

Rotifers from Bjørnøya (Svalbard), with the description of *Cephalodella evabroedi* n.sp. and *Synchaeta lakowitziana arctica* n. subsp.

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Fifty rotifer taxa were collected in a series of plankton and periphyton samples from Bjørnøya. Forty-eight of them had not previously been mentioned from the island. Twelve of the species are published for the first time from Svalbard. A new species of *Cephalodella* and subspecies of *Synchaeta* are described.

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1. INTRODUCTION

Bjørnøya (Bear Island) (74°30'N, 19°E) is an island in the low Arctic covered with numerous lakes and ponds. Its aquatic microfauna is poorly known. Only three publications known to us deal with the rotifers from Bjørnøya aquatic habitats. Richard (1898) mentioned «*Notholoca voisin de N. acuminata*» from the lakes and lakelets of the south-western part of the island. Summerhayes and Elton (1923) reported *Polyarthra platyptera* Ehrb. from a pond near Russehamna. Pejler (1974) examined plankton samples from El-lasjøen, Laksvatnet, Røyevatnet and Engelskelva and found four planktonic species: *Keratella hiemalis*, *Argonotholca foliacea*, *Polyarthra dolichoptera* and *Filinia terminalis*.

The material discussed here was collected on 7.9.1985 at the occasion of a biological expedition of the Antwerpen University to Svalbard. Although the number of water bodies sampled is low, and the localities could only be visited once, fifty taxa including a new species and subspecies to science were identified.

2. LOCALITIES SAMPLED

Six different water bodies near Norskehamna (Figs 1 and 2), in the south-western part of the island were sampled. Plankton was collected with a planktonnet (40 µm mesh

width) by a horizontal haul from the shore. Permanently submerged algae and mosses were squeezed.

N° 78: Krillvatnet: lakelet, surface ca 2.2 ha, depth 4.5 m, 52 m a.s.l., substratum sto-

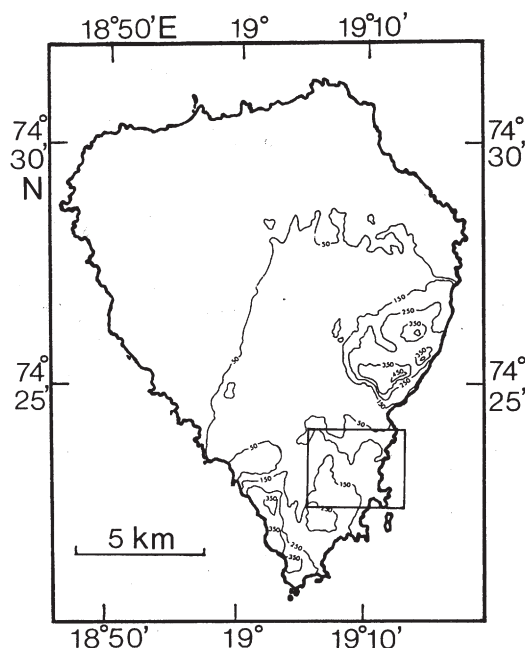


Fig. 1: Map of Bjørnøya with sampling area indicated.

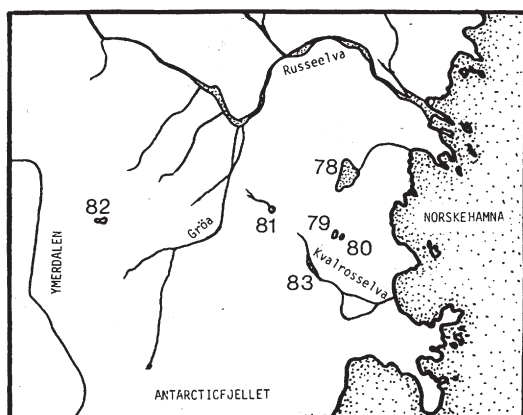


Fig. 2: Map of the sampling area. Numbers 78—83 indicate the localities investigated.

ny-sandy. Nature of samples: plankton and filamentous algae on stones.

N° 79: shallow pool, 20 m x 10 m, depth 5—20 cm, 60 m a.s.l., substratum sandy-muddy with plant debris. Nature of samples: plankton and submerged mosses.

N° 80: shallow pool near N° 79, 7 m x 10 m, depth 10—20, 60 m a.s.l., substratum muddy-sandy with much plant debris. Nature of samples: plankton and submerged mosses.

N° 81: pond, 40 m x 30 m, depth 1.5 m +, ca 100 m a.s.l., substratum stony. Nature of samples: plankton and submerged mosses.

N° 82: pond, 70 m x 25 m, dept 2 m +, ca 165 m a.s.l., substratum stony-sandy. Nature of samples: plankton and filamentous algae on stones.

N° 83: part of the Kvalrosselva forming a shallow pool, 20 m x 6 m, depth 5—10 cm, ca 35 m a.s.l., current 1.3 m. sec⁻¹, substratum muddy. Nature of samples: plankton and submerged mosses.

Geologically speaking, all localities sampled are situated in Ordovician systems (Horn & Orvin 1928). Localities 79 and 80 are in the Slate-Quartzite formation with green and red slates, and quartzitic sandstones. Locality 81 lies in the Younger Dolomite formation with grey dolomites. Locality 82 is in the *Tetradium* Limestone formation consisting of black limestone with *Tetradium*. The Krillvatnet (locality 78) is in part situated on both the Younger Dolomite and Slate-Quartzite formations.

The basic physico-chemistry of the surface water of the sampling localities on 7.9.1985 is shown in Table 1.

All waters are weakly alkaline. They belong to the beta-meso-ionic type ($220 \leq K_{25} (\mu S.cm^{-1}) \leq 550$), with medium mineralization (Olsen 1950). Pond 81 had soft water; the other water bodies are medium hard (78, 79, 82) to hard (80). The values for Cl^{-} , SO_4^{2+} , NO_2^{-} , NO_3^{-} , PO_4^{3+} , Ca^{2+} , Mg^{2+} , Na^{+} and K^{+} are normal for fresh waters (e.g. Rodier 1975). The conductivities and concentrations in Cl^{-} , SO_4^{2+} , Mg^{2+} and Na^{+} ions measured for the localities near to the sea and at lower altitude are higher (78, 79, 80, 83), than those found for the more inland waters at higher altitude (81, 82). This suggests a topographic influence whereby transfer of ions by runoff and especially sea spray, results in differences of ionic composition.

The rotifers found are listed in an alphabetical order, which shows their occurrence in the different water bodies and their relative abundance. The nomenclature follows Koste (1978).

3. COMMENTS ON SPECIES

Order Bdelloidea

Bdelloid rotifers were common to abundant in the algae or moss samples from the different waters, where they formed up to 45% of the total rotifers. They were also always present in the plankton samples at very low densities.

Order Monogononta

FAMILY EPIPHANIDAE

Rhinoglena frontalis Ehrenberg, 1853 (Pl. I, fig. 1a—d)

Two specimens in plankton. One animal with four embryos. Vitellarium lobate with 6 nuclei, each nucleus retained in a lobe. Uncus with 8 teeth. A cold stenothermal species inhabiting the pelagial of minor and shallow waters. Widespread.

Dimensions: body length 218 μm , body width 90—112 μm , mastax length 29 μm (fulcrum 8 μm , manubria 21 & 23 μm , rami 22 μm , unci 17 & 18 μm).

FAMILY BRACHIONIDAE

Notholca labis Gosse, 1887 (Pl. I, fig. 2)

Found in nearly all waters examined. The species is considered to be a true planktonic

Table 1: Physico-chemical information on surface water.

Sample N°	78	79	80	81	82	83
Watertemperature (°C)	6.0	6.5	8.5	4.5	4.5	6.0
pH	8.35	8.30	8.38	8.31	8.37	8.40
Conductivity 25°C ($\mu\text{S} \cdot \text{cm}^{-1}$)	470	534	531	324	421	467
Chloride ($\text{mg Cl}^{-} \cdot \text{l}^{-1}$)	51.3	63.0	62.4	25.5	37.5	45.6
Sulphate ($\text{mg SO}_4^{2-} \cdot \text{l}^{-1}$)	30	36	42	18	24	40
Nitrite ($\mu\text{g NO}_2^{-} \cdot \text{l}^{-1}$)	2.5	3.0	3.0	0.5	2.0	4.0
Nitrate ($\text{mg NO}_3^{-} \cdot \text{l}^{-1}$)	100	0	0	0	0	20
Orthophosphate ($\mu\text{g PO}_4^{3-} \cdot \text{l}^{-1}$)	90	80	70	90	90	80
Total hardness (°d)	8-14	8-14	16-21	4-7	8-14	4-7
Calcium ($\text{mg Ca}^{2+} \cdot \text{l}^{-1}$)	19.8	25.4	22.2	13.5	25.6	27.3
Magnesium ($\text{mg Mg}^{2+} \cdot \text{l}^{-1}$)	12.4	17.0	18.6	8.1	8.7	11.6
Sodium ($\text{mg Na}^{+} \cdot \text{l}^{-1}$)	24.8	30.2	31.2	14.2	18.6	23.4
Potassium ($\text{mg K}^{+} \cdot \text{l}^{-1}$)	1.3	1.1	1.3	1.0	1.2	1.1

species. In our material its frequency was generally higher in the periphyton samples. In his study on the benthic rotifers of Lapland, Pejler (1962) found it to be an important component of the benthos too. Widespread.

