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THE FRESHWATER MICRO- AND MEIOFAUNA OF ADMIRALTY BAY, KING GEORGE ISLAND, SOUTH SHETLAND ISLANDS

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Abstract: The species composition was studied at the water-sediment interface in various water bodies in the vicinity of Arctowski Station. The highest density of fauna was noted in moss banks, of which 75% were Bdelloidea, whereas the lowest was observed in running waters. Monogononta species occurred in nearshore ponds with a large number of taxa and comparably high density. Amongst rotifers, Bdelloidea and *Notholca salina* of Monogononta were most abundant.

1. Introduction

Although studies of freshwater fauna in Antarctica were commenced at the beginning of this century (MURRAY, 1906, 1910), detailed studies of limnology in the maritime Antarctic have been conducted since the 1960's on Signy Island (HEYWOOD, 1968; PRIDDLE and HEYWOOD, 1980). Investigations of freshwater environments on King George Island started in the 1970's (ORLOV, 1971; CAMPOS *et al.*, 1978; RAKUSA-SUSZCZEWSKI and LIPSKI, 1980), and Polish limnological studies continued in the Admiralty Bay region after the construction of Arctowski Station in 1977 (PRESLER, 1980; TATUR and MYRCHA, 1983; JURASZ *et al.*, 1983; JANIEC, 1988, 1991).

The purpose of this work is to describe and compare microfaunal composition, particularly of Rotifera, Tardigrada and Nematoda, in different kinds of freshwater bodies in the Admiralty Bay region.

2. Study Area

The present survey was conducted in three areas of Admiralty Bay, namely, Arctowski Station, Demay Point and Ferraz Station (Fig. 1). Particularly in the vicinity of Arctowski Station, the samples were taken at 14 sites (Fig. 1) during the austral summers of 1987/88 and 1990/91.

There are no large lakes in these areas, but the freshwater bodies shown in Fig. 1 have a character described below;

- ponds situated on glacial lateral moraines (sampling sites III, IV, VI, VII, IX)
- nearshore ponds behind the storm ridge (sampling sites I, II, VIII)
- moss banks (sampling sites X, XI, and XII)
- streams (sampling sites V, XIII and XIV)

Ponds start to melt in November except that those in more elevated positions (30–40 m above sea level) melt fully only in January.

