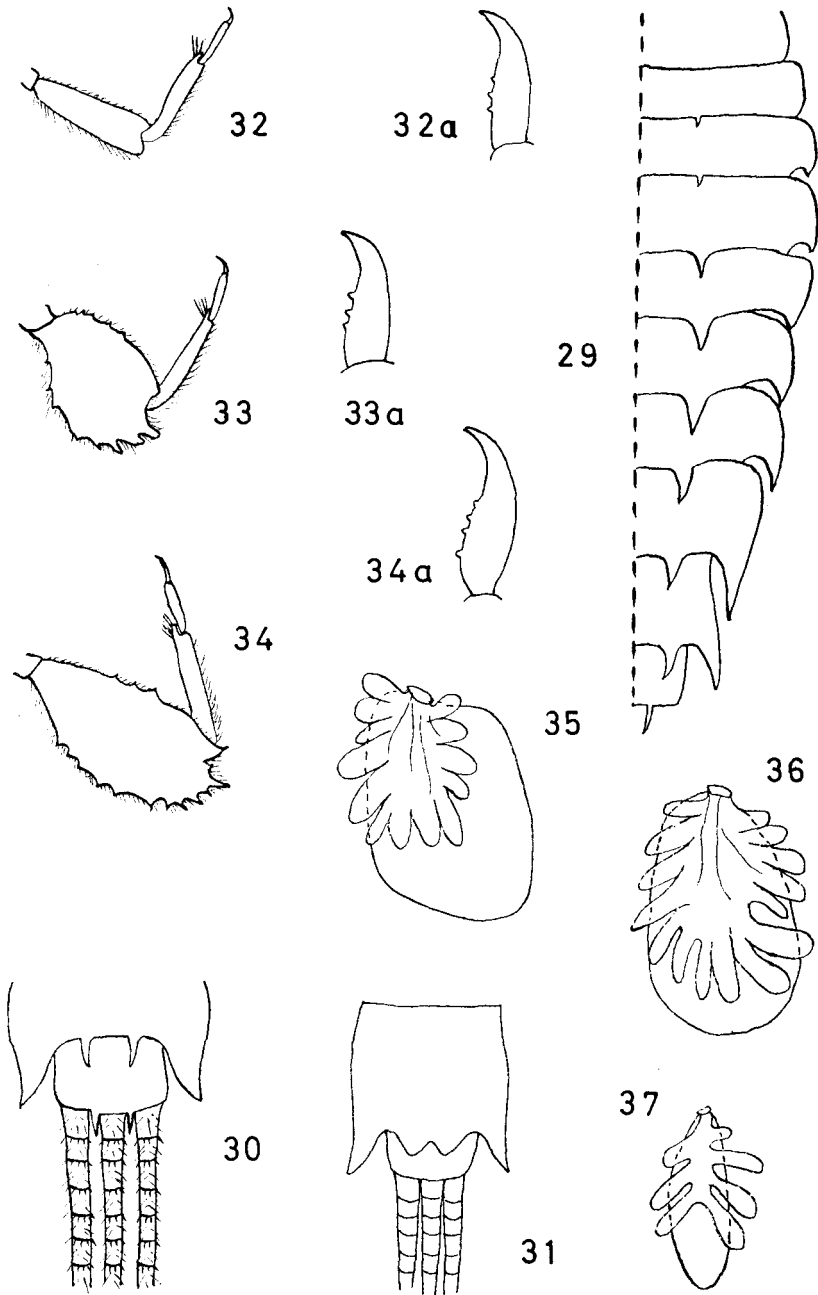
Lateral extensions are present on the abdominal segments 3rd to 9th inclusive (Fig. 29), bearing postero-lateral processes, which are especially well developed in flattened posterior segments. On the abdominal segments 2nd to 10th inclusive, there are paired dorsal spines directed backwards and successively increasing in length posteriorly, being the longest on the eighth tergite. Ninth sternite prolonged backwards into a tongue-shaped plate; the plate emarginated (Fig. 31).

