

Three new species of the genus *Centroptella* BRAASCH & SOLDÁN, 1980, from Sri Lanka (Insecta: Ephemeroptera)

By I. MÜLLER-LIEBENAU

With 11 figures and 2 tables in the text

Abstract

The nymphs of three new species of the genus *Centroptella* from Sri Lanka are described in detail: *Centroptella ceylonensis* sp. n., *Centroptella similis* sp. n. and *Centroptella soldani* sp. n. Additional remarks are given to the original description of the genus and species *Centroptella longisetosa* (BRAASCH & SOLDÁN 1980). Two more species appear to be closely related to the same genus: "Gen. No. 2 sp. 1" from Malaysia (MÜLLER-LIEBENAU 1984) and "*Centroptilum* sp. No. 4" from Natal (DEMOULIN 1970). The Genus *Centroptella* appears to be phenetically intermediate between *Notobaetis* MORIHARA & EDMUNDS and *Centroptilum* EATON, and is more closely related to *Notobaetis*. A Verification Table for the nymphs of all species of *Centroptella*, *Notobaetis penai*, "Gen. No. 2 sp. 1", "*Centroptilum* sp. No. 4", and the Genus *Centroptilum* in general is presented.

Introduction

BRAASCH & SOLDÁN (1980) described the new monotypic genus *Centroptella* of the family Baetidae (Ephemeroptera) from China with *Centroptella longisetosa*. A collection of baetid mayfly nymphs from Sri Lanka which I have studied contains three additional new species of the genus: *Centroptella ceylonensis* sp. n., *C. similis* sp. n. and *C. soldani* sp. n. — The material was collected by Dr. F. C. STARMÜHLNER and Dr. G. WENINGER, Vienna, and Dr. H. H. COSTA, Kelaniya, during the Austrian-Ceylonese Hydrobiological Mission 1970 of the 1st Zoological Institute, University of Vienna (Austria) and the Department of Zoology, Vidyalandara University of Ceylon, Kelaniya.

Descriptions

Centroptella ceylonensis sp. n.

Figs. 1, 4, 5

Material: 50 nymphs.

Mature nymph. — Coloration (Fig. 4): Color pattern on dorsum of abdomen distinct and clearly developed; legs lighter brown, shaded darker in middle of femur and at base of tibia. Caudal filaments uniformly light brown. — Body length: 4.2–4.6 mm, all three caudal filaments stout, approximately equal in length, hardly half length of body.

Morphological details shown in Fig. 1. Incisors of right mandible deeply cleft, of left mandible relatively fused. Right mandible with slender, branched prostheca. Maxilla with 4 teeth at apex¹. Tibia of all legs with extremely long, fine setae arising from sockets forming dorsal arc near base as described for *Notobaetis penai* by MORIHARA & EDMUNDS (1980). Course of arc of fine setae different on tibia of each pair of legs. No seam recognizable on tibia of 1st leg. Claws with two rows of 3–4 denticles (Fig. 1m, n). Numerous scales present on all legs, but these less elongate than on terga. Seven pairs of abdominal gills present. Hind wing pads minute, but clearly developed². — Surface and posterior margin of terga as in Fig. 5. Scales on terga elongate; posterior margin of terga I–VIII without spines, terga of segment IX and X with triangular, pointed spines. Cerci with fringe of long, fine setae on entire inner margin, same on both margins of terminal filament. Swimming bristles on margins of terminal filament and on inner margins of cerci developed as normal bristles at base but inflated and hyaline distally (same in all species discussed herein, Fig. 2c).

Holotype: Mature nymph; slide preparation. Ceylon, FC 27/b, Kuda Oya, near Buttala, SE of Ceylon, 9. 12. 1970; leg. STARMÜHLNER.

Holotype and some Paratypes are deposited at the Zool. Staatssammlung, München. The remaining Paratypes are deposited at Florida A and M University, Laboratory of Aquatic Entomology, Tallahassee, Florida, U.S.A.

Centroptella similis sp. n.

Figs. 2, 6, 7

Material: 18 nymphs.

Mature nymph: Coloration (Fig. 6) on dorsum of abdomen similar to that of *C. ceylonensis* sp. n., but less intense, basic pattern clearly developed on terga II–VI; terga IX and X darker than in *C. ceylonensis* sp. n.; symmetrical light dots near middle of dorsum (Muscle insertions) smaller in *C. similis* sp. n. than in *C. ceylonensis* sp. n. Legs lighter brown and as in *C. ceylonensis* sp. n. shaded darker in middle of femur and at base of tibia. Caudal filaments uniformly light brown with fringe of swimming bristles as in *C. ceylonensis* sp. n. — Body length 3.5–3.9 mm, cerci and terminal filament stout, approximately equal in length, hardly half the length of body. Hind wing pads absent (Fig. 2b). 7 pairs of gills present. — Surface of terga and posterior margin as in Fig. 7.

¹ The maxilla of all species of the genus *Centroptella* including the type species *C. longisetosa* have 4 apical teeth, not 3 as indicated in the original description of *C. longisetosa* (BRAASCH & SOLDÁN, 1980).

² Also in *C. longisetosa* the hind wing pads are reduced and minute as in *C. ceylonensis* (Fig. 1h).