Dimensions: lorica length 135—145 μm , lorica width 94—100 μm , length of dorso-caudal appendage 12—16 μm .

Notholca latistyla (Olofsson, 1918) (Pl. I, fig. 3)

A few empty loricas in plankton. This is the most southern report for the species, which was hitherto only known from Novaya Zemlya (Retowski 1935), Spitsbergen (Olofsson

1918, Amrén 1964a,c) and Edgeøya (De Smet *et al.* 1988b).

Dimensions: body length 135 μm , caudal appendage 12 μm .

Notholca foliacea (Ehrenberg, 1838) Pl. I, fig. 4)

Observed in all waters studied. Frequency usually higher in the plankton samples, where it formed up to 33% of the total rotifers. Cosmopolitan.

Dimensions: body length 170 μm , body width 75 μm , length of dorso-median spine 18 μm , length of caudal spine 5—10 μm .

Svalbard records: Bjørnøya (Pejler 1974), Edgeøya (De Smet *et al.* 1988b), Nordaust-

Table 2. Annotated alphabetical list of species.

Locality	78		79		80		81		82		83	
Nature of sample	P	A	P	M	P	M	P	M	P	A	P	M
<i>Albertia</i> cf. <i>naidis</i>	-	RRR	-	-	-	-	-	-	-	-	-	-
<i>Bdelloidea</i> indetermin.	RR	CCC	R	C	RR	C	RRR	CCC	R	CCC	RR	CCC
<i>Cephalodella</i> cf. <i>catellina</i>	-	C	R	RR	RR	R	-	-	RRR	CCC	RR	RR
<i>C. evabroedi</i>	R	RRR	RRR	-	-	-	-	-	-	-	-	-
<i>C. gibba</i>	-	-	RR	RRR	-	R	-	RRR	RRR	C	-	-
<i>Cephalodella</i> cf. <i>hoodi</i>	-	CCC	R	RRR	RRR	RR	-	C	-	C	-	-
<i>C. cf. ventripes</i> var. <i>angustior</i>	RR	-	-	RRR	-	R	-	-	-	C	-	-
<i>Cephalodella</i> sp.	-	-	-	C	-	RR	-	-	RR	CCC	-	RR
<i>Colurella adriatica</i>	+	CCC	RRR	RR	+	-	+	-	+	CCC	+	RR
<i>C. colurus</i>	-	RR	-	RR	RRR	-	-	RRR	-	RRR	+	RR
<i>C. geophila</i>	-	-	RRR	-	-	-	-	-	-	-	-	-
<i>C. hindenburgi</i>	-	-	-	-	+	-	-	RR	-	-	-	-
<i>C. obtusa</i>	-	RRR	+	RR	-	R	RR	C	-	-	-	RR
<i>C. uncinata</i>	-	-	-	-	-	-	RRR	RR	-	-	-	-
<i>Dicranophorus uncinatus</i>	-	-	-	RR	-	-	-	-	-	-	-	-
<i>Encentrum</i> sp.	-	-	-	-	-	-	-	-	-	RRR	-	-
<i>Eosphora najas</i>	-	-	-	-	-	RRR	-	-	-	-	-	-
<i>Euchlanis deflexa</i>	-	-	-	-	-	RRR	-	-	-	RRR	-	-
<i>E. dilatata</i>	-	-	-	R	-	R	-	-	RRR	-	-	-
<i>E. meneta</i>	-	-	RRR	-	-	R	-	RR	-	-	-	-
<i>Lecane closterocerca</i>	-	-	-	RR	+	RR	-	-	-	-	-	-
<i>L. flexilis</i>	-	-	-	-	-	RRR	-	-	-	-	-	-
<i>L. lunaris</i>	-	-	-	-	-	+	-	-	-	-	-	-
<i>L. rotundata</i>	RRR	-	R	-	RRR	RR	RR	-	-	-	-	-
<i>Lecane</i> sp.	-	-	-	-	-	-	-	RRR	-	-	-	-
<i>Lepadella acuminata</i>	-	-	RR	RRR	+	-	+	RR	RRR	-	-	-
<i>L. cf. minuta</i>	-	-	-	RR	-	R	-	R	-	-	-	RR
<i>L. ovalis</i>	-	-	RR	-	-	RR	-	-	-	-	-	CCC
<i>L. patella</i>	-	-	RRR	RRR	+	RR	-	RR	-	-	+	CC
<i>L. quadricarinata</i>	RRR	R	RR	RRR	+	R	-	R	++	-	-	-
<i>L. triptera</i>	-	-	RR	RR	+	R	RRR	RR	-	-	-	-
<i>Lindia</i> cf. <i>torulosa</i>	RRR	-	-	-	-	-	-	-	-	-	-	-
<i>Lophocharis oxyteron</i>	RRR	-	-	RR	-	-	-	-	RRR	-	-	-
<i>Mytilina mucronata</i>	-	-	-	-	RR	R	-	+	RR	-	-	-
<i>Notholca foliacea</i>	C	RR	C	R	R	R	CC	CCC	R	R	-	RRR
<i>N. labis</i>	-	-	RR	RR	RR	R	RRR	R	-	R	-	R
<i>N. latistyla</i>	-	-	+	-	-	-	-	-	+	-	-	-
<i>Notommata cyrtopus</i>	-	RR	-	-	-	-	-	-	-	-	-	-
<i>Polyarthra dolichoptera</i>	CCC	-	C	-	RR	-	CCC	R	CCC	C	C	-
<i>Proales</i> sp.	-	RRR	-	-	-	-	-	RR	-	-	RRR	-
<i>Ptygyra</i> sp.	-	-	-	-	-	-	RRR	C	-	RR	-	-
<i>Reticula nyssa</i>	-	-	-	-	-	-	-	RR	-	-	-	-
<i>Rhinoglena frontalis</i>	-	-	-	-	-	-	RR	-	-	-	-	-
<i>Squatinella mutica</i>	-	-	-	-	-	RR	-	-	-	-	-	-
<i>Synchaeta lakowitziana</i>	-	-	R	-	-	-	C	-	-	-	RR	-
<i>Trichocerca</i> cf. <i>arctica</i>	-	-	RRR	-	-	-	-	-	-	-	-	-
<i>T. rattus</i>	-	-	RR	RR	RR	C	-	RR	-	-	-	-
<i>T. relicta</i>	-	-	RRR	-	-	-	-	-	-	CCC	-	-
<i>T. uncinata</i>	-	-	RRR	-	-	-	-	-	-	-	-	-
<i>T. weberi</i>	-	-	-	-	-	RRR	-	-	-	-	-	-
<i>Trichotria pocillum</i>	-	-	-	-	-	-	-	R	-	-	-	-
Number of taxa	17		31		32		27		21		14	
	10	12	21	21	17	27	13	24	13	15	8	11
Species diversity	0.78	0.50	2.92	2.73	2.45	3.64	0.19	2.87	0.13	2.56	0.98	1.96

Abbreviations : P = plankton ; A = algae ; M = mosses ; + = empty loricas ; C = common ;
CC = very common ; CCC = abundant ; R = few ; RR = rare ; RRR = very rare.