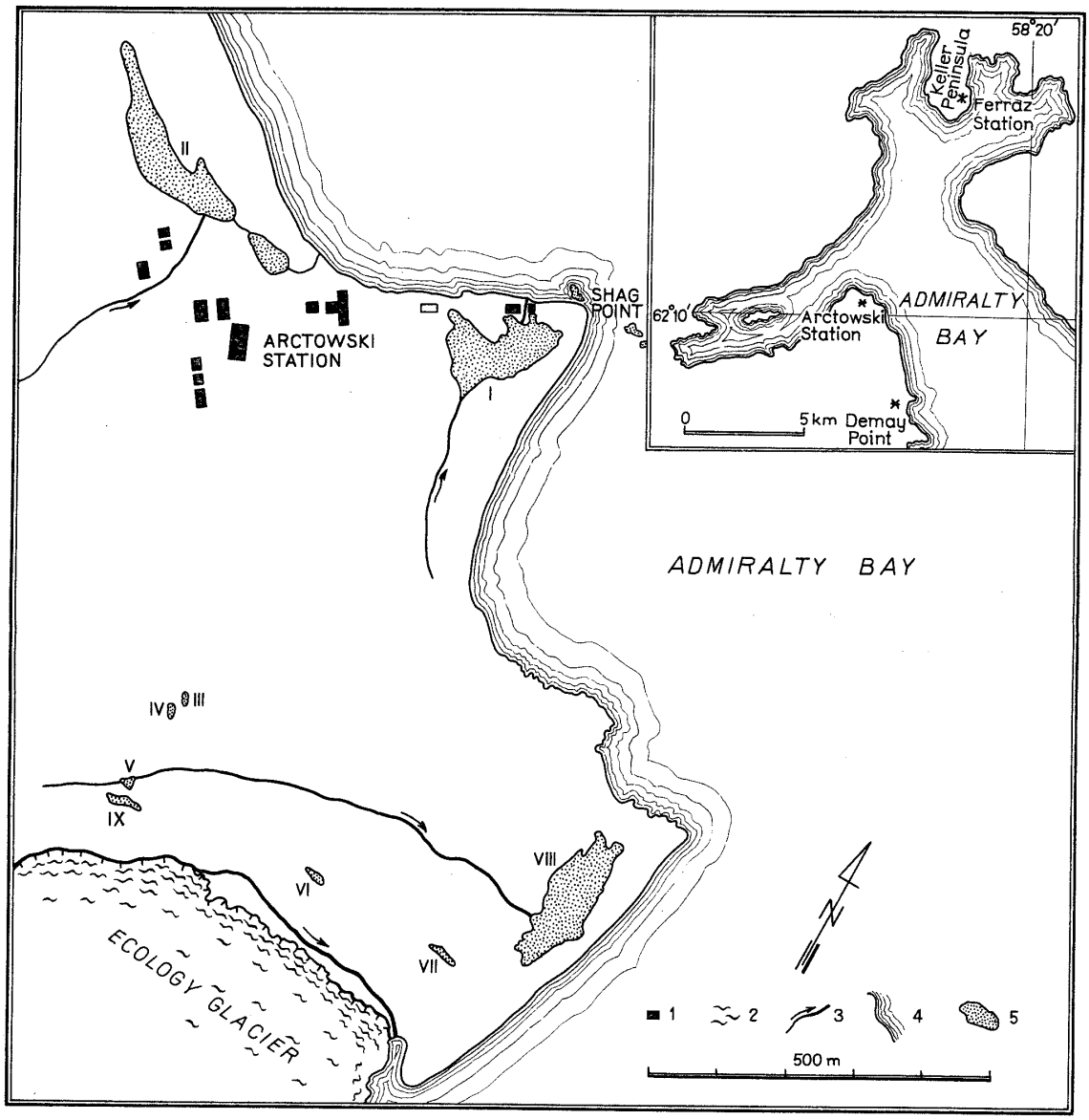

*Fig. 1. Investigated area. *: Regions of investigation. I–XIII: Sampling sites near Arctowski Station. 1: Station buildings, 2: Glacier, 3: Streams, 4: Freshwater reservoirs.*

Physicochemical conditions in the freshwater biotopes vary in each water body. Ephemeral moraine pools exist for 1–2 months before drying out. The time of year when these pools become ice-free depended on the rate of snow melting, and also on the elevation of the ponds. The delay in melting was of the order of two months in comparison with nearshore ponds. They are always small and shallow (15–40 cm depth) and the water temperature ranges from 1.6 to 14.1°C. The bottoms of these pools are mainly stony, without algal mats.

Large, nearshore ponds are water reservoirs located behind the storm ridge and were observed to be ice-free for 5–6 months. The water temperature was stable dur-

ing summer and did not exceed 10°C. In winter the ponds froze to the bottom and seemed to become anoxic. The bottom surface was covered by muddy sediments about 30–40 cm in thick, and 5–10% of it was covered with filamentous green algae. These ponds were often enriched by the salt breeze.

Moss banks became very wet during spring, but dried out during the summer. The temperature was very stable and the content of organic matter which serves as food for microfauna was high.

Streams carried cold water directly from melting snow or glaciers. A large amount of mineral matter was transported because of the large seasonal flow of water over volcanic bedrock. The nutrient content in these waters and streams depended mainly on their location with respect to penguin rookeries or seal resting places. The concentrations of NH_3, NO_3 and PO_4 were 2–170, 0–43 and 2–38 mg/*l* in streams near penguin colonies, and 0.2, 0.8 and 0.03 mg/*l* in sites remote from rookeries (TATUR and MYRCHA, 1983). Other data concerning nearshore ponds from the same sampling area, show similar results: respective concentrations of NO_3 (in mg/*l*) and P (in μm/*l*) were 0.13–5.7 and 44.3–1890 near penguin colonies, and 0.04–1.7 and 41.8–246 in those more distant from rookeries (LIPSKI, unpubl.). The pools situated on the moraine were also enriched by flying birds. An increase in the nutrient content might also be anthropogenic (KRZYSZOWSKA, 1990).

Ponds and streams generally had high oxygen levels, and were alkaline in pH (7.7–9.9), although in moss banks pH tended to be slightly acidic (6.1–6.3).

3. Methods

Water samples (0.25 *l*) were collected at the sediment-water interface, up to 10 cm above the sediment, in the deepest part of the water bodies. To count Bdelloidea particularly in living state, 5 m*l* subsamples were drawn from 30 μm mesh size filtered samples and counted immediately. All samples were then fixed with 4% formalin and used for the examination of other micro-invertebrates.

