

Notes on limnic water-bears (Tardigrada) from the Robertskollen nunataks, Dronning Maud Land, Antarctica

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(With 11 figures)

Abstract

Three tardigrade species, *Hypsibius antarcticus* (Richters), *Diphyscon pingue* (Marcus) and *Diphyscon sanae* Dastych et al., are reported from limnic habitats in the Ahlmannryggen nunataks, Dronning Maud Land, Antarctica. A record of *H. antarcticus* rediscovered recently in freshwater samples from Mt Erebus and Ross Island (collection of Murray, the Natural History Museum, London) is also provided.

Introduction

Prior to a number of recent biological surveys, very little was known about the tardigrade fauna of western Dronning Maud Land, Antarctica. These recent studies reported the presence of water-bears in the northwest Ahlmannryggen (Ryan et al. 1989, Dastych et al. 1990, Dastych & Harris, 1994, 1995, Steele et al. 1994), the Vestfjella and Heimefrontfjella (Sohlenius et al. 1995, 1996) and in the Mühlig-Hofmannfjella ranges (Sømme & Meier, 1995). However, all these studies focused on terrestrial habitats, the tardigrades being collected from mosses, lichens or fellfield mineral soil. Reports of limnic tardigrades from Dronning Maud Land are few; a note about the occurrence of *Hypsibius antarcticus* (Richters, 1904) in a small lake at the nunatak Basen in the Vestfjella range (Sohlenius et al. 1996), in Valterkulten Pond (Marshall et al., in press) and a record about the presence of three genera (*Macrobiotus*, *Hypsibius* and *Echiniscoides* - reported as "*Echiniscoides*") in Priyadarshani Lake (Ingole & Parulekar 1990). The genus *Echiniscoides* is a true marine taxon, thus the identifications reported in the above paper should be confirmed.

During the 1994/1995 austral summer a member (AED) of the South African Antarctic Expedition investigated the nutrient status and micro-biota of small waterbodies associated with the Robertskollen group of nunataks. This study was part of an investigation of the influence of ornithogenic products on the functioning of nunatak ecosystems. Numerous samples of water, algae, organic and mineral sediments were collected from tarns, pools and small streams for quantitative micrometazoan studies. Results of the nutrient analyses and the rotifer survey will be published separately. Some samples were retained for qualitative examination and below we present remarks on tardigrades found in the limnic habitats sampled.

Materials and Methods

The material originates from waterbodies of three Robertskollen nunataks (71° 28' S + 3° 15' W; for details see Ryan et al. 1989) located in the northwest of Ahmannryggen range, western Dronning Maud Land. Samples were collected by the junior author between 12 December 1994 and 13 January 1995 from:

- (1) Ice Axe Peak, coarse and fine sediment, algae were taken from the summit and bottom tarns (4 formalin and 3 dried samples);
- (2) Peaceful Hill, algae and sediment taken from the pool in the summit hollow (2 formalin, 2 dried samples);
- (3) Petrels Rest, coarse sediment from the stream in the east gully and gravel and algae were collected from the summit pool (2 formalin, 2 dried samples).

Altogether 16 samples of benthic sediment and algae were collected, preserved either in 4% formalin (eight samples) or air dried in small plastic Petri dishes (3.5 cm in diameter; seven samples). In the laboratory dried substrate was soaked with tap water for 2-3 hours to revive tardigrades, which were then extracted with a micropipette. This material and individuals preserved in formalin were mounted on slides in a chloral gum (Faure's medium) prior to identification. All slides are deposited in the Zoological Museum Hamburg (Reg. No. A34/96).