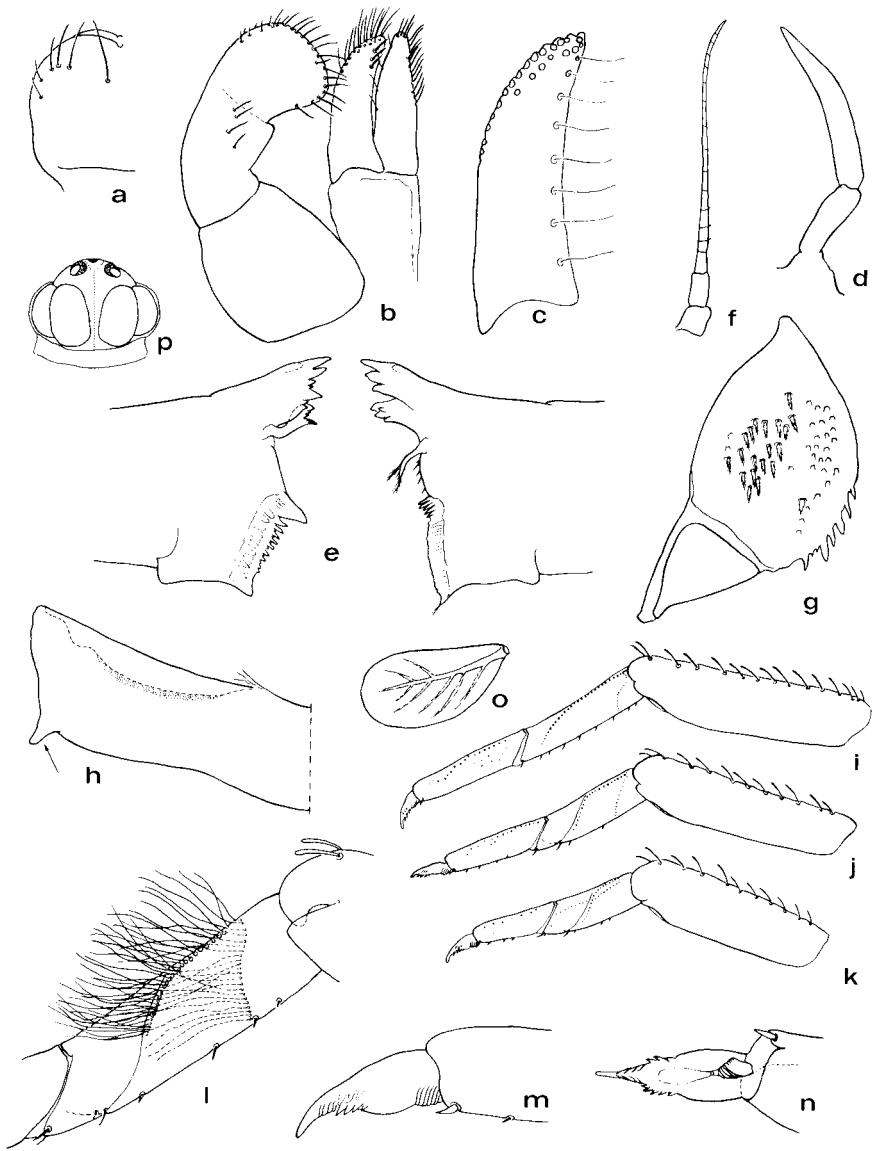


Fig. 1. *Centroptella ceylonensis* sp. n., nymph: a) left half of labrum; b) left half of labium; c) paraglossa, ventral; d) maxillary palpus; e) left and right mandibles; f) antenna; g) paraproct; h) left half of metatergum; i) 1st leg; j) 2nd leg; k) 3rd leg; l) tibia of 2nd leg; m) claw; n) claw, ventral; o) gill; p) head, dorsal.

Centroptella similis sp. n. is closely related to *C. ceylonensis* sp. n. The nymph resembles the nymph of *C. ceylonensis* sp. n. in most of the morphological characteristics (Fig. 1). The main difference between both species is

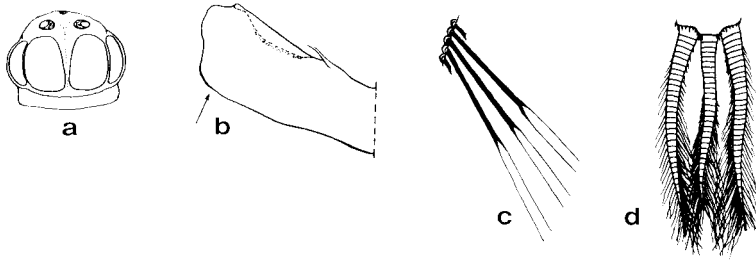


Fig. 2. *Centroptella similis* sp. n., nymph: a) head, dorsal; b) left half of metatergum; c) bristles of outer margin of cerci; d) cerci.

