

BAETIDAE FROM SABAH (EAST MALAYSIA) (EPHEMÉROPTERA)

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Abstract. The nymphs of five new species from Sabah /E. Malaysia/ included in four genera of the family Baetidae are described in detail. They are: Platybaetis probus sp.n., Baetis borneoensis sp.n., Baetis sabahensis sp.n., Pseudocloeon proximum sp.n., Centroptella pusilla sp.n. These newly described species are the first nymphal species records of baetine mayflies from Sabah and Borneo. The phylogenetic allocations to species groups and the affinities of the Baetidae from Sabah with previously described baetid species from the Sunda Islands, the Philippines, W. Malaysia, Sri Lanka /Müller-Liebenau, in press/ and the Bismarck Archipelago are discussed.

Taxonomy, nymphs, keys, Oriental

A small collection of baetine mayflies from Sabah, East Malaysia, was given to me by Dr. G. F. Edmunds, Jr., for investigation. Ulmer (1939, Table 1) in his comprehensive study of the Ephemeroptera from the Sunda Islands mentions 19 species from Borneo. The only baetid mayfly, Centroptilum vitellinum Ulmer (1939: 528 - 529) is represented by a single male (dried specimen). Dr. Edmunds' collection lacks any Centroptilum nymphs. The five newly described species are the first records of Baetidae from Borneo since Ulmer's publication.

The collection studied, including the Type specimens, was returned to Dr. G. F. Edmunds, Jr., Department of Biology, University of Utah, Salt Lake City, U.S.A.

DESCRIPTIONS

1. Platybaetis probus sp.n. (Figs. 1, 6, 7, 12)

Material: 6 nymphs, Sungai Moyog, 3 mi. E. Penampang, 29. 9. 1978.

Description: Body length male (nearly mature), 7.1 mm, cerci 7.2 mm, terminal filament reduced to about 8 segments; female (not fully mature) 7 mm, cerci 6.2 mm, terminal filament as in male. - Color pattern on dorsum of thoracic segments and of abdomen as in Figs. 6, 7. - Morphological details are shown in Fig. 1. Head with a clear incision in the middle of posterior margin. - Labrum very small compared to head capsule, ventrally directed and not visible from above in natural condition; bristles on labrum surrounded at base by a light corona. - Glossa near apex with two large clavate ventral spines. - Without hind wing pads. - Metanotum: a number of spines in the middle of posterior margin (Figs. 1f, 6) (spines of the same kind as on posterior margin of terga-Fig. 12). - Cerci densely beset with bristles: on inner margin they are brownish at basal third, then flattened and hyaline, on outer margin less numerous and completely hyaline, bristles on both margins of terminal filament as on inner margins of cerci. - 7 pairs of abdominal gills are developed. - Dorsal surface and posterior margin of terga as in Fig. 12.

Holotype: slide preparation, female nymph. E. Malaysia, Sabah, Sungai Moyog, 3 mi. E. Penampang, 29. 9. 1978. G. F. Edmunds, Jr., leg. - Paratypes: 5 nymphs in alcohol from same localities as Holotype.

Remarks: The genus Platybaetis was described by Müller-Liebenau (1980 a). The most striking generic characters pointed out in the original description are: labrum very small compared to head capsule, ventrally directed; glossa near apex with two large clavate spines on ventral surface; pronotum rounded laterally and on outer posterior margin. These characters are clearly developed in Pl. probus sp.n.

Platybaetis probus larvae are found most commonly on the upper surface of flat rocks. The larvae are oriented with the head upstream in moderately fast currents. The flattened larvae are reminiscent of Heptageniinae. When disturbed the larvae can move forward, backward and to the side.

Three species of Platybaetis are previously known: Pl. edmundsi from the Philippines (Müller-Liebenau 1980 a), Pl. uenoi from Nepal and Pl. bishopi from the River Gombak, W. Malaysia (both Müller-Liebenau 1980 b). The herein described Pl. probus sp.n. from Sabah, E. Malaysia, differs from the three above mentioned species mainly in having heavy spines on the posterior margin of the terga (Fig. 12). With Pl. edmundsi it has in common a clear incision in the middle of posterior margin of the head capsule (Fig. 1a).

The key to the nymphs of the three previously known species given by Müller-Liebenau (1980 b) is herein supplemented by the new species Pl. probus sp.n.

