Oriental Insects
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/toin20

Two new mayfly species (Baetidae) from India

C. Selva Kumar [a], S. Sundar [a] & K.G. Sivaramakrishnan [b]

[a] Sri Paramakalyani Centre for Environmental Sciences, Manonmaniam Sundaranar University, Alwarkurichi 627 412, Tamil Nadu, India

[b] Department of Zoology, Madras Christian College (Autonomous), Tambaram East, Chennai 600 059, Tamil Nadu, India

To cite this article: C. Selva Kumar, S. Sundar & K.G. Sivaramakrishnan (2012): Two new mayfly species (Baetidae) from India, Oriental Insects, 46:2, 116-129

To link to this article: http://dx.doi.org/10.1080/00305316.2012.689487

Oriental Insects
Vol. 46, No. 2, June 2012, 116–129

Two new mayfly species (Baetidae) from India

C. Selva Kumar[a]*, S. Sundar[a] and K.G. Sivaramakrishnan[b]

[a]*Sri Paramakalyani Centre for Environmental Sciences, Manonmaniam Sundaranar University, Alwarkurichi 627 412, Tamil Nadu, India;* [b]*Department of Zoology, Madras Christian College (Autonomous), Tambaram East, Chennai 600 059, Tamil Nadu, India*

(*Received 12 January 2012; final version received 16 February 2012*)

Two new mayfly species belonging to the family Baetidae, namely *Platybaetis arunachalae* sp. nov. and *Indobaetis michaelohubbardi* sp. nov., are described from nymphs collected in the Ramanadi and Tamiraparani rivers, respectively, of the southern Western Ghats, Tamil Nadu, India. Generic diagnosis based on nymphs and key to known species of *Platybaetis* and *Indobaetis* are also provided.

Keywords: Ephemeroptera; taxonomy; *Platybaetis arunachalae*; *Indobaetis michaelohubbardi*; India

Introduction

Baetid species in their nymphal stages inhabit a wide range of lentic and lotic habitats, and many such species are known from the running waters. These are sensitive to pollution and show different sensitivity. Hence, species level identification is crucial for biomonitoring of fresh water bodies. Recent developments in Baetidae taxonomy have resulted in reassignment of species among genera and subfamilies. This is apparently due to the practice of basing species identifications primarily on the larval morphology, and relying mainly on the imaginal features for delineating generic and suprageneric limits. (Dudgeon 1999). Such understanding of generic and species limits of Baetidae of Sri Lanka were made by Dr Muller-Liebenau and her co-workers (Muller-Liebenau 1982; Muller-Liebenau and Morihara 1982; Muller-Liebenau and Hubbard 1985).

Among such baetids, the genus *Platybaetis* Muller-Liebenau (1980a) has seven species: *P. edmundsi* from Philippines and *P. uenoi* from Nepal (both Muller-Liebenau 1980b); *P. bishopi* from West Malaysia (Muller-Liebenau 1980b) and *P. probus* from East Malaysia (Muller-Liebenau 1984); *P. sulawesiensis* and *P. wallacei* from Indonesia (both Tong and Dudgeon 1999); Suter (2001) described *P. gadadjuensis* from Australia and Braasch (1981) recorded its species from Philippines, Nepal and Malaysia, and provided details of the nymphal characters of the genus. The genus *Indobaetis* was established by Muller-Liebenau (1982) for *I. costai* and *I. starmuehlneri* from Sri Lanka.

This study explores these baetids from India and describes two new species based on nymphs. These include a species each of *Platybaetis* and *Indobaetis* from the

*Corresponding author. Email: selvaaa06@gmail.com

ISSN 0030–5316 print/ISSN 2157–8745 online

http://dx.doi.org/10.1080/00305316.2012.689487
http://www.tandfonline.com

Western Ghats of Tamil Nadu. Generic diagnosis based on nymphs and key to known species is also provided. The type specimens are deposited with the Zoological Survey of India, Kolkata (ZSI-K), and partly with Sri Parama Kalyani Centre for Environmental Sciences, Alwarkurichi, Tamil Nadu, India (SPKCES, MSUNMNH).

A. *Platybaetis arunachalae* sp. nov. (Figures 1–22)

Description

Nymph

Head flattened and subquadrangular, slightly wider than long; yellowish brown dorsally with irregular pale brown markings, whitish ventrally, maximum width 0.07 mm, inter ocular distance 0.05 mm. Ocelli semilunar shaped. Antennae pale yellow, thick and short, slightly longer than width of head; scape nearly as broad as long, pedicel cylindrical, about 0.7–1.2× longer than broad; flagellum with nearly 16 segments. Labrum nearly rectangular, approximately 2× wider than long; labrum directed ventrally (Figures 5 and 17). Hypopharynx as in Figures 10 and 22. Left mandible with incisors having 6–7 denticles, molar area with a stout, thumb like apical prolongation, approximately 2× as long as wide (Figures 7 and 19); right mandible with incisors having 6–7 denticles (Figures 8 and 20). Maxillae with 5–7 long, fine, simple setae on medial hump; palp three segmented, division between first and second segment indistinct (Figures 6 and 18); labium with narrow glossae which are shorter than the broad paraglossae and three segmented, and second segment of labial palpi with a very small lobe on its mesial margin (Figures 9 and 21).

