

## Ephemeroptera of Inari Lapland

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The distribution of mayflies in the biological province of Inari Lapland has been studied on the basis of material comprising 3772 specimens. The data have been plotted on UTM squares for each species. Four species are recorded as new for the province; viz. *Procloeon bifidum*, *Heptagenia joernensis*, *H. sulphurea* and *Paraleptophlebia cirrata*. Some comments on frequency and abundance of all species are also given in the light of the present material.

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### Introduction

There are several papers dealing with the mayfly fauna of Inari Lapland. However, they cover either only a part of the area, mainly Utsjoki commune (Bagge 1965 & 1968, Soldán 1981), or only one genera or species (Müller-Liebenau & Savolainen 1975, Savolainen 1980, Savolainen & Saaristo 1980). Only Tiensuu's (1939) report covers the whole province but his material is rather scanty and scattered although comprising museum collections and those of amateur collectors of his time.

The aim of this paper is to present distribution maps for every species found in Inari Lapland using the UTM system and to give information about their frequency and abundance.

### Material and methods

Inari Lapland is the northernmost Finnish biological province. It comprises two communes, viz. Inari and Utsjoki. The size, situation and natural conditions of the area have been described in several publications (e.g. Kallio et al. 1969, Linnaluoto & Koponen 1980 and Koponen 1984).

The material of this study consists of 3772 individuals, of which 3668 specimens are from the Kuopio Museum collection and 108 specimens from the Zoological Museum of the University of Turku. The bulk of the material was collected by E. Savolainen from the year 1969 onwards during short collection trips in the study area. Most of the samples have been taken along roads and the areal coverage of the material is thus imperfect. Furthermore, the material has originally been collected for purposes other than faunal research, the chief objective having usually been taxonomical, ethological and ecological studies of certain genera and species. Consequently, no proper quantitative faunistic-ecological sampling methods have been used. Collecting sites are presented in Fig. 1.

The material was originally analysed using the uniform Grid system (grid 27°E) with 10 x 10 km squares. However, it is here presented in the UTM system with 50 x 50 or 50 x 60 km squares (c.f. Mäkinen & Kallio 1979 and Koponen et al. 1982). Samples were collected from 39 Grid squares in all, which is 14.4 % of the total 270 squares of the study area, and from 11 UTM squares, which represent 68.8 % of the UTM squares of the area. Information from earlier studies has also been included in the distribution maps provided that the data have been precise enough for correct placing.

Table 1. List of species. — Kevo = surroundings of the Kevo Research Station (3 km radius). Symbols: x = occurrence of species, X = new record (not notified in Kevo), — = no record, (x) = only literature data.

	Inari	Utsjoki	Kevo
<b>SIPHONURIDAE</b>			
1. <i>Ameletus inopinatus</i> Eaton, 1887	x	x	x
2. <i>Parameletus chelififer</i> Bengtsson, 1908	x	x	x
3. <i>P. minor</i> (Bengtsson, 1909)	—	x	x
4. <i>Siphonurus aestivalis</i> (Eaton, 1903)	x	x	x
5. <i>S. alternatus</i> (Say, 1824)	x	x	x
6. <i>S. lacustris</i> Eaton, 1870	x	x	x
<b>BAETIDAE</b>			
7. <i>Acentrella lapponica</i> Bengtsson, 1912	x	x	x
8. <i>Baetis digitatus</i> Bengtsson, 1912	x	—	—
9. <i>B. fuscatus</i> (Linnaeus, 1761)	x	X	x
10. <i>B. macani</i> Kimmins, 1957	x	x	x
11. <i>B. muticus</i> (Linnaeus, 1758)	x	x	x
12. <i>B. niger</i> (Linnaeus, 1761)	x	x	x
13. <i>B. rhodani</i> (Pictet, 1843–45)	x	x	x
14. <i>B. subalpinus</i> Bengtsson, 1917	x	x	x
15. <i>B. vernus</i> Curtis, 1834	—	(x)	—
16. <i>Centroptilum luteolum</i> (Müller, 1776)	X	x	x
17. <i>Procloeon bifidum</i> (Bengtsson, 1912)	X	X	—
<b>HEPTAGENIDAE</b>			
18. <i>Heptagenia dalecarlica</i> Bengtsson, 1912	x	x	x
19. <i>H. fuscogrisea</i> (Retzius, 1783)	x	x	—
20. <i>H. joernensis</i> (Bengtsson, 1909)	X	X	x
21. <i>H. sulphurea</i> (Müller, 1776)	X	—	—
22. <i>Arthroplea congener</i> Bengtsson, 1908	x	x	x
<b>METRETOPODIDAE</b>			
23. <i>Metretopus alter</i> Bengtsson, 1930	X	(x)	—
24. <i>M. borealis</i> (Eaton, 1871)	x	x	x
<b>LEPTOPHLEBIIDAE</b>			
25. <i>Leptophlebia marginata</i> (Linnaeus, 1767)	x	x	x
26. <i>L. vespertina</i> (Linnaeus, 1758)	x	x	x
27. <i>Paraleptophlebia cincta</i> (Retzius, 1783)	X	—	—
28. <i>P. strandii</i> (Eaton, 1901)	X	(x)	x
29. <i>P. submarginata</i> (Stephens, 1835)	x	x	—
<b>EPHEMERELLIDAE</b>			
30. <i>Ephemerella aurivillii</i> (Bengtsson, 1908)	x	x	x
31. <i>E. ignita</i> (Poda, 1761)	x	(x)	—
32. <i>E. mucronata</i> (Bengtsson, 1909)	—	x	x
<b>EPHEMERIDAE</b>			
33. <i>Ephemera vulgata</i> Linnaeus, 1758	(x)	(x)	x
<b>CAENIDAE</b>			
34. <i>Caenis horaria</i> (Linnaeus, 1758)	x	—	—