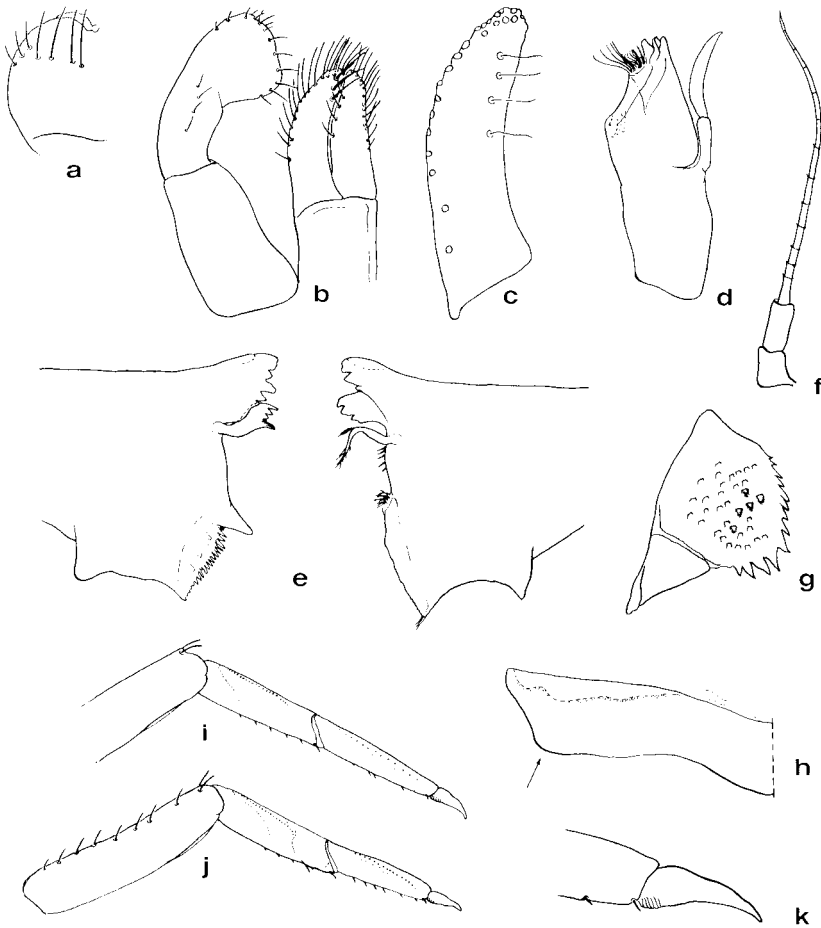


Fig. 3. *Centroptella soldani* sp. n., nymph: a) left half of labrum; b) left half of labium; c) paraglossa, ventral; d) maxilla; e) left and right mandibles; f) antenna; g) paraproct; h) left half of metatergum; i) 1st leg; j) 2nd leg; k) claw.

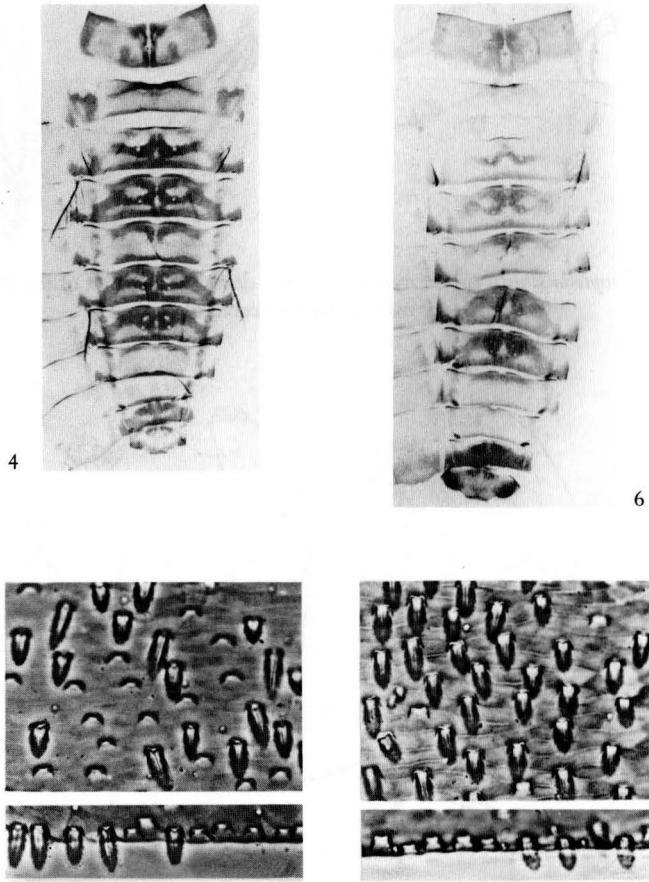


Fig. 4. *Centroptella ceylonensis* sp. n., nymph: color pattern of pronotum and abdomen.

Fig. 5. *Centroptella ceylonensis* sp. n., nymph: surface and posterior margin of tergum.

Fig. 6. *Centroptella similis* sp. n., nymph: color pattern of pronotum and abdomen.

Fig. 7. *Centroptella similis* sp. n., nymph: surface and posterior margin of tergum.

the lack of hind wing pads in *C. similis* sp. n. (in both sexes) (Fig. 2 b). Also the size ratio of turbinate eyes and the lateral eyes appears somewhat different in the male nymphs of both species (Fig. 1 p and 2 a). Surface of terga and structure of posterior margin of terga are very similar in both species (Figs. 5 and 7), although these are in general a little more elongate in *C. ceylonensis* sp. n.