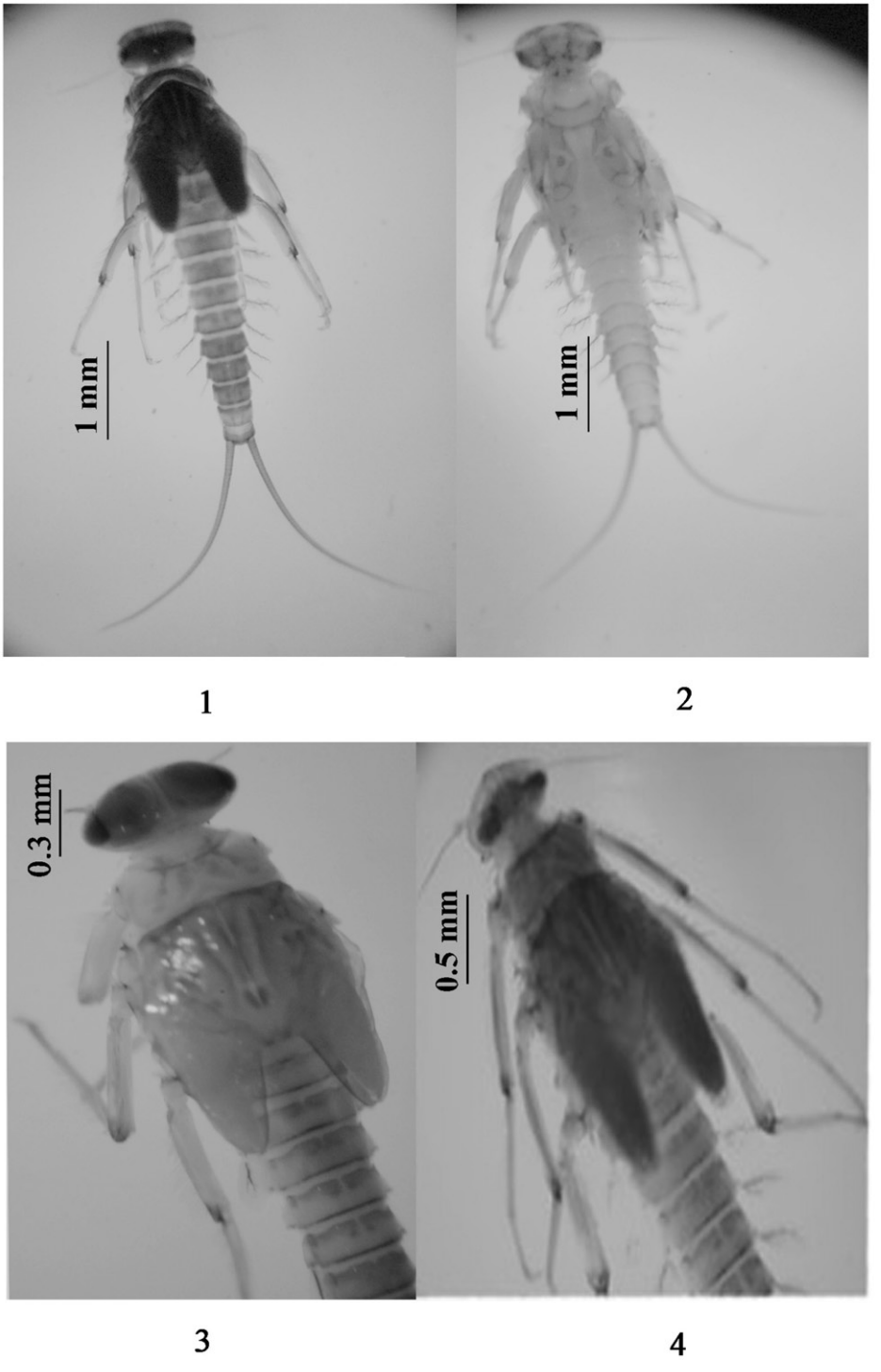
Thorax yellowish brown. Prothorax approximately as broad as head capsule in female, slightly narrower in male; and its posterolateral margin rounded. Hind wing pads absent or vestigial (Figure 14). Legs paler than thorax, with a single row of long, pinnate setae along dorsal margin of femora; similar row of less robust but denser setae on dorsal margins of tibiae and tarsi; submarginal setae along the dorsal margin of femora stout and conical; all submarginal setae approximately of same length as distance between bases of long setae; and tarsal claw with a single row of denticles, with the denticle near apex longest (Figure 15).

Abdomen yellowish brown dorsally, milky white ventrally; terga 2–9 each with brown markings medially, anterior pair rod like and divergent posteriorly, posterior pair shorter and smaller than anterior one; terga 1 and 10 without such markings, but each with long, acute posterior marginal spines (Figure 12). Gills simple and rather large; lamellae dark brown with strongly ramified tracheae; gills 1–7 each with numerous short, robust, simple setae near anterolateral margin (Figure 11). Paraproct as in Figure 16. Cerci nearly 0.5× as long as body, fringed with short hairs medially; and terminal filament reduced with only 13 segments (Figure 13).

