

MONOGONONT COMPOSITION IN DIFFERENT FRESHWATER HABITATS ON SPITSBERGEN (ARCTIC) AND KING GEORGE ISLAND (ANTARCTICA)

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Abstract: The monogonont composition of two polar regions: Spitsbergen (Arctic) and King George Island (Antarctica) is compared. Four different freshwater habitats (moss banks, moraine ponds, nearshore ponds and thaw ponds) were surveyed. Twenty monogonont species on Spitsbergen and 11 species on King George Island were found. *Euchlanis dilatata* and *Notholca salina* were the most numerous monogononts in both regions respectively. The maximum number of species on Spitsbergen was observed in nearshore ponds (19), while on King George in thaw ponds (8). In each habitat species diversity was higher on Spitsbergen than on King George Island. Species composition was different because of: different sources of colonisation, longer colonisation on Spitsbergen than on King George Island, better developed tundra habitat on Spitsbergen with more abundant flora, and smaller geographical isolation of Spitsbergen from the place of colonizers origin.

1. Introduction

Freshwater rotifers from the Svalbard archipelago (Arctic) have been well described (THOMASSON, 1958, 1961; AMRÉN, 1964a, b; PEJLER, 1974; DE SMET *et al.*, 1987, 1993; DE SMET, 1990, 1993). AMRÉN (1964a) described 14 monogonont species from Spitsbergen, while DE SMET *et al.* (1987) reported 34 species, many of them not previously recorded from this region.

There is also a considerable body of literature on Antarctic rotifers (*e.g.* SUDZUKI, 1964, 1979; OPALIŃSKI, 1972; DARTNALL, 1980, 1983, 1993; DARTNALL and HOLLOWDAY, 1985). Ten monogonont species have been reported from King George Island in the South Shetlands (DE PAGGI, 1982).

This paper deals with monogononts from freshwater and submerged moss habitats at both poles: Hornsund, Spitsbergen in the Arctic, and Admiralty Bay, King George Island in the Antarctic. Our aim was to highlight previously undescribed differences in monogonont composition between these locations in different freshwater habitats.

2. Study Area and Methods

Samples were collected in the Arctic between June and September of 1989 in the vicinity of the Polish Polar Station on Spitsbergen (77°N, 15°30'E). Samples were collected in the Antarctic between November 1991 and February 1992 in the vicinity of the Polish Station Henryk Arctowski on King George Island (62°S, 58°30'W) (Fig. 1). In both localities samples were collected weekly during the three summer months.