Holotype: Mature nymph; slide preparation. Ceylon, FC 11/c, Rasanawa-Fall, Ratnapura, 19. 11. 1970. leg. STARMÜHLNER.

Paratypes: 12 nymphs in alcohol, 4 slide preparations.

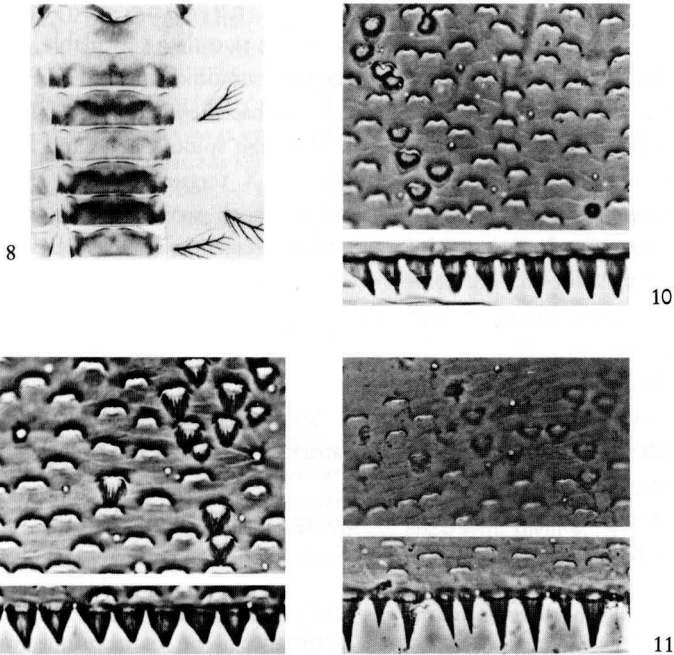


Fig. 8. *Centroptella soldani* sp. n., nymph: color pattern of abdomen (segments I—VII).

Fig. 9. *Centroptella soldani* sp. n., nymph: surface and posterior margin of tergum.

Fig. 10. *Centroptella longisetosa*, nymph: surface and posterior margin of tergum.

Fig. 11. "*Centroptilum* sp. No. 4" DEMOULIN, nymph: surface and posterior margin of tergum.

Holotypes and some Paratypes are deposited at the Zool. Staatssammlung, München. The remaining Paratypes are deposited at Florida A and M University, Laboratory of Aquatic Entomology, Tallahassee, Florida, U.S.A.

Centroptella soldani sp. n.

Figs. 3, 8, 9

Material: 2 nymphs.

Mature nymph: Coloration (Fig. 8): no clearly recognizable color pattern on dorsum of abdomen, but basic pattern developed as in *C. ceylonensis* sp. n.; muscle insertions small and not marked as light dots. Legs as in both preceding species. Caudalfilaments probably same as in *C. ceylonensis* sp. n. and *C. similis* (they are broken off in both specimens available). — Body length 3.8 mm.

Morphological details as in Fig. 3. Hind wing pads absent. Seven pairs of abdominal gills present. — Only two legs available, probably 1st and 2nd leg (Fig. 3 i and 3 j) (1st leg without tibial seam). Claws (Fig. 3 k) without denticles. Scales on terga broad based and triangular (Fig. 9); posterior margin of all terga with spines, although spines on 1st and 2nd segments small, increasing in size continuously onto X. tergum.

Centroptella soldani sp. n. differs from both preceding species by the color pattern on the dorsum of abdomen, by the scales on dorsal surface of terga and by having spines on posterior margin of terga.

Holotype: Mature nymph: slide preparation. Ceylon, FC 11/c, Rasanawa-Fall, Ratnapura. 19. 11. 1970; leg. STARMÜHLNER.

Paratype: 1 nymph in alcohol.

Holotype is deposited at Zool. Staatssammlung, München, Paratype at Florida A and M University, Laboratory of Aquatic Entomology, Tallahassee, Florida, U.S.A.

Etymology: *Centroptella soldani* sp. n. is dedicated to Dr. T. SOLDÁN, České Budějovice, C.S.S.R.

Ecology

All collecting sites visited during the Austrian-Ceylonese Mission 1970 are described in detail by COSTA & STARMÜHLNER (1972) as follows:

Ecological data (abbreviations: Alt.: Altitude (in m); Br.: Breadth (in cm or m); D.: Depth (in cm or m); Curr.: Current (in m/sec); Gr.: Ground; Te.: Temperature (in °Celsius):

Region of Deniyaya

FC 5: 11. 11. 1970: Campden Hill-Dola, torrent running between Tea-plantations, no shadow.

Alt.: 700 m. — Br.: 3–10 m. — D.: 10–20 cm. — Curr.: Cascades: 75 cm—1 m/sec. — Gr.: granitic boulders, pebbles, sand, stones with slimy cover of Algae. — Te.: 24.1 °C (9^h)—24.7 °C (11).

FC 6: 11. 11. 1970: Kiriwel-Dola, before the tea-factory of Enselwatte-Group, running between plantations, no shadow.