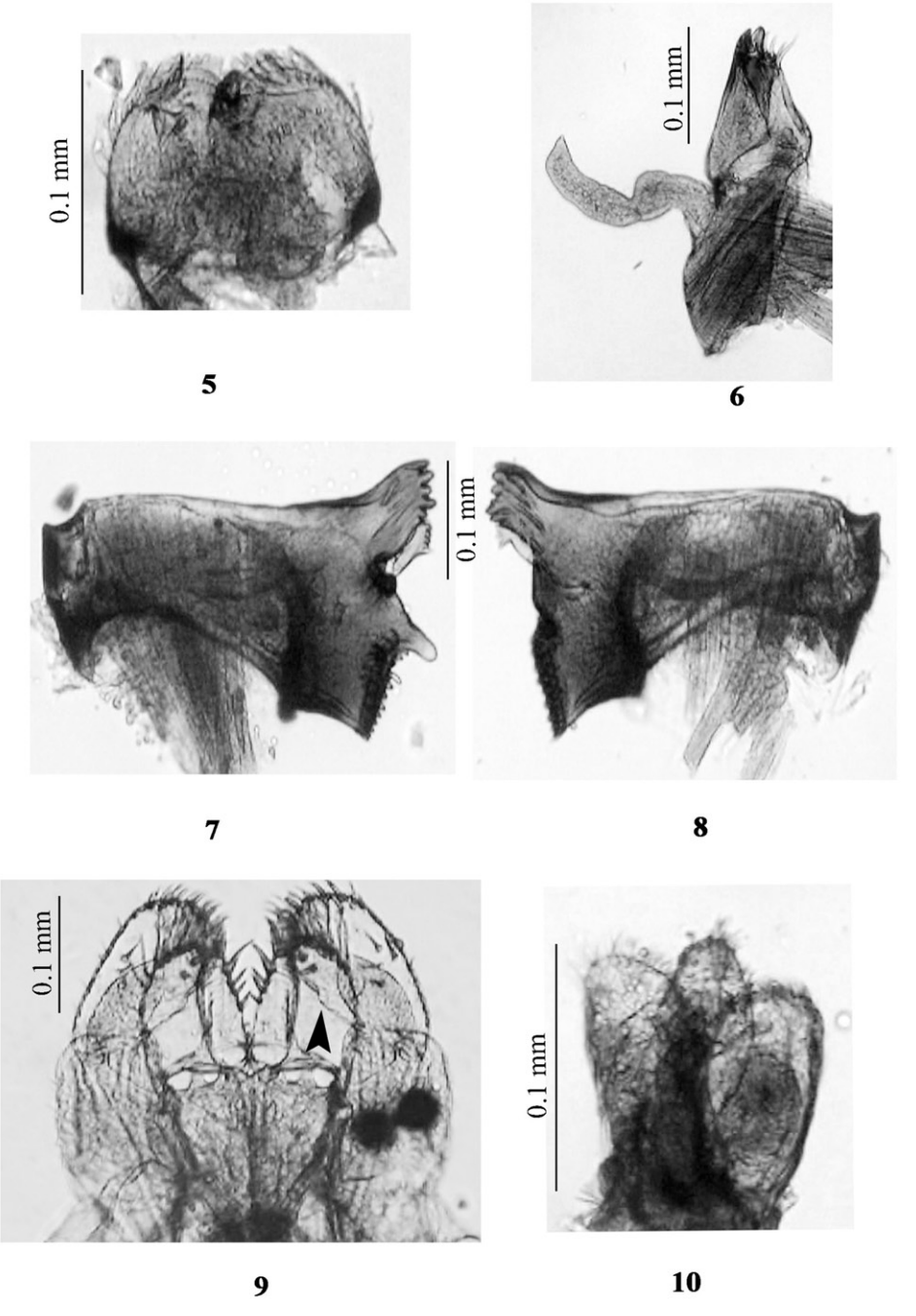
Body length: 5.2–5.9 mm (male); 4.8–5.4 mm (female); cerci: 2.3–3.1 mm (male), 2.1–2.9 mm (female) and terminal filament 0.04 mm.

Holotype

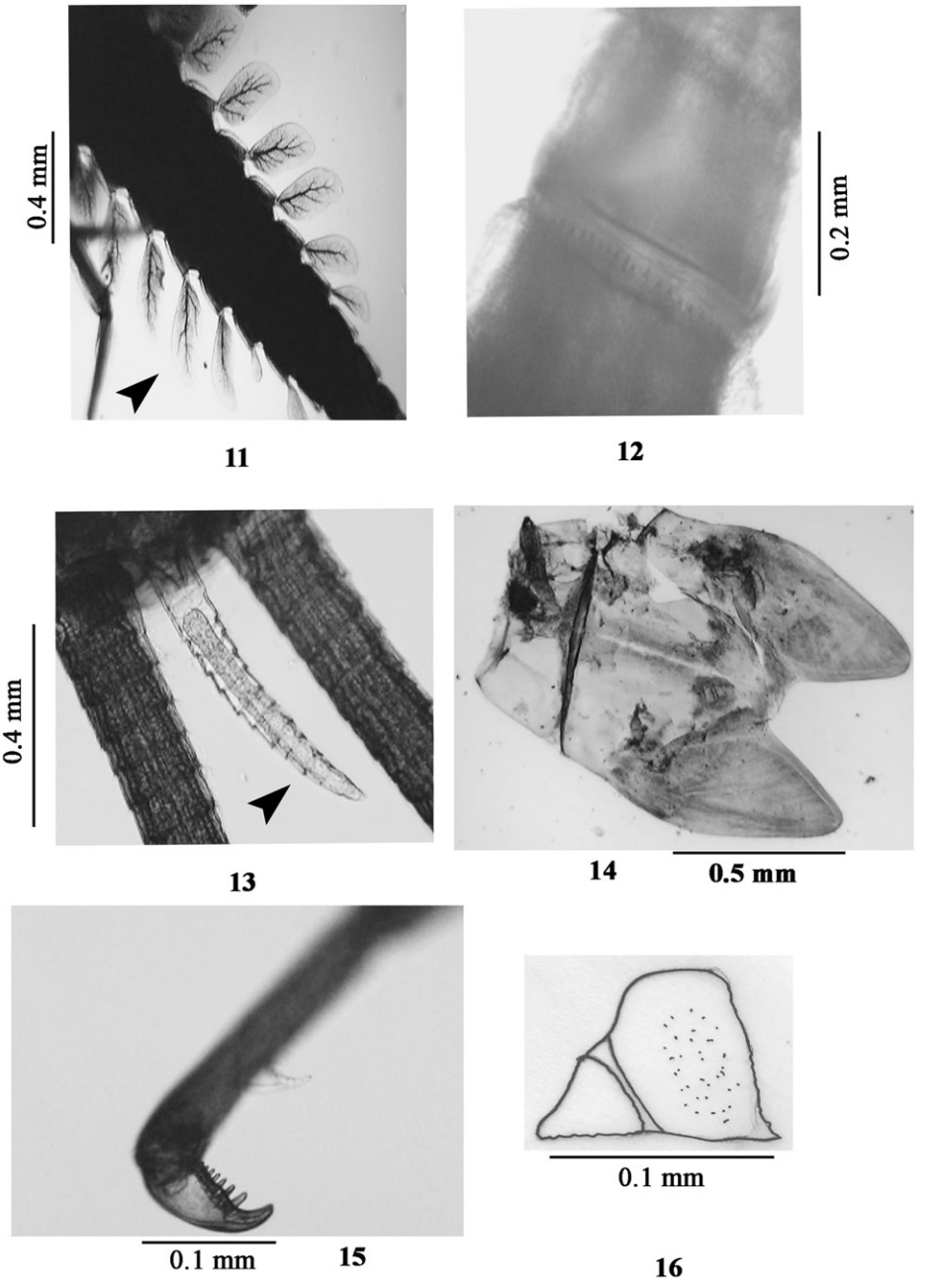
m, mature nymph, 15.vii.2009. Coll. C. Selvakumar and S. Sundar, in ethyl alcohol; *paratypes*, m,f, nymphs, 15.vii.2009. Coll. C. Selvakumar and S. Sundar, in