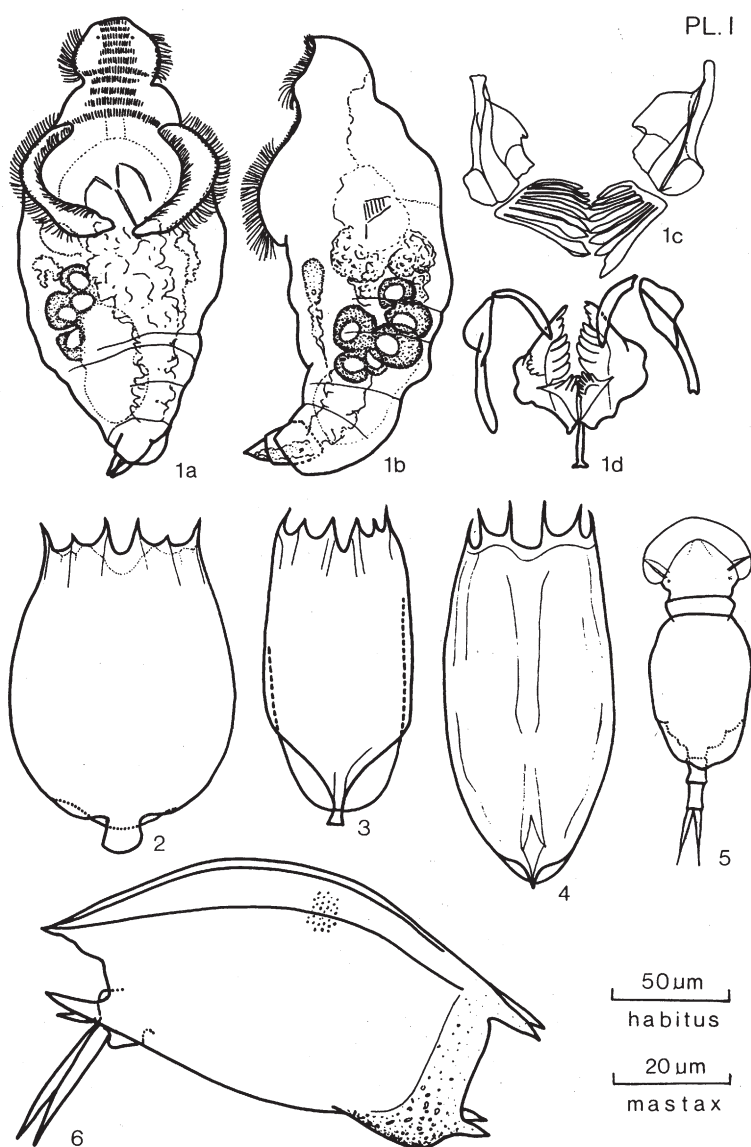


Plate I: Fig. 1a-d *Rhinoglena frontalis*; 2 *Notholca labis*; 3 *Notholca latistyla*; 4 *Notholca foliacea*; 5 *Squatinella mutica*; 6 *Mytilina mucronata*.

landet (Thomasson 1958), Spitsbergen (Olofsson 1918, Thomasson 1961, Armén 1964a,b).

FAMILY EUCHLANIDAE

Euchlanis meneta Myers, 1930 (Pl. II, fig. 2a-b)

A few specimens of this cosmopolitan species were found in plankton and periphyton. Mastax asymmetrical; toes strongly tapering

at their end. The species is said to prefer acid waters.

Dimensions: lorica length 175 μm , lorica width 145 μm , lorica height 123 μm , length of toes 67–72 μm , width of toes 6–6.5 μm , mastax 31 μm (fulcrum 9 μm , manubria 30&36 μm , unci 21 μm).

Svalbard records: Nordaustlandet (Thomasson 1958), Spitsbergen (Olofsson 1918 sub *Euchlanis oropha* Gosse).

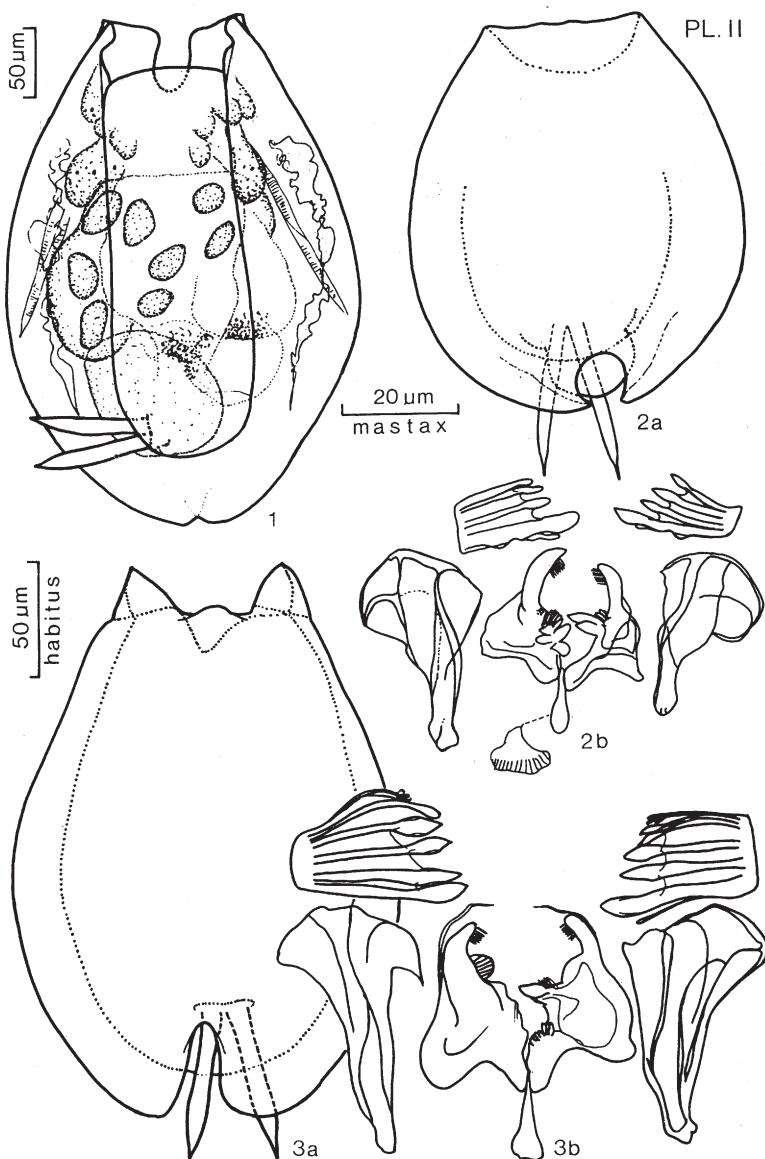


Plate II: Fig. 1 *Euchlanis deflexa*; 2a-b *Euchlanis meneta*; 3a-b *Euchlanis dilatata*.

Euchlanis dilatata Ehrenberg, 1832 (P1. II, fig. 3a-b)

A cosmopolitan, littoral and periphytic species, few to very rare.

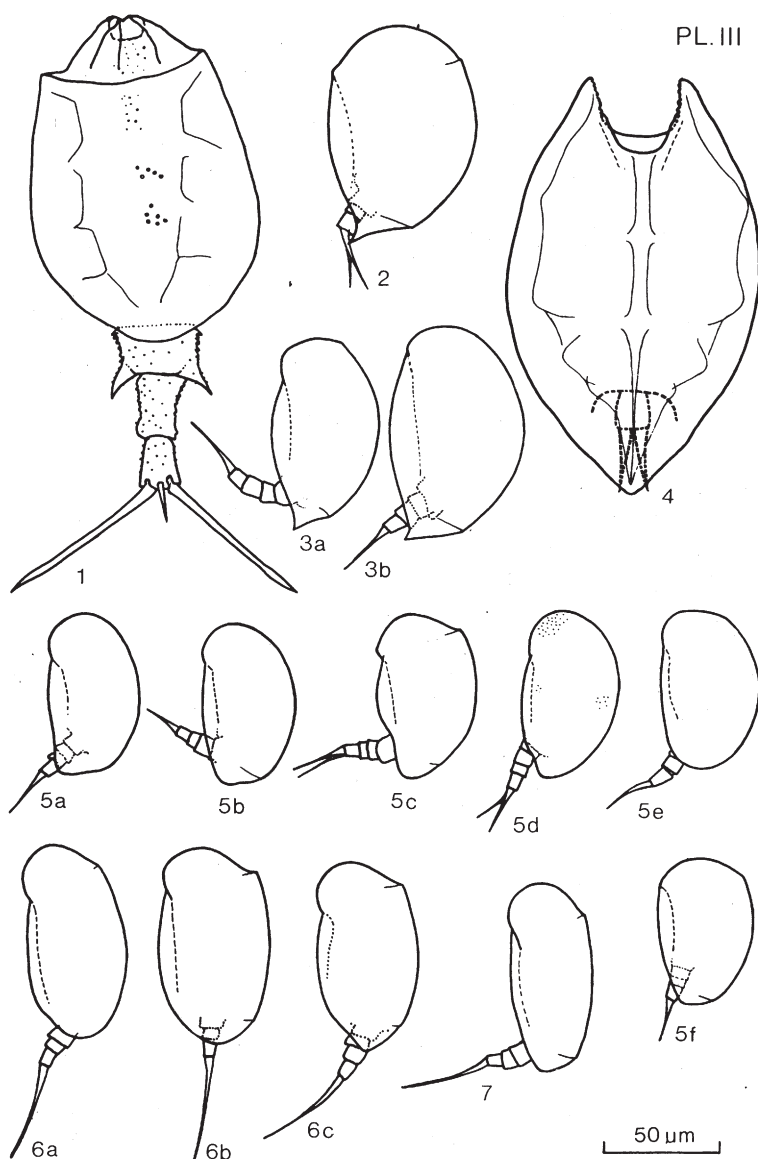
Dimensions: length of dorsal plate 238 µm, width of dorsal plate 165 µm, length of ventral plate 200 µm, width of ventral plate 125 µm, length of toes 70 µm, width of toes 9 µm, length of mastax 43 µm (fulcrum 15 µm, manubria 42&43 µm, rami 29&31 µm, unci 28 & 30 µm).

Svalbard records: Nordaustlandet (Thomasson 1958), Spitsbergen (Olofsson 1918, Summerhayes & Elton 1923, Amrén 1964c).

