

Redescription of *Parameletus chelifer* Bengtsson and *P. minor* (Bengtsson), with keys to nymphal and adult stages of the Fennoscandian species of Siphonuridae (Ephemeroptera)

OLLE SÖDERSTRÖM and JAN NILSSON



Söderström, O. & Nilsson, J.: Redescription of *Parameletus chelifer* Bengtsson and *P. minor* (Bengtsson), with keys to nymphal and adult stages of the Fennoscandian species of Siphonuridae (Ephemeroptera).

Ent. scand 17:107–117. Copenhagen, Denmark 23 May 1986. ISSN 0013–8711.

It is established by electrophoretic analysis and morphological examination that *Parameletus chelifer* and *P. minor* are two separate species. A redescription of the major life-stages of the two species is given together with notes on the distribution in northern Fennoscandia. Keys to adult and nymphal stages are given for Fennoscandian species of the family Siphonuridae. Lectotypes are designated by the senior author for *P. chelifer* Bengtsson and *P. minor* (Bengtsson).

Olle Söderström, Department of Ecological Zoology, University of Umeå, S–901 87 Umeå, Sweden.

Jan Nilsson, Department of Genetics, University of Umeå, S–901 87 Umeå, Sweden.

There has been some confusion about whether one or two species of *Parameletus* occur in Fennoscandia. Old records, e.g. Bengtsson (1931), Tiensuu (1939), Brekke (1940), Ulmer (1943) and Brinck & Wingstrand (1951), include 2 species. Modern Swedish records include only *P. chelifer* (Olsson & Söderström 1978, Engblom & Lingdell 1983), thus treating *P. minor* as a junior synonym. However, Olsson (1983) indicated the possibility of two species. Modern records from Finland and Norway include both *P. chelifer* and *P. minor* (Dahlby 1973, Saaristo & Savolainen 1980, Savolainen & Saaristo 1981, 1984, Soldan 1981, Silfverberg 1984). The lack of descriptions with good illustrations of the major life-stages is the main cause of this confusion. The nymphs especially are poorly described (Saaristo & Savolainen 1980).

In the latest checklist of Finnish Ephemeroptera, Silfverberg (1984) lists both species from Finland. Further Saaristo & Savolainen (1980) list both species also from Norway and Sweden, based on older records only, and *P. chelifer* also from the Fennoscandian part of USSR. Chernova

(1967) lists both species from the European part of USSR. Our findings from the province of Västerbotten and Norrbotten, northern Sweden, show that both species co-occur in the same habitat and that they can be found probably all over northern Sweden.

The many names given to these two species has resulted in a very complex nomenclatural situation. The validity of the generic name *Parameletus* Bengtsson, 1908 was established by Hubbard (1977). *P. chelifer* Bengtsson (for synonyms see below) is the type species (by monotypy). Bengtsson (1909) also published a detailed description of the adults of both sexes of *Potameis minor*, later included in his genus *Parameletus* (Bengtsson 1930). Detailed descriptions, though of a limited diagnostic value, of the nymphs of *P. chelifer* and *P. minor* were given by Bengtsson (1917).

To overcome the above-mentioned confusion, we will show here that *Parameletus chelifer* Bengtsson, 1908 and *P. minor* (Bengtsson, 1909) are distinct species, and give full redescriptions of them together with keys to the Fennoscandian species of the family Siphonuridae.

Material and methods

About 750 specimens (nymphs, subimagos and imagos) from the Vindelälven river at Sirapsbacken (64°22'N, 19°28'E) about 25 km upstream Vindeln, northern Sweden were analysed by electrophoresis. From these, heads, legs, the last abdominal segments including cerci and wings when present were saved of 19 nymphs, 13 subimagos and 1 imago of *P. chelififer* and 10 nymphs, 23 subimagos and 11 imagos of *P. minor* for morphological examination. The remaining body was analysed by electrophoresis. Morphological and electrophoretic results could be compared since all body parts from each specimen had been given a unique code.

Electrophoresis were performed with 12% starch gels and buffer system A of Ayala et al. (1972). Staining procedures can be found in the same reference. For a description of the method and its applicability in systematics see Ferguson (1980).

The morphological analysis and description is based upon specimens preserved in alcohol. Mouthparts, legs, gills and abdomen of about 20 nymphs of each species and wings, legs, abdomen and genitalia of about 20 subimagos and imagos of each sex and species were mounted in euparal on glass slides. These mounted specimens were drawn and measurements were made with a binocular microscope fitted with a micrometer. Body length was measured from the tip of the head to the end of last abdominal segment, and fore wings from the tip to the base of the wings. Head width was measured over the widest part at the eyes.

A total of about 10 000 specimens of *P. chelififer* and *P. minor* were examined from the following localities. Abbreviation of collectors used are SB = S. Bengtsson, JB = J. Brittain, AN = A. Nilsson, IN = I. Näslund, TO = T. Olsson and OS = O. Söderström.

P. chelififer and *P. minor* co-occurring:

Sweden. — TO: Vassijokk, 13.viii.1909, SB. — LU: Kvikjokk, 3.vii.1905, SB. — NB: Åkersselet, 11.vi.1978, TO; Fällberg, 11.vi.1978, TO; Strycktjärn, 11.vi.1978, TO. — PI: Adolfström, 25.vi.1984, IN; Björkliden, 9.vi.1978, TO; Hästskoforsen, 9.vi.1978, TO; Luspeströmmen, 9.vi.1978, TO. — LY: Siksele, 9.vi.1978, TO; Stryckfors, 8.vi.1978, TO; Grundfors, 8.vi.1978, TO; Holmfors, 8.vi.1978, TO; Sandsele, 8.vi.1978, TO; Bräskafors, 9.vi.1978, TO; Långforsen, 9.vi.1978, TO; Björkfors, vii.1903, SB. — ÅS: Borgsjön, 10.vi.1984, IN. — VB: Brattby, 8.vi.1978, TO; Östra Selet, 8.vi.1978, TO; Degerfors, 8.vi.1978, TO;

Kronlund, 8.vi.1978, TO; Sirapsbacken, vi.1980 – 84, OS; Åmsele, 8.vi.1978, TO. — ME: Mjällän, 11.vi.1984, AN.

