

New records of *Paraleptophlebia weneri* Ulmer, 1920 and *P. strandii* (Eaton, 1901) from Finland (Ephemeroptera, Leptophlebiidae)

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Abstract

The mayfly species *Paraleptophlebia weneri* has been rediscovered from Finland. The species was classified as RE (regionally extinct) in the most recent national red-list assessment. The new locality is close to the Russian border in NE Lapland, Savukoski. Adult males were collected with a sweep net around a pond. *Paraleptophlebia strandii* is a rather poorly known but widespread Finnish species. The adults of this species occurred in great numbers in aapamires of central Lapland (Sodankylä). We hypothesize that these leptophlebid species are not dependent on running water but may instead thrive in small lentic water bodies.

Keywords

Lapland, faunistics, mayflies, aapamires, ponds

Introduction

The genus *Paraleptophlebia* Lestage (Ephemeroptera, Leptophlebiidae) consists of six European species (Bauernfeind and Soldán 2012), four of which have been recorded from Finland (*P. cincta* (Retzius, 1783), *P. strandii* (Eaton, 1901) *P. submarginata* (Stephens, 1835) and *P. weneri* Ulmer, 1920, Savolainen 2009). According to Savolainen (2009), larvae of the Finnish species are associated with lotic waters. Some species, however, have been collected from summer-dry streams and slow-flowing parts of rivers (Bauernfeind and Soldán 2012). In this paper we report two poorly known and rarely caught species based on material collected from Finnish Lapland, north boreal ecoregion. Brief historical and ecological accounts are given for the species.

Materials and methods

Adult specimens of mayflies were collected by using a sweep net in 2012 (Suppl. materials 1, 2). Specimens were collected among aerial swarms or from lower vegetation. The collected sample was placed in a plastic bag with a pad wetted in chloroform and stunned insects were finally preserved in ethanol. Mayfly nymphs were searched by using kick-net (mesh size 0,5 mm) in 2013. Layer photos were taken using an Olympus E520 digital camera attached to an Olympus SZX16 stereomicroscope. Digital photos were captured using the software Deep Focus v. 3.1 and Quick PHOTO CAMERA 2.3. Layer photos were finally combined with the program Combine ZP. Coordinates are given in WGS84 format.

Taxon treatments

Paraleptophlebia wernerii Ulmer, 1920

Materials

- a. country: Finland; verbatimLocality: Lapponia kemensis pars orientalis: Savukoski, Törmäoja, Ahot; verbatimLatitude: 67.8276 N; verbatimLongitude: 29.4394 E; eventDate: 16.8.2012; individualCount: 2; sex: males; lifeStage: adult; recordedBy: J. Salmela; institutionCode: Jukka Salmela; occurrenceID: F84A80CF-0DD9-5102-8A2F-31AAEF107361
- b. country: Finland; verbatimLocality: Lapponia kemensis pars orientalis: Savukoski, Törmäoja, Ahot; verbatimLatitude: 67.8276 N; verbatimLongitude: 29.4394 E; eventDate: 16.8.2012; individualCount: 7; sex: males; lifeStage: adult; catalogNumber: 8607; recordedBy: J. Salmela; institutionCode: Kuopio Natural History Museum; occurrenceID: 1E8BD281-36ED-58D1-AB1C-044D5297AC6D

Notes

The sampling locality was a pond in a rather open landscape (Fig. 1). The pond is apparently permanent, i.e. not very susceptible of drying out in summer. Its surface area was ca. 850 m² and its maximum depth ca. 150 cm. The water was slightly brownish, colored by humic substances. There was sparse submerged vegetation, shores were wet and dominated by tall sedges and grasses. The pond was likely lacking fish and without an outlet, except for a marshy area connecting it to Törmäoja stream. The distance from Törmäoja stream was ca. 80 m. The adult males were caught from the shores of the pond by using a sweep net. No other mayfly species were present in the sample. In 2012 a sweep net sample was also collected from the shore of the stream, some 900 m north of the pond, but no *P. wernerii* specimens were found. The sampling locality was a pond in a rather open landscape (Fig. 1). The pond is apparently permanent, i.e. not very susceptible of drying out in summer. Its surface area was ca. 850 m² and its maximum depth ca. 150 cm. The water was slightly brownish, colored by humic substances. There was sparse submerged