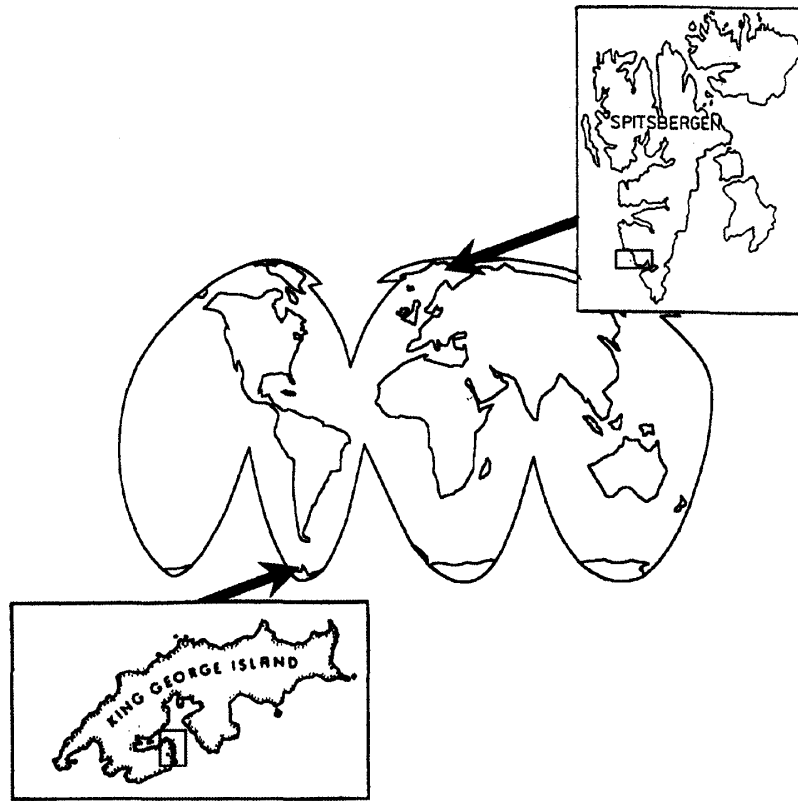


Fig. 1. Study areas (marked with the rectangles) in the Arctic (Spitsbergen) and Antarctic (King George Island).

Four different freshwater habitats were considered:

- moss banks,
- moraine ponds, situated on lateral moraines covering up to 100 m², and attaining depths of some 30 to 40 cm,
- nearshore ponds, situated on beaches close to the seashore, behind the storm ridge, covering between 3000 and 20000 m², and attaining depths of 1.5 m,
- thaw ponds, short lived and shallow (10–15 cm) areas filled with water from melting snow, covering up to 5000 m².

Water samples of 0.25 l were taken from the sediment-water interface (up to 10 cm above the sediment) in each pond type. Water was then filtered through a 30 μ mesh plankton net and the material in the net collected in a small volume of water in a sample jar. Samples from the moss banks were taken directly, by squeezing the water from a *ca.* 15 cm² area directly into a sample jar.

Two 5 ml subsamples were taken of each sample and observed *in vivo* under a light microscope. After this initial examination, all samples were fixed with formalin to a final concentration of 4%, and 1 subsample examined further at a later date.

Rotifers in these samples were classified according to KUTIKOVA (1970) and DARTNALL and HOLLOWDAY (1985).

3. Results and Discussion

During this work we recorded 20 monogonont species on Spitsbergen and 11 monogonont species on King George Island (Table 1). Most of the species we recorded in our research were cosmopolitan, although only three of them (*Lepadella patella*, *Colurella colurus* and *Cephalodella catellina*) occurred in common in both regions. Two different subspecies of *Notholca squamula* were recorded on Spitsbergen and King George Island. We had only a few endemic polar species: *Lecane rotundata* and *Lecane piepelsi*

Table 1. List of species.

Spitsbergen	King George Island
Family: Notommatidae	
<i>Cephalodella gibba</i> (EHRENBERG, 1832)	<i>Cephalodella forficata</i> (EHRENBERG, 1832)
<i>Cephalodella ventripes</i> (DIXON-NUTTALL, 1901)	<i>Cephalodella catellina</i> (MÜLLER, 1786)
<i>Cephalodella catellina</i> (MÜLLER, 1786)	<i>Resticula gelida</i> (HARRING et MYERS, 1922)
	<i>Resticula nyssa</i> (HARRING et MYERS, 1924)
Family: Colurellidae	
<i>Lepadella patella</i> (MÜLLER, 1786)	<i>Lepadella patella</i> (MÜLLER, 1786)
<i>Lepadella ovalis</i> (MÜLLER, 1786)	<i>Colurella colurus</i> (EHRENBERG, 1830)
<i>Colurella colurus</i> (EHRENBERG, 1830)	
Family: Brachionidae	
<i>Notholca foliacea</i> (EHRENBERG, 1838)	<i>Notholca squamula salina</i> (MÜLLER, 1786)
<i>Notholca squamula</i> (MÜLLER, 1786)	<i>Notholca walterkosteii</i> (DE PAGGI, 1982)
Family: Dicranophoridae	
<i>Encentrum</i> 2 spp.**	<i>Encentrum</i> sp.**
<i>Dicranophorus uncinatus</i> (MILNE, 1886)	<i>Encentrum mustela</i> (MILNE, 1885)
Family: Trichocercidae	
<i>Trichocerca weberi</i> (JENNINGS, 1903)	
<i>Trichocerca</i> cf. <i>cavia</i> (GOSSE, 1886)	
Family: Epiphanidae	
	<i>Epiphanes senta</i> (MÜLLER, 1773)
Family: Lecanidae	
<i>Lecane rotundata</i> * (OLOFFSON, 1918)	
<i>Lecane</i> (<i>Monostyla</i>) <i>lunaris</i> (EHRENBERG, 1832)	
<i>Lecane</i> (<i>Monostyla</i>) <i>piepelsi</i> (DE SMET, 1993)	
Family: Mytylinidae	
<i>Mytylina mucronata</i> * (MÜLLER, 1773)	
<i>Mytylina ventralis brevispina</i> (EHRENBERG, 1832)	
Family: Euchlanidae	
<i>Euchlanis dilatata</i> (EHRENBERG, 1832)	
Family: Collothecidae	
<i>Collothea ornata cornuta</i> (DOBIE, 1842)	