P. chelififer only:

Sweden. — PI: Mårsomjaure, 12.vi.1978, TO; Forsnäs, 12.vi.1978, TO; Laptjok, 12.vi.1978, TO; Målkevikén, 12.vi.1978, TO; Vuollesavon, 12.vi.1978, TO; Trollforsen, 12.vi.1978, TO; Ginnudden, 9.vi.1978, TO. — LY: Rockmyrsheden, 9.vi.1978, TO; Örträsk, 16.vi.1983, OS. — VB: Jörn, 30.vii.1909, SB. Norway. — On: Gjerde, 16.vi.1972, JB.

P. minor only:

Sweden. — LY: Jovendmåske, 28.vii.1903, SB. — ÅS: Avasjö, vi.1977, OS. Norway. — Fn: Julelva, 14.vii.1974, JB. — NTi: Namsen, 7.vi.1982, JB. — HE: Glomma, 14.vi.1978, JB.

The nomenclature of external genitalia follows Brinck (1957), of wing venation Needham et al. (1935) and of nymphal morphology Macan (1979). The taxonomic nomenclature follows Puthz (1978).

Electrophoresis

The banding patterns of enzymes Lap (leucine aminopeptidase) and Sod (superoxide dismutase) observed from nymphs are shown in Fig. 1. Specimens stained for Lap showed either two bands or one band at an intermediate position. The Sod staining, with a few exceptions, also gave two types of banding patterns, both with two zones of enzyme activity. The exceptions are three specimens with a three banded pattern at the anodal zone. This pattern is the expected phenotype of heterozygotes for an enzyme with a dimeric structure.

An important observation is that all specimens that showed two bands when stained for Lap always showed the faster migrating forms of the anodal and cathodal Sod enzymes, and those with a single Lap band always showed the slow forms. Runs including sexed adults and stained for Sod made clear that the different forms were not sex linked.

Of 699 nymphs investigated, 338 showed two Lap bands and the fast variants of Sod enzymes. The alternative combination, a single Lap-band and the slow variants of Sod, was found in 358 specimens. Of the three individuals classified as heterozygotes for the anodal Sod 2 had the fast cathodal Sod and two Lap-bands whereas the remaining one had the slow cathodal Sod variant and one Lap-band.

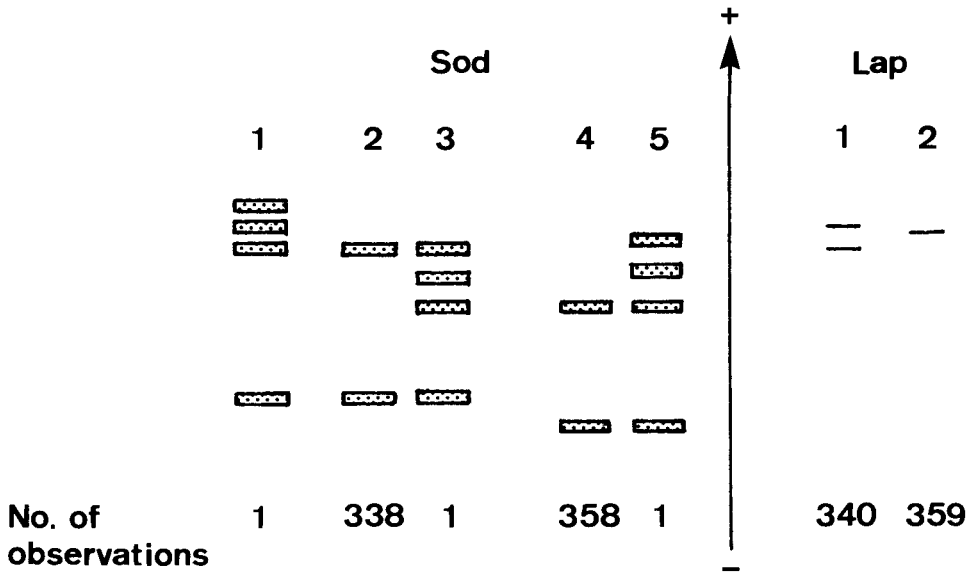


Fig. 1. Observed enzyme patterns for *Parameletus* spp. nymphs.

Thus, on the basis of these enzyme patterns, the nymphs can be separated into two groups. The most reasonable interpretation is that our samples were a mixture of specimens from two different gene pools. Adults have a Lap banding pattern different from the nymphs and this pattern is not diagnostic. However, the Sod enzymes remain as a mean to separate adult specimens into two groups.

From the morphological analysis of specimens analysed by electrophoresis and the study of type material, we can state that the two different gene pools correspond to the two species *Parameletus chelifier* and *P. minor*. Specimens with one Lap-band and the slow variants of the Sod enzymes were *P. chelifier*, and those with two Lap-bands and the fast variants of Sod were *P. minor*.

TAXONOMY

***Parameletus chelifier* Bengtsson**

Figs. 2;3 A,B,E,G,I,K,M;4 A,C,E,G,I.

- Eutonia borealis* Bengtsson, 1904:131, nomen nudum.
- Parameletus chelifier* Bengtsson, 1908:242.
- Sparrea norvegica* Esben-Petersen, 1909:554.
- Potameis elegans* Bengtsson, 1909:15.
- Palmenia fennica* Aro, 1910:31.

Type area: Of *P. chelifier*: Sweden; of *P. norvegica*: Norway; of *P. elegans*: Sweden and of *P. fennica*: Finland.

Type material: Lectotype ♂ of *Parameletus chelifier* Bengtsson (here designated), Sweden, Dalarna: labelled "Dalarne Idre by d. 10 Juli 1907, Tagna in copula", "*Parameletus chelifier* Bgtss", "Lectotypus ♂ 1961 design. Brinck and Müller-Liebenau". "*Parameletus chelifier* Bengtsson ♂" and the lectotype label of the senior author. Styliger plate and penis in separate tube. — Paralectotype, 1 ♀ (here designated), from the same locality, labelled "*Parameletus chelifier* Bengtsson, Dalarne Idre by d. 10 Juli 1907, 1 ♂ als lectotypus entnommen 1961, Brinck and Müller-Liebenau" and the paralectotype label of the senior author. Type material in Lund (UZM), Sweden.