vegetation, shores were wet and dominated by tall sedges and grasses. The pond was likely lacking fish and without an outlet, except for a marshy area connecting it to Törmäoja stream. The distance from Törmäoja stream was ca. 80 m. The adult males were caught from the shores of the pond by using a sweep net. No other mayfly species were present in the sample. In 2012, a sweep net sample was also collected from the shore of the stream, some 900 m north of the pond, but no *P. weneri* specimens were found. This streamside sample included two mayfly species: *P. cincta* (Retzius, 1783) and *Siphonurus lacustris* Eaton, 1870. However, in 2013 one *P. weneri* male specimen was caught from the slow flowing section of the headwater stream, some 470 m north of the pond. Larvae of *P. weneri* were collected from the bottom of the pond, among fine organic detritus and submerged vegetation. Larvae of this species were also collected from a nearby permanent pond, surface area 830 m², lacking inlet or outlet brooks. Geographic distance of these two ponds is 760 meters. Two other smaller, temporary ponds in the vicinity were also sampled but no ephemeropteran larvae were found.

***Paraleptophlebia strandii* (Eaton, 1901)**

Materials

- a. verbatimLocality: Lapponia kemensis pars orientalis: Sodankylä, Satovaara;
locationRemarks: rich flark fen; verbatimLatitude: 67.6777 N; verbatimLongitude: 27.0878 E; eventDate: 20.8.2012; individualCount: 5; sex: males; recordedBy: J. Salmela;
occurrenceID: 149972F7-14D2-5399-A890-9A35B960A162
- b. verbatimLocality: Lapponia kemensis pars orientalis: Sodankylä, Sonniharju SE;
locationRemarks: rich flark fen; verbatimLatitude: 67.6823 N; verbatimLongitude: 27.0926 E; eventDate: 20.8.2012; individualCount: 5; sex: males; recordedBy: J. Salmela;
occurrenceID: 02F0F8B0-4A4D-50D2-9F26-AA292B39C934
- c. verbatimLocality: Lapponia kemensis pars orientalis: Sodankylä, Postoselkä E;
locationRemarks: rich flark fen; verbatimLatitude: 67.7978 N; verbatimLongitude: 26.6655 E; eventDate: 9.8.2012; individualCount: 10; sex: males; recordedBy: J. Salmela;
occurrenceID: 0DF9F837-A0DA-526C-9081-DD82F5DABEF2

Notes

All sampling localities are aapamires, i.e. fens that receive water and nutrient input from the surrounding mineral lands (versus raised bogs that only receive rain water). The mires are lying on bedrock which consists of calcareous or non-acidic rocks such as ultramafic volcanic rock, gabbro and schists (Geological Survey of Finland, <http://en.gtk.fi/>). The calcareous influence can be seen in the bryophyte flora, which includes species such as *Campylium stellatum*, *Scorpidium revolvens*, *Tomentypnum nitens* and *Hamatocaulis vernicosus*. The fens were characterized by wet flarks (i.e. inundated moss cover) and mud-bottom pools. The collecting sites were hard to access and difficult to walk on. There were no available mineral substrates for aquatic insects. However, due to their wetness and sloping profile (most notably in Sonniharju), there were some shallow surface flows on the fens.

Adults of *P. strandii* were very numerous at the collecting sites. Males formed huge swarms consisting of thousands of specimens. Swarming took place over narrow strings with sedge (*Carex*) shoots in the vicinity of the pools. Swarming was observed approximately within 0.6 and 2 m of height, in the afternoon during sunny weather. The minimum distance to the nearest stream was one kilometer.