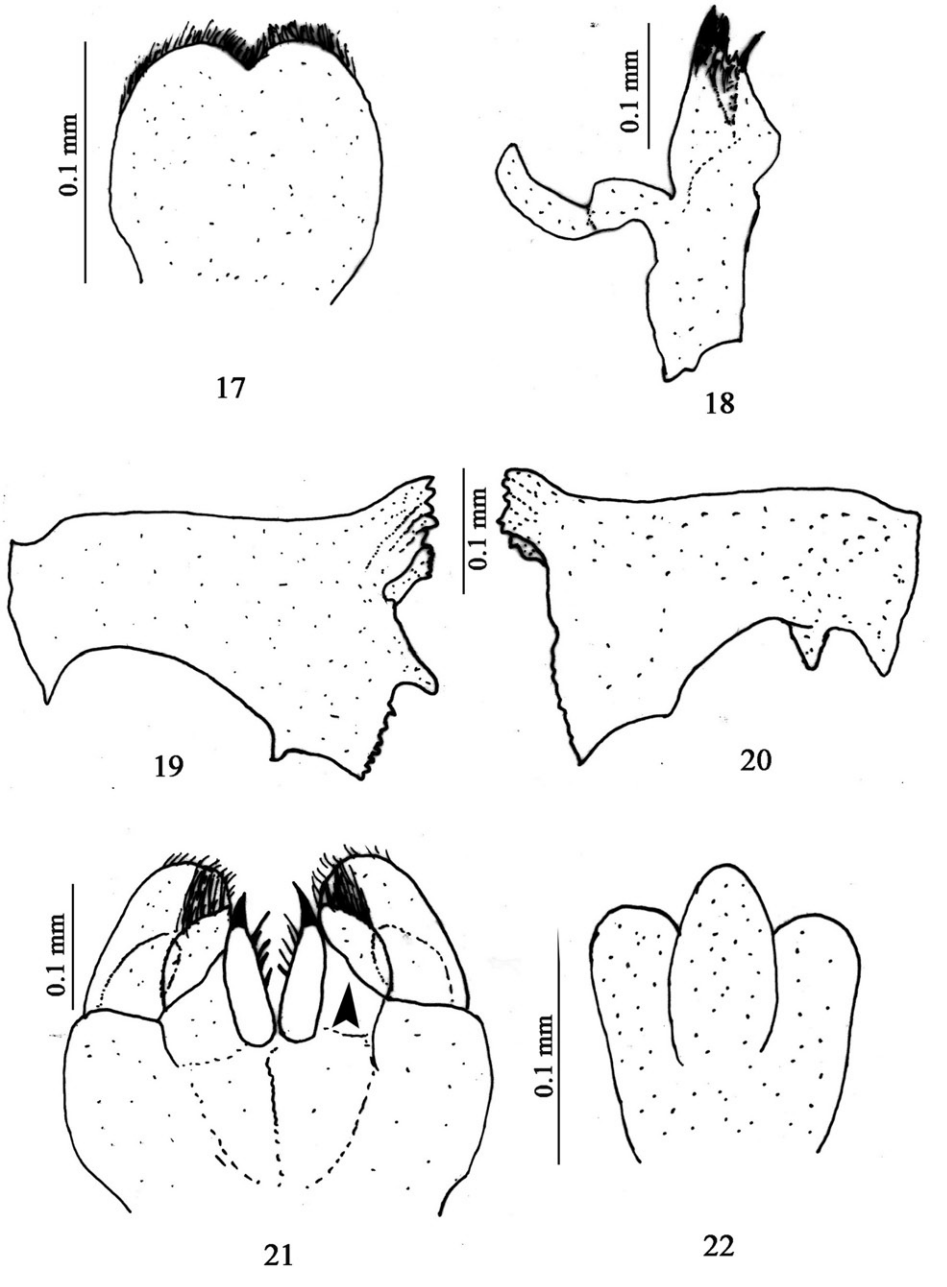
Figures 1–4. *Platybaetis arunachalae* sp. nov.;
1, dorsal view; 2, ventral view; 3, male; 4, female.