Results and Discussion

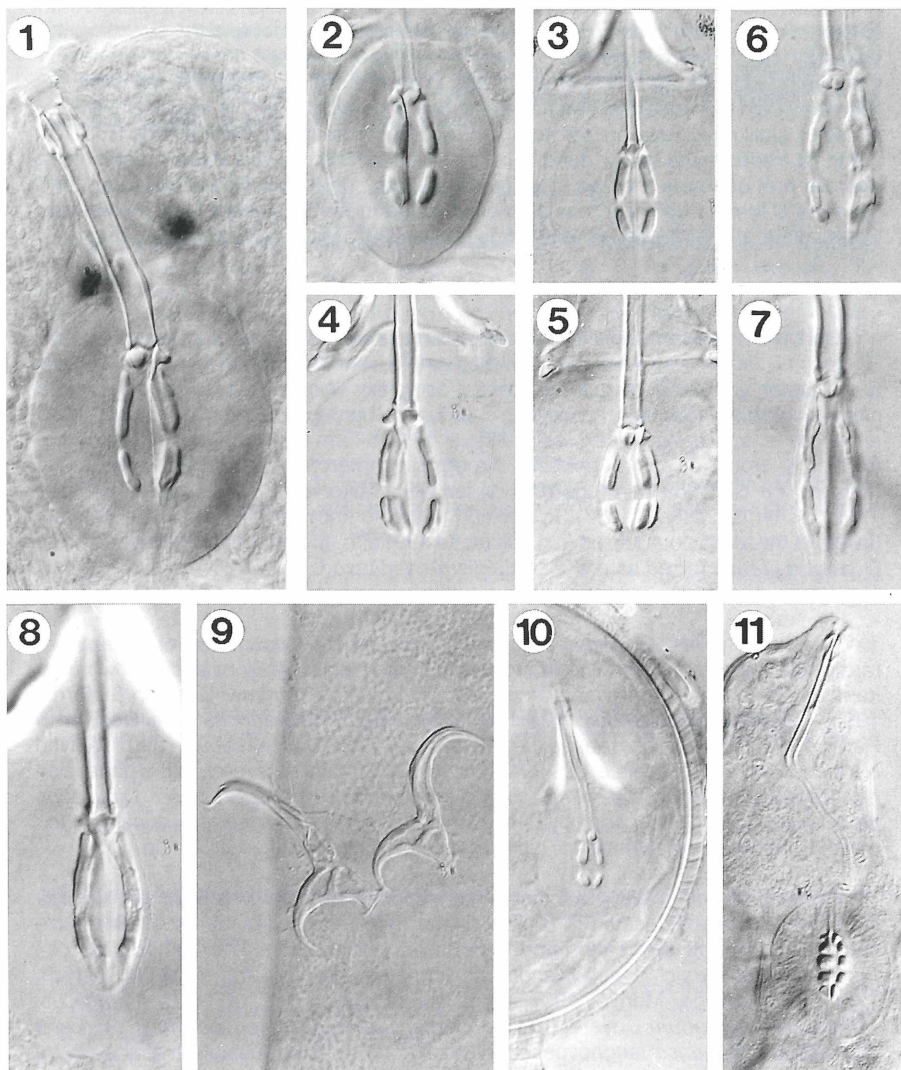
In all, 369 tardigrades and 38 eggs have been found in these samples and they represent the following three taxa:

Hypsibius antarcticus (Richters, 1904) (Figs 1-10)

The most frequent and dominant species (312 specimens, 26 eggs) which occurred in all samples from Peaceful Hill and Ice Axe Peak but not in the Petrels Rest samples. The majority of individuals have typically shaped buccal apparatus (Fig. 1), claws with distinct internal sculpture (Fig. 9) and a variable shape of macroplacoids (Figs 1-5). In some specimens, however, the macroplacoids were aberrantly shaped (Figs 6-8), perhaps resulting from genetic isolation of the population. The eggs have a characteristic and relatively thick shell, some eggs with embryo inside (Fig. 10).

This recently redescribed taxon (Dastych 1991) represents the most widely distributed tardigrade in the Antarctic and belongs to the characteristic form for freshwater habitats. Its synonym, at least for the Antarctic region, is *H. arcticus* (Murray, 1907). The species occurs both in the maritime and continental Antarctic (for review see Dastych *op. cit.* and also Cathey et al. 1981, Janiec 1993, Marshall et al., in press, McInnes 1995a, b, Miller 1995, Miller & Heatwole 1995, Miller et al. 1994a, b, 1995, 1996, Sohlenius et al. 1995, 1996, Utsugi & Ohyama 1989, 1991, 1993). Lately *H. antarcticus* has also been found (rediscovered) in two Antarctic freshwater samples from the remnants of Murray's collection, held at the Natural History Museum (London). The material was collected at the beginning of 20th century and is preserved in formalin. The samples originate from a pond on Mt. Erebus and from Ross Island and contain hundreds of specimens and eggs of this species (unpublished, det. H. Dastych).

Very little is known about the biology and ecology of *H. antarcticus*. In particular there is no information about its mode of reproduction; it is possible that this species is parthenogenetic, as are the bdelloid rotifers which are frequently found in the same habitat.



Figs 1-11. *Hypsibius antarcticus* (Richters), 1-10: 1- buccal apparatus, lateral view, 2-5: pharynx, dorsal, 6-8: pharynx with aberrant macroplacoids, dorsal, 9- claws on legs III, ventral, 10- fragment of egg, lateral; *Diphascoen sanae* (Dastyk et al.), 11- buccal apparatus, lateral (all DIC contrast).