Euchlanis deflexa (Gosse, 1851) (P1. II, fig. I)

Very rare in periphyton. Widespread.

Dimensions: length of dorsal plate 367 µm, width of dorsal plate 352 µm, length of ventral plate 322 µm, width of ventral plate 105



PL. III

Plate III: Fig. 1 *Trichotria pocillum*; 2 *Colurella uncinata*; 3a-b *Colurella adriatica*; 4 *Lophocharis oxysternon*; 5a-d *Colurella* cf. *hindenburgi*; 5e-f *Colurella* cf. *obtusa*; 6a-c *Colurella colurus*; 7 *Colurella geophila*.

μm , length of toes $87 \mu\text{m}$, width of toes $13 \mu\text{m}$.

Svalbard records: Spitsbergen (Olofsson 1918, Bryce 1922, Summerhayes & Elton 1923).

FAMILY MYTILINIDAE

Mytilina mucronata (O.F. Müller, 1773) (P1. I, fig. 6)

A few specimens in plankton and submer-

ged moss. Known from benthos and among plants, occasional migrant in the plankton.

Dimensions: lorica length $220 \mu\text{m}$, lorica height $102 \mu\text{m}$, length of toes $60 \mu\text{m}$.

Svalbard records: Edgeøya (De Smet *et al.* 1988b), Nordaustlandet (Thomasson 1958), Spitsbergen (Olofsson 1918).

Lophocharis oxysternon (Gosse, 1851) (P1. III, fig. 4)

This benthic species was rare to very rare in plankton and periphyton.

Dimensions: lorica length 180—185 μm , lorica width 110—113 μm , length of toes 27—28 μm .

Svalbard records: Spitsbergen (Olofsson 1918).

FAMILY TRICHOTRIIDAE

Trichotria pocillum (O.F. Müller, 1776) (P1. III, fig. 1)

A littoral species preferring alkaline waters. A few specimens collected from submerged moss. Lorica strongly granulated. Spines on the second joint of the foot very short, ranging from 15—20 μm (55—66 μm after Voigt (1957) and Koste (1978)). The length of the toes is 70—75 μm , which is also smaller than is usual for this species. De Ridder (1972) gives a length of 125 μm and Voigt (1957) gives the length as ranging from 83—145 μm . The length of the lorica of our specimens is within the normal range.

Dimensions: length of lorica (head retracted) 120—125 μm , width of lorica 97 μm , length of foot 70 μm , spines of second foot segment 15—20 μm , spine between toes 11—12 μm .

FAMILY COLURELLIDAE

Colurella obtusa (Gosse, 1886) (P1. III, fig. 5e-f)

Colurella hindenburgi Steinecke, 1917 (P1. III, fig. 5a-d)

Animals belonging to the *obtusa-hindenburgi*-complex were found in almost all waters, from rare to common. Both species are distinctly larger than is usual. The specimens from Bjørnøya are 63—74 μm . De Ridder (1972) gives the length of the lorica (nominates and forms) as varying between 52 and 68 μm ; the usual range, as given by Koste (1978) is from 53 to 63 μm . The species vary very much in shape, and it is not always possible to distinguish between them, as some intermediate forms exist. The length of the toes has been used by several authors as a differentiating characteristic. According to Voigt (1957) the length of the toes is 14—18 μm in *C. obtusa* and 21—23 μm in *C. hindenburgi*. Koste (1978) gives a length of 16—18 μm for the Formenkreis *obtusa* s. str. and 20—33 μm for *hindenburgi* s.l.. If we make a tentative

although probably not justifiable distinction between the species concerned, on the basis of the outline of the ventral margin of the lorica that should be undulant in *C. hindenburgi*, the length of the toes can not be used as its dimensions overlap: 19—23 μm in the *obtusa*-type and 17—22 μm in the *hindenburgi*-type.

Dimensions: *C. cf. obtusa*: lor.le. 63—69 μm , lor.he. 41—42 μm , lor.wi. 28—30 μm , toe 19—23 μm , lor.le./lor.he. 1.59. *C. cf. hindenburgi*: lor.le. 69—74 μm , lor.he. 39—43 μm , lor.wi. 31—33 μm , toe. 17—22 μm , lor.le./lor.he. 1.73

Svalbard records: *C. hindenburgi*: Edgeøya (De Smet *et al.* 1988b), Spitsbergen (Thomasson 1961). *C. obtusa*: Spitsbergen (Olofsson 1918).

Colurella colurus Ehrenberg, 1830 (P1. III, fig. 6a-c)

Rare at all sampling stations, mainly periphytic. The length of the toes is larger than is usual for this species. Koste (1978) gives the length of the toes as ranging from 25—40 μm . The range for the specimens from Bjørnøya is 42—46 μm .

Dimensions: lorica length 83—86 μm , lorica height 42—49 μm , lorica width 30—38 μm , length of toes 42—46 μm , index lorica length/lorica height = 1.89.

Svalbard records: Spitsbergen (Olofsson 1918, sub *Colurella amblytelus* (Gosse), Summerhayes & Elton 1923, De Smet *et al.* 1988b).

Colurella adriatica Ehrenberg, 1831 (P1. III, fig. 3a-b)

Present in all water bodies, planktonic and periphytic, sometimes abundant. Toes distinctly smaller (25—27 μm) than is usual for the species. Koste (1978) gives the length of the toes as varying between 32 and 48 μm ; De Ridder (1972) gives the length as ranging from 30 to 40 μm .

Dimensions: lorica length 84—94 μm , lorica height 45—57 μm , length of toes 25—27 μm , index lorica length/lorica height = 1.75.

Svalbard records: Edgeøya (De Smet *et al.* 1988b), Spitsbergen (Bryce 1897 sub *Colurus caudatus* Ehr., Olofsson 1918).

Colurella geophila Donner, 1951 (P1. III, fig. 7)

A single specimen in the plankton from 79.

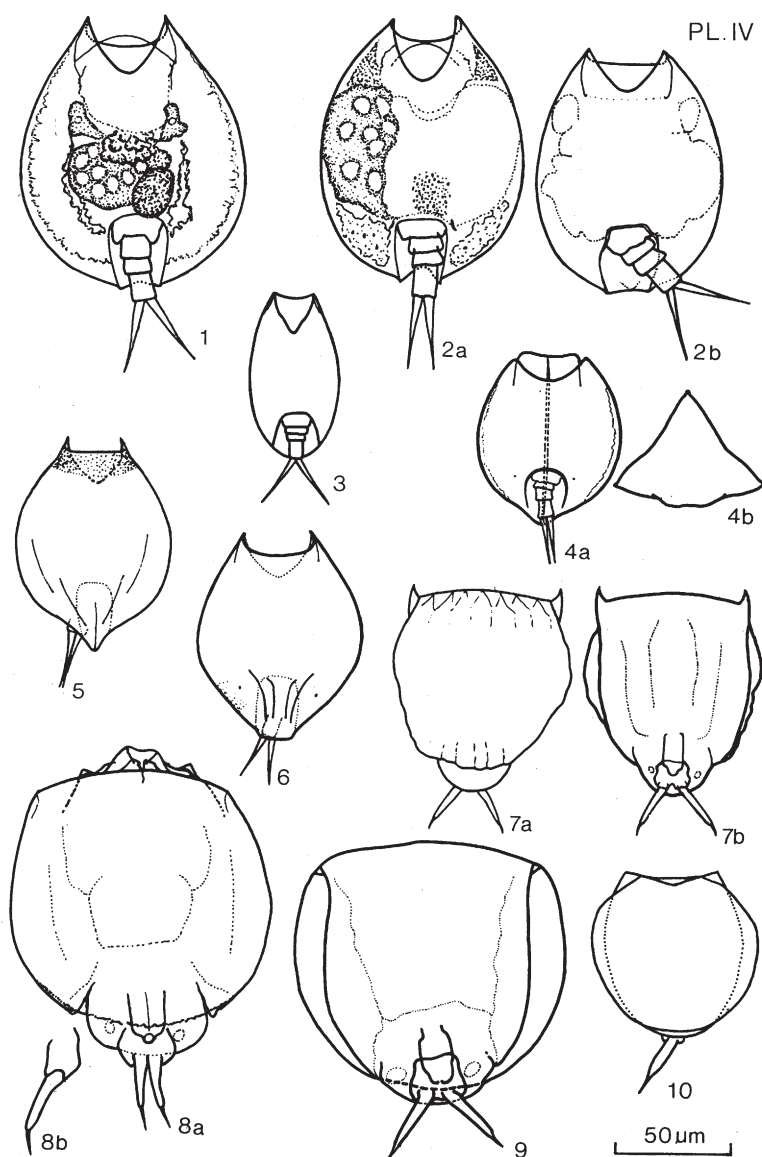


Plate IV: Fig. 1 *Lepadella ovalis*; 2a-b *Lepadella patella*; 3 *Lepadella cf. minuta*; 4a-b *Lepadella triptera*; 5 *Lepadella acuminata*; 6 *Lepadella quadricarinata*; 7a-b *Lecane flexilis*; 8a-b *Lecane* sp.; 9 *Lecane rotundata*; 10 *Lecane closteroerca*.