Alt.: 700 m. — Br.: 5–10 m. — D.: 30–50 cm. — Curr.: 30–75 cm/sec. — Gr.: pebbles, sand. — Te.: 23.8 °C (15^h).

Region of Ratnapura

FC 10: 18. 11. 1970: Katugas-Ela, torrent with waterfalls in a narrow gorge, forest, very shady.

Alt.: 450 m. — Br.: 1–10 m. — D.: cascades: 1 cm. pools with slight current: 50 cm—1 m. — Curr.: cascades: more than 1 m/sec, pools with slight current: 30–50 cm/sec. — Gr.: granite rocks, boulders, in pools with slight currents: gravel, sand. — Te.: 25.1 °C (9.³⁰)—25.3 °C (12^h).

FC 11: 19. 11. 1970: Rajanawa-Dola, torrent with waterfalls running through forest, shady.

Alt.: 250 m. — Br.: 50 cm—3 m. — D.: cascades: 1—3 cm, pools with slight current: 10—50 cm. — Curr.: cascades: more than 1 m/sec, pools with slight current 0—10 cm/sec. — Gr.: granitic rocks, boulders, gravel with sand. — Te.: 24.6 °C (9^h)—25.8 °C (12^h)—26.1 °C (13^h).

FC 12: 20. 11. 1970: Kalu-Ganga before the town of Ratnapura, the river is in a deep valley running between plantations and forests.

Alt.: 30 m. — Br.: 20—30 m. — D.: to 3 m in the middle of the river. — Curr.: cascades: more than 1 m/sec, on the banks: 0—30 cm/sec. — Gr.: granitic boulders, gravel and on the banks with muddy sand. — Te.: 26.1 °C (10^h)—26.6 °C (11.3⁰).

FC 13: 21. 11. 1970: Upper reaches of Kalu-Ganga at Malwala, running through plantations, no shadow.

Alt.: 80 m. — Br.: 15—20 m. — D.: 30—50 cm. — Curr.: 50—75 cm/sec, pools with slight current: 5—10 cm/sec. — Gr.: granitic rocks, boulders, gravel, on the stones were found long waterplants floating in the current, banks and pools with sand. — Te.: 26.7 °C (13³⁰)—26.3 °C (16^h).

FC 14: 22. 11. 1970: Upper reaches of Kalu-Ganga on the south flank of the Adam's Peak, near Carney-Estate, deep gorge in primary rain-forest, very shady.

Alt.: 800 m. — Br.: 2—10 m. — D.: cascades: 1—3 cm, in pools with slight current: 30—50 cm. — Curr.: cascades, 75 cm—1 m/sec, pools with slight current: 15—30 cm/sec. — Gr.: granitic rocks and boulders of 1—3 m, gravel sand. — Te.: 22.8 °C (10^h)—23.8 °C (12^h).

FC 15: 23. 11. 1970: Ira Handha Pana-Dola, torrent and tributary of Kalu-Ganga, running through plantations, no shadow.

Alt.: 100 m. — Br.: 2—4 m. — D.: 10—20 cm, in pools with slight current: 30—50 cm. — Curr.: Cascades: more than 1 m/sec, in pools with slight current: 30—50 cm/sec. — Gr.: granitic boulders from 50 cm—2 m, gravel, sand. — Te.: 18.7 °C (9³⁰)—20.7 °C (12^h).

Region of Belihuloya-Buttala

FC 25: 8. 12. 1970: Kirikatu-Oya, coming from the Horton Plains. At World's End the Oya runs down as a torrent some 100 m down the cascades, no shadow.

Alt.: 700 m. — Br.: 5—8 m. — D.: 20 cm, to 1 m. — Curr.: 40—50 cm/sec, over cascades: more than 1 m/sec, in pools with slight current: 0—20 cm/sec. — Gr.: granitic rocks, boulders (1—3 m), gravel, sand. — Te.: 18.8 °C (9^h)—19.6 °C (12^h).

FC 27: 9. 12. 1970: Kuda-Oya, near Buttala in the Southeast of Ceylon, running through forest and very shady.

Alt.: 150 m. — Br.: 10—15 m. — D.: 20 cm—1 m. — Curr.: 30—50 cm/sec, on small cascades: 1 m/sec. — Gr.: gravel, sand between some rocks. — Te.: 25.5 °C (11^h).

Region of Kitulgala

FC 34: 26. 12. 1970: Bibili-Oya, a tributary of Kelani Ganga, near Kitulgala partially shady.

Alt.: 80 m. — Br.: 6—10 m. — D.: 10—50 cm, in pools: 1 m. — Curr.: 50 cm—1 m/sec. — Gr.: granitic boulders (30 cm—2 m) gravel, sand, on submerged rocks floating waterplants. — Te.: 25.4 °C (14^h)—25.8 °C (16^h).

FC 35: 27. 12. 1970: Hal-Oya near Ginigathhena, a tributary torrent of Kelani-Ganga, no shadow.

Alt.: 650 m. — Br.: 1—5 m. — D.: 10—50 cm, in pools: 1 m. — Curr.: 30—50 cm/sec, in cascades: more than 1 m/sec, in pools: 0—2 cm/sec. — Gr.: granitic boulders (1—2 m), gravel, sand. — Te.: 22.5 °C (9^h)—23.1 °C (11^h).