## Results and discussion

The distribution of different species is presented in Table 1 and Maps 1–34. In the species list (Table 1) the presence of the species is given separately for Inari and Utsjoki communes and the surroundings of the Kevo Research Station (radius 3 km; see inside back cover and Koponen et al. 1982).

Table 2 gives a survey of the frequency and abundance of different species. In this context frequency represents the number of those collection squares in which the species in question has been collected and abundance indicates the individuals of different species as a percentage of the total number of collected specimens. The results of this study must be regarded as only indicating trends because sampling methods have been incoherent and non-quantitative.

According to Soldán (1981) the most frequent species in Utsjoki is *Ameletus inopinatus*; other very common species include *Siphonurus aestivalis* and *Leptophlebia marginata*. *Baetis*

Table 2. Frequencies and abundances of mayfly species collected in Inari Lapland according to material from Kuopio Museum.

Species	Number of squares with observation		Number of specimens	Abundance (%)	Ranking order by abundance
	Grid	UTM			
<i>S. lacustris</i>	20	10	480	13,1	1.
<i>H. dalearctica</i>	17	9	381	10,4	2.
<i>L. vespertina</i>	15	9	307	8,4	4.
<i>B. rhodani</i>	12	7	285	7,8	5.
<i>M. borealis</i>	11	8	134	3,7	8.
<i>H. joernensis</i>	11	7	371	10,1	3.
<i>A. congener</i>	11	8	116	3,2	12.
<i>S. aestivalis</i>	10	7	123	3,4	10.
<i>A. inopinatus</i>	10	6	123	3,4	9.
<i>P. chelifera</i>	7	6	118	3,2	11.
<i>B. subalpinus</i>	7	5	31	0,9	24.
<i>H. fuscogrisea</i>	7	4	74	2,0	15.
<i>B. niger</i>	6	6	53	1,4	18.
<i>B. lapponicus</i>	6	6	43	1,2	19.
<i>B. fuscatus</i>	6	6	40	1,1	22.
<i>S. alternatus</i>	6	6	41	1,1	20.
<i>L. marginata</i>	6	4	14	0,4	28.
<i>E. ignita</i>	5	5	112	3,1	13.
<i>P. bifidum</i>	5	5	73	2,0	16.
<i>E. aurivillii</i>	5	4	31	0,9	23.
<i>H. sulphurea</i>	5	5	27	0,7	26.
<i>B. macani</i>	4	4	78	2,1	14.
<i>C. luteolum</i>	4	4	31	0,9	25.
<i>P. cincta</i>	4	2	41	1,1	21.
<i>B. muticus</i>	4	3	18	0,5	27.
<i>P. strandii</i>	2	2	169	4,6	7.
<i>P. minor</i>	2	2	64	1,7	17.
<i>M. alter</i>	2	1	3	0,1	29.
<i>P. submarginata</i>	2	2	2	0,1	31.
<i>C. horaria</i>	1	1	282	7,7	6.
<i>B. digitatus</i>	1	1	2	0,1	30.
<i>E. mucronata</i>	1	1	1	0,03	32.