It could be distinguished from *C. colurus* by the low lorica and relatively long toes.

Dimensions: lorica length 82 μm , lorica height 35 μm ; length of toes 38 μm , index lorica length/lorica height = 2.34.

Colurella uncinata (O.F. Müller, 1773) (P1. III, fig. 2)

Rare to very rare in plankton and periphyton from 81.

Dimensions: lorica length 90–96 μm , lo-

rica height 61–63 μm , lorica width 43–45 μm , length of toes 26–28 μm , index lorica length/lorica height = 1.50.

Svalbard records: Edgeøya (De Smet *et al.* 1988b).

Squatinella mutica (Ehrenberg, 1832) (P1. I, fig. 5)

A few specimens of this littoral species between mosses from pool 80. Caudal end of

lorica broadly rounded dorsally or with three blunt lobes. Widespread.

Dimensions: body length 126 μm , width of head shield 46 μm , length of toes 25 μm .

Lepadella ovalis (O.F. Müller, 1786) (P1. IV, fig. 1)

This cosmopolitan species was found in three of the water bodies studied. It was a dominant rotifer in the submerged mosses from 83, where it formed 30% of the total rotifers. Some specimens are intermediate between *L. ovalis* and the co-occurring *L. patella*, as concerns the space occupied by the body contents inside the lorica, the extension of the area and the height of the lorica.

Dimensions: lorica length 110—119 μm , lorica width 84—100 μm , lorica height 28 μm , length of toes 34—35 μm , foot groove 30—32 x 21—25/17 μm , depth of dorsal sinus 13—15 μm , depth of ventral sinus 15—25 μm .

Lepadella patella (O.F. Müller, 1786) (P1. IV, fig. 2a-b)

In the periphyton and occasionally in the plankton of most waters. It was one of the dominant rotifers in the moss sample from 83, where it formed 15% of the total rotifers. Outline of lorica variable. The shape of the foot groove varies from nearly parallel-sided to slightly ovate; sometimes six-sided, the uppermost lateral margin more or less concave. Eurytopic species.

Dimensions: lorica length 105—116 μm , lorica width 79—91 μm , length of toes 30—32 μm , foot groove 28—32 x 21—24 μm , depth of dorsal sinus 8—11 μm , depth of ventral sinus 17—28 μm .

Svalbard records: Edgeøya (De Smet *et al.* 1988b), Nordaustlandet (Thomasson 1958), Spitsbergen (Bryce 1897 sub *Metopidia lepadella* Ehr., Bryce 1922, Olofsson 1918 sub *Metopidia oblonga* (Ehrbg.) and *M. lepadella* Ehrbg., Summerhayes & Elton 1923 sub *L. patella* and *Metopidia patella* Ehrbg., Thomasson 1961).

Lepadella cf. minuta (Montet, 1918) (P1. IV, fig. 3)

Specimens of a form that best fits the description of Montet's species were found in the periphyton of most of the waters. The body size varies from 68—71 μm , which is larger than the range (49—53 μm) given by Koste (1978). Probably cosmopolitan.

Dimensions: lorica length 68—71 μm , lorica width 37—39 μm , lorica height 34—35 μm , depth of ventral sinus 17 μm , length of toes 22—24 μm , foot groove 19 x 13/21 μm .

Lepadella acuminata (Ehrenberg, 1834) (P1. IV, fig. 5)

Rare to very rare in plankton and periphyton. All animals seen with ridges on their dorsal plate.

Dimensions: lorica length 91—94 μm , lorica width 59—70 μm , depth of ventral sinus 19—21 μm , depth of dorsal sinus 5—12 μm , foot groove 29—32 x 16—20 μm , length of toes 24 μm .

Svalbard records: Edgeøya (De Smet *et al.* 1988b), Spitsbergen (Olofsson 1918 sub *Metopidia acuminata* Ehrbg.).

Lepadella quadricarinata (Stenroos, 1898) (P1. IV, fig. 6)

The typical *quadricarinata*-form with four postero-dorsal ridges was found in almost all samples, both planktonic and periphytic. Some specimens are pustulated all over the lorica.

Dimensions: lorica length 89—93 μm , lorica width 70 μm , depth of dorsal sinus 8—10 μm , depth of ventral sinus 14—18 μm , length of toes 21—24 μm , foot groove 26—27 x 17—18 μm .

Svalbard records: Spitsbergen (Olofsson 1918 sub *Metopidia quadricarinata* Stenroos).

Lepadella triptera Ehrenberg, 1830 (P1. IV, fig. 4a-b)

In plankton and periphyton, never in large numbers. Cosmopolitan.

Dimensions: lorica length 73 μm , lorica width 61 μm , lorica height 50 μm , foot groove 18—19 μm , length of toes 21 μm .

Svalbard records: Nordaustlandet (Thomasson 1958).

FAMILY LECANIDAE

Lecane rotundata (Olofsson, 1918) (P1. IV, fig. 9)

Found at almost all localities in plankton and periphyton. Some of the specimens show obvious coxal plates. The species has been reported from Spitsbergen (Olofsson 1918), Novaya Zemlya (Idelson 1925) and Swedish Lapland (Pejler 1962). It has also been found (sub *L. latissima* Yamamoto, 1955, which

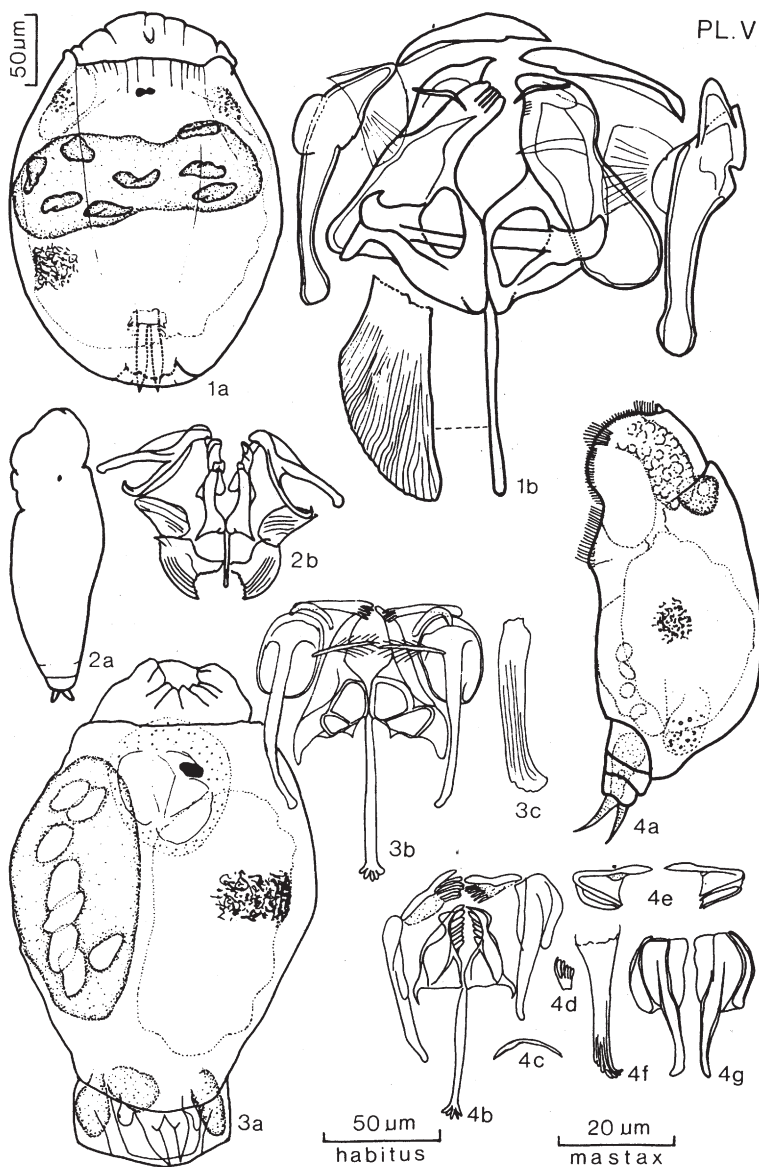


Plate V: Fig. 1a-b *Eosporhaja najas*; 2a-b *Lindia* cf. *torulosa*; 3a-c *Resitula nyssa*; 4a-g *Notommata cyrtopus*.

was synonymized by Koste 1978) in the extreme north of Honshu (Yamamoto 1955) and Hokkaido (Koste 1978), Japan. Coussemont & Dumont (1980) reported *L. cf. latissima* from the high Atlas and thus added the alpine zone to its arctic-boreal distribution.

Dimensions: length of dorsal plate 98–108 μm , width of dorsal plate 100–116 μm , length of ventral plate 76–114 μm , width of ventral plate 77–90 μm , length of toes

(claws inclusive) 33–35 μm , length of claws 6–8 μm .