Key to the nymphs of the four species of Platybaetis

1. head in the middle of posterior margin with a clear incision 2

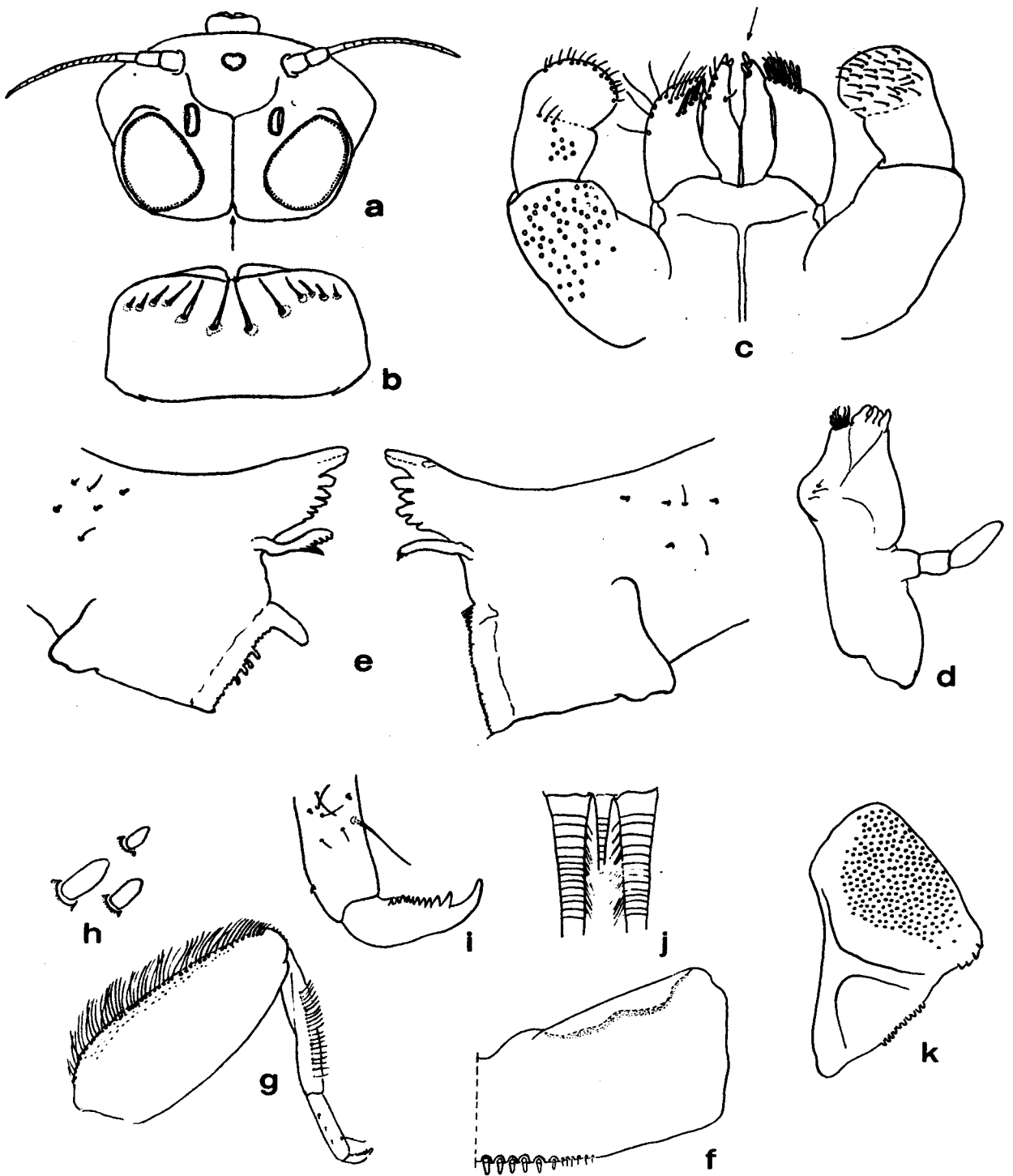


Fig. 1: Nymph of Platybaetis probus sp.n., a - head capsule. b - labrum. c - labium, left half dorsal, right half ventral. d - maxilla. e - canini and molar area of left and right mandible. f - right half of metanotum. g - leg. h - submarginal bristles near outer margin of femur. i - claw. j - basal segments of caudal filaments. k - paraproct.

- Head in the middle of posterior margin at most with a shallow indentation 3
- 2. Hind wing pads heavily reduced; spines on posterior margin of terga pointed (and of the normal kind); Philippines edmundsi
- Hind wing pads not developed; spines on posterior margin of terga inserted submarginally, appearing like large bristles (Figs. 1f, 12); Sabah probus sp.n.
- 3. Terminal filament reduced to 1 segment; bristles at inner row near apical margin of paraglossa clavate; hind wing pads not developed; spines on posterior margin of terga broad, rounded; W. Malaysia bishopi
- Terminal filament with about five segments; bristles at inner row near apical margin of paraglossa pointed; hind wing pad condition and spines on posterior margin of terga not known; Nepal uenoi

2. Baetis borneoensis sp.n. (Figs. 2, 8, 13)

Material: 19 nymphs.

Description: Body length male 5.0 mm, cerci 4.5 mm; female 5.1 mm, cerci 4.5 mm; terminal filament in both sexes about 2.0 mm. - Color pattern on pronotum and dorsum of abdomen as in Fig. 8. Caudal filaments with a dark band at the end of the first third (near the middle of terminal filament), then light and a darker band on cerci beyond tip of terminal filament, tips of cerci light. - Seven pairs of abdominal gills present. - Morphological details shown in Fig. 2. Submarginal bristles on labrum branched. - Maxillary palpus with clear lateral indentation near apex. - Outer apical lobe of pedicel of antenna well developed. - Hind wing pads developed, about one third the length of metanotum. - Dorsal surface and posterior margin of terga as in Fig. 13.

