

ANTARCTIC TARDIGRADA

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Abstract: For studying the Antarctic tardigrades, a variety of 31 samples including mosses, lichens and algae were examined. These samples were supplied by the staff of the National Institute of Polar Research in Japan, having been collected mostly at several stations close to Japanese Syowa Station in Antarctica. Tardigrades sorted out were mounted in Gum-chloral for phase-contrast microscope observation.

Five species were found in 15 samples collected from 7 stations. *Hypsibius arcticus* was widely found in all of the samples from 5 stations (Ongul Island, Langhovde, Skarvsnes, Einstöingen and Rundvågshetta). The other 4 species were rarely found; *Macrobiotus harmsworthi* from Rundvågshetta and Einstöingen, *Diphascon chilensis* from Einstöingen and the Sør Rondane Mountains, *D. ongulensis* from Langhovde, and *Pseudechiniscus* sp. from Strandnibba. Of these tardigrades, *P.* sp. was reported from Antarctica probably for the first time.

1. Introduction

Since the early Antarctic expeditions, many kinds of tardigrades have been reported to live in Antarctica (RICHTERS, 1907, 1909; MURRAY, 1906, 1910; SUDZUKI and SHIMOIZUMI, 1967; JENNINGS, 1976a, b). According to MORIKAWA (1962), more than fifty species exist there. He also found a new species, *Hypsibius (Diphascon) ongulensis* from Ongul Island. SUDZUKI (1964) also reported a faunistic list of the Antarctic tardigrades and described a new subspecies, *Hypsibius mertoni simoizumii* from Langhovde.

This report attempts to classify the tardigrades from samples of moss, lichen and algae which were collected from several places near the Japanese Syowa Station.

2. Materials and Methods

Thirty-one samples were supplied by the staff of the National Institute of Polar Research, having been collected from several places around Syowa Station from 1975 through 1985.

The specimens collected by Y. OHYAMA has been already separated from algae or moss and were fixed in alcohol. On the other hand, the samples given by H. KANDA were frozen and/or dried mosses and lichens. The authors gathered tardigrades by macerating these samples. From the microscopic preparations of mosses given by S. OHTANI, the tardigrades were sorted out with a pipette. Most of these specimens were mounted in Gum-chloral for phase-contrast microscopic observation.

The species of tardigrades are indentified according to RAMAZZOTTI and MAUCCI monograph (1983).

3. Results

The seven stations where the samples were collected are shown in Fig. 1. The occurrence of each species is summarized in Table 1. The characteristics of each species are described as follows.

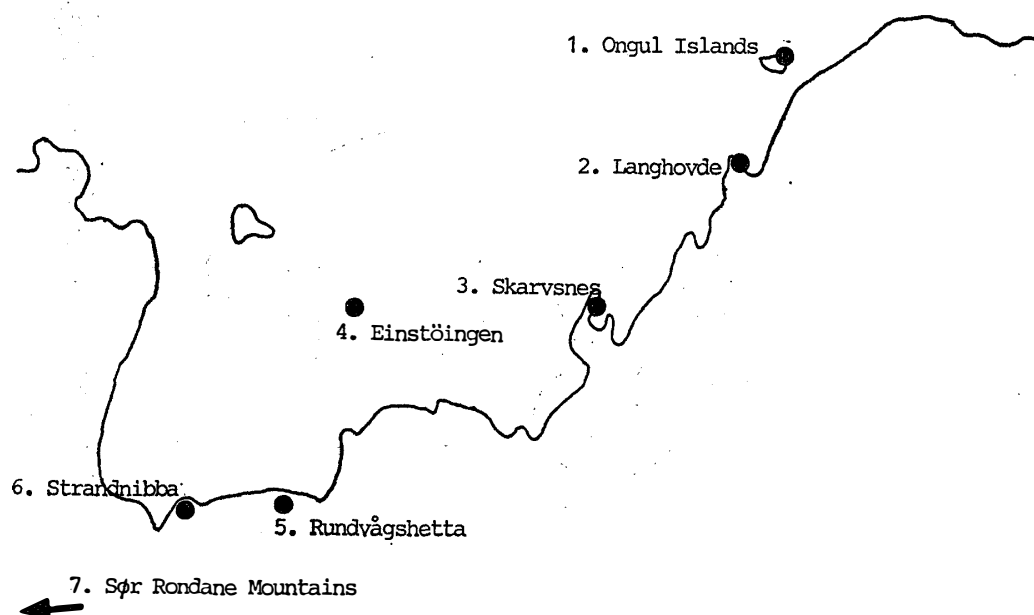


Fig. 1. Sampling stations.