Hind-leg is longest and fore-leg shortest (Figs. 32, 33, 34). Femora of mid- and hind-legs large, robust and flattened; either side margin armed with a number of strong teeth of unequal size; inner margin armed with 3-5, outer margin armed with 7-11; the infero-terminal corner of tibia elongated into a long spine-like process. Claws rather large, bearing three (four in hind-claw)



Figs. 23-28 *Ephemerella* sp. TEA

23: dorsal view of the nymph. 24: labrum. 25: left mandible.
 25a: canine area. 25b: molar. 26: right mandible. 26a: canine area.
 26b: molar. 27: maxilla. 27a: tip of galea-lacinia. 27b: distal two
 joints of maxillary palp. 28: labium. 28a: terminal joint of labial
 palp.



Figs. 29-37 *Ephemerella* sp. TEA

29: dorsal view of right half of abdominal segments. 30: last two abdominal segments and basal parts of caudal filaments. 31: ventral aspect of 9th and 10th abdominal segments. 32: right fore-leg. 32a: claw. 33: mid-leg. 33a: claw. 34: hind-leg. 34a: claw. 35-37: gills 1, 3, 5, numbered from the front.

small teeth on the inner margin (Figs. 23, 33a, 34a).

Five pairs of gills present on the abdominal segments 3rd to 7th (Figs. 35, 36, 37), wholly dorsal in position, all bilamellate, the 7th the smallest; each anterior lamella obtuse ovoid, tracheation not distinct; each posterior lamella cut into many small lobelets.

4. *Ephemerella* sp. TEB

Length of body 6.7 mm, caudal filaments 3.8 mm. General colour dark brown, legs and caudal filaments paler (Fig. 38). Head directed downwards, frontal margin rounded, lateral margins somewhat expanded along the eyes. A small ovate marking situated near the frontal margin; a pair of rounded marking situated on anterior side along the inner margin of compound eye (Fig. 43).

Labrum wider than long, slightly emarginate in the median part of anterior margin, beset thickly with short curved bristles; on the antero-lateral margin with two rows of long bristles (Fig. 39).

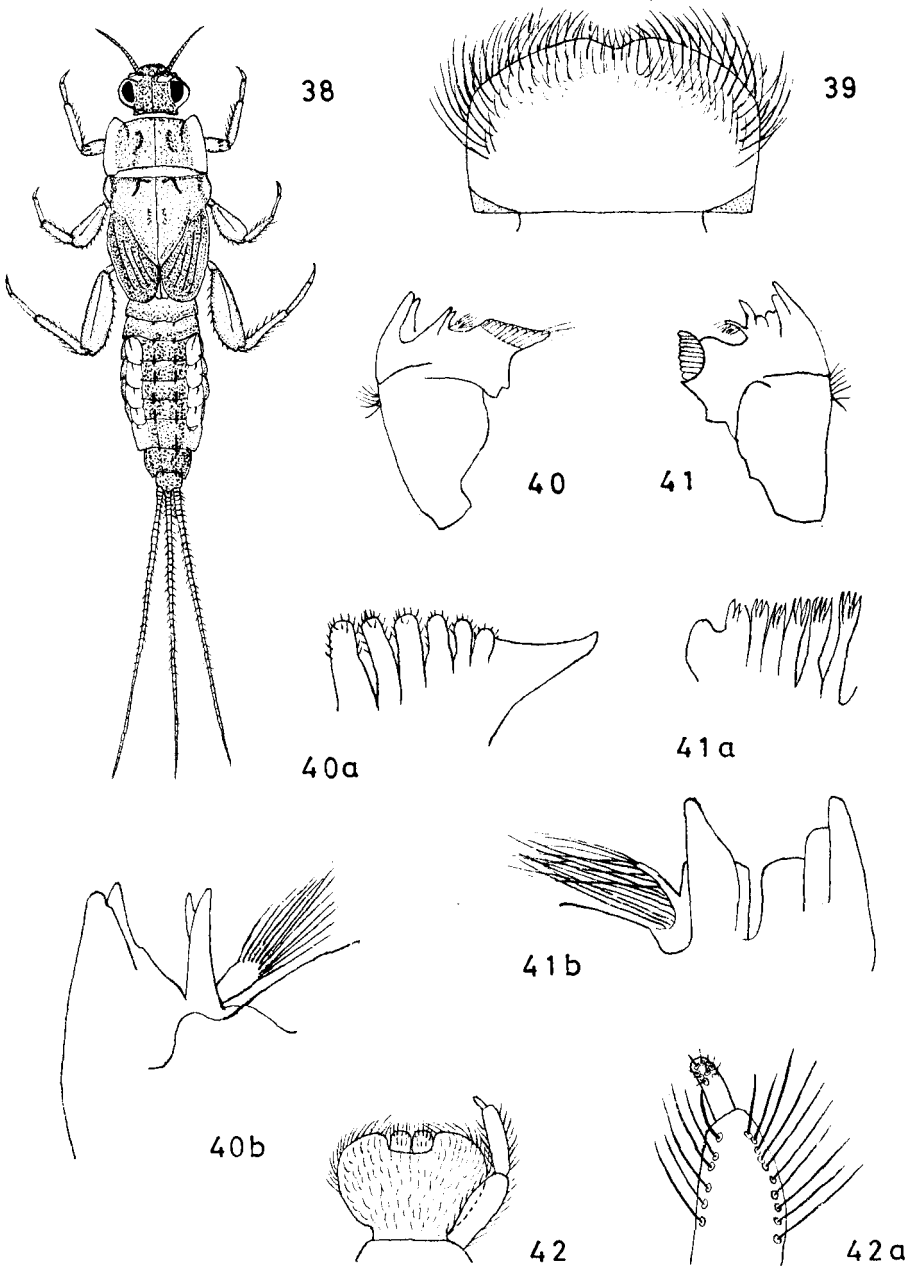
Mandibles rather short and robust (Figs. 40, 41); canines rather short, the outer canine of both mandibles being nearly as long as the inner one (Figs. 40, 41), prosthema well developed in both mandibles; left with a group of bristles on inner margin (Fig. 41b), right with a group of bristles on apical margin (Fig. 40b).

