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Two species of Alona (Cladocera, Chydoridae) new for Norway

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The occurrence of two species of *Alona, A. karelica* Stenroos and *A. weltneri* Keilhack, new to Norway is noted and some environmental data provided. Some comments on the zoogeographical distribution of the Norwegian Cladocera are also given.

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INTRODUCTION

Since the pioneer work of G.O. Sars on the Norwegian cladocerans (Sars 1862, 1863, 1864, 1890) many studies have dealt with the occurrence of freshwater cladocerans in Norway. Most of these have, however, been published in reports written in Norwegian, and are little known outside Norway.

A summary of the distribution of Norwegian species of Cladocera has recently been published by Nøst et al. (1986). They list 76 species of freshwater Cladocera from Norway, of which 7 belong to the genus *Alona* This paper presents records and environmental data for two additional *Alona* species and discusses the zoogeography of the Norwegian cladoceran fauna in the light of these new records.

TAXONOMY AND DISTRIBUTION

The genus *Alona* belongs to the family Chydoridae, the largest family in the Cladocera, and is among the taxonomically more difficult genera. Smirnov (1971), in his monography, described 45 species of *Alona* together with a number of subspecies. In the European part of the Palaearctic 17 species are known (Illies 1978), two of which, *A. affinis* and *A. intermedia,* according to Smirnov (1971), belong to the genus *Biapertura.*

The following *Alona* species have been recorded from Norway: *A. affinis* (Leydig), *A. costata* Sars, *A. guttata* Sars, *A. intermedia* Sars, *A. quadrangularis* (O.F.M.), *A. rectangula* Sars, *A. rustica* Scott and the two species *A. karelica* Stenroos and *A. weltneri* Keilhack recorded in the present paper. Except for *A. rustica,* all species are widely distributed both in Europe and in Norway. *A. rustica* was recorded from Norway for the first time as late as in 1973 (Halvorsen 1973), but since then the species has been shown to be quite common, at least in south-eastern Norway. It seems to be especially common in acidified areas. For example, in three areas in the Sørlandet region of southern Norway, the species was found in 28 out of 35 localities (Halvorsen 1981, 1983, 1985).

Alona karelica Stenroos

This species is among the rarest *Alona*-species. The species has been found in only a few localities in Germany, Finland and the northeastern part of USSR (Smirnov 1971, Flössner 1972). Little is known about its ecology. According to Professor David G. Frey (pers. comm., also cited by Illies 1978), *A. karelica* has been previously found in Norway, just north of Oslo.

A. karelica has recently been found in the littoral zone of three small lakes in the drainage area of the river Etna, in the county of Oppland (Fig. 1). It was found in 3 samples, two from June and one from July, in a dense vegetation of *Carex rostrata.*

Table 1 gives some environmental data from the localities (Halvorsen 1980). The lakes are situated near the border between the northern boreal zone and the subalpine zone. The lakes are oligotrophic and oligo- to mesohumic, with medium high pH and low salt content. The lowest values given in Table 1