Discussion

Paraleptophlebia weneri is a western Palaearctic species. Its range extends from the British Isles to the eastern side of Urals (Russia), and from northern Fennoscandia to the Alps (Bauernfeind and Soldán 2012). The species occurs in Norway (Johansen and Lunde 1993) and the Swedish records are from the northern provinces (Lycksele Lappmark, Pite Lappmark and Torne Lappmark, Engblom 2001). In his nationwide mayfly survey, Tiensuu (1939) reported only a single locality for *P. weneri* from *Regio kuusamoensis*: Kuusamo, W. Hellén leg., 1 male. No more specific locality or habitat information was given in that publication or found in Tiensuu's otherwise detailed note books. It is likely however that the locality is currently on the Russian side of the border (Savolainen 2009). Another verified record is the one by Mauri Hirvenoja from *Lapponia kemensis pars orientalis*: Sodankylä, Mutenianjoki River, 30.6.1960, several swarming males (Savolainen 2009). One of us (ES) saw the sample and verified the identification in 1967. Regrettably, the Mutenianjoki river and the surrounding landscape were inundated and destroyed at the end of the 1960s due to the construction of the Lokka reservoir (200–400 square kilometers in area, depending on the water level). In addition to the above mentioned two sites, the species was reported from South Finland (*Tavastia australis*: Hausjärvi, [Hirvenoja 2002]). However, that record was based on small larvae and the habitat has since been destroyed (M. Hirvenoja, personal communication). In order to assess its range size and conservation status, *P. weneri* has been the focus of intensive searches during the last four decades in North Finland. Nevertheless, the species remained undetected until 2012. In the most recent national red-list assessment *P. weneri* was classified as RE (regionally extinct, Savolainen and Ilmonen 2010).

Adult males of *Paraleptophlebia weneri* are easily distinguished from other European species due to their characteristic genitalia and the shape of their gonopods (Fig. 2). See, e.g., Elliott and Humpesch (1983), Bauernfeind and Soldán (2012) for the identification of adults; Macan (1979), Bauernfeind and Humpesch (2001) for the identification of larvae.

According to literature records the larvae of this species dwell in several kinds of water bodies. Bauernfeind and Soldán (2012) state that *P. weneri* is an inhabitant of lowland streams and rivers characterized by abundance of submerged vegetation, usually in backwaters and ephemeral (summer dry) water bodies. Also Elliott and Humpesch (1983) note that the species thrives in lotic waters that lack water flow during summer. In the Swedish fell area the species has been caught from alpine headwater streams and even small ponds (Engblom 2001, E. Engblom, personal communication).

The first Finnish locality, the now vanished Mutenianjoki river, was a less than 10 m in breadth, eutrophic, slow flowing river with a muddy and stony bed. During summer time the river usually had low water level. The water was neutral or alkaline (pH over 7) and turbid due to abundance of algae. The river harbored aquatic insect larvae in great numbers. Mauri Hirvenoja collected his sample from the slow flowing outlet of the river. Lake Sompiojärvi, the source of the river, was shallow but well oxygenated (M. Hirvenoja, personal communication).

According to Bauernfeind and Soldán (2012) *P. weneri* is a univoltine, early summer species, whose adults emerge from April to June. The record from River Mutenianjoki is from the end of June. In northern Sweden, however, larvae have been collected at the end of July (E. Engblom, personal communication). The adult males reported here were caught in mid August.

Paraleptophlebia strandii is a North Palaearctic species with a wide range encompassing Fennoscandia and Russian Far East (Bauernfeind and Soldán 2012). The first Finnish record was given by Aro (1928), from three provinces in southern and northern Finland. According to Savolainen (2009) the species is absent from western and southwestern Finland and has been recorded from eastern and northern Finland, including northernmost Lapland.

The natural history and occurrence of *P. strandii* are hitherto poorly known. There are scanty notes in the literature (see Bauernfeind and Soldán 2012), and according to Tiensuu (1935) the species favors small forest brooks with a slow current. In Finland the species is associated with running waters, especially small streams with aquatic mosses and vascular plants (Savolainen 2009). The life cycle of the species is unknown but it may be of the univoltine summer type (Bauernfeind and Soldán 2012).