Maxillae with two terminal teeth on the inner apical margin (Fig. 44a), a row of bristles on the inner apical margin; on the outer apical margin with two rows of bristles (Fig. 44), which beset with feathered bristles arranged on one of the bristles (Figs. 44a, 44b); a row of bristles on the inner basal portion. Maxillary palp absent.

Glossae and paraglossae of labium (Fig. 42) nearly equal in length, labial palp relatively short and robust, bearing bristles on each side, terminal or the third joint rudimentary and conical; the arrangement of bristles on the terminal portion of palp as shown in Fig. 42a. Median lobe of hypopharynx round; lateral lobes rounded apically (Fig. 46).

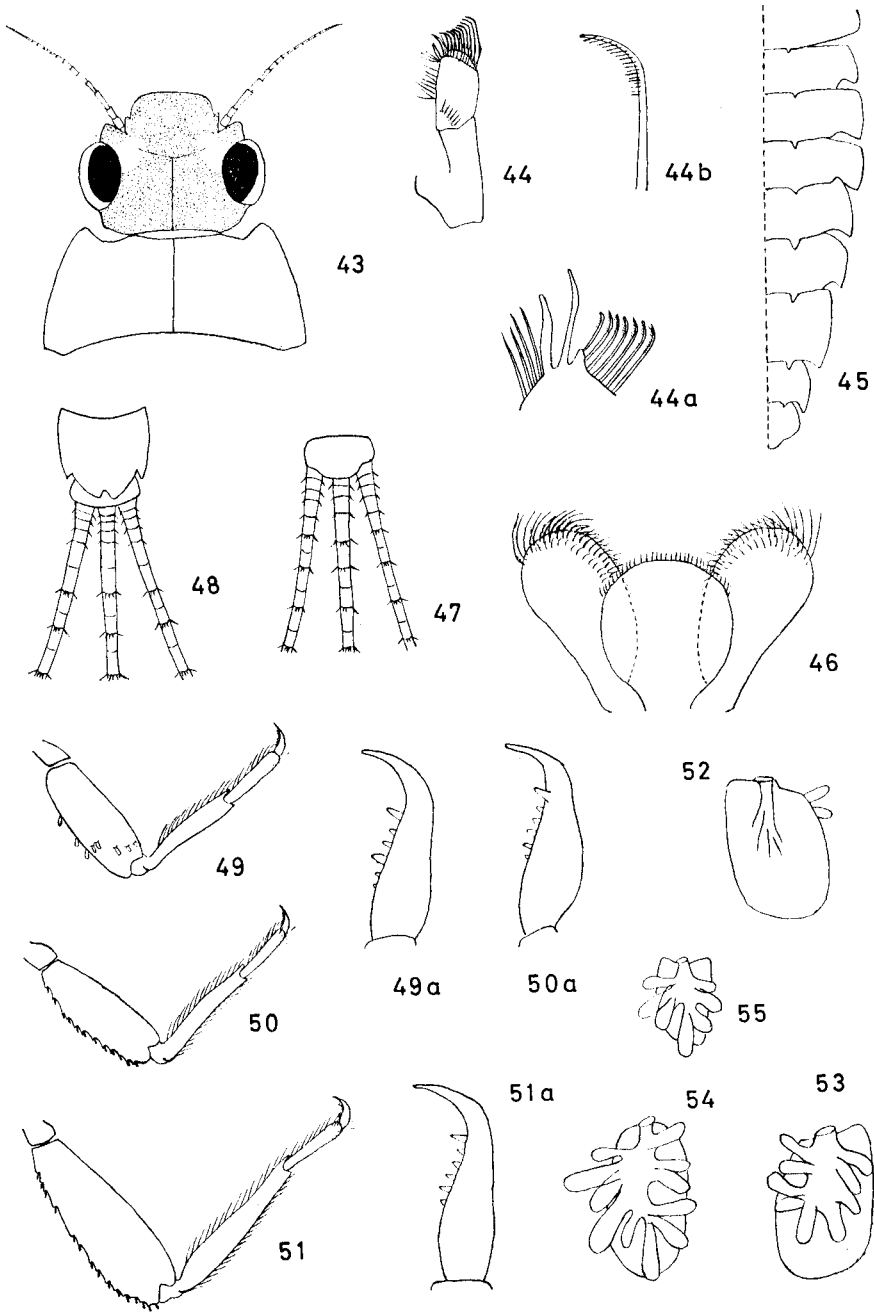
Pronotum wider than head, quadrangular, a little widened posteriorly, anterior margin narrower than posterior margin; antero-lateral angle a little projected forwards, lateral margins nearly straight, dorsum arched, with a pair of dark markings on the median line; mesothorax arched dorsally, antero-lateral angle prolonged as spiniform, with two pairs of dark markings on the median line, the anterior marking vermiform and divergent posteriorly, the posterior one I-like, shorter and paler than the anterior one (Fig. 38).

Lateral extensions are present on the abdominal segments 3rd to 9th inclusive (Fig. 45); there are paired dorsal spines directed backwards and successively increasing in length posteriorly. Ninth sternite prolonged backwards



Figs. 38-42 *Ephemerella* sp. TEB

38: dorsal view of the nymph. 39: labrum. 40: right mandible.
 40a: molar. 40b: canine area. 41: left mandible. 41a: molar. 41b:
 canine area. 42: labium. 42a: tip of labial palp.