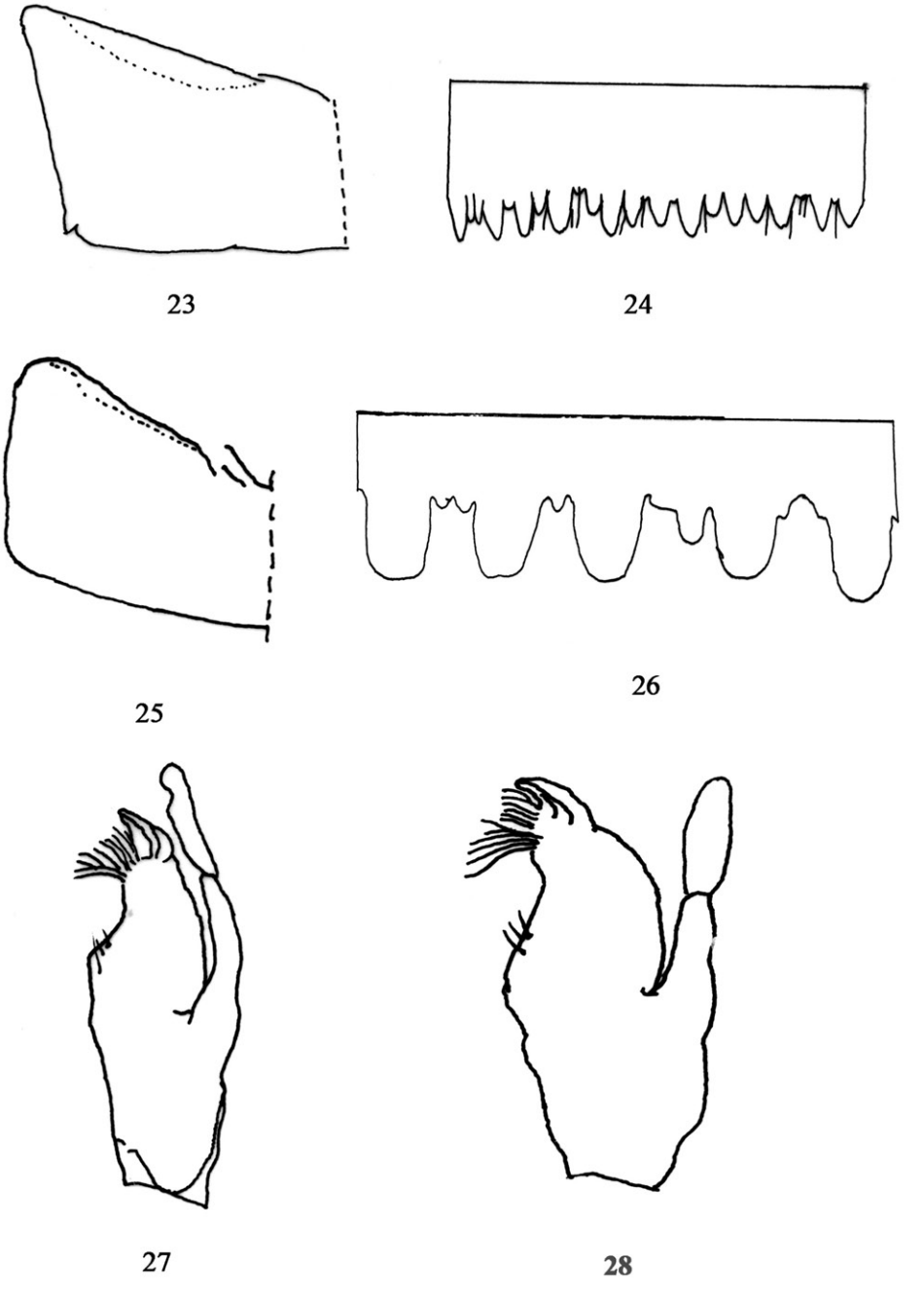
Figures 5–10. *Platybaetis arunachalae* sp. nov.;
5, labrum; 6, maxilla; 7, left mandible; 8, right mandible; 9, labium; 10, hypopharynx.



Figures 11–16. *Platybaetis arunachalae* sp. nov.;
11, abdomen gills; 12, posterior marginal spines of abdomen; 13, terminal filament; 14, wing pad; 15, claw; 16, paraproct.

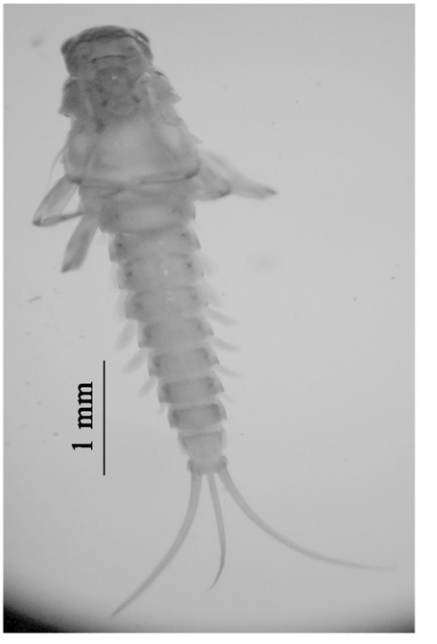


Figures 17–22. *Platybaetis arunachalae* sp. nov.;
17, labrum; 18, maxilla; 19, left mandible; 20, right mandible; 21, labium; 22, hypopharynx.

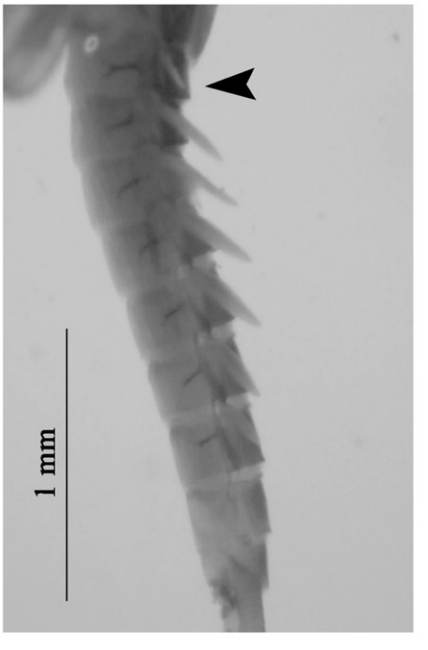


Figures 23–28. *P. wallacei*: 23, left half of metanotum; 24, abdominal blunt spines; *P. Bishopi*: 25, left half of metanotum; 26, abdominal tergum with blunt spines; 27, maxillary palp of *Indobaetis costai*; 28, maxillary palp of *Indobaetis starmuelhneri*.