Svalbard records: Spitsbergen (Olofsson sub *Catyphyna rotundata*).

Lecane sp. (P1. IV, fig. 8a-b)

A single specimen that could not be identified was found in submerged moss (81). Animal large, with two toes. Outline of lorica more or less circular, lateral margins of dorsal and ventral plate coincident, the posterior

margin of the ventral plate projects beyond the posterior margin of the dorsal plate, coxal plates visible, antero-lateral processes absent. Toes short, with long claws marked by joints.

Dimensions: body length 130 μm , length of dorsal plate 110 μm , width of ventral and dorsal plate 114 μm , length of toes 27 μm , length of claws 11 μm .

Lecane flexilis (Gosse, 1889) (P1. IV, fig. 7a-b)

A single specimen of this cosmopolitan species, preferring alkaline waters, was found among submerged moss (80).

Dimensions: length of dorsal plate 78 μm , width of dorsal plate 76 μm , length of ventral plate 87 μm , width of ventral plate 65 μm , length of toes (with claw) 26 μm , length of claw 5 μm .

Lecane lunaris (Ehrenberg, 1832)

A few damaged empty loricas of this cosmopolitan species were found in the periphyton.

Svalbard records: Spitsbergen (sub *Monostyla lunaris* (Ehrbg.): Olofsson 1918, Bryce 1922, Summerhayes & Elton 1923).

Lecane closterocerca (Schmarda, 1859) (P1. IV, fig. 10)

A cosmopolitan species, rarely found in our submerged moss samples.

Dimensions: length of dorsal plate 70–72 μm , width of ventral plate 64–71 μm , length of ventral plate 72–76 μm , width of ventral plate 52–59 μm , length of toes 27–30 μm .

Svalbard records: Spitsbergen (sub *Monostyla cornuta* (Müll.): Olofsson 1918, Bryce 1922, Summerhayes & Elton 1923).

FAMILY PROALIDAE

Proales sp. (P1. VIII, fig. 3a-b)

A few specimens of an unidentified species available from plankton and periphyton.

Dimensions: body length 100–115 μm , length of toes 12–13 μm .

FAMILY LINDIIDAE

Lindia cf. *torulosa* Dujardin, 1841 (P1. V, fig. 2a-b)

A single specimen near to *L. torulosa* on

evidence of the structure of the mastax, was found in the plankton from Krillvatnet.

Dimensions: body length 122 μm , length of mastax 63 μm .

FAMILY NOTOMMATIDAE

Eosphora najas Ehrenberg, 1830 (P1. V, fig. 1a-b)

A single specimen of this cosmopolitan species, living between vegetation of the littoral, was found in submerged moss. The identification was decided by the structure of the mastax. The gut contained jaws of *Notolca labis*, *Cephalodella gibba*, *Ptygura* sp. and unidentified rotifers.

Dimensions: body length contracted 270 μm , length of toes 48 μm , length of mastax 74 μm (fulcrum 32 μm , manubria 45 μm , rami 42 & 44 μm , unci 27 & 30 μm).

Resticula nyssa Harring & Myers, 1924 (P1. V, fig. 3a-c)

Two individuals in periphyton (81). Eye spot distinct; the toes show the characteristic basal bulb at their inner side. Salivary glands large and of the same size. A widespread species, known from Europe, Asia and N. America. Periphytic and littoral, pH-tolerant, oligo-euryhalobiont.

Dimensions: body length contracted 220 μm , length of toes 22 μm , length of mastax 48 μm (fulcrum 28 μm , manubria 34 μm , rami 27 μm , unci 35 μm).

Notommata cyrtopus Gosse, 1886 (P1. V, fig. 4a-g)

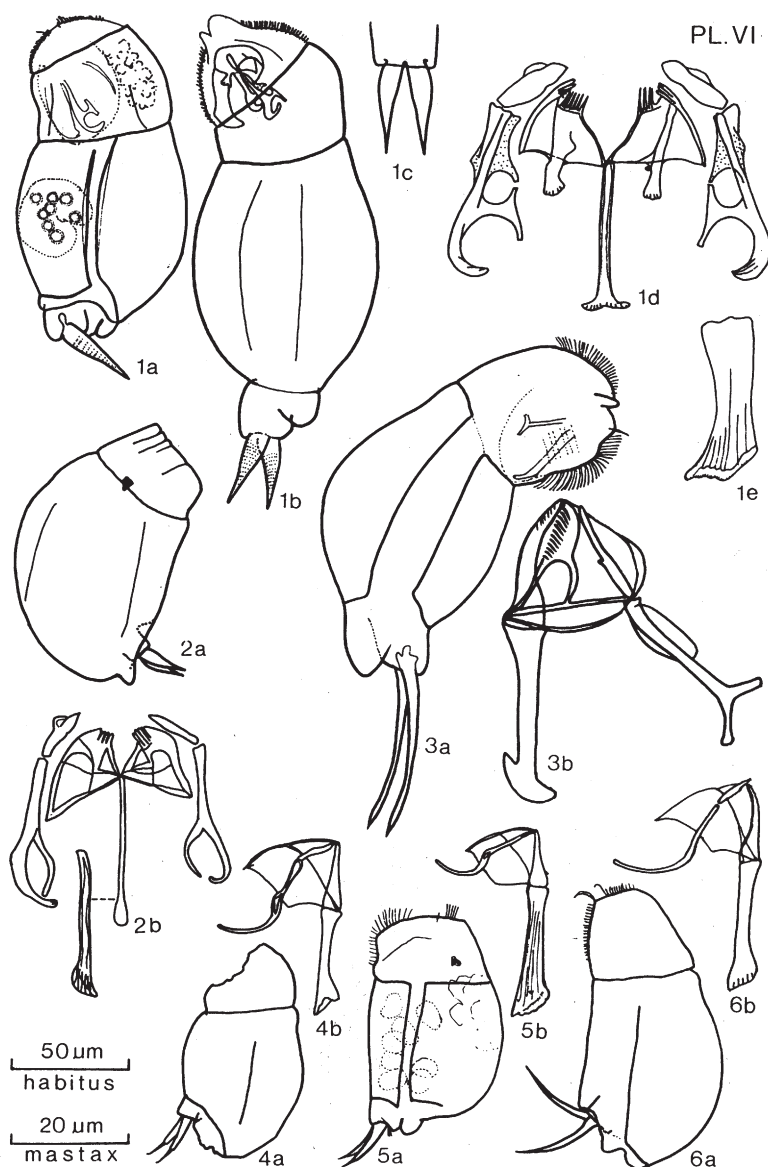
Rare among filamentous algae from Krillvatnet. A cosmopolitan species occurring between periphyton and decaying plant material, especially from running waters.

Dimensions: body length 170 μm , body width 78 μm , body height 75 μm , length of toes 22–24 μm , length of mastax 36 μm (fulcrum 23 μm , manubria 24 & 26 μm , rami 14 μm , unci 14 μm).

Cephalodella cf. *ventripes* var. *angustior* Donner, 1949 (P1. VI, fig. 5a-b)

The shape of the body and toes, and the structure of the mastax showing manubria with an eye, suggest a close relationship with *C. ventripes* var. *angustior*. Very rare to common, mostly between mosses and algae.

Dimensions: body length (contracted) 95 μm , length of toes 25 μm , length of mastax 32 μm (fulcrum 23 μm , manubria 16 μm).



PL. VI

Plate VI: Fig. 1a-e *Cephalodella evabroedi*; 2a-b *Cephalodella* cf. *catellina*; 3a-b *Cephalodella gibba*; 4a-b *Cephalodella* sp.; 5a-b *Cephalodella* cf. *Ventripes* var. *angustior*; 6a-b *Cephalodella* cf. *hoodi*.

Cephalodella cf. *hoodi* (Gosse, 1896) (P1. VI, fig. 6a-b)

The shape of the toes and structure of the mastax suggest a close relationship with *C. hoodi*. Present in most of the periphyton samples. Dominant in the algal streamers of Krillvatnet where it constituted 93% of the total rotifers.

Dimensions: body length (contracted) 120 μ m, length of toes 37 μ m, length of mastax 36 μ m (fulcrum 23 μ m, manubria 21 μ m).

Cephalodella gibba (Ehrenberg, 1838) (P1. VI, fig. 3a-b)

Very rare to common between filamentous algae and mosses at almost all localities. The species displays a high variability in the length of the toes, even in the same sample.

Dimensions: body length 165–190 μ m, length of toes 57–81 μ m, length of mastax 46 μ m (fulcrum 30 μ m, manubria 31 μ m, unci 17 μ m).

Svalbard records: Edgeøya (De Smet *et al.* 1988b), Spitsbergen (Olofsson 1918 sub *Diaschiza gibba* (Ehrbg.)).

Cephalodella cf. *catellina* (O.F. Müller, 1786) (P1. VI, fig. 2a-b)

Present in almost all samples, predom-

Cephalodella sp. (P1. VI, fig. 4a-b)

A species near to the preceding one, from which it mainly differs by the toes that have marked joints, and the more stout manubria with larger eyes. This form was found between algae and mosses in most of the waters, where it formed up to 28% of the total rotifers.