Holotype: Female nymph on slide preparation: E. Malaysia, Sabah, S. Moyog at trib. 8 mi. E. Penampang, 1. 10. 1978. leg. G. F. Edmunds, Jr. - Paratypes: 3 slide preparations, 15 nymphs in alcohol: Sungai Moyog, 3 mi. E. of Penampang, 27. 9. 1978; Sungai Tuaran, Tamparuli, 3. 10. 1978.

Remarks: Based on its morphological characters Baetis borneoensis sp.n. is easily associated to the Oriental molawinensis group (which is the Oriental component to the European atrebatinus group and the North American propinquus group Müller-Liebenau in press). With this group B. borneoensis sp.n. has in common the branched submarginal bristles of the labrum with B. difficilis and B. operosus from W. Malaysia (Müller-Liebenau in press b), and with Baetis sp. from Madagascar (Demoulin 1968). The main morphological differences are the following: B. difficilis (W. Malaysia) has wing pads which are nearly of the same length as the metanotum. From the species from

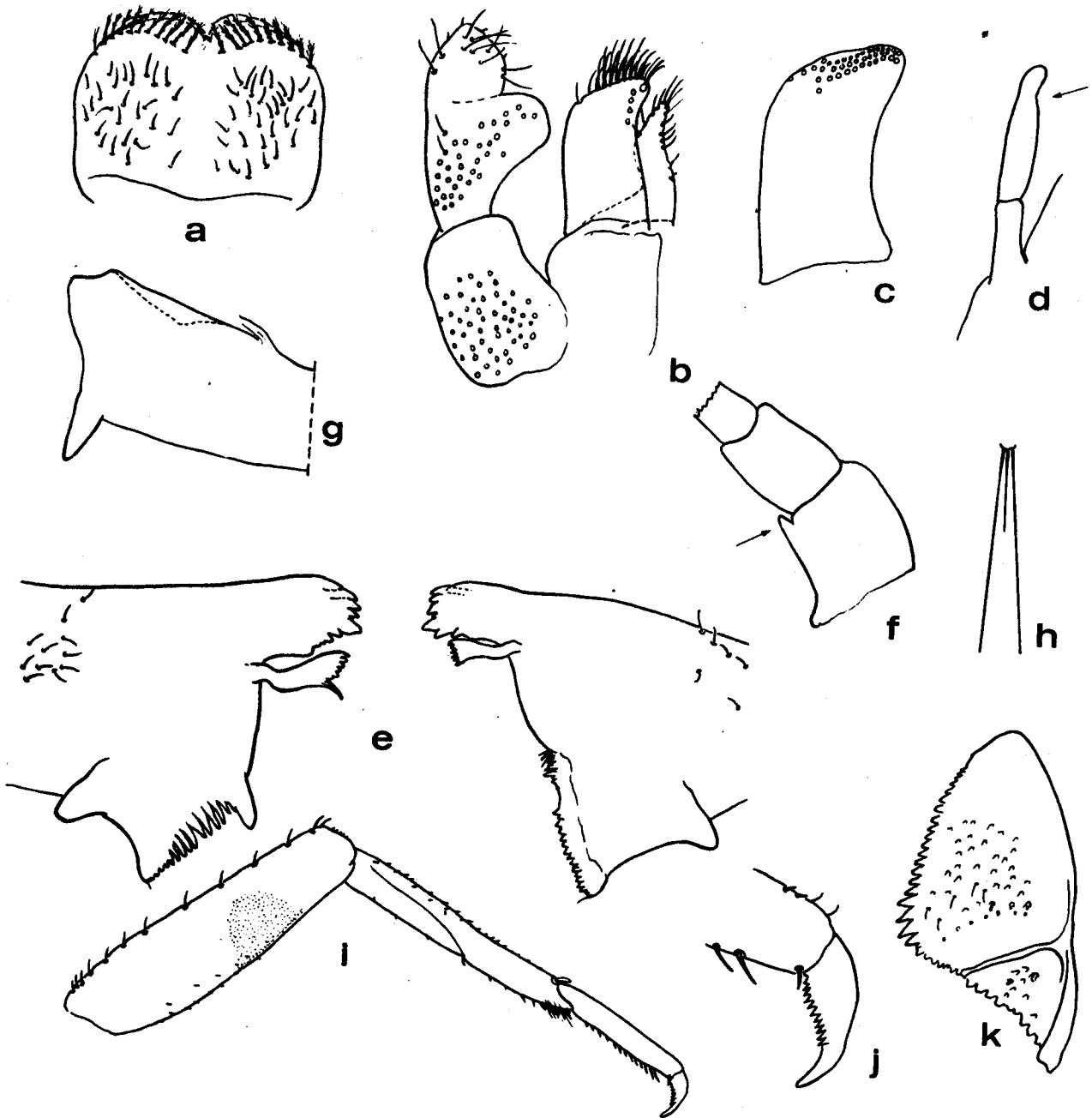


Fig. 2: Nymph of Baetis borneoensis sp.n., a - labrum. b - left half of labium. c - paraglossa at higher magnification, ventral. d - maxillary palpus. e - canini and molar area of left and right mandible. f - basal segments of antenna. g - left half of metanotum. h - caudal filaments. i - leg. j - claw. k - paraproct.