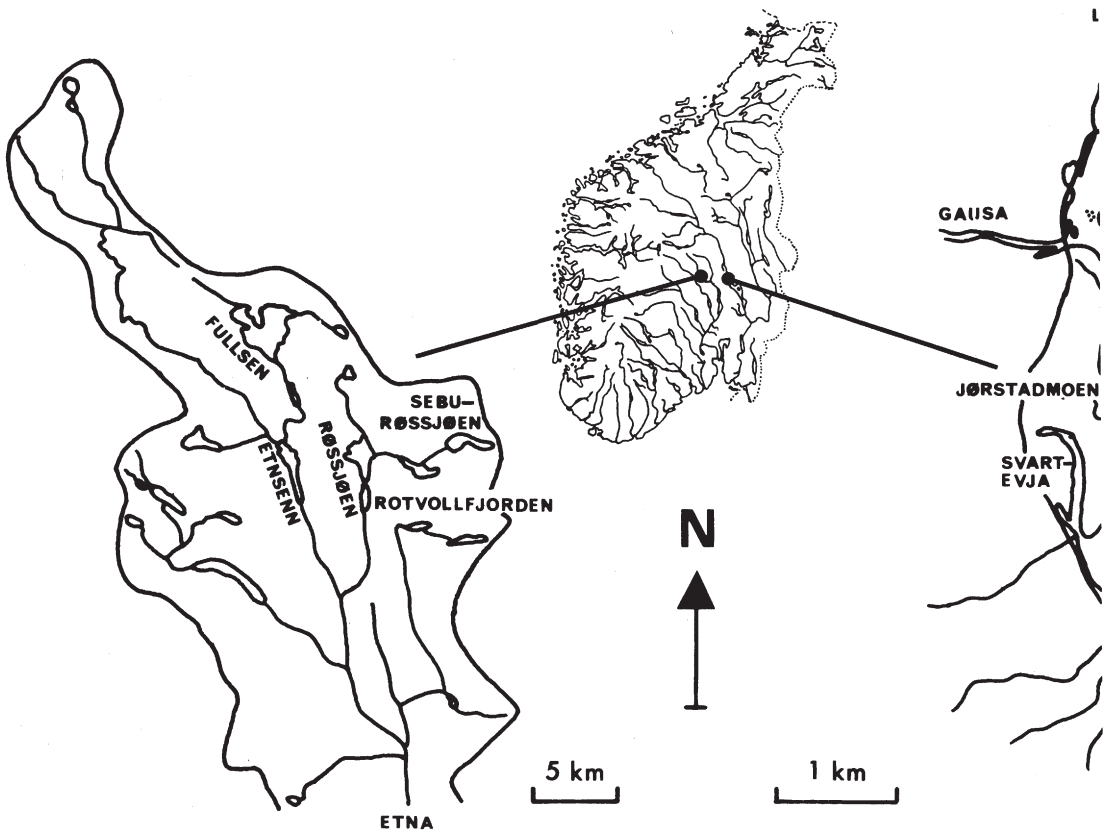

Fig. 1. The study areas showing the localities mentioned in the text.

are from the period of ice-cover (April), while the highest values are from the summer season.

The littoral vegetation is generally sparse, and most of the littoral zone consists of coarse material, stone, gravel, etc. (Moss & Volden 1979). In scattered, more sheltered places the littoral vegetation is more developed, with dense belts of *Carex rostrata* and more open belts of *Equisetum fluitans. Sparganium angustifolium, Myriophyllum alterniflora* and *Isoetes lacustris* are also common. The aquatic vegetation almost disappears at a depth of 3.5—4.0 m.

Table 1. Environmental data from three lakes in the Etna watershed. Data from 1978.

	Sebu-Røssjøen	Røssjøen	Etnsenn.
UTM-coordinates	32V NN 363773	32V NN 307765	32V NN 266757
Height m a.s.l.	963	895	801
Surface area, km²	1.3	1.7	1.3
Depth, m	7.5	15.2	9.0
Drainage area, km²	21	76	209
pH	5.6-6.7	5.5-6.7	5.7-6.8
Conductivity (K_{25}) mS/m	1.4-2.5	1.3-2.8	1.4-3.2
Alkalinity μeq/l	0.1-0.2	0.1-0.2	0.1-0.3
Ca mg/l	1.8-3.1	1.8-4.1	1.7-3.4
Colour mg/l Pt	15-40	15-50	20-60

Alona weltneri Keilhack

A. weltneri is as rare as *A. karelica.* In addition to its occurrence in Norway, it has been found in only a very few localities in England, Switzerland, Germany, Poland and Finland (Smirnov 1971, Flössner 1972). According to Enckell (1980) the species maybe also occurs in Denmark. Almost nothing is known about its ecology.