4. Results and Discussion

Table 1 shows the freshwater fauna observed during the present survey around Arctowski Station. These taxa are typical of the maritime Antarctic (EVERITT, 1981; DASTYCH, 1984; PAGGI, 1987). The following groups of invertebrates were also found in the surveyed areas: Protozoa, Nematoda, Rotifera, Tardigrada, Copepoda, Branchiopoda and Chironomidae (PRESLER, 1980; JANIEC, 1991). Because of the lack of large lakes in the surveyed areas, few taxa occurred in the present study.

According to CAMPOS *et al.* (1978) and PAGGI (1987), the diversity of freshwater fauna of King George Island is lower than that of the South Orkney Islands (*cf.* JENNINGS, 1976; MASLEN, 1979; DARTNALL, 1983), but richer than that of the Antarctic Peninsula (*cf.* MASLEN, 1979; DARTNALL, 1980), with the exception of Crustacea. For example, the copepod *Parabroteas sarsi* occurs in some Antarctic Peninsula lakes (DATNALL, 1980), but not on King George Island.

In Admiralty Bay there are no large lakes but only shallow ponds and pools. In

Table 1. Freshwater fauna observed in the present survey around Arctowski Station.

Rotatoria	Nematoda
Monogononta	*Monhystera* 2 spp.
Lepadella patella	*Plectus* 2 spp.
Lepadella minuta	*Mononchus* sp.
Notholca salina	*Eudorylaimus* sp.
Notholca walterkostei (?)	Tardigrada
Epiphanes senta	*Echiniscus* sp.
Cephalodella forficata	*Dactylobiotus ambiguus*
Cephalodella sterea (?)	*Hypsibius arcticus*
Proales reinhardti (?)	*Isohypsibius granulifer*
Encentrum 2 spp.	*Isohypsibius* sp.
Bdelloidea	*Diphascon scoticus* (?)
Crustacea	
Copepoda	
Pseudoboeckella poppei	
Branchiopoda	
Branchinecta gaini	

nearshore ponds, the microfauna was diverse and stable (Fig. 2), particularly in Monogononta (Fig. 3). The density of the individuals in the surveyed taxa, however, was lower than in the Antarctic lakes whose bottom surface is covered by algal mats (McINNES and ELLIS-EVANS, 1990). The relative stability of the nearshore ponds promotes the occurrence of two crustacean species. It appears that a high density of these detrivorous crustaceans may have led to a decrease in numbers of some rotifer species

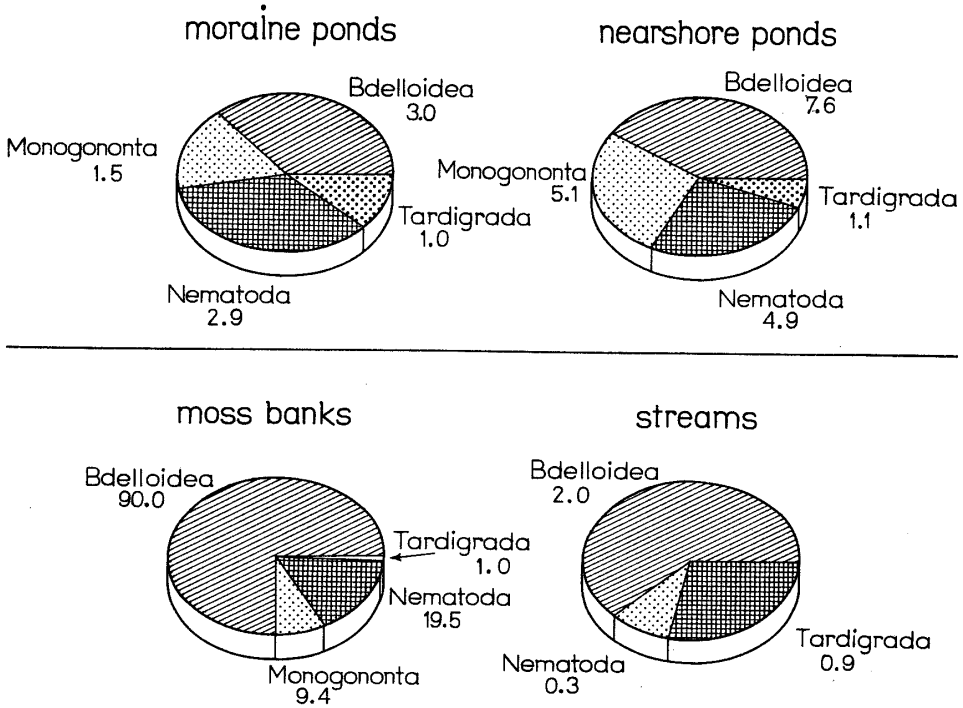

Fig. 2. Composition of freshwater microfauna, Admiralty Bay region, King George Island. Mean number of individuals per cm^3.