Madagascar B. borneoensis sp.n. differs mainly by the labial palpus (which is concave on frontal margin on 2nd segment in Demoulin's species).

3. Baetis sabahensis sp.n. (Figs., 3, 9, 14, 14a)

Material: 9 nymphs.

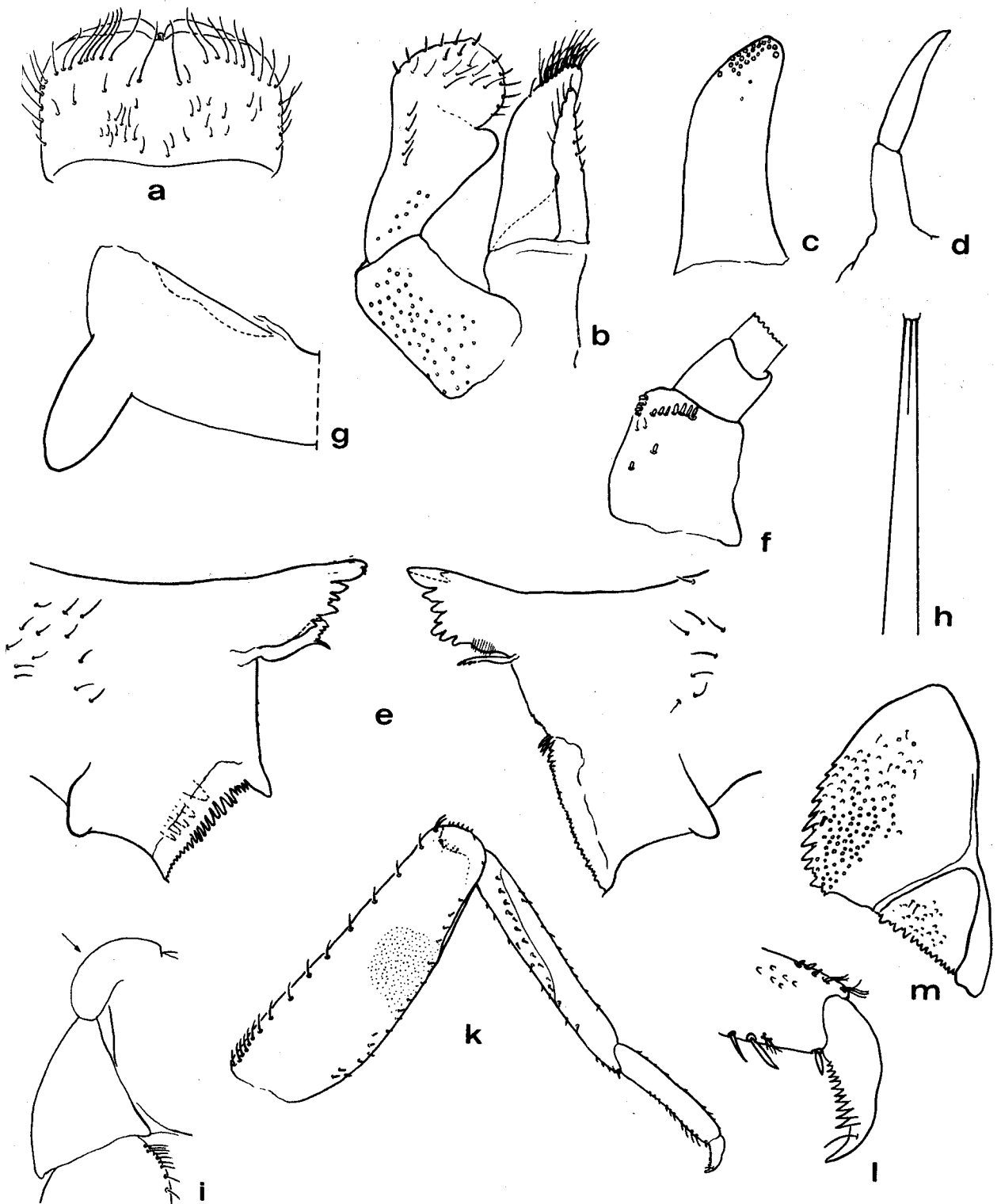


Fig. 3: Nymph of *Baetis sabahensis* sp.n., a - labrum. b - left half of labium. c - paraglossa at higher magnification, ventral. d - maxillary palpus. e - canini and molar area of left and right mandible. f - basal segments of antenna. g - left half of metanotum. h - caudal filaments. i - coxa and trochanter of femur with coxal gill. k - leg. l - claw. m - paraproct.