In Norway, *A. weltneri* is known from only a single locality, Svartevja, a lagoon in the delta of Gudbrandsdalslågen as it enters Lake Mjøsa, in the county of Oppland (Fig. 1) (Walseng et al. 1986). The material consists of three specimens collected on 10 September 1985. The lagoon is almost separated from the river except during flood periods. It is shallow, has a high density of fish and is enriched by runoff from surrounding farmland. Along the shore the lagoon is partly edged by a narrow belt of *Carex rostrata,* while the shore is overhung by a canopy of deciduous trees, with *Alnus incana* dominating (Fremstad 1985).

Table 2 gives some characteristical environmental data from the locality. Unfortunately no chemical data are available, and data from the main river are given. Through most of the year, except in flood periods, both pH and conductivity are probably higher in the lagoon than in the river.

DISCUSSION

The list of freshwater cladocerans found in Norway consists of 78 species, including the two species of *Alona* recorded here. According to the compiled list of species in the European part of Palaearctic given by Illies (1978) the number of species which may be expected to occur in Norway is nearly 100. Thus it is still possible to increase the number of species from Norway. There are still large areas where no or very few studies have been made on littoral freshwater crustaceans. The littoral cladoceran fauna is poorly known from the western and northern parts of Norway. The eastern part of South-Norway, the county of Hedmark and Østfold, is also almost unknown in this respect.

Table 2. Environmental data from Svartevja and the river Gudbrandsdalslågen (the chemical data are from a sample taken September 10th 1985).

	Svartevja	Gudbrands-dalslågen
UTM-coordinates	32V NN 752795	32V NN 754802
Height a.s.l.	123 m	123 m
Surface area, km²	0.08	-
pH	-	7.13
Conductivity, (K_{25}) mS/m	-	4.93
Alkalinity μeq/l	-	0.295
Ca mg/l	-	7.63
Colour mg/l Pt	-	30

Much of the Norwegian freshwater fauna shows easterly and north-easterly immigration patterns. The best known group in this respect are the freshwater fishes, which have with a few exceptions immigrated from the Baltic sea during the freshwater stage 6—7000 years ago (Huitfeldt-Kaas 1918). The highest number of fish species occurs in those areas in South and Northern Norway which have drained to the ancient Baltic Sea. In the south, the rivers Glomma, including Gudbrandsdalslågen, and Drammenselva have the highest number of fish species. For the other freshwater-groups the distribution is not so clear, but Drammenselva appears to be the western limit for a number of mayfly species which have reached Norway from the east (Brittain 1985).

In spite of the fact that most of the cladocerans have a reasonable chance of passive dispersal, the overall distribution seems to agree to some extent with that of the fishes. The greatest number of species found in one area, 54, is from the forested area just north of Oslo (Jørgensen 1972) and 52 have been recorded from the watershed of the rivers Etna and Dokka a little further north of Oslo (Halvorsen 1980). The two new species of *Alona* have been found in the rivers Drammenselva and Glomma, and further unrecorded species can be expected from these watersheds, especially from the Glomma. To expand our knowledge concerning the distribution of freshwater crustacean there is a need for more studies especially in these watersheds.

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REFERENCES

Brittain, J.E. 1985. *Baetis digitatus* Bengtsson (Ephemeroptera), a new mayfly species for Norway. *Fauna norv. Ser. B, 32:* 106—108.

Enckell, P.H. 1980. *Kräftdjur.* Fältfauna. Signum, Lund, 685 pp.

Flössner, D. 1972. Krebstiere, Crustacea. Kiemen- und Blattfüsser, Branchiopoda, Fischläuse, Branchiura. *Tierwelt Dtl, 60:* 1—501.

Fremstad, E. 1985. Multipurpose plan for water resources in Gudbrandsdalen, South East Norway. Botanical investigations 1. Inventory of the alluvial plains of Lågen. *Økoforsk Rapp.* 1985-3: 1—184 (Norwegian with English abstract).