Table 1. Distribution of tardigrades in the area close to Syowa Station.

Sampling stations	Samples	Collector*	<i>Macrobiotus harmsworthi</i>	<i>Hypsibius arcticus</i>	<i>Diphascon chilenensis</i>	<i>Diphascon ongulensis</i>	<i>Pseudechiniscus sp.</i>
1. Ongul Islands	sand	Y. O.		○**			
2. Langhovde	blue-green algae	Y. O.		○			
"	green algae	Y. O.		○		○	
"	moss	H. K.		○			
3. Skarvsnes	blue-green algae	Y. O.		○			
"	moss	Y. O.		○			
4. Einstöingen	moss	H. K.	○		○		
5. Rundvågshetta	moss	Y. O.	○	○			
6. Strandnibba	moss	S. O.					○
7. Sør Rondane Mt.	moss	H. K.			○		
"	lichen	H. K.			○		

* Collector's initials Y. O., H. K. and S. O. indicate Drs. Y. OHYAMA, H. KANDA and S. OHTANI respectively.

** ○ means the occurrence of the species.

Macrobiotus harmsworthi J. MURRAY, 1907.

(Fig. 2. a-e)

Body $490\text{ }\mu\text{m}$ ($450\text{--}560$) in length. Cuticle smooth and almost colorless. Eyespots present. Mouth tube wide ($6\text{ }\mu\text{m}$ to $450\text{ }\mu\text{m}$ specimens). Pharyngeal bulb oval. Apophysis at end of mouth tube. Macroplacoids rod-like, three in number; the third is longest. Microplacoids normally present.

Eggs laid separately. Internal diameter $70\text{ }\mu\text{m}$. Surface projection cone-like, $20\text{ }\mu\text{m}$ in height.

This species is cosmopolitan. The present specimens were found in the mosses taken from Rundvågshetta and Einstöingen.

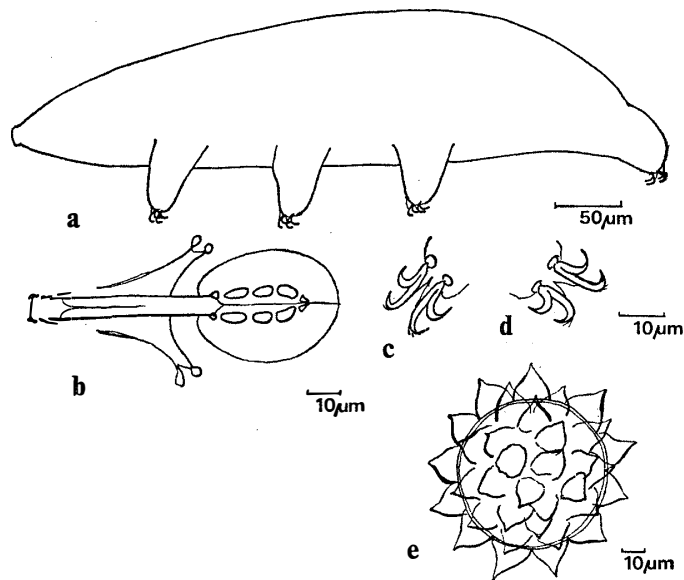


Fig. 2. *Macrobiotus harmsworthi*: a. Left lateral view; b. mouth apparatus; c. claws of I-III legs; d. claws of IV leg; e. egg.

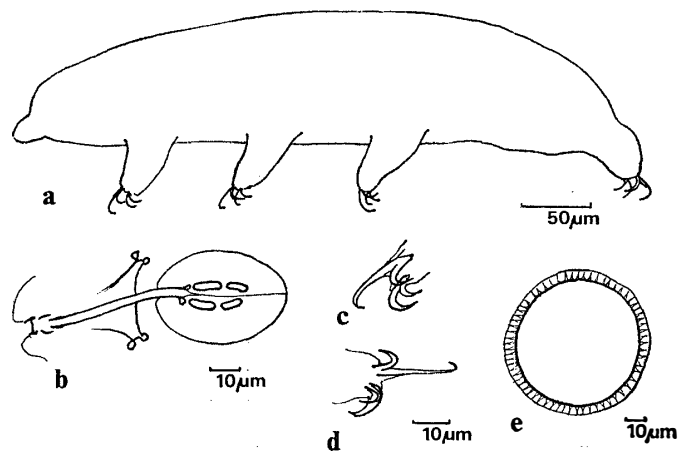


Fig. 3. *Hypsibius arcticus*: a. Left lateral view; b. mouth apparatus; c. claws of I-III legs; d. claws of IV leg; e. egg.