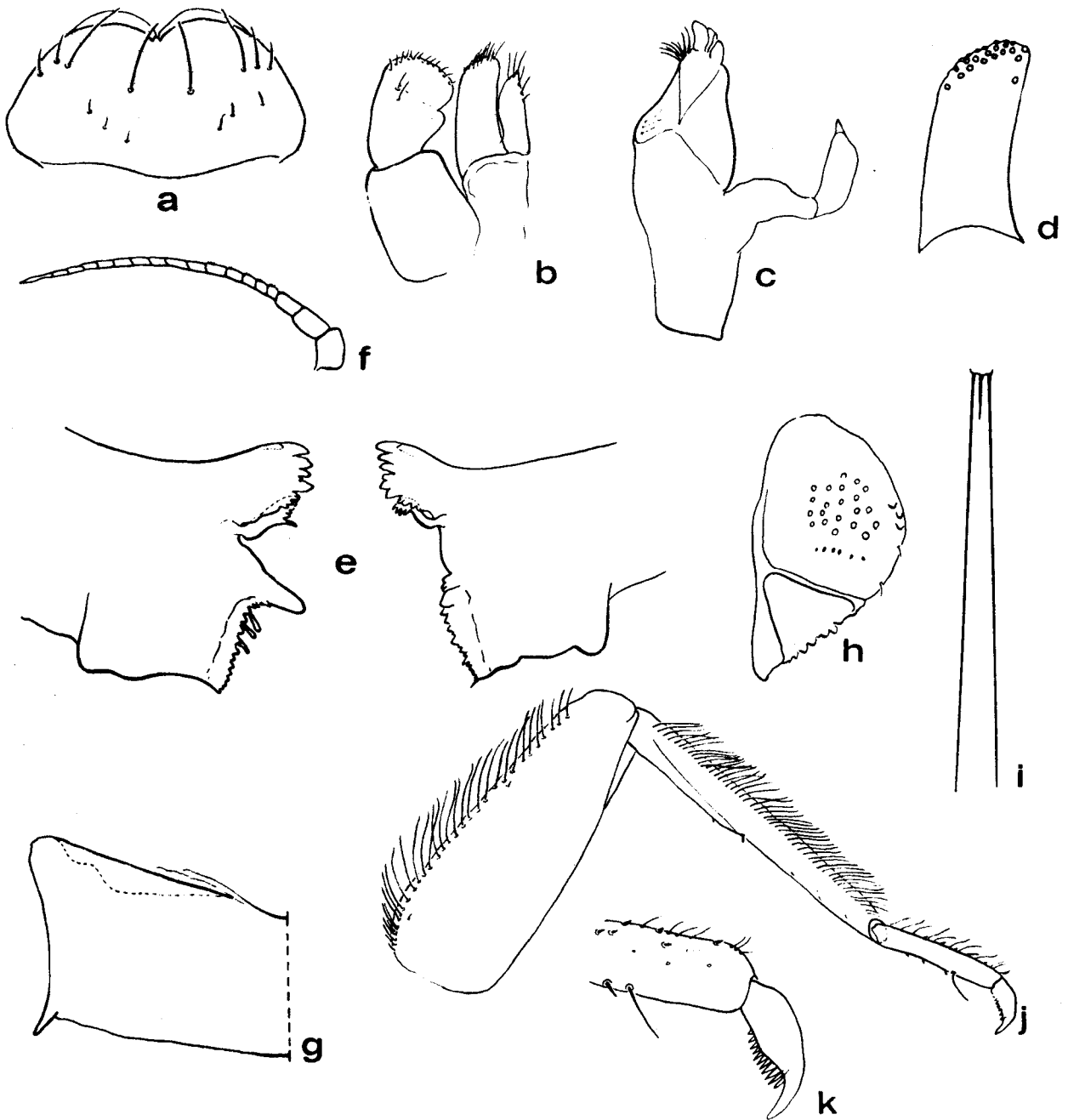


Fig. 4: Nymph of *Pseudocloeon proximum* sp.n., a - labrum. b - left half of labium. c - maxilla. d - paraglossa at higher magnification, ventral. e - canini and molar area of left and right mandible. f - left antenna. g - left half of metanotum with reduced hind wing pad. h - paraproct. i - caudal filaments. j - leg. k - claw.

Description: Body length male 8.0 mm, cerci 5.5 mm; female 8.5 mm, cerci 8.5 mm, terminal filament about 2.8 mm in both sexes. - Color pattern on pronotum and dorsum of abdomen shown in Fig. 9. Caudal filaments brownish, darker near base, with a lighter band near apex of terminal filament. - Morphological details as in Fig. 3. Stout submarginal bristles on basal segments of antenna. - Hind wing pads large, about as long as me-

tanotum. - Legs: 1st pair of legs with a single coxal gill (Fig. 3 i). - Seven pairs of gills are developed. Posterior half of gills a little darker than anterior half and covered with scales and scale bases. - Claw with a slightly curved subapical bristle. - Spines on posterior margin of terga rather short and rounded on frontal segments (Fig. 14), elongate and pointed on posterior segments (Fig. 14 a). Dorsal surface of terga as in Fig. 14.