General remarks: The lectotype designation of Brinck and Müller-Liebenau was not published and is thus invalid. *Eutonia borealis* is a nomen nudum and a synonym of *Parameletus chelifier* according to Bengtsson (1930:13). *Sparrea norvegica*, *Potameis elegans* and *Palmenia fennica* are all synonyms of *Parameletus chelifier* according to Bengtsson (1930). *Parameletus affinis* Bengtsson 1904:131 is a nomen nudum and a synonym of *Ameletus alpinus* Bengtsson (= *Ameletus inopinatus* Eaton) according to Bengtsson (1930:14), and not a synonym of *Parameletus chelifier* as he had stated earlier (Bengtsson 1908:242).

Description

The description of *P. chelifier* is made as complete as possible while that of *P. minor* only includes

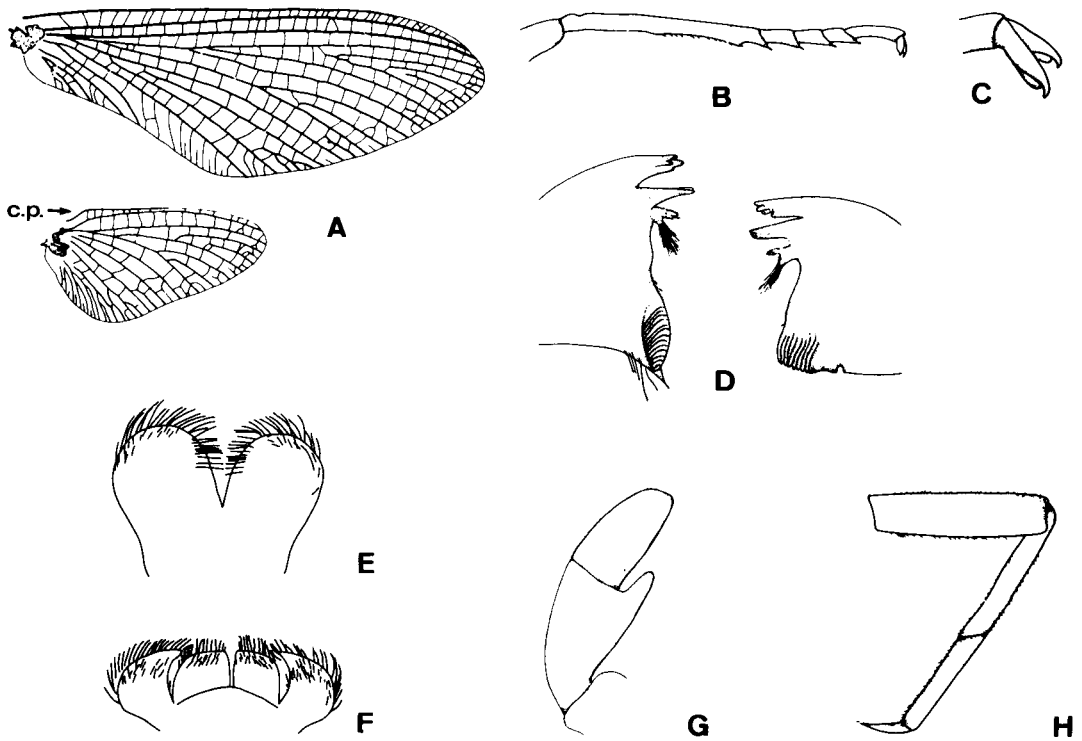


Fig. 2. *Parametetus chelifer*, mouth and body parts (of identical appearance also in *P. minor*). A–C imago, D–H mature nymph. — A, right wings, c.p. = costal process. — B, hind tibia and tarsus. — C, claws. — D, mandibles. — E, hypopharynx. — F, glossae and paraglossae. — G, labial palpus. — H, hind leg.

those characters that differ between the two species. Figs. 2A–H include only characters identical in both species.

MALE IMAGO

Colour. Head gray; upper portion of eyes whitish-gray, lower portion bluish-gray; membrane of wings hyaline, fore wings with a bronze sheen; wing veins distinctly yellowish-brown; fore legs yellowish-brown, mid and hind legs yellowish-white; abdomen dull yellowish-brown; cerci yellowish-brown.

Wings. Length of fore wing (mm) 10.2 ± 0.54 ($\bar{x} \pm S.D.$, $n=16$), shape triangular; M and Cu_1 in fore wings subparallel (Fig. 2A); numerous cubital intercalary veins run from Cu_1 to hind margin of fore wings; hind wings well developed with both longitudinal and cross veins distinct; R_4 and R_5 in hind wings separated at wing margin; costal process of hind wing obtuse.

Legs (Figs. 2B–C). Ratio of femur:tibia: tarsal segments 1–5, 3.0:2.8:1.9: 2.1:2.1:1.7:1.0 of fore leg; ratio of femur:tibia:tarsus 1.1:1.0:1.0 for mid, 1.0:1.0:1.0 for hind leg; tarsus 5-segmented, segment 1 distinct on fore leg and reduced on mid and hind legs; 2 claws, similar, distally curved.

Body. Length (mm) 10.8 ± 0.93 ($n=11$); cerci 2, length (mm) 15.6 ± 0.88 ($n=10$).

Genitalia (Figs. 3A,B,E). Stylus 4-segmented, with basal segment reduced and segment 2 elongated, longer than segment 3–4 combined; posterior margin of styliger with a shallow emargination on each side of curved median extension; penis dorsally with 2 pointed processes that almost reach its apex.

MALE SUBIMAGO

Colour. Head and eyes as in male imago; wing membrane translucent; legs yellowish-brown;