* New records for Svalbard.

** Genus *Encentrum* was not identified to the species level.

from Spitsbergen and *Notholca walterkosteii* from King George Island. From the latter, also *Resticula gelida* is considered to be a cold stenotherm.

The Monogononta we found in the Hornsund region have previously been reported from Spitsbergen (DE SMET *et al.*, 1987). New records for the Svalbard area, however, include *L. rotundata* previously only reported from the Canadian Arctic (DE SMET and BAFORT, 1990), and *Lecane (M.) lunaris* and *M. mucronata* reported from the Canadian Arctic and Greenland (DE SMET and BAFORT, 1990; DE SMET *et al.*, 1993).

From King George Island DE PAGGI (1982) has reported 10 monogonont species, four of which (*Lepadella patella*, *Notholca walterkosteii*, *Notholca salina*, *Epiphanes senta*) we also recorded. All species we recorded in the Antarctic have been previously noted in

Table 2. List of rotifer species from Spitsbergen in different habitats.

Species	Moss banks	Moraine ponds	Nearshore ponds	Thaw ponds
<i>C. gibba</i>	+	+	+	+
<i>C. ventripes</i>	+	+	+	+
<i>C. catellina</i>	+	+	+	+
<i>L. patella</i>	+	+	+	+
<i>L. ovalis</i>	–	+	+	+
<i>C. colurus</i>	+	+	+	+
<i>N. foliacea</i>	+	+	+	+
<i>N. squamula</i>	+	+	+	+
<i>Encentrum</i> 2 spp.	+	+	+	+
<i>D. uncinatus</i>	+	–	+	–
<i>T. weberi</i>	+	+	+	+
<i>T. cf. cavia</i>	+	+	+	+
<i>L. rotundata</i>	+	–	+	–
<i>L. (M.) lunaris</i>	+	–	+	–
<i>L. (M.) piepelsi</i>	–	–	+	+
<i>M. mucronata</i>	+	+	+	+
<i>M. ventralis brevispina</i>	+	+	+	–
<i>E. dilatata</i>	+	+	+	+
<i>C. ornata cornuta</i>	+	–	+	–

Table 3. List of rotifer species from King George Island in different habitats.

Species	Moss banks	Moraine ponds	Nearshore ponds	Thaw ponds
<i>C. forficata</i>	–	+	+	+
<i>C. catellina</i>	–	–	+	–
<i>R. gelida</i>	+	+	–	+
<i>R. nyssa</i>	+	–	+	+
<i>L. patella</i>	–	–	+	+
<i>C. colurus</i>	–	–	–	+
<i>N. squamula salina</i>	–	+	+	+
<i>N. walterkosteii</i>	–	+	+	–
<i>Encentrum</i> sp.	+	+	+	+
<i>E. mustela</i>	+	+	–	+
<i>E. senta</i>	–	+	–	–

this region, except for *R. nyssa* previously recorded only in the Subantarctic (DARTNALL and HOLLOWDAY, 1985).

We also compared monogonont species composition on Spitsbergen and King George Island in terms of those found in four different freshwater habitats (Tables 2, 3). On the former we recorded almost all monogonont species in each habitat (*cf.* Table 2), the fewest were noted in moraine ponds, a fact most likely attributable to these areas being the most recently formed and colonised. The greatest species diversity was recorded in nearshore ponds (all 20 species), habitats which in turn probably have the longest history of colonisation and the most stable environmental conditions.