In the present work we report *P. strandii* from boreal aapamires. These new observations are significant, because the notion of the species as a lotic one is challenged. Based on earlier records this species occurs in running water habitats with high oxygen levels. Our new records indicate that *P. strandii* is a common inhabitant of northern aapamires and that the species may be locally abundant. It may be assumed that *P. strandii* overwinters as an egg. Due to flowing of groundwater and thick snow cover, the flarks and pools in aapamires may retain some free water during snow covered periods (Koutaniemi and Seppälä 1986, Seppälä and Koutaniemi 1985), thus enabling the survival of the eggs. On the other hand, it has been noted that eggs of other mayfly species such as *Baetis macani* and *B. bundyae* may tolerate freezing (Giberson et al. 2007, Drotz et al. 2012).

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References

- Aro J (1928) Suomen päivänkorennoiset (Ephemera). [Mayflies of Finland]. Otavan hyönteiskirjasto, 3. Otava, Helsinki, 68 pp. [In Finnish].
- Bauernfeind E, Humpesch U (2001) Die Eintagsfliegen Zentraleuropas (Insecta: Ephemeroptera): Bestimmung und Ökologie. Verlag des Naturhistorischen Museums Wien, Vienna, 239 pp.
- Bauernfeind E, Soldán T (2012) The mayflies of Europe (Ephemeroptera). Apollo Books, Ollerup, 781 pp.
- Drotz M, Savolainen E, Saura A, Ståhls G (2012) The genetic population structure of lotic and lentic mayflies of the *Baetis vernus* group (Ephemeroptera: Baetidae). *The Canadian Entomologist* 144 (5): 679-690. <https://doi.org/10.4039/tce.2012.69>
- Elliott J, Humpesch U (1983) A key to the adults of the British Ephemeroptera with notes on their ecology. Scientific publications, 47. Freshwater Biological Association, Cumbria, 101 pp.
- Engblom E (2001) An annotated check-list of Swedish mayflies (Ephemeroptera). *Ephemera* 3: 109-116.
- Giberson D, Burian S, Shouldice M (2007) Life history of the northern mayfly *Baetis bundyae* in Rankin Inlet, Nunavut, Canada, with updates to the list of mayflies of Nunavut. *The Canadian Entomologist* 139 (5): 628-642. <https://doi.org/10.4039/n06-089>
- Hirvenoja M (2002) The fauna in two cold springs and in an epirhithral pool in southern Finland. *Sahlbergia* 7: 7-25.
- Johansen G, Lunde V (1993) Sjekklister for norske dognfluer (Ephemeroptera) med forslag til norske artsnavn. *Insekt-Nytt* 18: 19-22. [In Norwegian].
- Koutaniemi L, Seppälä M (1986) Apasuoan routaa säätelevät tekijät – esimerkkitaipaus Kuusamosta. *Terra* 98: 60-67. [In Finnish].
- Macan T (1979) A key to the nymphs of the British species of Ephemeroptera with notes on their ecology. Scientific publications, 20. Freshwater Biological Association, Cumbria, 80 pp.
- Savolainen E (2009) Päivänkorentojen (Ephemeroptera) esiintyminen Suomessa. *Kulumus* 15: 1-32. [In Finnish]. URL: <http://www.kuopionluonnontieteellinenmuseumo.fi/julkaisut/kulumus.html>
- Savolainen E, Ilmonen J, Rassi P, Hyvärinen E, Juslen A, Mannerkoski I (2010) Mayflies, Ephemeroptera. The 2010 Red List of Finnish Species. Ministry of Environment, Finnish Environmental Institute, Helsinki, 685 pp.
- Seppälä M, Koutaniemi L (1985) Formation of a string and pool topography as expressed by morphology, stratigraphy and current processes on a mire in Kuusamo, Finland. *Boreas* 14: 287-309.
- Tiensuu L (1935) On the Ephemeroptera-fauna of Laatokan Karjala (Karelia Ladogensis). *Annales Entomologi Fennici* 1: 3-23.
- Tiensuu L (1939) A survey of the distribution of mayflies (Ephemera) in Finland. *Annales Entomologi Fennici* 5: 97-124.