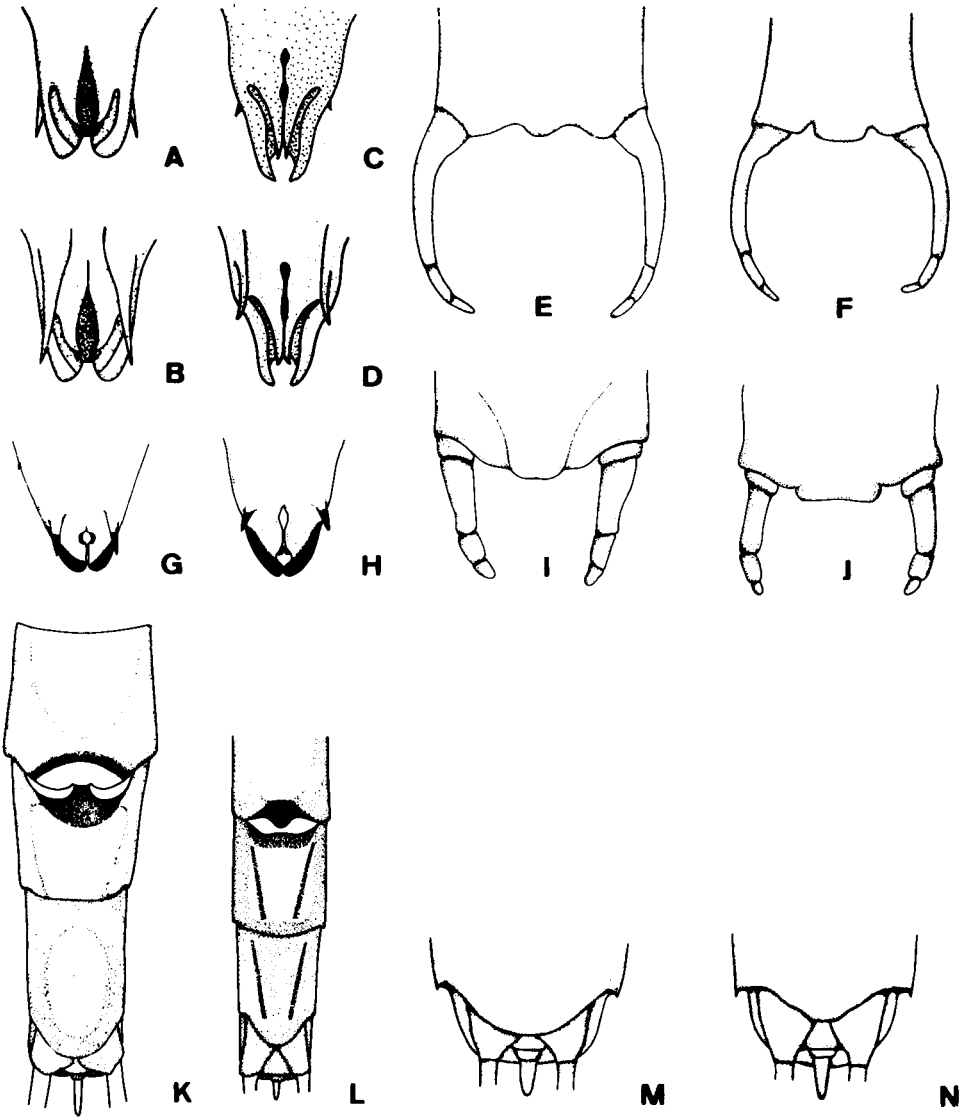


Fig. 3. *Parametelus chelifer* (A,B,E,G,I,K,M) and *P. minor* (C,D,F,H,J,L,N). — A,C, penis, ventral view, ♂ imago. — B,D, penis, dorsal view, ♂ imago. — E,F, styli, ventral view, ♂ imago. — G,H, penis, dorsal view, ♂ subimago. — I,J, styli, ventral view, ♂ subimago. — K,L, abdominal segments 7-9, ventral view, ♀ imago. — M,N, postgenital plate, ventral view, ♀ imago.

abdomen dull yellowish-brown; sterna sometimes with 2 lighter submedian spots; cerci basally distinct yellowish-brown.

Genitalia (Figs. 3G,I). Posterior median extension of styli only 1/4 of the length of hind margin; stylus distinctly 4-segmented; 2 pointed processes of penis as in male imago.

FEMALE IMAGO

Colour. Head gray; eyes dark bluish-gray; wings as in male imago; legs yellowish-white; abdomen dull brownish-white, at the ovaries reddish-brown; pigmentation near vestibulum characteristic (Fig. 3K); hind margin of sternum 7 with

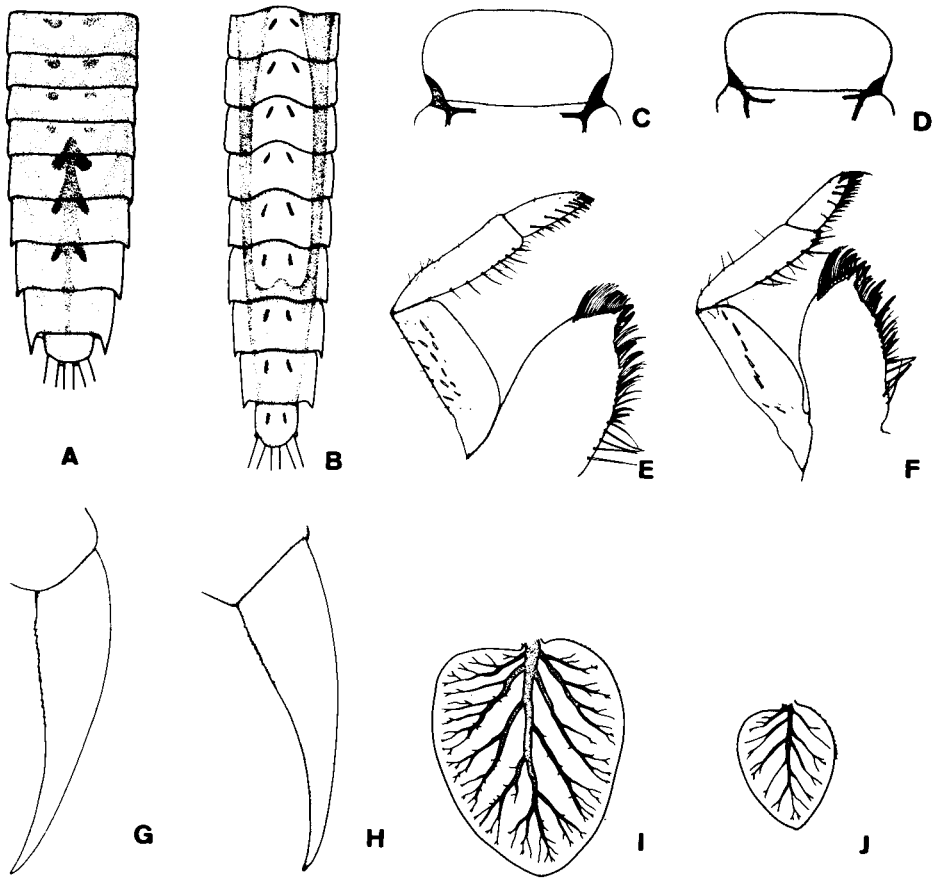


Fig. 4. *Parametelus chelifera* (A,C,E,G,I) and *P. minor* (B,D,F,H,J), mature nymph. — A,B, abdomen, dorsal view (pattern drawn more distinct to visualize the difference in pigmentation). — C,D, outline of labrum. — E,F, left maxilla and maxillary palpus. — G,H, tarsal claw. — I,J, third gill.

dark curved pigmentation anterior to lighter median part; sternum 8 with dark median spot along front margin and a dark median lobe projecting forwards to sternum 7; central part of sternum 7–8 (–9) distinctly lighter; sternum 8–9 never with 2 longitudinal submedian spots; cerci as in male imago.