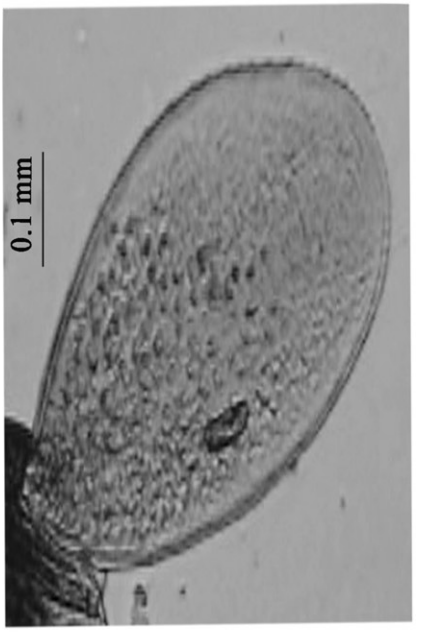
29



30

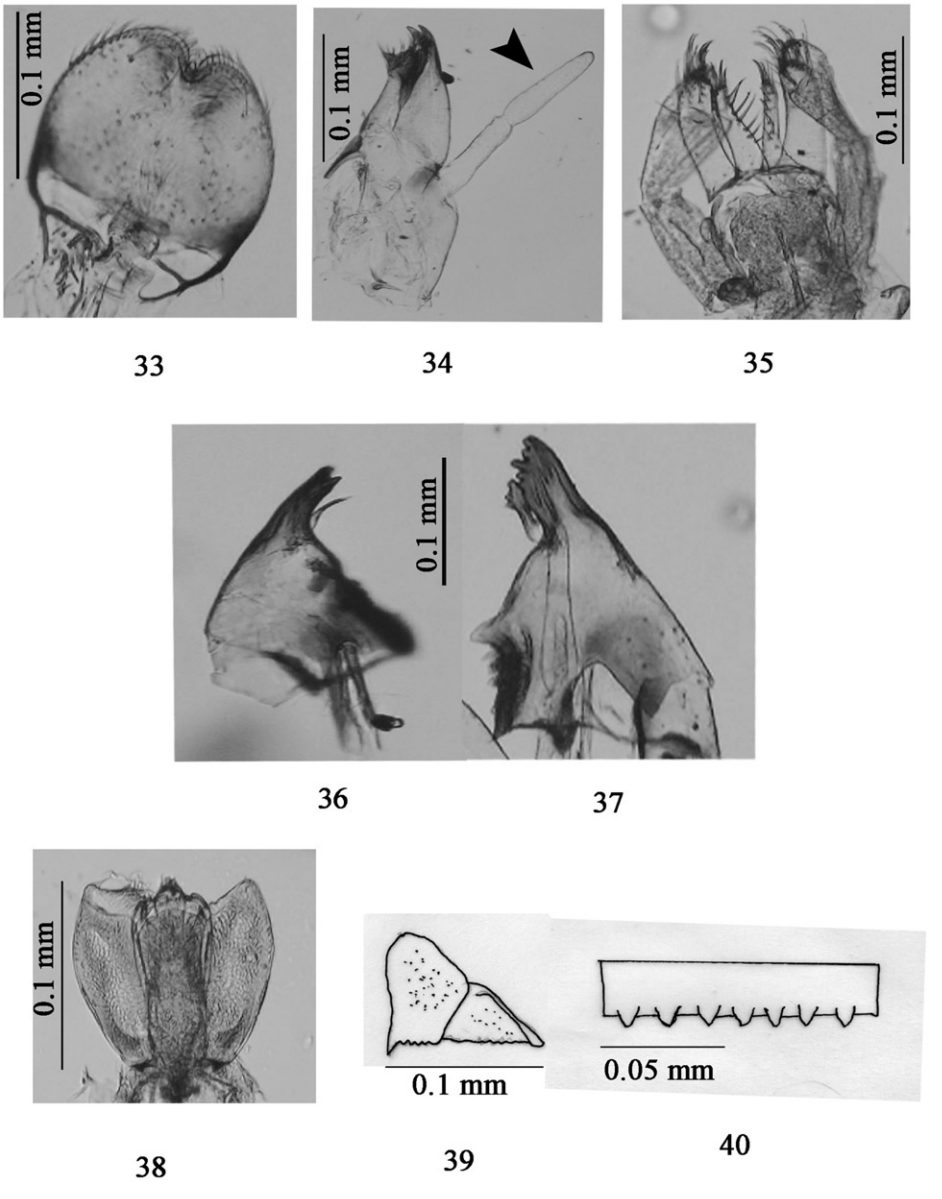


31



32

Figures 29–32. *Indobaetis michaelohubbardi* sp. nov.; 29, dorsal view of nymph; 30, ventral view of nymph; 31, seven pairs of abdominal gills; 32, gill.