FC 36: 27. 12. 1970: Rambukpoth-Oya near Pitawela, a tributary torrent of Kelani-Ganga, running through a deep gorge, no shadow.

Alt.: 625 m. — Br.: 5–8 m. — D.: 5–30 cm, in pools: 50 cm. — Curr.: 30–75 cm/sec, in cascades: more than 1 m/sec. — Gr.: granitic boulders (1–3 m), gravel, sand. — Te.: 25.1 °C (13^h).

FC 37: 28. 12. 1970: Kelani-Ganga near the Kitulgala Resthouse.

Alt.: 60 m. — Br.: 30–40 m. — D.: 30–50 cm. — Curr.: 50 cm—1 m/sec. — Gr.: granitic rocks, gravel, sand, sometimes with floating waterplants.

Hydro-chemical data

Table 1 shows the hydro-chemical data available and the presence of *Centroptella* species in the collecting sites. There is no evidence from the water-chemistry to account for the special preferences of the *Centroptella* species herein described. Further investigations are needed for a precise understanding of the ecological demands of the species of the genus *Centroptella*.

According to Table 1 *Centroptella ceylonensis* sp. n. (50 specimens) is the most frequent species, whereas *C. similis* sp. n. (18 specimens) occurs in five places and the two specimens of *C. soldani* sp. n. were collected only at one station.

All the places in which nymphs of the newly described *Centroptella* species were collected appear to be typical habitats for baetinae mayflies: they are stony streams and rivers with an average depth of 5–100 cm and an average width of 3–20 (40) m. The river bottom is composed of granite rocks (several cascades), partly covered with boulders, pebbles, gravel and sand, with floating vegetation near the river banks. The water courses run through tea plantations and forest and are more or less shaded. In the months November–December 1970 when the collections were made, the water temperatures ranged from 22.3 °C (altitude of 800 m) to 27.2 °C (altitude of 20 m).

Continued exploration, especially devoted to the baetine mayflies will probably give an even more exact impression of species and their distribution in the running waters of this island.

Discussion

In 1980, MORIHARA & EDMUNDS described the genus and species *Notobaetis penai* from Argentina. The authors point out that *Notobaetis* indicates a close relationship to *Centroptilum* EATON. *Notobaetis* can be separated from *Centroptilum* in nymphal stage by the mandibles and by the rounded apical segment of its labial palpus, and less reliably by its shorter claws. The male differs from *Baetis* only by the position of the hook-like, broadly based costal projection, arising near midlength of wings (MORIHARA & EDMUNDS 1980). Further it is mentioned that the new genus *Notobaetis* is proposed with reservation.

However, the study of the herein discussed species — *Centroptella longisetosa* BRAASCH & SOLDÁN (1980) from China and *C. ceylonensis* sp. n., *C. similis*

Table 1. Hydro-chemical data and the presence of *Centropptella* species in the collecting sites.

FC	pH	El ₂₀ μS ₂₀ /cm	Tot.H. °dH	Ca.H. °dH	Alk. mval/l	CaO mg/l	MgO mg/l	SiO ₂ mg/l	Cl mg/l	NO ₃ mg/l	NH ₄ mg/l	P ₂ O ₅ mg/l	<i>ceylo-</i> <i>nensis</i>	<i>simi-</i> <i>lis</i>	<i>sol-</i> <i>dani</i>
5	5.8	–	0.6	0.56	0.2	2.0	–	–	–	–	–	–	+	+	–
6	5.8	26	0.6	0.56	0.2	2.0	–	–	–	–	–	–	+	–	–
10	5.8	29	0.6	0.20	0.2	2.0	–	–	–	–	–	–	–	+	–
11	5.8	29	0.6	0.56	0.2	2.0	–	–	–	–	–	–	–	+	+
12	6.5	46	1.2	1.12	0.4	6.0	–	–	–	–	–	–	–	+	–
13	7.2	41	1.15	–	0.4	6.38	3.6	9.7	1.94	0.094	0.16	0.12	+	–	–
14	6.5	14.6	0.25	–	0.14	1.12	0.99	7.4	1.6	0.94	0.21	0.12	+	–	–
15	6.7	25.5	0.5	–	0.25	2.35	1.90	4.4	1.6	0.101	0.08	0	+	–	–
25	7.1	34	1.0	–	0.45	4.7	3.8	11.0	1.42	0.071	0.03	0.14	+	–	–
27	7.7	295	9.2	–	3.55	52.0	28.9	28.8	7.1	0.108	0.02	0.11	+	–	–
34	6.0	–	0.8	–	–	–	–	–	–	–	–	–	+	–	–
35	6.8	36	0.82	–	0.4	5.15	2.16	12.3	1.99	0.04	0.03	0.16	+	–	–
36	6.7	18.7	0.36	–	0.14	0.89	1.92	11.2	1.70	0.037	0.03	0.18	–	+	–
37	6.65	33.5	0.71	–	0.28	4.48	1.84	6.5	–	–	–	–	+	–	–

Table 2. Verification Table, comparing the main morphological characteristics of the 4 closely related genera *Notobaetis*, *Centroptella*, "Genus No. 2 sp. 1" M.-L., "*Centroptilum* No. 4" DEM. and *Centroptilum* with together 8 species.