On King George Island the fewest species were recorded from moss banks (4), and the maximum from thaw ponds (8) (Table 3). Highest monogonont numbers (in terms of individuals) were also found in the latter; such a habitat on King George Island displays the most favourable conditions for microfauna with relatively high water temperatures and about 50% of the substrate showing plant cover.

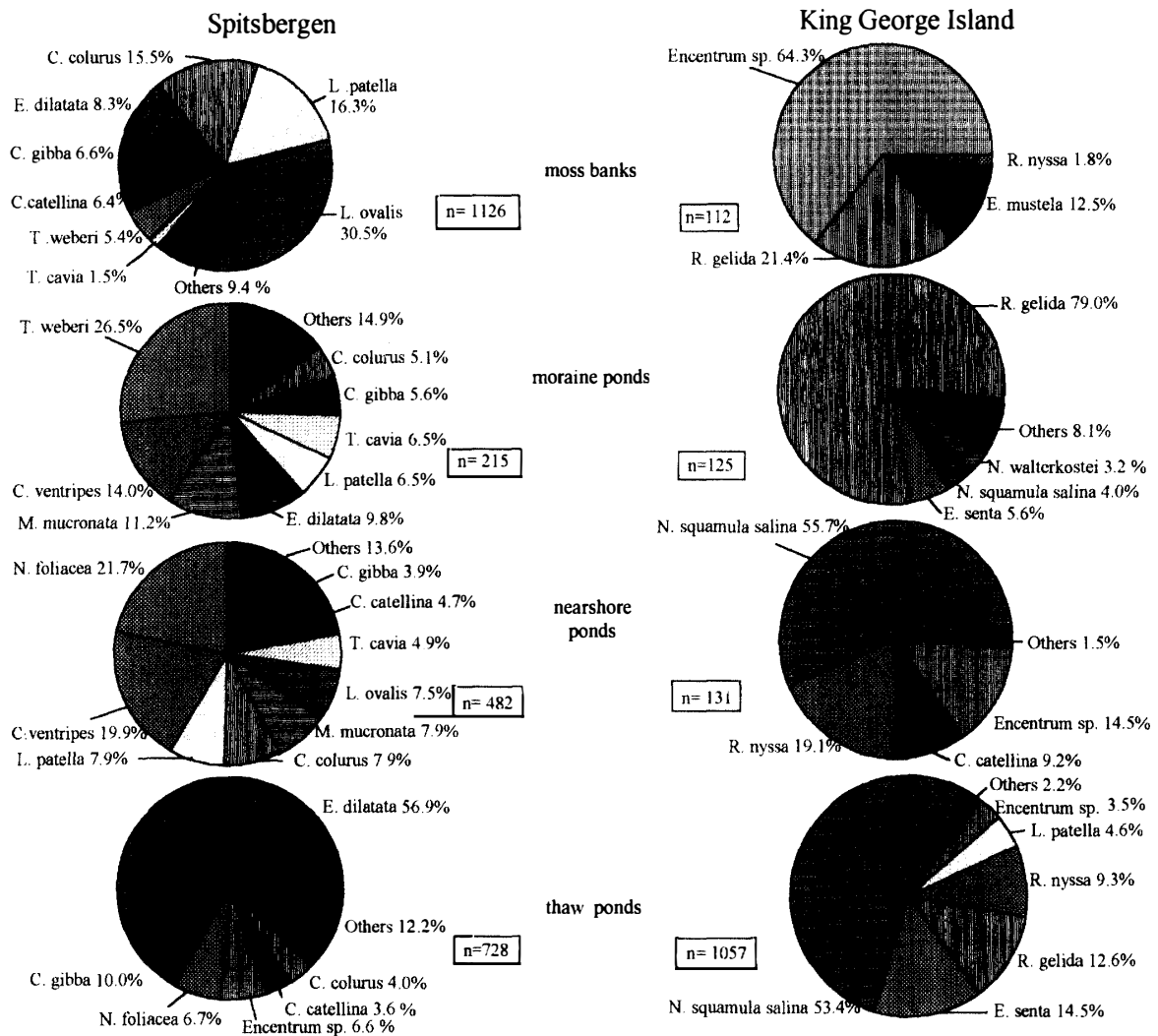


Fig. 2. Monogonont composition in freshwater habitats on Spitsbergen and King George Island. n = total number of observed specimens.