Diphascon sanae Dastych, Ryan & Watkins, 1990 (Fig. 11)

Numerous (56) individuals and occasional eggs of this species, including some with embryos, were found in samples from Petrels Rest summit pool and the stream in the east gully. Until now the eggs of *D. sanae* had not been reported, they were present in these samples in groups of 5, 3, 3, and 1 egg in each exuvium. *D. sanae* was originally described from the Robertskollen nunataks, the *locus typicus* of this taxon (Dastych et al. 1990). Until now the taxon has not been recorded from limnic habitats; the Robertskollen type specimens being found in lichen samples from Ice Axe Peak. Recently the species has been reported as *D. chilense* Plate, 1888 from Dronning Maud Land (Sømme & Meier 1995) and has also been found in the East Antarctic: the Mawson Coast and the Prince Charles Mountains (Miller 1995, Miller & Heatwole 1995).

Diphascon pingue (Marcus, 1936)

Only one specimen of this taxonomically confusing species (here representing "form B" *sensu* Dastych 1984) was found in the sample from the pool on Peaceful Hill. The taxon belongs to the *pingue-chilense* complex, which includes at least three morphologically similar taxa, and is long overdue for thorough revision. *D. pingue*, listed either as a species-complex, as a single or two-form taxon, has been reported frequently from terrestrial habitats throughout Antarctica and the Sub-Antarctic (Dastych, *op. cit.*, 1989, Jennings 1976, Miller 1995, Miller et al. 1994, Ottesen & Meier 1990, Usher & Dastych 1987). In addition it is also known from freshwater habitats (lakes) in the Maritime Antarctic (e.g.: McInnes 1995a, b, McInnes & Ellis-Evans 1987). *D. pingue* is recognized as a worldwide distributed taxon.

The listed papers and present material confirm the occurrence of at least 11 tardigrade species in Dronning Maud Land. Four species were already known from nunataks in the Ahlmannryggen range, i.e. *Macrobiotus krynauwi* Dastych & Harris, 1995, *Minibiotus stuckenbergi* (Dastych et al., 1990), *Hebesuncus ryani* Dastych & Harris, 1994 and *Diphascon sanae* (see Ryan et al. 1989, Dastych et al. 1990, Dastych & Harris 1994, 1995, Steele et al. 1994). With two other taxa recorded in this paper and new for that area (*H. antarcticus*, *D. pingue*), their number increased to six. *Diphascon chilense* Plate, 1888 reported by Ryan et al. (1989) from the range and identified then by W. R. Miller and H. Heatwole, turned out to be a misidentified *D. sanae*.

Sohlenius et al. (1995, 1996) listed eight species from the Vestfjella and Heimefjella ranges, both located W of the Ahlmannryggen, and provided comprehensive discussion on their distribution and the species composition. The authors (*op. cit.*) reported *Echiniscus* cf. *pseudowendti* Dastych, 1984, *Macrobiotus* cf. *blocki* Dastych, 1984, *M. cf. furciger* Murray, 1907, *M. cf. hufelandi* Schultze, 1834, *H. antarcticus*, *Milnesium tardigradum* Doyère, 1840, *Hebesuncus* cf. *schusteri* Dastych, 1984 and *Diphascon chilense langhovdense* (Sudzuki, 1964). It is possible that the above mentioned *M. cf. blocki* and *He. cf. schusteri* actually represent *M. krynauwi* and *He. ryani*, respectively. This supposition, however, should be confirmed by the egg morphology; the eggs were not found in the above material. In the Mühlig-Hofmannfjella range located E of the Ahlmannryggen, a cold tolerance of tardigrades was studied by Sømme & Meier (1995), who reported *Echiniscus jenningsi* Dastych, 1984, *M. furciger* and *D. chilense*. The latter taxon, however, represents misidentified *D. sanae* and the specimens named *E. jenningsi* belong, in our opinion, to a very similar new species.

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Zusammenfassung

Es wird über das Vorkommen von drei Tardigradenarten, *Hypsibius antarcticus* (Richters), *Diphascon pingue* (Marcus) and *D. sanae* Dastych et al. in limnischen Habitaten der Ahlmannryggen-Nunataken (Antarktis: west Dronning Maud Land) berichtet. Gleichzeitig ist *H. antarcticus* in limnischen Proben von Mt. Erebus und der Ross Insel festgestellt worden; diese werden im Naturhistorischen Museum London aufbewahrt (Restsammlung von Murray). Ein Überblick der in der Region bekannten Bärtierchen wird präsentiert.

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