Holotype: slide preparation of nymph: E. Malaysia, Sabah, Sungai Moyog at trib. 8 mi. E. Penampang 1. 10. 1978, leg. G. F. Edmunds, Jr. - Paratypes 2 slide preparations and 6 nymphs in alcohol: Sungai Moyog at trib. 8 mi. E. Penampang, 1. 10. 1978 and 2. 10. 1978; trib. of Sungai Moyog 3 mi. E. Penampang, 30. 10. 1978.

Remarks: Baetis sabahensis sp.n. is the only species in the genus with coxal gills on the first pair of legs. A certain similarity of B. sabahensis sp.n. to B. javanicus Ulmer (Java, Sumatra, Müller-Liebenau 1981) is seen in a number of morphological characteristics, among other shape and submarginal bristling on labrum, stout bristles on pedicel of antenna, bristling on legs, a long curved bristle near apex of claw. - Both Baetis sabahensis sp.n. and B. javanicus are not included in any known species-group.

4. Pseudocloeon proximum sp.n. (Figs. 4, 10, 15)

Material: 20 nymphs.

Description: Body length male 3.2 - 3.5 mm, cerci 2.1 mm; female 3.2 - 3.6 mm, cerci 2.3 mm; terminal filament reduced to about 12 segments in both sexes. - Color pattern of pronotum and dorsum of abdomen as in Fig. 10. Caudal filaments brownish. - Morphological characteristics as in Fig. 4. Labrum comparatively wide at base and tapering apically. - Third segment of labial palpus shorter than broad. - Maxillary palpus at apex with isolated sclerotised tip. - Basal segments of antenna serrated at inner margin. - Hind wing pads reduced. - Femur without submarginal bristles along bases long bristles (at most one or two). - Tibia of 3rd leg on outer margin with two rows of long bristles (Fig. 4 j shows 1st leg with only 1 row of long bristles). - Cerci fringed with swimming bristles on inner margin. - Dorsal surface and posterior margin of terga as in Fig. 15. Spines short, rounded and with more or less distance from each other.

Holotype: slide preparation, male nymph: E. Malaysia, Sabah, Sungai Tuaran, Tamparuli. G. F. Edmunds, Jr., leg. 3. 10. 1978. Paratypes: 18 nymphs in alcohol, 1 slide preparation, same localities as Holotype.

Remarks: Pseudocloeon proximum sp.n. appears closely related to Ps. verum (W. Malaysia) and to Pseudocloeon sp. 1 Ulmer 1939 (S. Sumatra) and is therefore easily placed in the verum group of this genus (see Verification Table in Müller-Liebenau 1982). The main common characters in this group are a broad