Wings. Length of fore wing (mm) 10.13 ± 0.38 (n=23).

Legs. Ratio of femur:tibia:tarsus, 1.1:1.0:1.1 of fore, 1.2:1.1:1.0 of mid and hind leg.

Body (Fig. 3M). Length (mm) 10.0 ± 0.53 (n=14); cerci 2, length (mm) 10.7 ± 1.38 (n=14); posterior margin of postgenital plate bluntly and evenly curved; paraprocts close together all the way to hind margin.

FEMALE SUBIMAGO

Colour. Head and eyes as in female imago; wings as in male subimago; legs yellowish-brown; abdomen dull reddish-brown; pigmentation near vestibulum weaker than in female imago.

Body. Shape of postgenital plate and paraprocts as in female imago.

MATURE NYMPH

Colour. Head dark yellowish-brown with narrow lighter yellowish-white field around eyes; eyes dark bluish-black; antenna pale brown; nota dark yellowish-brown; wing-buds brownish-black; legs yellowish-brown; abdomen yellowish-brown,

sterna somewhat lighter; terga 5–7 medially dark (Fig. 4A), pattern less conspicuous on other terga and of varying form and distinctness; cerci of a uniform yellowish-brown colour.

Head. Width (mm) 1.7 ± 0.08 ($n=20$); antenna as long as head; labrum less than 2x as broad as long (Fig. 4C), densely setose; apical tooth of left mandible with 4 denticles (Fig. 2D); subapical tooth with 2 denticles on left and 3 overlapping on right mandible; prostheca formed by short-haired segment with long brush densely covered with fine setae; galea-lacinia almost 2x the width of basal segment of maxillary palpus and with a row of fairly stout uniform setae subapically (Fig. 4E); inner margin with 5 stout spines and many uniformly robust setae; maxillary palpus 2x the length of galea-lacinia, innermost broadened segment with 10–14 stout compound spines; segment 2 of same length as basal segment, and with at least 1 seta in basal 1/3 of inner margin; segment 3 1/2 length of segment 2, and with a row of stout setae along entire inner margin, apex thick and blunt; hypopharynx apically densely setose (Fig. 2E); penultimate segment of labial palpus with inner apical process (Fig. 2G); glossae and paraglossae densely setose (Fig. 2F).

Legs. (Figs. 2H, 4G). Ratio of femur:tibia:tarsus, 1.9:1.0:1.4 of fore, 1.8:1.0:1.2 of mid, and 1.6:1.0:1.4 of hind leg; all legs with numerous compound spines; claw with delicate serration along basal 1/2 of inner margin.

Body. (Fig. 4A). Length (mm) 10.8 ± 0.62 ($n=20$); hind corners of abdominal segment 7–9 drawn out into distinct spines, on segment 9 extending at least half way along 10th segment.

Gills. (Fig. 4I). 7 single asymmetrical gills decreasing in size posteriorly; tracheae with many small branches; length 3rd gill (mm) 2.2 ± 0.23 ($n=19$).

Cerci. Length (mm) 4.9 ± 0.31 ($n=20$) of all 3 filaments; mid filament with bilateral, outer ones with unilateral, inner setation.

Parameletus minor (Bengtsson)

Figs. 2; 3 C,D,F,H,J,L,N; 4 B,D,F,H,J.

Remipalpus minor Bengtsson, 1908:242, nomen nudum.

Potameis minor Bengtsson, 1909:15.

Parameletus minor: Bengtsson 1930:15.

Type area: Sweden.

Type material: *Lectotype* ♂ of *P. minor* Bengtsson (here designated), Sweden, Dalarna, labelled: "*Parameletus minor* B", "Dalarna Elfdalen 2 Juli 1907, *Remipalpus minor* n. sp.", "*Lectotypus* ♂ 1961 design. Brinck and Müller-Liebenau", "*Parameletus minor* Bengtsson ♂" and the lectotype label of the senior author. *Stylicher* plate and penis in separate tube. – *Paralectotypes*, 1♂ 2♀ in two tubes (here designated), from the same locality, labelled: "Dalarna Elfdalen 2 Juli 1907", "*Allolectotypus* ♂ 1961 design. Brinck and Müller-Lienenau", "*Parameletus minor* Bengtsson ♂", "*Parameletus minor* Bgtss. Dalarna Elfdalen 2 Juli 1907 1♂ lectotypus, 1♀ allolectotypus entnommen 1961 Brinck and Müller-Liebenau" and the paralectotype label of the senior author. Type material in Lund (UZM), Sweden.

General remarks: The type designation of Brinck and Müller-Liebenau was not published and is thus invalid.

Description

MALE IMAGO

Colour. Wing veins pale yellowish-brown; cerci yellowish-white.

Wings. Length of fore wing (mm) 8.9 ± 0.68 ($n=30$).

Legs. Ratio of femur:tibia:tarsal segments 1–5, 3.4:3.0:1.8:2.1:2.1:1.5:1.0 of fore leg; ratio of femur:tibia:tarsus, 1.2:1.0:1.0 of mid and hind leg.

Body. Length (mm) 9.3 ± 0.91 ($n=29$); length of cerci (mm) 12.8 ± 1.92 ($n=29$).

Genitalia (Figs. 3C, D, F). Posterior margin of stylicher with a sharp emargination on each side of rectangular, relatively broad median extension; penis dorsally with 2 pointed processes that reach 1/2 way to hind margin.