Halvorsen, G. 1973. Crustacea from the high mountain area Hardangervidda, South Norway. *Rapp. Høyfjells-Økol. Forskn. Stn., Finse, Norge 1973 (2):* 1—17.

Halvorsen, G. 1980. Planktoniske og littorale krepsdyr innenfor vassdragene Etna og Dokka. *Kontaktutv. Vassdragsreg., Univ. Oslo, Rapp. 11:* 1—95.

Halvorsen, G. 1981. Hydrografi og evertebrater i Lyngdalsvassdraget i 1978 og 1980. *Kontaktutv. Vassdragsreg., Univ. Oslo, Rapp. 26:* 1—89.

Halvorsen, G. 1983. Hydrografi og evertebrater i Kosånavassdraget 1981. *Kontaktutv. Vassdragsreg., Univ. Oslo, Rapp. 62:* 1—62.

Halvorsen, G. 1985. Hydrography, plankton and littoral Crustacea in the Kilå watercourse, Fyresdal, during the summer of 1984. *Kontaktutv. Vassdragsreg., Univ. Oslo, Rep. 80:* 1—48 (Norwegian with English abstract).

Huitfeldt-Kaas, H. 1918. *Ferskvandsfiskenes utbredelse og indvandring i Norge, med et tillæg om krebsen.* Centraltrykkeriet, Kristiania. 106 pp.

Illies, J. (ed.) 1978. *Limnofauna Europea.* Gustav Fischer Verlag, Stuttgart, New York, Swets & Zeitlinger B.V. Amsterdam. 532 pp.

Jørgensen, I. 1972. *Forandringer i strukturen til planktoniske og littorale Crustacea-samfunn under gjengroing av humusvann i området Nordmarka og Krokskogen ved Oslo, korrelert med hydrografiske data.* Unpubl. Thesis, Univ. Oslo, 83 pp.

Moss, O.O. & Volden, T. 1980. Botaniske undersøkelser i Etnas og Dokkas nedbørfelt med vegetasjonskart over magasinområdene Dokkfløy og Rotvoll/Røssjøen. *Kontaktutv. Vassdragsreg., Univ. Oslo, Rapp. 12:* 1—114.

Nøst, T., Aagaard, K., Arnekleiv, J.V., Jensen, J.W., Koksvik, J.I. & Solem, J.O. 1986. Hydroelectric development and freshwater invertebrates. A survey of present knowledge. *Økoforsk. Utredn. 1986-1:* 1—80 (Norwegian with English abstract).

Sars, G.O. 1862. Oversigt af de i Omegnen af Christiania iagttagne Crustacea Cladocera. *Forh. Vidensk.-Selsk. Christiania 1861:* 144—167, 250—302.

Sars, G.O. 1863. *Beretning om en i sommeren 1862 foretagen Zoologisk Reise i Christiania og Trondhjems Stifter.* Christiania, Johan Dahl, 60 pp.

Sars, G.O. 1864. *Beretning om en i sommeren 1863 foretagen Zoologisk Reise i Christiania Stift.* Christiania, Johan Dahl, 36 pp.

Sars, G.O. 1890. Oversigt af Norges Crustaceer med foreløbige Bemærkninger over de nye eller mindre bekjendte Arter. II. Branchiopoda — Ostracoda — Cirripedia. *Forh. Vidensk.-Selsk. Christiania 1890, 1:* 1—80.

Smirnov, N.N. 1971. *Chydoridae, Fauna USSR, Crustacea 1 (2).* Israel Program for Scientific Translations, Jerusalem 1974, 644 pp.

Walseng, B., Brittain, J.E. & Halvorsen, G. 1986. Flerbruksplan for vassdrag i Gudbrandsdalen — Limnologisk befaring, september 1985 og juli 1986. *Vassdragsforsk., Univ. Oslo, Rapp. 104:* 1—78.

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