In both regions the actual composition of the monogononts varied considerably, depending on the particular habitat (Fig. 2).

Moss banks on Spitsbergen were dominated by family Colurellidae (typical for this habitat), while on King George Island this family was absent. In fact this habitat was so dominated by Bdelloidea (comprising some 98% of total monogonont numbers), that throughout the summer we only recorded 112 Monogononta individuals.

On Spitsbergen *T. weberi* and *C. ventripes* were the two most numerous species in moraine ponds. A large percentage (33%) characterised Trichocercidae in this habitat. On King George Island we mainly recorded *R. gelida*, a species common to colder regions.

There were two dominant species in the nearshore ponds on Spitsbergen, *N. foliacea* and *C. ventripes*; both, in fact, were found in each habitat examined. Conversely, nearshore ponds on King George Island were dominated solely by *N. s. salina*. It also dominates in thaw ponds, confirmation that this species shows some degree of halotolerance.

In thaw ponds, more than 50% of individuals found were *E. dilatata* on Spitsbergen and *N. s. salina* on King George Island. *E. dilatata* in Hornsund dominated only in this shallow habitat; it was not found in deeper nearshore ponds. On King George Island *N. s. salina* was the most numerous monogonont occurring in freshwater habitats.

In total numbers (in terms of individuals) *Euchlanis dilatata* was the most numerous monogonont from Spitsbergen and *Notholca squamula salina* from King George Island.

The total number of species was higher in the Hornsund region. In each habitat, the number of monogonont species observed was higher on Spitsbergen than on King George Island (Fig. 3).

Although Spitsbergen and King George Island are in similar climatic conditions and similar freshwater habitats were surveyed, monogonont composition in each varies considerably. We believe that a number of factors have led to this phenomenon, principal among these being:

a) Longer period of colonisation on Spitsbergen, viz. marine beaches in the Hornsund

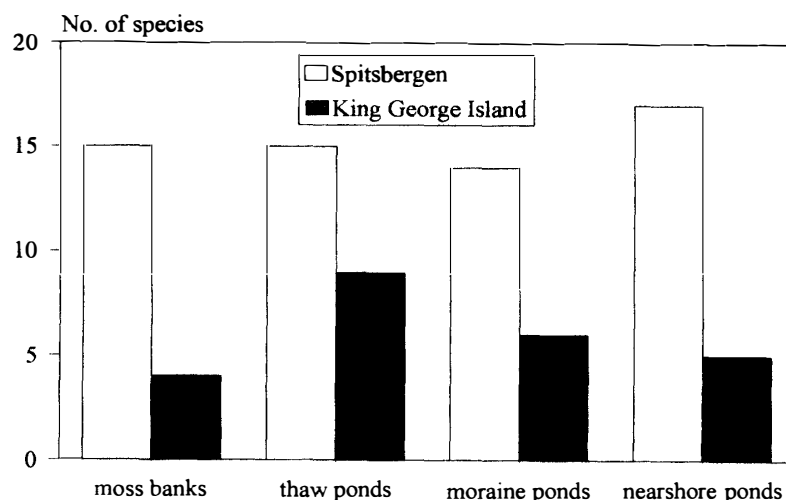


Fig. 3. Number of species observed on Spitsbergen and King George Island.

area of this island are presumed to be around 10000 years old (KARCZEWSKI *et al.*, 1981), whereas those in the Admiralty Bay area are described as being of only *ca.* 500 years (BIRKENMAJER, 1981).

- b) More highly developed tundra habitat on Spitsbergen, with more abundant moss flora
- c) Spitsbergen is less isolated in geographic terms and is therefore closer to sources of colonisation than King George Island, which means:
- more pronounced and lengthier anthropogenic influence on Spitsbergen, with intensive whaling activity on the Svalbard archipelago going back some 700 years compared to about 100 years in the South Shetlands.
 - more diverse, abundant and migrating avifauna on Spitsbergen than on King George Island

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