Dimensions: body length (contracted) 92 μ m, length of toes 26 μ m, length of mastax 30 μ m (fulcrum 18 μ m, manubria 18 μ m).

inantly in submerged moss, where it formed up to 20% of total rotifers. The habitus and dimensions agree with *C. catellina*. Eye spot present. The structure of the mastax differs in having well developed teeth on the inner side of the tip of the rami. Dumont & Coussement (1976) reported *catellina*-like animals with teeth on rami from Rio de Oro (North-Western Sahara). They suggest that it may be an undescribed taxon.

Dimensions: body length 110—120 μm , length of toes 20 μm , length of mastax 36 μm (fulcrum 26 μm , manubria 26 & 24 μm , unci 10 μm).

Cephalodella evabroedi n. sp. (Pl. VI, fig. 1a-e)

Eleven specimens of an apparently new species were found in the plankton samples 78 and 79.

Description: the body is stout, moderately gibbous dorsally. Plates of lorica distinct, lateral clefts relatively narrow and parallel-sided. The foot is small; the posterior portion of the abdomen projects as a small prominent tail. The toes are short and stout and the bases are somewhat swollen, tapering gradually to acute points. Their outer margins are convex and the inner margins are more or less straight in dorsal view. The toes are ornamented with transverse rows of minute stipples.

The mastax is very large and almost symmetrical, with teeth on the inner side of the rami and thus should be classed with the B-type of Wulfert (1938). The fulcrum is long, strongly expanded at the posterior end and very broad in side-view (4.4 to 6.4 times as high as width). Manubria almost symmetrical, rod-like and strongly recurved at their posterior ends. They show a typical crutched dorsal projection at 3/7 of their posterior end; one half of the crutch forms a 3/4 circle with the bended terminal end of the manubrium; a small triangular plate and a larger more or less rectangular basal with semi-circular posterior margin, the free corner of it projecting towards the anterior half of the crutch and thus forming a circular interstice. Rami provided with teeth at the inner edges near the apex, and short and broad pleural rod-like structures. Unci stout with knob.

Retrocerebral organ present, eyespot absent

Vitellarium U-shaped with 8 nuclei.

Type locality: Krillvatnet, Bjørnøya.

Dimensions: body length 170—180 μm (contracted 77—117 μm), length of toes 31—41 μm ($\bar{x}$ = 38 μm), length of mastax 40—42 μm (fulcrum 26—29 μm , manubria 28—30 μm , rami 18—21 μm , unci 11—14 μm).

The species is named after Mrs. Elisa Evabroed, drawing artist and beloved friend.

Comparison with other species: *C. evabroedi* differs from any other known species of the genus by the characteristic shape of the mastax.

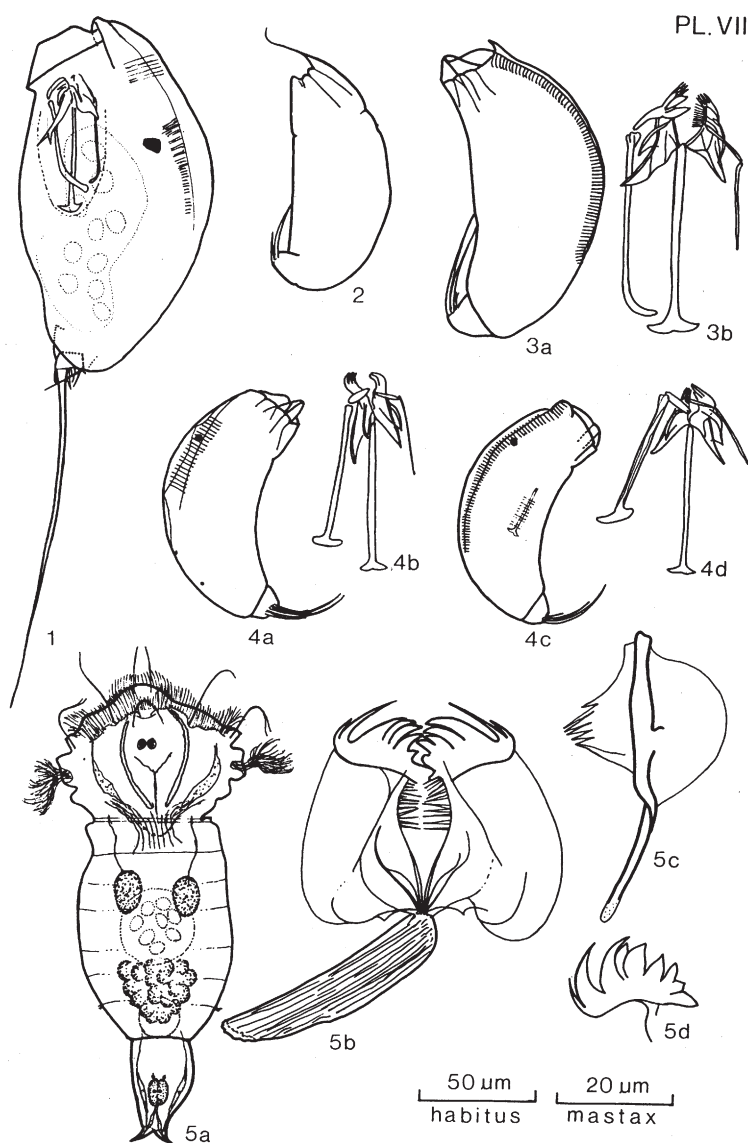
Holotype: a mastax preparation, mounted in glycerine and deposited with the author at the Laboratorium voor Algemene Biologie, Rijksuniversiteit Antwerpen, Belgium.

Paratype material: a series of 7 complete animals and 3 mastax preparations, all mounted in glycerine and deposited with the author.

FAMILY TRICHOCERCIDAE

*Trichocerca relict*a (Donner, 1950) (Pl. VII, fig. 4a-d)

Present in the samples from half of the water bodies studied. Rare to abundant in plankton and periphyton, forming respectively up to 15 and 17% of the total rotifers. Comparing our material with the drawings of *Diurella obtusidens* described from Spitsbergen by Olofsson (1918: 583, Fig. 39a,b), we consider *T. relict*a and *D. obtusidens* to be conspecific. In the same paper Olofsson (583: fig. 40a,b) describes another species, *Diurella minuta*, for which Voigt (1957) proposed the new name *arctica*, as the former name *minuta* was used earlier for another species of the genus *Trichocerca*. The distinction between *T. obtusidens* and *T. relict*a rests upon the absence of teeth and processes on the anterior border of the lorica: in *T. minuta* the left side of the anterior border is only extending (a little) beyond the right margin. In our material we found transitional forms between the *relict*a (fig. 4a-b) and *minuta*-types (fig. 4e-d). The structure of the mastax appears identical for both. It is clear to us that the two types are the terminal points of a variation series, and it is hardly possible to regard them as separate species. Our observations confirm the doubts of Koste (1978), who hesitantly placed *D. minuta* in synonymy with *T. relict*a.



PL. VII

Plate VII: Fig. 1 *Trichocerca rattus*; 2 *Trichocerca uncinata*; 3a-b *Trichocerca weberi*; 4a-d *Trichocerca relictia*; 5a-d *Synchaeta lakowitziana arctica*.

Svalbard records: Spitsbergen (Olofsson 1918 sub *Diurella obtusidens* and *D. minuta*).

Trichocerca uncinata (Voigt, 1902) (Pl. VII, fig. 2)

Occurrence irregular, very rare to abundant. Between algae it formed up to 15% of the total rotifers. A widespread species.

Dimensions: body length (without spine) 108 μm , length of spine 28 μm , length of toes 25 & 13 μm .

Svalbard records: Edgeøya (De Smet *et al.* 1988b), Nordaustlandet (Thomasson 1958), Spitsbergen (Olofsson 1918 sub *Diurella uncinata*, Voigt).

Trichocerca weberi Jennings, 1903 (Pl. VII, fig. 3a-b)

One specimen from a moss sample. Probably cosmopolitan.

Dimensions: body length 138 μm , toes 45 & 39 μm , length of mastax 42 μm (fulcrum 32 μm , manubria 32 & 15 μm , unci 11 & 9 μm).

Svalbard records: Edgeøya (De Smet *et al.* 1988b).

Trichocerca rattus (O.F. Müller, 1776) (Pl. VII, fig. 1)

A single specimen belonging to the f. *carinata* (Ehrb. 1830) in plankton.

Dimensions: body length 109 μm , length of left toe 150 μm .

Dimensions: body length (without process) 96–113 μm , length of process 3–12 μm , lorica height 37–42 μm , length of longest toe 33–40 μm , length of mastax 33–36 μm (fulcrum 26–27 μm , manubria 12–14 & 24–25 μm , unci 4 & 5.2 μm).