MALE SUBIMAGO

Colour. Head light gray; upper portion of eyes whitish-gray, lower portion dark bluish-gray; wing membrane translucent; legs light yellow; abdomen yellowish-red; cerci as in male imago.

Genitalia (Figs. 3H–J). Posterior median extension of stylicher half the width of entire hind margin; 2 pointed processes of penis as in male imago.

FEMALE IMAGO

Colour. Head light gray; wings as in male imago; pigmentation near vestibulum distinct (Fig. 3L); posterior margin of sternum 7 medially dark,

including median emargination; sternum 8 with dark median spot at anterior margin; sternum 7–8 distinctly lighter in central part; sternum 8–9 always with longitudinal submedian markings; cerci as in male imago.

Wings. Length of fore wing (mm) 9.3 ± 0.60 (n=16).

Legs. Ratio of femur:tibia:tarsus, 1.2:1.0:1.3 of fore, 1.2:1.0:1.0 of mid and hind legs.

Body (Fig. 3N). Length (mm) 8.6 ± 0.71 (n=12); length of cerci (mm) 9.6 ± 0.96 (n=12); posterior margin of postgenital plate pointed; paraprocts distinctly separated all the way to hind margin.

FEMALE SUBIMAGO

Colour. Head white; wings as in male subimago; abdomen light reddish-brown; pigmentation near vestibulum weaker than in female imago.

Abdomen. Postgenital plate and paraprocts as in female imago.

MATURE NYMPH

Colour. Head and nota light yellowish-brown; legs yellowish-white; abdominal terga 2–9 each with a pair of dark submedian spots (Fig. 4B), sometimes indistinct but always present; terga 2–7 lighter in central part; cerci of uniform yellowish-white colour.

Head (Figs. 4D, F). Width (mm) 1.4 ± 0.11 (n=20); labrum twice as broad as long; width of galea-lacinia about 1.5x width of basal segment of maxillary palpus, which is slightly broader than segments 2–3, and with 5–9 stout compound spines; segment 2 without seta in basal 1/3 of inner margin; segment 3 apically pointed.

Legs (Fig. 4H). Ratio of femur:tibia:tarsus, 1.8:1.0:1.3: of fore leg, 1.9:1.0:1.2 of mid and hind leg; claw with delicate serration in basal 1/3 of inner margin.

Body (Fig. 4B). Length (mm) 9.4 ± 0.77 (n=20); hind corners of abdominal segments 7–9 with spine-like prolongations, these on segment 9 shorter, always < 1/2 length of segment 10.

Gills (Fig. 4J). Tracheae with few small branches; length 3rd gill (mm) 1.5 ± 0.15 (n=19).

Cerci. Length (mm) 4.1 ± 0.26 (n=20).

Key to imagines of the Fennoscandian species of Siphonuridae

1. Hind tarsus longer than hind tibia (Fig. 5A) ... 2
- Hind tarsus shorter than (Fig. 5B) or subequal to hind tibia (Fig. 2B) 4
2. Abdominal sterna 3-8 with distinct colour pattern consisting of dark-brown dots and spots (Fig. 5C). Femora with dark band. Penis fairly blunt (Fig. 5I) *Siphonurus alternatus* Say
- Abdominal sterna without spots and dots. Femora without a dark-brown band. Penis elongated (Figs. 5 J-K) 3
3. Abdominal sterna 3-8 with U-shaped dark-brown pattern (Fig. 5D). Penis pointed at apices (Fig. 5J) *Siphonurus lacustris* Eaton
- Abdominal sterna of a uniform dark-brown tint (Fig. 5E). Penis rounded at apices (Fig. 5K) ..
..... *Siphonurus aestivalis* Eaton
4. Hind tarsus shorter than hind tibia (Fig. 5B). Anterior tarsal claw broadened with blunt apex (Fig. 5G). Styliiger with deep median excision (Fig. 5F). Costal process of hind wing acute (Fig. 5H) *Ameletus inopinatus* Eaton
- Hind tarsus as long as hind tibia (Fig. 2B). Tarsal claw not broadened, apex acute (Fig. 2C). Styliiger without deep median excision (Figs. 3E, F). Costal process of hind wing obtuse (Fig. 2A)..... 5
5. *Male:* posterior margin of styliiger with shallow emargination on each side of curved median extension (Fig. 3E); penis with 2 pointed processes that almost reach its apex (Fig. 3A, B).
Female: hind margin of sternum 7 with dark curved pigmentation anterior to lighter median part (Fig. 3K); sternum 8 with dark median spot at anterior margin and dark median lobe projecting anteriorly to sternum 7 (Fig. 3K); posterior margin of postgenital plate blunt and evenly curved (Fig. 3M); paraprocts close to each other all the way to the hind margin (Fig. 3M)
..... *Parameletus chelififer* Bengtsson
- *Male:* posterior margin of styliiger with sharp emargination on each side of a rectangular relatively broad median extension (Fig. 3F); penis with 2 pointed processes that reach 1/2 way to its apex (Figs. 3C, D).
Female: hind median margin of sternum 7 with dark pigmentation which includes the outer median emargination (Fig. 3L); sternum 8 with dark median spot at anterior margin, but without dark median lobe projecting anteriorly to sternum 7 (Fig. 3L); posterior margin of postgenital plate pointed (Fig. 3N); Paraprocts distinctly separated all the way to the hind margin (Fig. 3N)
..... *Parameletus minor* (Bengtsson)

Key to mature nymphs of the Fennoscandian species of Siphonuridae

1. Penultimate segment of labial palpus with inner apical process (Fig. 2G). Gills simple 2
- Penultimate segment of labial palpus not produced inwards (Fig. 6A). Gills simple or with 2