Hypsibius arcticus J. MURRAY, 1907

(Fig. 3. a-e)

Body $267\text{ }\mu\text{m}$ (226–321) in length. Cuticle smooth, colorless or brownish. Eyespots present. Mouth tube thin ($3\text{ }\mu\text{m}$ to $270\text{ }\mu\text{m}$ specimens). Pharyngeal bulb short oval ($34:28\text{ }\mu\text{m}$). Macroplacoids rod-like, two in number; the first one is longer than the second ($8\text{ }\mu\text{m}$; $6\text{ }\mu\text{m}$ to $280\text{ }\mu\text{m}$ specimens). Microplacoids absent. Double-claws comparatively large. Internal claws with branches of equal length. External claws with a long primary branch.

Eggs laid separately or in molted cuticle. Internal diameter $90\text{ }\mu\text{m}$. Surface projections slender, cone-like, embedded in hyaline layer.

This species is a cosmopolitan. The present specimens were found in a wide area close to Syowa Station; Ongul Islands, Langhovde, Skarvsnes, Rundvågshetta.

Diphascon chilensis PLATE, 1888.

(Fig. 4. a-d)

Body $220\text{ }\mu\text{m}$ (158–250) in length. Cuticle smooth. Eyespots absent. Mouth opening subterminal of head. Mouth tube $1\text{ }\mu\text{m}$ in diameter, $21\text{ }\mu\text{m}$ in length, straight. Pharyngeal tube $1\text{ }\mu\text{m}$ in diameter, $62\text{ }\mu\text{m}$ in length, curved. Pharyngeal bulb short oval ($23:21\text{ }\mu\text{m}$ to $250\text{ }\mu\text{m}$ specimens). Macroplacoids granular, three in number, all of which are almost equal in length ($1.5\text{ }\mu\text{m}$). Microplacoids present, septulum absent.

The present specimens were found in Einstöingen and the Sør Rondane Mountains.

Diphascon ongulensis MORIKAWA, 1962.

(Fig. 5. a-d)

Body $180\text{ }\mu\text{m}$ (164–204) in length. Cuticle smooth and colorless. Mouth opening subterminal of head. Eyespots absent. Mouth tube $1\text{ }\mu\text{m}$ in diameter, $18\text{ }\mu\text{m}$ in length, straight. Pharyngeal tube $1\text{ }\mu\text{m}$ in diameter, $30\text{ }\mu\text{m}$ in length, curved. Pharyngeal bulb oval ($26:18\text{ }\mu\text{m}$ to $204\text{ }\mu\text{m}$ specimens). Macroplacoids three small rods increasing in length from first to third ($2\text{ }\mu\text{m}$, $2.6\text{ }\mu\text{m}$, $4\text{ }\mu\text{m}$). Microplacoids and septulum present. Anterior and posterior claws of the same thickness. Primary and secondary branches differing slightly.

The present specimens was found in the green algae from a stream in Langhovde.

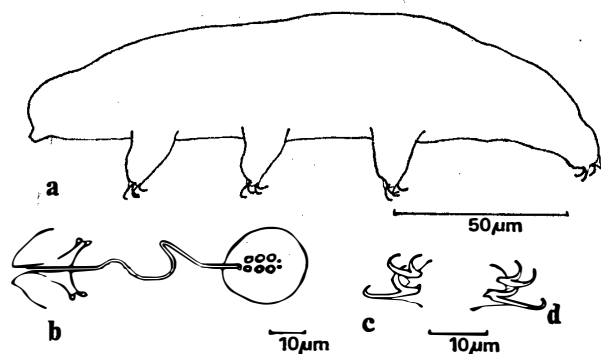


Fig. 4. *Diphascon chilensis*: a. Left lateral view; b. mouth apparatus; c. claws of I-III legs; d. claws of IV leg.