Figs. 43-55 *Ephemereella* sp. TEB

43: head and pronotum. 44: maxilla. 44a: tip of galea lacinia. 44b: feather spines on the outer apical margin of galea-lacinia. 45: dorsal view of the right half of abdominal segments. 46: hypopharynx. 47: last abdominal segment and basal parts of caudal filaments. 48: ventral aspect of 9th and 10th abdominal segments. 49: right fore-leg. 49a: claw. 50: mid-leg. 50a: claw. 51: hind-leg. 51a: claw. 52-55: gills 1, 3, 4 and 5, numbered from the front.

into a tongue-shaped plate, the plate emarginated (Figs. 47, 48).

Hind-leg is the longest and fore-leg the shortest (Figs. 49, 50, 51). Femora somewhat flattened, spinous except on the hind-leg; with clavate spine. Along the inner margin of tibia and tarsus with a row of long hairs. Claws rather large, bearing six small teeth on the inner margin (Figs. 49a, 50a, 51a).

Three caudal filaments of equal length; whorls of minute spines at the joints. Five pairs of gills present on the abdominal segments 3rd to 7th, wholly dorsal in position, all bilamellate, the 7th the smallest (Figs. 52, 53, 54, 55); each anterior lamella obtuse ovoid, tracheation not distinct; each posterior lamella cut into many small lobelets.

Remarks This nymph is characterized by the presence of three pale spots in the median part of head, consisting of a pair of rounded markings close to the compound eyes and the other one of small size on the median ocellus. The nymph resembles closely that of *Ephemerella* sp. nay (Imanishi 1940) collected from Japan and China (Manchoukuo), but differs from it in the presence of the head markings.

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