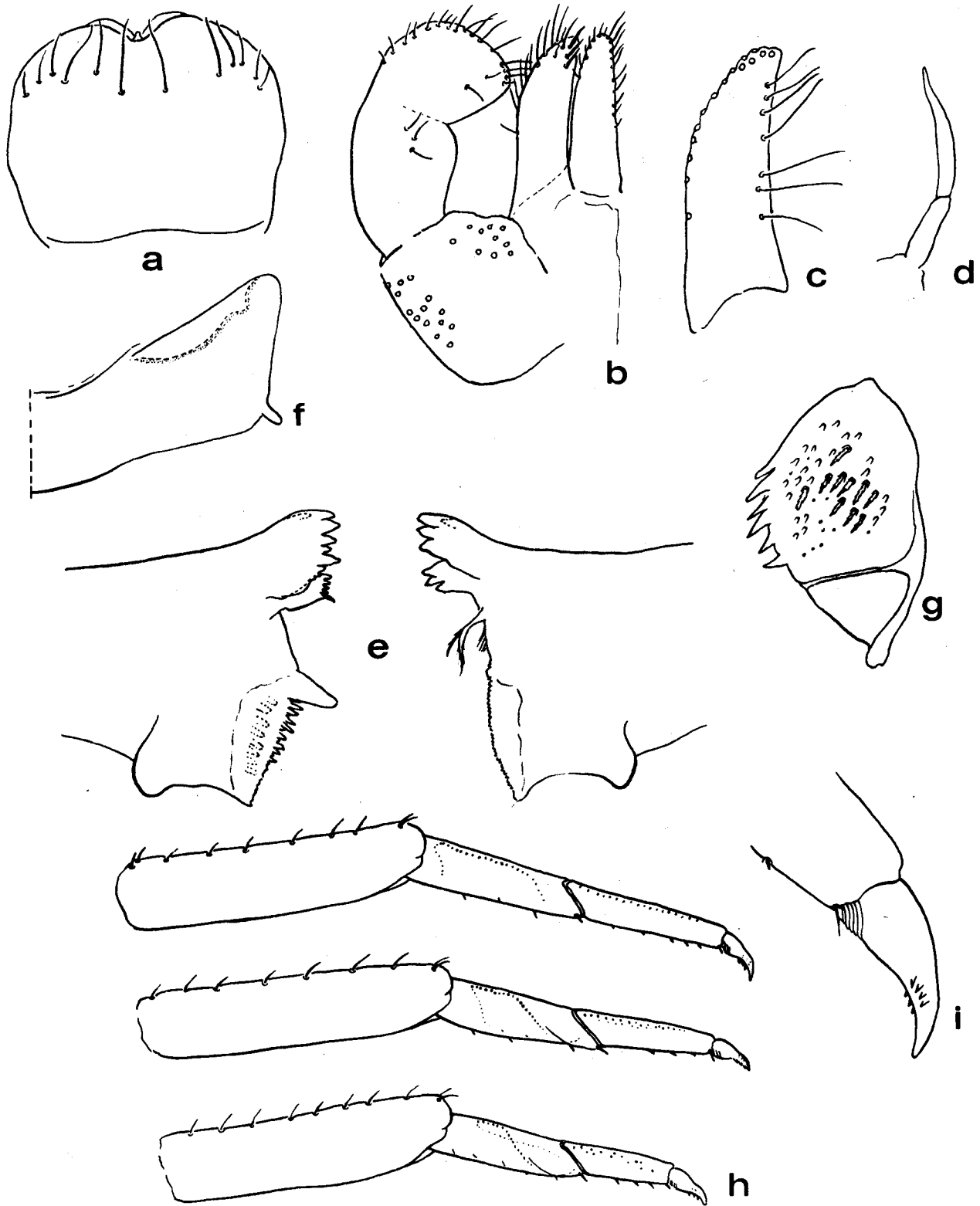


Fig. 5: Nymph of Centroptella pusilla sp.n., a - labrum. b - left half of labium. c - paraglossa at higher magnification, ventral. d - maxillary palpus. e - canini and molar area of left and right mandible. f - right half of metanotum with reduced hind wing pad. g - paraproct. h - leg I, II, III. i - claw.

With both species it has in common the elongate scales and the lack of spines on posterior margin of terga (except segment IX and X with spines). The color pattern on the pronotum is quite different from that of C. ceylonensis and C. similis. The color pattern on the dorsum of abdomen differs conspicuously from that of C. ceylonensis but corresponds fairly well with that of C. similis. Striking morphological differences between C. pusilla sp.n. and both other species are hardly recognisable. C. pusilla sp.n. differs from C. similis by having small reduced hind wing pads, from C. ceylonensis by the color pattern of dorsum of abdomen and by the considerable smaller body size (see Verification Table in Müller-Liebenau 1983).

A comparison of all five Centroptella species known shows that two species-groups appear to turn out as follows:

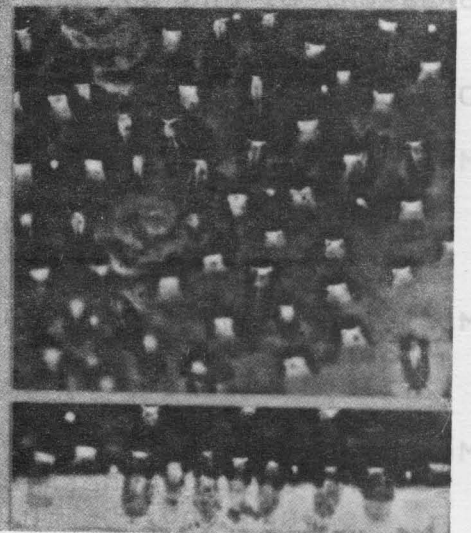
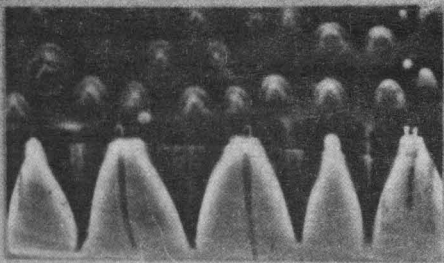
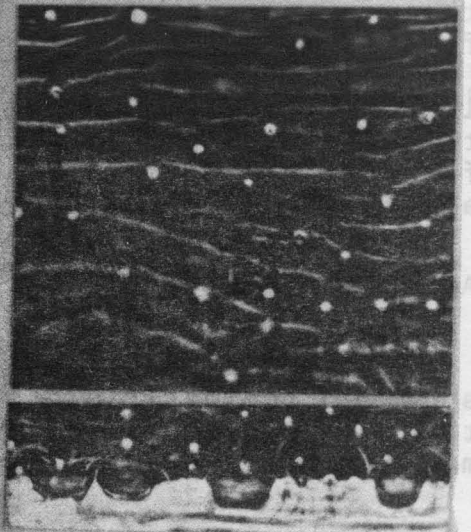
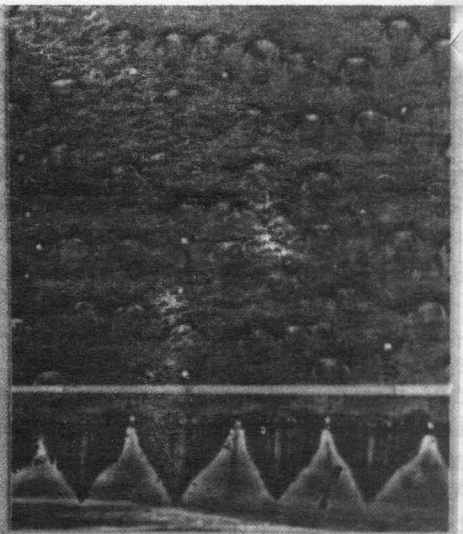
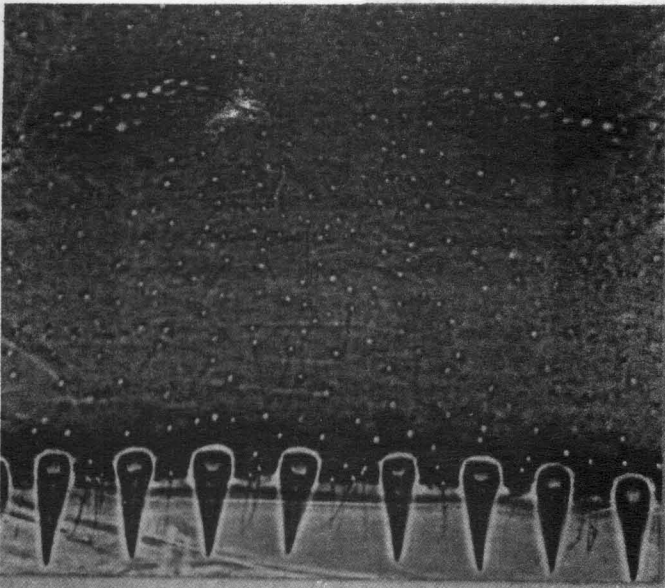
	<u>ceylonensis</u> <u>similis</u> <u>pusilla</u> sp.n.	<u>soldani</u> <u>longisetosa</u>
Claws	with two rows of denticles	without denticles
Scales	elongate	short
Posterior margin of terga	without spines (only on segment IX and X)	with spines

DISCUSSION

The study of this small collection from Sabah, E. Malaysia, has to be looked at an important addition to our present knowledge of the family Baetidae in South East Asia. New species of recently described genera and also of well known genera are described. They give a broader view of the distribution of these genera: 1) The finding of a new species of Platybaetis in the South East Asian Archipelago is not surprising. Although little is known from the hitherto known species, it is possible that these are endemic in their respective regions: Platybaetis bis-hopi in W. Malaysia, Pl. probus sp.n. in Sabah (all Borneo ?),

12	13
14	15
14a	16

Figs. 12 - 16: 12 - Nymph of Platybaetis probus sp.n., surface and posterior margin of nymphal tergum. 13 - Baetis borneoensis sp.n., surface and posterior margin of nymphal tergum. 14 - Baetis saba-hensis sp.n., surface and posterior margin of nymphal tergum, segment II. 14a - the same, segment VI. 15 - Pseudocloeon proximum sp.n., surface and posterior margin of nymphal tergum. 16 - Centroptella pusilla sp.n., surface and posterior margin of nymphal tergum.



some general remarks (Insecta: Epheuroptera). Mitt. Hamb. Zool. Mus. Iner., 78: 197-208.

Pl. edmundsi in the Philippines, and Pl. uenoi in a wider range in Nepal. Too little material is available and too little is known about the ecological demands of these species for more comprehensive conclusions. Further study is necessary for giving a valuable concept of the geographical dispersion of this genus and its species. - 2) As pointed out in a previous publication (Müller-Liebenau in press b) a high percentage of the Oriental Baetis species belongs to the Oriental molawiensis species-group: three of seven species in the Sunda Islands; two of four species from the Philippines; six of thirteen species in Dr. Bishop's collection from W. Malaysia; three of seven species from Sri Lanka; one of two species from the Bismarck Archipelago. Also one of the two newly described Baetis species treated in this paper belong to the molawinensis group, i.e. B. borneensis sp.n. - 3) A single species of Pseudocloeon contained in the collection studied, Ps. proximum sp.n. fits well in the verum group of this genus. This group includes Ps. verum from W. Malaysia and Pseudocloeon sp. 1 Ulmer from S. Sumatra (Müller-Liebenau 1982). - 4) The genus Centroptella, originally described from China, is now known also from Sri Lanka with three species (Müller-Liebenau in press b) and with one species from Sabah, and in all probability its range of dispersal will after further study prove to be very broad.

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