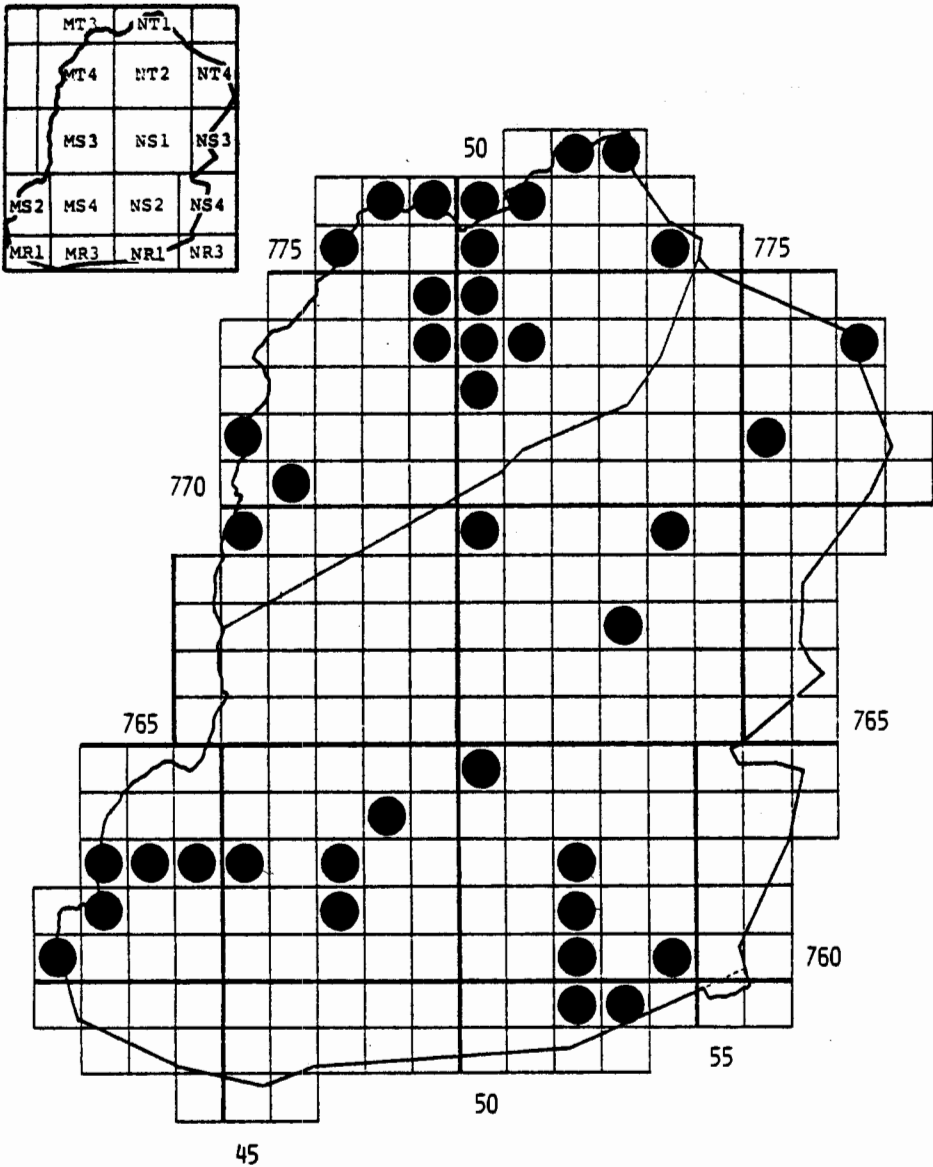
*rhodani*, *B. muticus*, *Ephemerella aurivillii* and *Heptagenia dalearlica* are also common species. The most abundant species were *B. rhodani* (altogether 30.4 % of specimens collected), *S. aestivalis* and *A. inopinatus*. Locally common species were *Acentrella lapponica*, *L. marginata*, *H. dalearlica* and *Baetis niger*.

The results of this study deviate rather greatly from those of Soldán (1981). For example, the most frequent and the most common species in the present material is distinctly *Siphonurus lacustris*, which occurred in 20 Grid squares. It therefore comprised 13.1 % of the total number of all specimens collected whereas Soldán found it in only two places and a total of 10 specimens. *H. dalearlica* was found in 17 squares (Soldán: 9 localities) and *L. vespertina* in 15 squares (according to Soldán very rare). Other frequent species which were found in at least 10 squares are *B. rhodani* (the most abundant species of Soldán), *Metretopus borealis* (Soldán: rather few in number), *Heptagenia joernensis* (Soldán: no records), *Arthroplea congener* (Soldán: one nymph), *S. aestivalis* (Soldán: second in frequency), and *A. inopinatus* (Soldán: the most frequent species).

*Caenis horaria*, *Baetis digitatus* and *Ephemerella mucronata* were found in a single square and then only a few nymphs of the latter two. On the other hand, *C. horaria* seems to be locally very abundant even at the northernmost limits of its range. *Paraleptophlebia strandii*, *P. submarginata*, *Parameletus minor*, and *Metretopus alter* are also very rare species in Inari Lapland. The first two species may be locally abundant but the last two are very few in number. *M. alter* is also, globally taken, extremely rare as until now only a few specimens have been found in northernmost Norway, Utsjoki and Inari. The remaining 16 species of the present material seem to be rather frequent and most of them may be locally quite abundant.