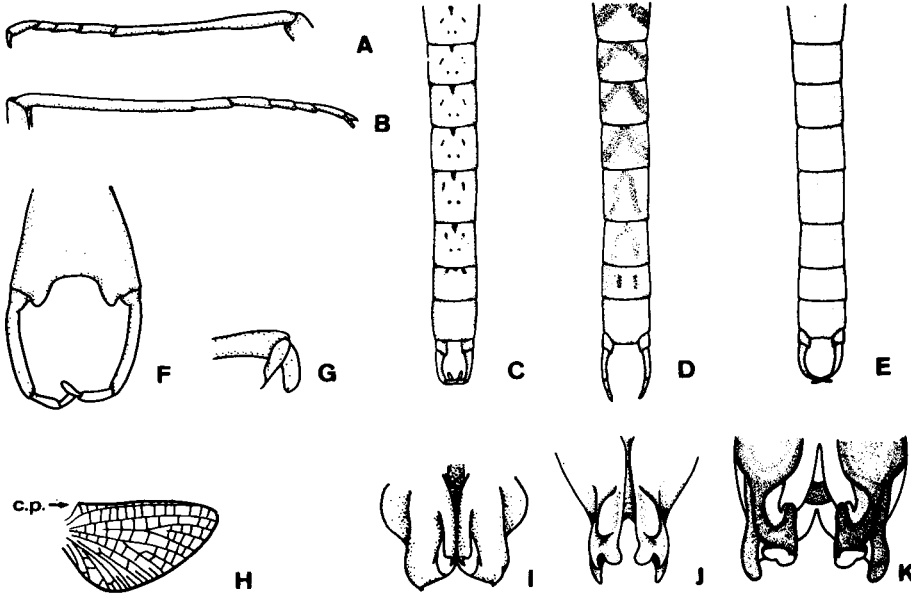


Fig. 5. *Siphonurus* spp. (A), *Ameletus inopinatus* (B,F,G,H), *Siphonurus alternatus* (C,I), *S. lacustris* (D,J), *S. aestivalis* (E,K), imago. — A,B, hind leg. — C,D,E, abdomen, ventral view, ♂. — F, styliger, ventral view, ♂. — G, tarsal claws. — H, hind wing, c.p.=costal process. — I,J,K, penis, ventral view, ♂. — Figs. A,B,F,G,H,I,J from Elliott & Humpesch (1983).

- lamellae 3
- 2. Abdominal dorsal colour pattern as in Fig.4A, terga 5-7 with more or less distinct dark median spot. Posterior spine-like prolongations of segment 9 at least 1/2 as long as segment 10 (Fig. 4A). Gills large, with distinctly branched tracheae with many small branches (Fig. 4I) *Parameletus chelifera*¹ Bengtsson
- Abdominal dorsal colour pattern as in Fig.4B, with 2 dark submedian spots (Fig. 4B). Posterior spine-like prolongations of segment 9 less than 1/2 length of segment 10 (Fig. 4B). Gills small, with fewer branched tracheae and lacking most of the fine-branched tracheae (Fig. 4J) *Parameletus minor*¹ (Bengtsson)
- 3. Lacinia distally broadened, apical margin truncate and provided with a characteristic row of spines (Fig. 6D). All gills simple *Ameletus inopinatus* Eaton
- Lacinia narrow, apical margin pointed and with numerous setae along distal and inner margin (Fig. 6B). Some gills with 2 lamellae 4
- 4. Tergum 8-9 laterally with dark median band reaching outer margin (Fig. 6F). 6 anterior gills each with 2 lamellae ... *Siphonurus alternatus* Say
- Terga 8-9 laterally uniformly pale (Fig. 6E) or with dark median spot not reaching outer margin

- (Fig. 6G). Only 2 anterior gills each with 2 lamellae 5
- 5. Terga (2-) 8-9 laterally with isolated round or oval dark spot (Fig. 6G). Distal segment of labial palpus dorsally with regular row of long setae (Fig. 6C) *Siphonurus lacustris* Eaton
- Terga without spots laterally, uniformly pale (Fig. 6E). Distal segment of labial palpus with long dorsal setae in an irregular row (Fig. 6A) *Siphonurus aestivalis* Eaton

Acknowledgements. We wish to thank Dr. I. Müller-Liebenau, Plön, Dr. A. Nilsson, Umeå and Dr. T. I. Olsson, Umeå for their comments on the manuscript. Dr. J. E. Brittain, Oslo, Dr. R. Danielsson, Lund, Dr. A. Nilsson, Umeå, Mr. I. Näslund, Umeå and Dr. T. I. Olsson generously submitted types and other material. This work has been supported by grants from the Larsénska foundation, Lund.

References

Aro, J. E. 1910. Piirteitä päiväkorennoisten (Ephemeroidea) elämäntavoista ja kehityksestä. — Ylipainos Viipurin suomal. reallilyseon vuosikertomuksesta 1910: 1-32.

Ayala, F.J., Powell, J.R., Tracey, M. L., Moirno, C. A. & Perez-Salas, S. 1972. Enzyme gene variability in

¹ The characters should serve to identify all nymphs of *P. chelifera* and *P. minor* that are half full-size or larger.