	<i>Notobaetis</i> <i>penai</i>	<i>ceylonensis</i> sp.n.	<i>Centroptella</i> <i>similis</i> sp.n.	<i>soldani</i> sp.n.	<i>longisetosa</i>	"Genus No. 2 sp. 1" M.-L. Malaysia	" <i>Centro-</i> <i>ptilum</i> No. 4" DEM. Natal	Genus <i>Centro-</i> <i>ptilum</i> Holarktis
	Argentina	Sri Lanka	Sri Lanka	Sri Lanka	China			
Incisors of mandibles								
deeply cleft onto base								
in both mandibles	-	-	-	-	-	-	-	+
less deeply cleft only								
in right mandible	+	+	+	+	+	+	+	-
Prosthema of right mandible								
of normal shape	-	-	-	-	-	+	-	-
branched	+	+	+	+	+	-	+	+ ¹
Labial palpus								
3rd segment concave	-	-	-	-	-	-	-	+
3rd segment rounded	+	+	+	+	+	+	+	-
Paraglossa								
a) wider than glossa	+	-	-	-	-	-	-	-
about as wide as glossa	-	+	+	+	+	+	+	+
b) outer and inner margin of								
glossa and paragl. more or								
less straight vertically	+	+	+	+	+	+	+	-
outer and inner margin of								
glossa and paraglossa con-								
vex, forming a circle	-	-	-	-	-	-	-	+
Maxillary palpus								
a) two segmented	-	+	+	+	+	+	+	-
indication of a third								
segment	+	-	-	-	-	-	-	+
b) about half the length of								
galea-lacinia	-	-	-	-	+	-	-	-
about same length as or								
reaching beyond gelea-lac.	+	+	+	+	-	+	+	+

Hind wing pads								
well developed	+	-	-	-	-	-	+	+
reduced, minute	-	+	-	-	+	+	-	-
lacking	-	-	+	+	-	-	-	-
Seam on tibia of 1st leg								
clearly developed	+	-	-	-	-	-	-	+
not recognisable	-	+	+	+	+	+	+	-
Claws								
with 1 row of denticles	-	-	-	-	-	-	-	²
with 2 rows of denticles	-	+	+	-	-	+	-	+
without denticles	+	-	-	+	+	-	+	-
Long, fine bristles on tibia								
forming short dorsal arc near base	+	-	-	-	-	-	-	-
forming longer arc nearly along entire tibia	-	+	+	+	+	+	³	-
no arc, only few such bristles	-	-	-	-	-	-	-	+
Terga								
a) scales elongate	-	+	+	-	-	+	-	-
scales shorter	+	-	-	+	+	⁴	+	-
scales lacking	-	-	-	-	-	-	-	+
b) posterior margin with spines	+	-	-	+	+	+	+	+
posterior margin without spines	-	+	+	-	-	-	-	-
c) inner structure of scales								
pencil like	-	+	+	+	+	+	+	-
no typical inner structure of scales recognisable	+	-	-	-	-	-	-	+

¹ slender, pointed, but not branched, ² 1 row or two rows are developed in different species, ³ arc about half the length of tibia, ⁴ longer in frontal segments (I-IV), shorter in posterior segments.

sp. n. and *C. soldani* sp. n. from Sri Lanka — and a comparison of *Notobaetis* and *Centroptella* with *Centroptilum* EATON confirms the justification of the establishment of the genus *Notobaetis* MORIHARA & EDMUNDS. Also it can be shown that the phenetical relationship of *Notobaetis* to *Centroptella* is considerably closer than to *Centroptilum* (see Verification Table, Table 2).

Most striking common characteristics of *Notobaetis* and *Centroptella* are the mandibles: deeply cleft incisors and slender, branched prosthema on right mandible in combination with fused incisors on left mandible. The main difference between the nymphs of both genera are glossa and paraglossa. In *Notobaetis penai* the paraglossa is broader than the glossa and therefore more *Baetis*-like, whereas in *Centroptella* glossa and paraglossa are of about same width (as also in *Centroptilum*). Furthermore, in *N. penai* the seam on the tibia of all three legs is clearly developed and the dorsal arc of long, fine bristles is short and confined near base of the segment. In *Centroptella* no tibial-seam is recognisable on the 1st leg, and the long, fine bristles form a dorsal arc nearly along the entire tibia (Fig. 1).

Centroptella longisetosa BRAASCH & SOLDÁN differs from the three newly described species of the genus from Sri Lanka mainly by its very short maxillary palpus (about half the length of the galea lacinia).

Centroptilum has the incisors of both mandibles divided into two clear groups completely onto the base; the outer margins of glossa and paraglossa are convex forming together a kind of circle, whereas they are straight in a vertical direction in *Notobaetis* and *Centroptella*. Scales (and scale bases) on terga are completely lacking in *Centroptilum*, and the spines on posterior margin of terga are rather elongate and pointed.