Svalbard records: Spitsbergen (Olofsson 1918 sub *Rattulus carinatus* Lam.).

FAMILY SYNCHAETIDAE

Synchaeta lakowitziana arctica n. subsp. (Pl. VII, fig. 5a-d)

In the plankton samples of localities 79, 81 and 83 a form of *Synchaeta* was encountered, which showed the external characteristics of *S. lakowitziana*, but differed distinctly from that species by the structure of the mastax and the smaller body size.

Description: the body is vase-shaped, with long and distinct foot; two normal short toes of equal length. The apical field is domed; tufts of cilia not on a tentacle. Cerebral eye double, eyes of equal size. Vitellarium rounded with 8 nuclei.

Uncus with a small and a large sharply pointed tooth, and a comblike plate with 6–7 teeth. Manubria with semi-circular outer plate (about 3/5–2/3 of the total length), and broad triangular inner plate (about 1/2 of the total length), the top of which is serrate.

Rami with rounded alulae, and needle-like structures at the inner side of the anterior third. Fulcrum slender, in side-view moderately broad.

Dimensions: body length 160–195 μm , length of foot 28–40 μm , length of toes 8–10 μm , length of mastax 74–76 μm (fulcrum 35–41 μm , manubria 51–55 μm , unci 19–22 μm).

Comparison with other species: in general it resembles *S. lakowitziana* Lucks 1930, but it is below (160–195 μm) the usual size of this species that ranges from 250–300 μm (Koste 1978). The vitellarium is rounded and not horseshoe-shaped. The triangular inner plate of the manubria is broad, instead of the smaller one in *S. lakowitziana*. The shape of the unci showing a small and a large pointed tooth falls outside the hitherto known variation (Koste 1978) for the species (one large, or two large and a small tooth).

Holotype: a mastax preparation, mounted in glycerine and deposited with the author at the Laboratorium voor Algemene Biologie, Rijksuniversitair Centrum Antwerpen, Belgium.

Paratype: a series of complete animals and mastax preparations, all mounted in glycerine and deposited with the author.

Polyarthra dolichoptera Idelson, 1925 (Pl. VIII, fig. 2)

Planktonic in all waters studied, where it formed up to 99% of the total rotifers. Occasionally between moss. A few aptera forms in sample 83. Probably nearly cosmopolitan; in temperate to tropical regions possibly in colder seasons.

Dimensions: body length 125 μm , fin length 175 μm , fin width 17 μm , length of ventral finlets 79 μm , ratio fin length/fin width = 10.3, ratio fin length/body length = 1.4.

Svalbard records: Bjørnøya (Pejler 1974), Edgeøya (De Smet *et al.* 1988b), Nordaustlandet (Thomasson 1958), Spitsbergen (Thomasson 1961, Amrén 1964c).

Dicranophorus uncinatus (Linné, 1786) (Pl. VIII, fig. 4a-b)

Two specimens of this probably cosmopolitan species were found between submerged moss from a shallow pool.

Dimensions: body length 190 μm , body height 90 μm , length of toes 72 μm , length of mastax 27 μm (fulcrum 4.5 μm , manubria 24 μm , rami 21 μm , unci 14 μm).

Svalbard records: Edgeøya (De Smet *et al.* 1988b).

Encentrum sp. (Pl. VIII, fig. 5a-b)

A single specimen that could not be identified to species level, between filamentous algae.

Dimensions: body length (contracted) 77 μm , length of toes 19 μm .

Albertia cf. *naidis* Bousfield, 1886 (Pl. VIII, fig. 1a-b)

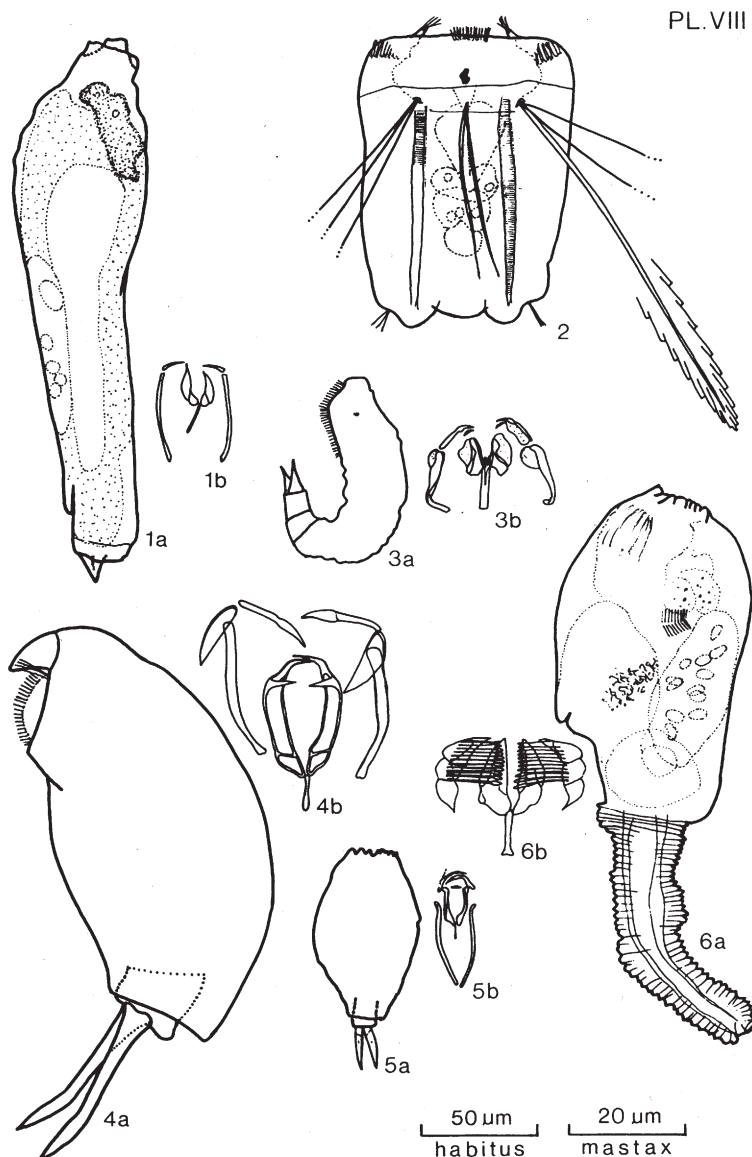
A single specimen from Krillvatnet. The small head with round sucking-ring, the unsegmented foot, papillate toe, and in lateral view slender fulcrum suggest a close relationship with *A. naidis*. The species parasitizes oligochaetes and is occasionally found free-living. Rami of the specimen found slightly asymmetrical, manubria terminally broadened.

Dimensions: body length 235 μm , body height 58 μm (fulcrum 6 μm , manubria 10 μm , rami 6 & 7.5 μm , unci 4 μm).

FAMILY FLOSCULARIIDAE

Ptygura sp. (Pl. VIII, fig. 6a-b)

Occasionally common between algae. The



specimens could not be identified to species level. About 11 uncinal teeth.

Dimensions: body length (contracted 260 µm, length of mastax 15 µm.

4. GENERAL REMARKS

With the reports of *Keratella hiemalis* and *Filinia terminalis* from literature (Pejler 1974), the rotifer fauna of Bjørnøya now comprises 52 taxa. Twelve of the rotifers

identified up to species level are new for Svalbard.

Most of the species are cosmopolitan or widespread. There were only a few species characteristic for cold waters. *Rhinoglena frontalis* is cold stenothermous. *Notholca latistyla* is restricted to the arctic region and *Lecane rotundata* has an arctic boreo-alpine distribution. Two forms, *Cephalodella evabroedi* and *Synchaeta lakowitziana arctica*, discovered by ourselves, are of course so far limited to Bjørnøya and could be endemic species. The insular status of Bjørnøya is probably responsible for a restricted faunal exchange between the island and surrounding land masses. Differences in shape and dimensions observed for the local populations (e.g. *Trichotria pocillum*, *Colurella* spp. etc.)

could thus be explained by a limited gene flow.

The number of rotifer taxa found in each of the water bodies is rather low and varies from 14 to 32 (plankton 8–23, periphyton 11–27). Except for some four species (*Notholca foliacea*, *Polyarthra dolichoptera*, *Colurella adriatica*, *C. colurus*) shared in common, the rotifer composition is rather different in the various samples. This is probably due to the great morphometric differences of the water

bodies and their different physical and chemical evolution during the year. Species diversity (Shannon-Wiener) is low for each of the plankton ($H = 0.13-2.92$) and periphyton ($H = 0.50-3.64$) communities, by the absolute dominance of one or two species (resp. *Polyarthra dolichoptera*, *Notholca foliacea*, *Trichocerca uncinata*, *Cephalodella* cf. *catellina*, *C.* cf. *hoodi*, *Cephalodella* sp.).

Comparison of the semi-quantitative numbers pro litre for rotifers with those for Copepoda and Cladocera shows that there is no evidence for the limiting of rotifer abundance by cyclopod predation or from cladoceran competition.

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