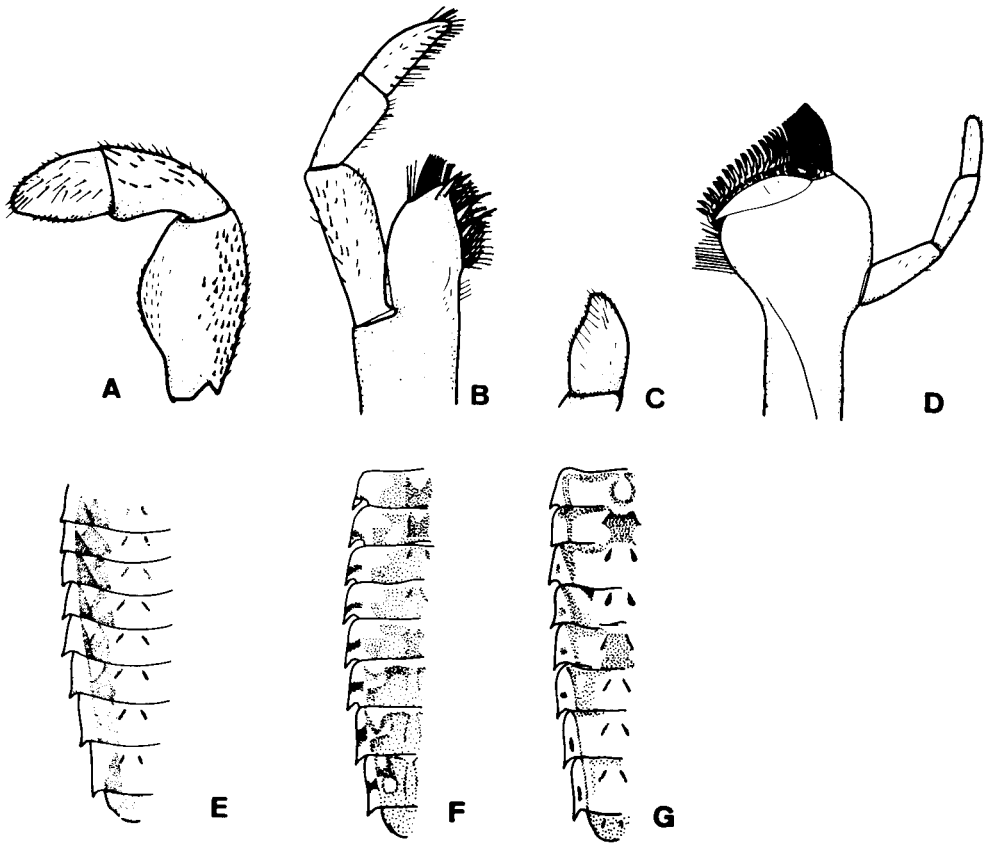


Fig. 6. *Siphonurus aestivalis* (A,E), *S. alternatus* (B,F), *S. lacustris* (C,G), *Ameletus inopinatus* (D), mature nymphs. — A, labial palpus. — B,D, maxilla. — C, outer segment of labial palpus. — E,F,G, abdomen, dorsal view. — Figs. A,B,C,D,F,G from Macan (1979).

the *D. willistoni* group. IV. Genic variation in natural populations of *D. willistoni*. — Genetics, Princeton, etc. 70:113.

- Bengtsson, S. 1904. Reseberättelse afgifven af Regnellske stipendiaten docenten Simon Bengtsson för en zoologisk resa till Umeå Lappmark 1903. — K. svenska Vetensk Akad. Årsb. 1904: 117–131.
- 1908. Berättelse öfver en resa i entomologiskt syfte till mellersta Sverige sommaren 1907. — Ibidem 6:237–246.
- 1909. Beiträge zur Kenntnis der paläarktischen Ephemeriden. — Acta Univ. lund. (N.F), Afd. 2, 5(4):1–19.
- 1917. Weitere Beiträge zur Kenntnis der nordischen Eintagsfliegen. — Ent. Tidskr. 38:174–194.
- 1930. Kritische Bemerkungen über einige nordische Ephemeroter, nebst Beschreibung neuer Larven. — Acta Univ. lund. (N.F), Afd. 2, 26(3):1–27.
- 1931. 11. Dagsländor – Ephemeroptera. — Pp. 56–57, in: Sjöstedt, Insektsfaunan inom Abisko nationalpark III. — K. svenska Vetensk Akad. Skr. Naturskydd. 18.

Brekke, R. 1940. The Norwegian mayflies (Ephemeroptera). — Norsk ent. Tidsskr. 5:55–73.

Brinck, P. 1957. Reproductive system and mating in Ephemeroptera. — Opusc. ent. 22:1–37.

Brinck, P. & Wingstrand, K. G. 1951. The mountain fauna of Virihaure area in Swedish Lapland II. — Acta Univ. lund. (N. F.), Avd. 2, 46(2):1–73.

Chernova, O. A. 1967. 5. Order Ephemeroptera – mayflies. — Pp. 110–136, in: Theodor, Keys to the insects of the European USSR 1. — Springfield Virginia.

Dahlby, R. 1973. A check-list and synonyms of the Norwegian species of Ephemeroptera. — Norsk ent. Tidsskr. 20:249–252.

Elliot, J. M. & Humpesch, U. H. 1983. A key to the adults of the British Ephemeroptera. — Scient. Publ. Freshwat. biol. Ass. 47: 101 pp.

Engblom, E. & Lingdell, P. E. 1983. Bottenfaunans användbarhet som pH-indikator. — SNV PM 1741: 181 pp.

Esben-Petersen, P. 1909. New Ephemeridae from Denmark, Arctic Norway and the Argentine Re-

- public. — Dt. ent. Z. 1909:551–556.
- Ferguson, A. 1980. Biochemical systematics and evolution. — Blackie, Glasgow & London.
- Hubbard, M. D. 1977. The validity of the generic name *Parameletus* Bengtsson (Ephemeroptera: Siphonuridae). — Proc. ent. Soc. Wash. 79:409–410.
- Macan, T. T. 1979. A key to the nymphs of the British species of Ephemeroptera with notes on their ecology. — Scient. Publ. Freshwat. biol. Ass. 20: 80 pp.
- Needham, J. G., Traver, J. R. & Hsu, Y.-C. 1935. The biology of mayflies with a systematic account of North American species. — 759 pp., Comstock, Ithaca.
- Olsson, T. I. 1983. Seasonal variation in the lateral distribution of mayfly nymphs in a boreal river. — Holarct. Ecol. 6:333–339.
- Olsson, T. I. & Söderström, O. 1978. Springtime migration and growth of *Parameletus chelifera* (Ephemeroptera) in a temporary stream in northern Sweden. — Oikos 31:284–289.
- Puthz, V. 1978. Ephemeroptera. — Pp. 256–263, in: Illies, Limnofauna Europaea. — Stuttgart.
- Saaristo, M. I. and Savolainen, E. 1980. Suomen päivänkorennot – Finlands dagsländor (Ephemeroptera). — Notul. ent. 60:181–186.
- Savolainen, E. & Saaristo, M. I. 1981. Distribution of mayflies (Ephemeroptera) in the biological province of Kuusamo (Ks), Finland. — Ibidem 61:117–124.
- 1984. Ephemeroptera of Inari Lapland. — Kevo Notes 7:23–29.
- Silfverberg, H. 1984. Ephemeroptera. — Pp. 1–29, in: Huldén, A check list of the Finnish insects. Small orders. — Notul. ent. 64.
- Soldan, T. 1981. The mayflies (Ephemeroptera) of Utsjoki, northernmost Finland. — Anns Univ. turku (A) 17:81–85.
- Tiensuu, L. 1939. A survey of the distribution of mayflies (Ephemerida) in Finland. — Suom. hyönt. Aikak. 5:97–124.
- Ulmer, G. 1943. Die von Prof. A. Thieneman in der Umgegend von Abisko (Lappland) gesammelten Eintagsfliegen und ihre Larven. — Arch. Hydrobiol. 40:329–361.

Revised manuscript accepted June 1985.