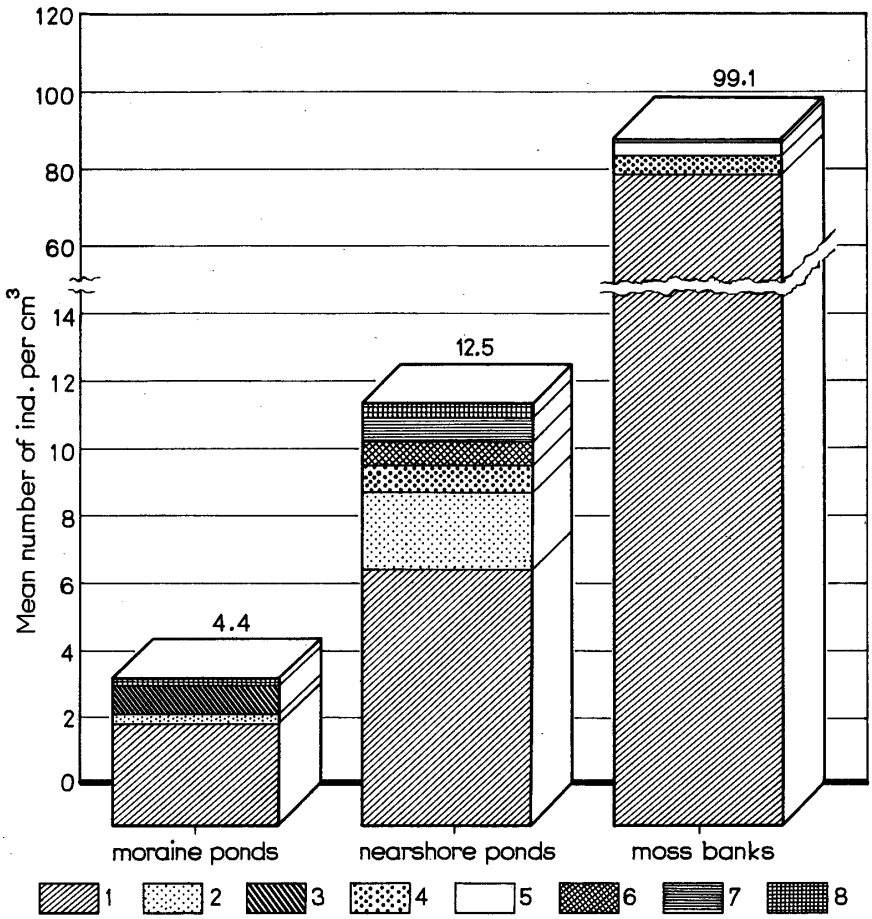

Fig. 3. Composition of freshwater rotifers, Admiralty Bay region, King George Island. 1: Bdelloidea, 2: Notholca salina, *3:* Proales reinhardti, *4:* Lepadella patella, *5:* L. minuta, *6:* Epiphanes senta, *7:* Encentrum *sp., 8: Others.*

living in detritus. In nearshore ponds influenced by the salt breeze, the rotifer *Notholca salina* was abundant, and in ponds enriched by run-off from penguin rookeries, a second rotifer *Epiphanes senta* was predominant. In all ponds of this type, bdelloids were the most abundant among rotifers, while two species of *Plectus* were the dominant nematodes, and *Hypsibius arcticus* was the commonest tardigrade.

In moraine ephemeral pools the microfaunal composition was similar to that in the nearshore ponds, although both individuals and species were small in number (Fig. 2), especially of rotifers (Fig. 3). The copepod *Pseudoboeckella poppei* was also found in some pools.

The moss banks showed the highest density of individuals, dominated by bdelloids (Fig. 3), and also had various taxa indicating high densities of nematodes and tardigrades (*H. arcticus*) (Fig. 2). No meiofauna was observed in water retained here.

Fewest taxa were noted in running waters. The streams were rather short (*ca.* 2.5 km) and carried meltwater directly from glaciers or snowfields, so that the microfaunal diversity and abundance were low (Fig. 2). No rheophilic taxa were observed in the present study.

The human impact of Arctowski Station on freshwater fauna was local and connected with physical changes in terraine, water bodies and courses. These may have had an influence on the distribution of *Branchinecta gaini* (JURASZ *et al.*, 1983; JANIEC, 1991).

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