Figure 1.

The collecting locality of *Paraleptophlebia wernerii* in NE Lapland, Savukoski, Törmäoja in 16.8.2012. Photo J. Ilmonen.

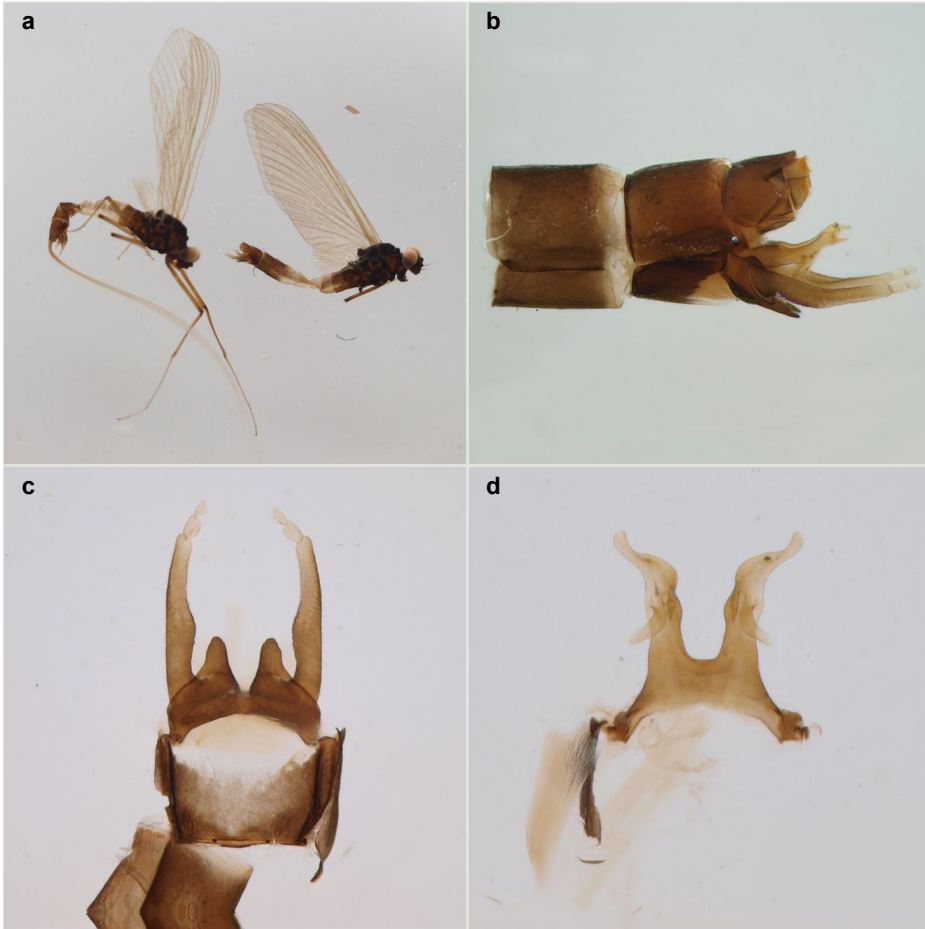


Figure 2.

Paraleptophlebia wernerii, collected from NE Lapland, Savukoski, Törmäoja.

a: adult males, habitus, lateral view, wing length ca. 5.5 mm

b: male abdominal terminalia, lateral view

c: male abdominal terminalia and forceps (gonopods), ventral view

d: penis, ventral view

Supplementary materials

Suppl. material 1: New records of *Paraleptophlebia weneri* and *P. strandi* from Finland

Authors: J. Salmela & E. Savolainen

Data type: occurrences

Brief description: New records of four may fly species are given from Finnish Lapland

Filename: occurrence-1_Paraleptophlebia.xlsx - [Download file](#) (59.18 kb)

Suppl. material 2: Occurrence data

Authors: J. Salmela & E. Savolainen

Data type: occurrences

Filename: occurrence-1_Paraleptophlebia.xlsx - [Download file](#) (59.99 kb)