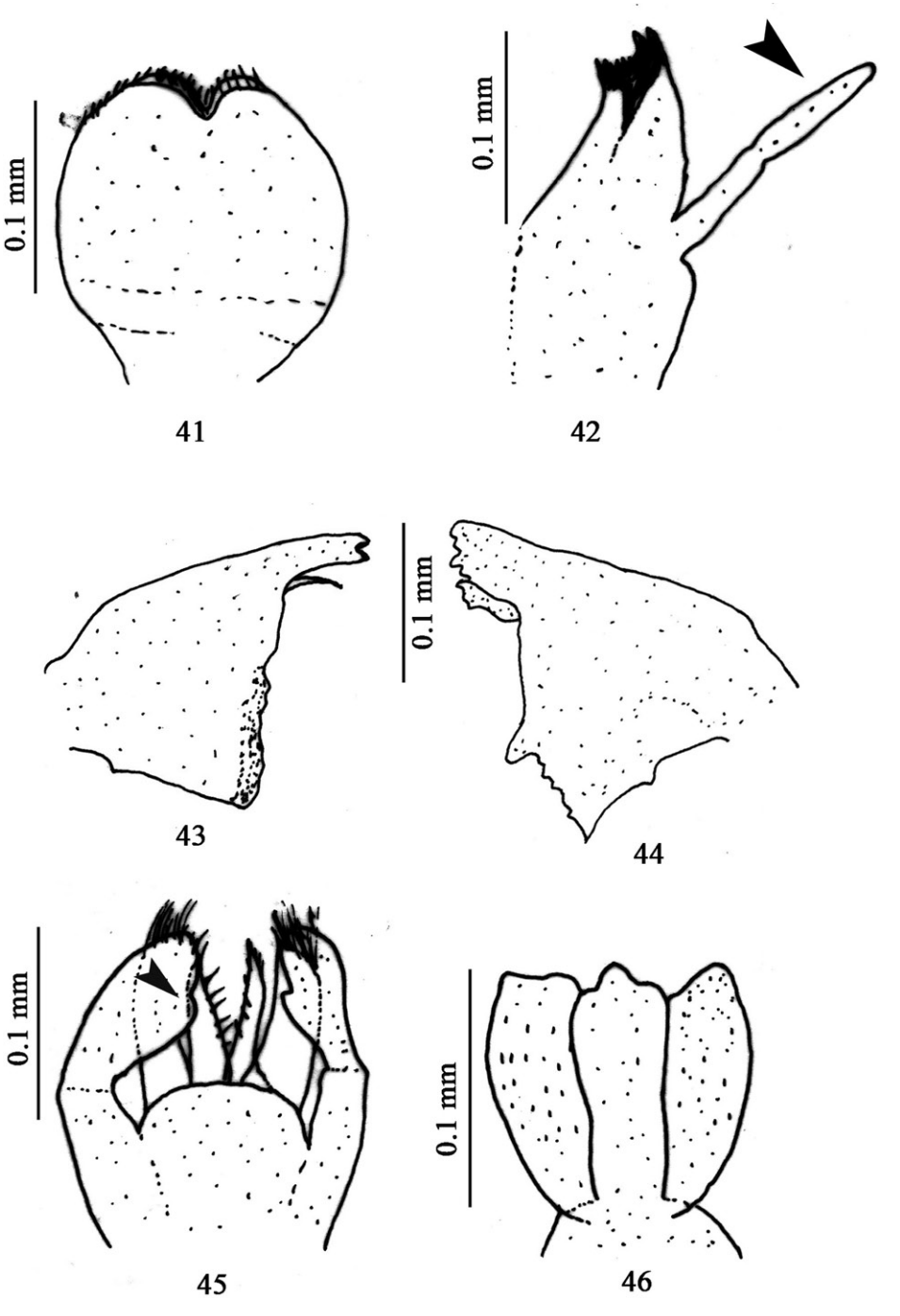


Figures 33–40. *Indobaetis michaelohubbardi* sp. nov.; 33, labrum; 34, maxilla; 35, labium; 36, left mandible; 37, right mandible; 38, hypopharynx; 39, paraproct; 40, posterior marginal spines of abdomen.

ethyl alcohol. (ZSI-K -Ref. No: 4847/H13 –holotype; 4848/H13- paratypes; dt. 16/12/2011).

Comments

Nymphs of this new species can be distinguished from other species of *Platybaetis* in the following combination of characters: Abdominal gills 1–7; abdominal terga 1–10



Figures 41–46. *Indobaetis michaelohubbardi* sp. nov.; 41, labrum; 42, maxilla; 43, left mandible; 44, right mandible; 45, labium; 46, hypopharynx.

each with long, acute posterior marginal spines; second segment of labial palp with a very small lobe on mesial margin and terminal filament reduced to about 13 segments.

Nymphs occur most commonly on the upper surface of large flat rocks in moderate to swift current where the stream is not heavily shaded by riparian vegetation. The type locality in the Ramanadi river, above Dam, 237 m, N 08° 50′ 53.4″, E 077°18′ 51.2″ has its origin in the eastern slopes of the KMTR of Western Ghats at 1572 msl after flowing about 8 km along the eastern slopes. It emerges in the plains on the north-eastern side of Melakadayam, Ambasamudram taluk, Tirunelveli District. After flowing 7 km it joins with another stream called Jambunadi (also called as Veeranadi) and flows through the plains for 12 km. It confluences with Gadana to the north-east of Kila Ambur village in Ambasamudram taluk.

Generic diagnosis vs nymphs

The genus *Platybaetis* is presently distinguished in its nymphal stage from all other Baetidae in the combination of characters namely: both sexes dorsoventrally flattened; head prognathous, broader than long, with very small labrum; thorax (especially the pronotum) somewhat rounded laterally; legs stout with femora having a dense row of fine ciliated bristles along the outer margins; a pair of long setae near the apex of each tarsus; gills present on abdominal segments 1–7 or 2–7; hind wing pads absent or much reduced; and median terminal filament greatly reduced while the cerci subequal in length to the body.

Etymology

This species is named in honour of Prof. M. Arunachalam, Manonmaniam Sundaranar University, Alwarkurichi, Tirunelveli, Tamil Nadu, for his immense interest to build up a database on benthic macroinvertebrates.

B. Key to the species of Platybaetis *(based on nymphs)*

(1) Head in the middle of posterior margin with a clear incision 2
Head in the middle of posterior margin utmost with a shallow indentation 3

(2) Hind wing pads heavily reduced; spines on posterior margin of terga pointed; distribution Philippines..... *edmundsi*
Hind wing pads not developed; spines on posterior margin of terga inserted submarginally, appearing like large bristles; distribution Malaysia..... *probus*

(3) Terminal filament reduced to one segment 4
Terminal filament reduced but with more than one segment 7

(4) Bristles at inner row near apical margin of paraglossae clavate..... 5
Bristles at inner row near apical margin of paraglossae pointed; distribution Nepal ..... *uenoi*

(5) Terga 1–10 each with long, acute posterior marginal spines; distribution Indonesia ..... *sulawesiensis*
Terga 1–10 with broad, rounded posterior marginal spines 6

(6) Left half of metanotum with hind wing pads as in Figure 23; hind margin of larval abdominal tergum with conspicuously broad, rounded, blunt spines as in Figure 24; distribution Indonesia..... *wallacei*
Left half of metanotum without hind wing pads as in Figure 25; hind margin of larval abdominal tergum with slightly broad, rounded, blunt spines as in Figure 26; distribution Malaysia .....*bishopi*

(7) Terminal filament with about 16 segments; gills present on segments 2–7, second segment of labial palpi with a well developed lobe on mesial margin; distribution Australia ..... *gagadjuensis*
Terminal filament with only 13 segments; gills present on segments 1–7, second segment of labial palpi with a very small lobe on mesial margin; distribution India..... *arunachalae* sp. nov.