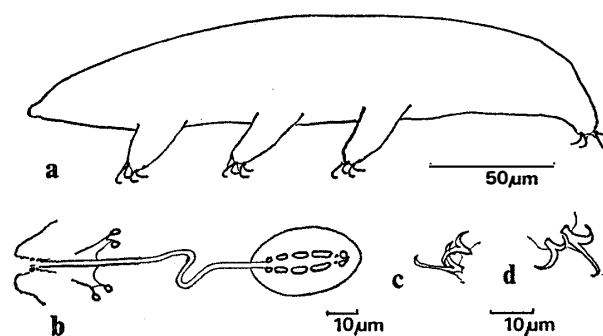


Fig. 5. *Diphascon ongulensis*: a. Left lateral view; b. mouth apparatus; c. claws of I-III legs; d. claws of IV leg.

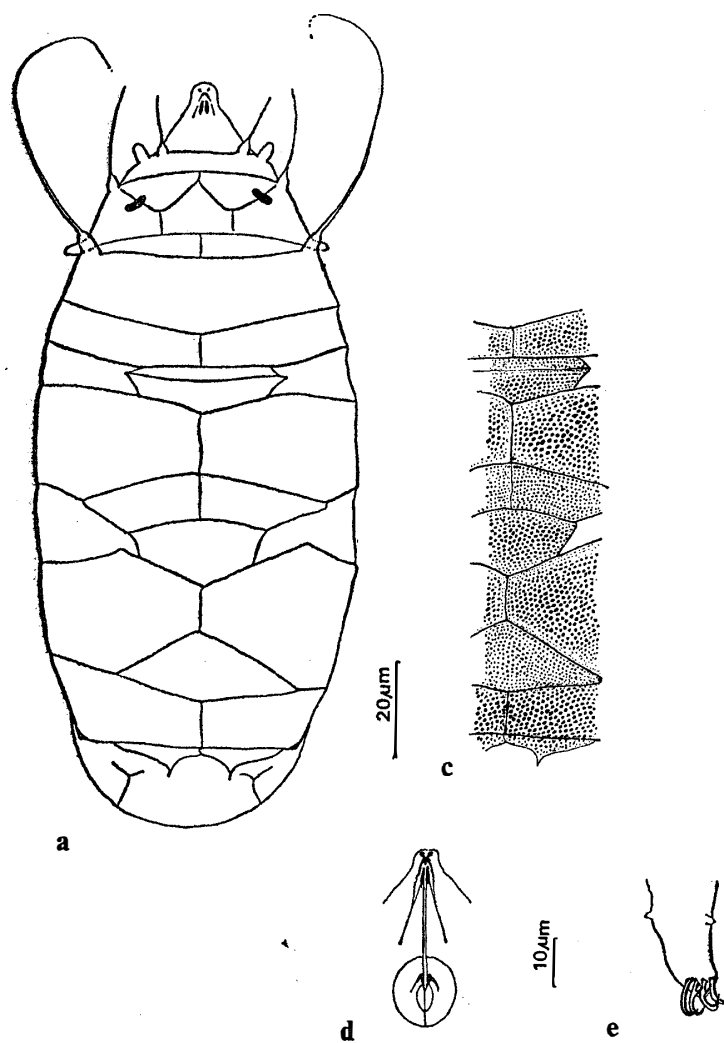


Fig. 6. *Pseudechiniscus* sp.: a. Dorsal view except legs; b. sculpture on dorsal plates (median area); c. mouth apparatus; d. fourth leg and its claws.

Pseudechiniscus sp.

(Fig. 6. a-f)

Body $150\text{ }\mu\text{m}$ ($140\text{--}160$) in length. Body color unknown. Eyespots dark brown. Surface sculpture irregularly arranged, fine dots seen under the phase-contrast microscope, but small granules seen through the Nomarsky method. Cuticular plates apparent. All of the scapular, first, second and third plates paired by dividing median lines. Third plates with a pair of triangular processes on its posterior margin. First and second median plates divided transversely into two parts, third one not. Terminal plate with notches.

Cirri A long ($62\text{ }\mu\text{m}$ to $160\text{ }\mu\text{m}$ specimens). Internal and external peribuccal cirri present. Lateral and dorsal accessories behind cirri A absent. Indented collar on fourth pair of legs absent. Papilla present outside of fourth leg. Internal claws ($10\text{ }\mu\text{m}$) with a spur curved toward base. Eggs laid in molted cuticle. Egg size $16\text{--}24\text{ }\mu\text{m}$ in diameter.

The present specimens was found in the preparations of mosses from Strandnibba.