DEMOULIN (1970: 50–52, Fig. 4) described the nymph of a species which is signified "*Centroptilum* sp. No. 4" from Natal, Albert Falls, Umgeni River, 13 miles E Pietermaritzburg³. The morphological characters of this nymph — right mandible, labial palpus, size relation glossa/paraglossa — indicate a close relationship to the above discussed genus complex *Notobaetis-Centroptella*. Also the basic color pattern on dorsum of abdomen is similar to that of both *Centroptella ceylonensis* sp. n. and *C. similis* sp. n. The scales and scale bases on surface of terga are comparable to those of *C. longisetosa* (Figs. 10 and 11); the spines on the posterior margin of terga are elongate and pointed.

Regarding the geographical distribution of all these species — *Centroptella longisetosa* from China, *Centroptella ceylonensis* sp. n., *C. similis* sp. n. and *C. soldani* sp. n. from Sri Lanka, "Gen. No. 2 sp. 1" from Malaysia (MÜLLER-LIEBENAU 1984, in press), DEMOULIN's species from Natal, and *Notobaetis penai* from Argentina one is tempted to state a connection between the historical

³ Two nymphs and two slide preparations are stored in the Zoological Museum, University of Lund (Sweden).

evolution of the continents and the zoogeography of the species discussed. Whereas *Centropetella* and the closely related "Gen. No. 2 sp. 1" are the representatives in South East Palaearctis and in the Oriental Region, "*Centropetillum* sp. No. 4" (DEMOULIN 1970) is the South African component, and *Notobaetis* might be endemic in South America.

Continued study of these interesting questions will certainly reveal the real statement of this genus complex and its distribution.

Zusammenfassung

Drei neue Arten der Gattung *Centropetella* BRAASCH & SOLDÁN, 1980 (leg. STARMÜHLNER) werden beschrieben. Die taxonomischen Beziehungen der nunmehr vier bekannten Arten dieser Gattung zu den Arten nächstverwandter Gattungen aus Malaysia, Natal und Südamerika werden diskutiert. Tabelle 2 gibt einen Überblick über die morphologischen Merkmale aller besprochenen Arten. Die Larven der neu beschriebenen Arten wurden in Sri Lanka in Fließgewässern gesammelt, die mit ihrem steinigem, sandigen und teils felsigen Untergrund und mit flutender Vegetation als typische Habitate für Baetiden-Larven angesehen werden können. In Tabelle 1 sind die verfügbaren hydrochemischen Daten zusammengestellt (nach COSTA & STARMÜHLNER, 1972). Mit Ausnahme von FC 27 (elektrolytreich und stark karbonathaltig, und besonders reich an MgO und SiO₂) unterscheiden sich die Gewässer nur geringfügig; eine Bevorzugung durch die Larven der einzelnen Arten läßt sich nicht erkennen. Zukünftige Untersuchungen an umfangreichem Material könnten zu einem genaueren Verständnis der ökologischen Ansprüche der einzelnen *Centropetella*-Arten führen.

Acknowledgement

I am indebted to Professor Dr. F. STARMÜHLNER, Zoological Institute of the University of Vienna, who kindly gave me the material collected in Sri Lanka for studying. Further I want to give my thanks to Dr. T. SOLDÁN, Entomological Institute of the Czechoslovakian Academy of Science, České Budějovice, for the gift of a nymph of *Centropetella longisetosa*, Dr. D. K. MORIHARA, XTERMCO, Kahului, Maui, Hawaii, for slide preparations of *Notobaetis penai* and R. DANIELSSON, Department of Zoology, Zoological Museum, University Lund, Sweden, for the loan of the two single nymphal specimens of "*Centropetillum* sp. No. 4" DEMOULIN 1970 from Natal.

References

- BRAASCH, D. & SOLDÁN, T. (1980): *Centropetella* n. gen., eine neue Gattung der Eintagsfliegen aus China (Baetidae, Ephemeroptera). — *Reichenbachia* **18** (20): 123–127.
- COSTA, H. H. & STARMÜHLNER, F. (1972): Results of the Austrian-Ceylonese Hydrobiological Mission 1970 of the 1st Zoological Institute of the University of Vienna (Austria) and the Department of Zoology of the Vidyalankara University of Ceylon, Kelaniya. Part I. — Preliminary Report: Introduction and description of the stations. — *Bull. Fish. Res. Stn., Sri Lanka (Ceylon)* **23** (1/2): 43–76.
- DEMOULIN, G. (1970): Ephemeroptera des faunes éthiopienne et malgache. — In: *South African Animal Life, Results of the Lund Univ. Expedition in 1950–1951*, **14**: 24–170.

- MORIHARA, D. K. & EDMUNDS, G. F. Jr. (1980): *Notobaetis*: A New Genus of Baetidae (Ephemeroptera) from South America. — Int. Revue ges. Hydrobiol. **65** (4): 605—610.
- MÜLLER-LIEBENAU, I. (1984): New Genera and Species of the Family Baetidae from Malaysia (River Gombak) (Insecta: Ephemeroptera). — Spixiana (in press).

The author's address:

Dr. INGRID MÜLLER-LIEBENAU, Max-Planck-Institut für Limnologie, Abt. Allgemeine Limnologie, D-2320 Plön.