C. *Indobaetis michaelohubbardi* sp. nov. (Figures 29–46)

Description

Nymph

Colour uniform pale brown dorsally, distal pale muscle insertions dorsally on segments II–IX; caudal filaments lighter than dorsum of abdomen (Figures 29 and 30). Head with antennae about 0.5× as long as body, with a spine at inner apical margin of each segment in basal half of antenna. Labrum with two strong submarginal bristles on each half and a number of fine bristles (Figures 33 and 41). Mandibles with all canini fused basally, almost similar in size, domed ventrally; with right prostheca slender and pointed (Figures 36, 37, 43 and 44). Maxillae with palp reaching beyond galea-lacinia, and without indentation on inner margin near apex (Figures 34 and 42). Labium with glossa as long as paraglossa, with a subapical transverse row of 6 fine bristles; labial palp slender, no inner apical lobe on second segment, third segment about 2× as long as broad, and second segment of palpi with a well developed lobe on its mesial margin (Figures 35 and 45). Hypopharynx with a 'brush' at apex of middle lobe (Figures 38 and 46). Legs slender with strong setae on outer margin of femur and tibia, and claws with single long setae between two apical denticles near margin. Hindwing pads absent. Abdominal gills in segments 1–7. Paraproct with a tongue-like prolongation at its inner posterior edge (Figure 39). Surface of terga with rounded scales, posterior margin with basically broad, elongate and pointed spines (Figure 40).

Body length 3.0–4.5 mm; cerci 0.33× as long as body; terminal filament 0.5× as long as caudal.

Holotype

m, mature nymph, 18.vii.2009. Coll. C. Selva kumar and S. Sundar, in ethyl alcohol (ZSI-K; Ref. No: 4849/H13 dt. 16/12/2011); *paratypes*, m,f, nymphs, 18.vii.2009. Coll. C. Selva kumar and S. Sundar, in ethyl alcohol (SPKCES, MSUNMNH – ref. MSUMNH I 6/ 003).

Etymology

This new species is named in honour of Prof. Michael Hubbard in recognition of his contributions to the Oriental mayflies.

Comments

The nymphs of this new species can be distinguished from all other species of *Indobaetis* in the following combination of characters: Maxillary palp reaching beyond galea-lacinia, without indentation on inner margin near apex; second segment of labial palpi with a well developed lobe on its mesial margin; and with abdominal gills in segments 1–7.

The type locality Tamiraparani river, Papanasam, 108 m, N 08°42′37.1″, E 077° 22′03.01″, is a major east flowing river, originating from the Pothigai hills of KMTR of Western Ghats (8° 42′ N and 77°24′ E, 2074 msl), meanders through a distance of 120 km (24 km in hilly terrain and 96 km in plains) in Tirunelveli and Tuticorin districts and drain into the Bay of Bengal.

Generic diagnosis vs nymphs

The genus *Indobaetis* is presently distinguishable in its nymphal stage from all other Baetidae genera in the combination of characters: head bowed vertically and head and thorax laterally compressed; mandibular incisors fused together with the right mandibular protheca slender and pointed; apical teeth on the galea-lacinia long and sharp, and second segment of the maxillary palp with a slight indentation on inner margin near the apex; lapial palp rather slender, with third segment not broadly rounded; tarsal claws with a single long setae between the apical denticles; inner posterior edge in paraproct with a tongue like prolongation and terminal filament subequal in length to the cerci.

D. Key to the species of Indobaetis *(based on nymphs)*

(1) Maxillary palp reaching beyond galea-lacinia, with indentation on inner margin near apex (Figure 27), second segment of labial palpi without a lobe on mesial margin, abdominal gills in segments 2–7 2
Maxillary palp reaching beyond galea-lacinia, without indentation on inner margin near apex, second segment of labial palp with a well developed lobe on the mesial margin; abdominal gills in segments 1–7 (Figures 34, 42); distribution India ..... *michaelohubbardi* sp.nov.

(2) Maxillary palp with its indentation near apex deep (Figure 27); distribution Sri Lanka ..... *costai*
Maxillary palp with its indentation near apex shallow (Figure 28); distribution Sri Lanka ..... *starmuelhneri*

Acknowledgements

The authors thank Dr K.A. Subramanian, ZSI, Kolkata, for critical review of this manuscript. KGS thanks the UGC, New Delhi, India, for the award of Emeritus Fellowship (No.F.6-39/2011-SA-II).

References

Braasch D. 1981. Zum Status einiger eintagsfliegenarten der ausbeute der japanischen Himalaya-Expeditionen 1952–53 und 1960, bearbeitet von M Ueno (I). Reichenbachia. 18:31–32.

Dudgeon D. 1999. Tropical Asian streams zoobenthos, ecology and conservation. Hong Kong: Hong Kong University Press. p. 830.

Muller-Liebenau I. 1980a. *Jubabaetis* Gen.N. and *Platybaetis* Gen.N., two new genera of the family Baetidae from the oriental region. In: Flannagan JF, Marshall KE, editors. Advances in Ephemeroptera Biology. New York: Plenum Press. p. 103–114.

Muller-Liebenau I. 1980b. A new species of the genus *Platybaetis* Muller-Liebenau I. 1980, *P.bishopi* sp.n., from Malaysia (Insecta, Ephemeroptera). Gevass. Abwass. 66/67:95–101.

Muller-Liebenau I. 1982. A new genus and species of Baetidae from Sri Lanka (Ceylon): *Indocloen primum* gen. n. sp. n. (Insecta: Ephemeroptera). Aquatic Insects. 4:125–129.

Muller-Liebenau I. 1984. Baetidae from Sabah (East Malaysia) (Ephemeroptera). In: Proceedings of the IVth International Conference on Ephemeroptera, CSAV, Bechyně, p. 85-89.

Muller-Liebenau I, Hubbard MD. 1985. Baetidae from Sri Lanka with some general remarks on the Baetidae of the oriental region (Insecta: Ephemeroptera). Florida Entomologist. 68: 537–561.

Muller-Liebenau I, Morihara DK. 1982. *Indobaetis*: A new genus of Baetidae from Sri Lanka (Insecta: Ephemeroptera) with two new species. Gewasser und Abwasse. 68: 26–34.

Suter PJ. 2001. *Platybaetis gagadjuensis*, a new species from northern Australia (Ephemeroptera: Baetidae). In: Dominguez, DE. (ed) Trends in Research in Ephemeroptera and Plecoptera. Kluwer Academics/Plenum Press, New York, pp. 359–364.

Tong X, Dudgeon D. 1999. Two new species of *Platybaetis* (Ephemeroptera, Baetidae) from Sulawesi, Indonesia. Entomologist News. 110(5):90–296.