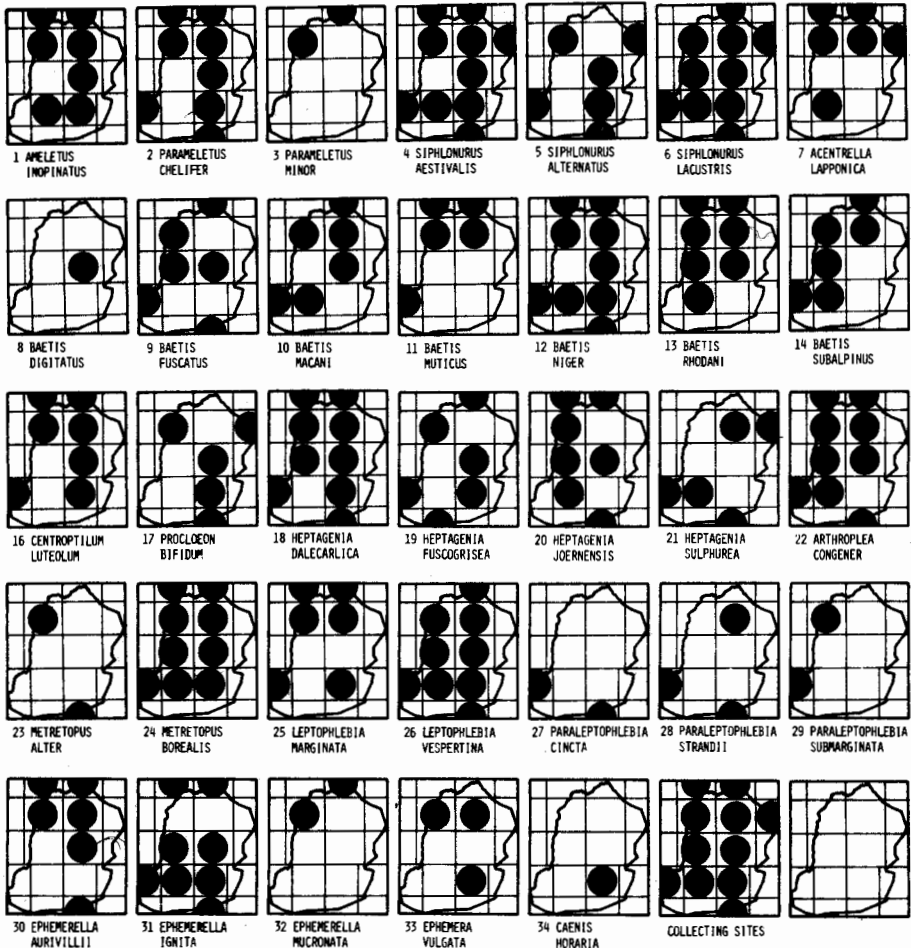
It is rather difficult to assess the reasons for the differences between the results of Soldán's (1981) report and the present study. However, Soldán's material was collected over a relatively short period at the beginning of July in 1981 when the weather was rather rainy. This prevented the collection of imagoes. The material of this study was collected over several years, which may guarantee that more species are caught, at least as nymphs. Sampling methods also differed; Soldán used a metal cup with a screen bottom and a long handle for collecting nymphs. Specimens for this study, on the other hand, were collected with a dip net with a metal edge, which is much more effective in thick vegetation than Soldán's metal cup.

Prior this study 30 mayfly species had been recorded from Inari Lapland (Tiensuu 1939, Bagge 1965 & 1968, Müller-Liebenau & Savolainen 1975, Savolainen 1980, Savolainen & Saaristo 1980, and Soldán 1981); of these 27 were found in Utsjoki and 21 in Inari. During this study four species new to the province were found, viz. *Procloeon bifidum*, *Heptagenia joernensis*, *H. sulphurea*, and *Paraleptophlebia cincta*. In addition seven species new to Inari commune and three to Utsjoki commune were identified (see Table 1). Accordingly 34 species have now been recorded from Inari Lapland, 31 species from Utsjoki and 30 species from Inari. The number of the species now known from Inari Lapland is 69.4 % of the total number of Finnish mayflies (see Savolainen & Saaristo 1980 and Savolainen 1984). Since Tiensuu (1939), Kuusamo is the only Finnish biological province which has been adequately studied in recent years (Savolainen & Saaristo 1981). According to that study and some later information (Savolainen 1984) the mayfly fauna of Kuusamo province now totals 41 species, which is 83.7 % of all Finnish mayfly fauna. The reason that Kuusamo has more species than Inari Lapland is that, apart from species found in the whole country, all northern and eastern species are found in Kuusamo and also the range of some southern species extends to the province.



*Fig. 1.* Collecting sites of Ephemeroptera in Inari Lapland. The small map shows the Universal Transverse Mercator (UTM) squares of 50 x 50 and 50 x 60 km.

## Distribution maps



## References

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