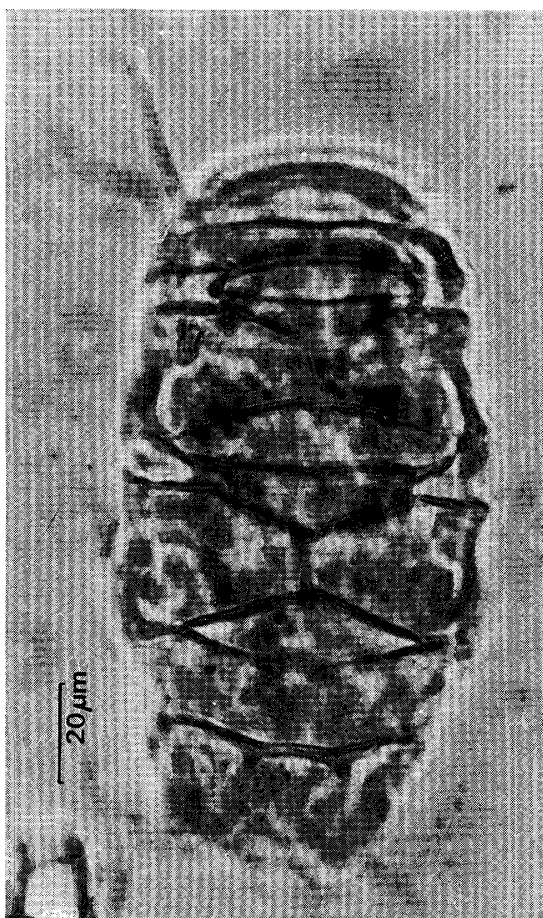
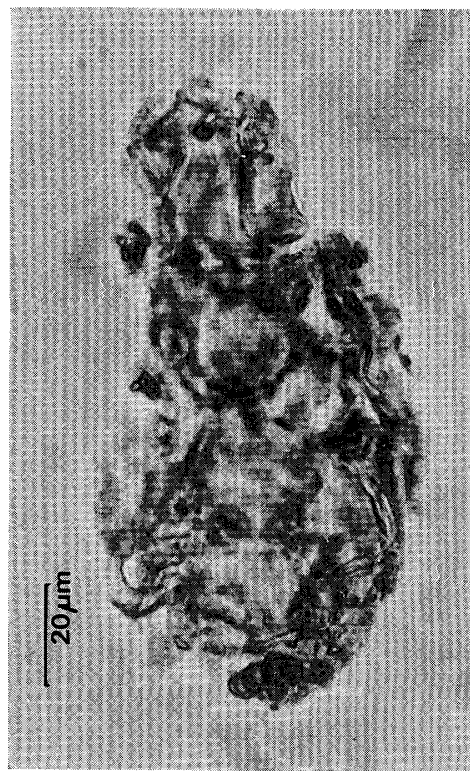
**b****f**

Fig. 6. *Pseudechiniscus* sp.: b, dorsal view through phase-contrast microscope; f, eggs laid in molted skin.

4. Discussion

Although not much were known about the sampling sites, five species were found out of fifteen samples collected from seven stations. Three out of five species are widely distributed, having been found in other countries or areas.

Diphascon ongulensis was reported as a new species by MORIKAWA (1962). Those specimens were collected by Y. NAKANO from a pond of East Ongul Island near the Japanese Syowa Station. The present specimens were collected from green algae by Y. OHYAMA from a stream in Langhovde about 25 km south of Syowa Station. It is also conceivable that *D. ongulensis* may be found not only on Ongul Island but also in the areas around the Island.

Pseudechiniscus sp. has two distinct characteristics in comparison with other species of this genus. One remarkable characteristic is that the scapular plate is divided into two parts by a median line, and the other one is the length of cirri A which is very long (about 40% of body length), as compared to a common species of this genus (10–15% of body length). In general, various species of the same genus lay eggs in their molted skin, in different ways. Therefore, the eggs found in the molted skin which retained the characteristics of *Pseudechiniscus* sp. seem to have been laid by this species. However, it is at present impossible to determine whether or not this species is a new endemic species, without comparing it with a living specimens of other species of this genus.

The authors also ascertained that *Diphascon chilensis* is able to survive under severe conditions. During the research period, the samples from the Sør Rondane Mountains in 1984 by H. KANDA were kept frozen for several years. After that the samples were taken out of the freezer to thaw for one month in the author's laboratory. The samples were reexamined and the tardigrades were found to be alive. *D. chilensis* as well as many other species of tardigrades may be possible to resist severe coldness and desiccation as long as they are kept in moss or lichen.

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