

# ENTOMOLOGISCHE MITTEILUNGEN aus dem Zoologischen Museum Hamburg

Herausgeber: Professor Dr. HANS STRÜMPFEL, Dr. GISELA RACK,  
Professor Dr. RUDOLF ABRAHAM, Professor Dr. WALTER RÜHM

Schriftleitung: Dr. GISELA RACK

ISSN 0044-5223

Hamburg

9. Band

30. November 1989

Nr. 136/137

## An annotated list of Tardigrada from the Antarctic Hieronim Dastych

(With 2 figures)

### A b s t r a c t

Eight tardigrade taxa from six genera (*Echiniscus*, *Pseudechiniscus*, *Macrobiotus*, *Hypsibius*, *Diphascon* and *Milnesium*) were found in mosses and lichens collected in the Antarctic, from around Faraday and Casey Stations. Seven of the taxa were already known from this region, and one taxon, a representative of the super-species *Macrobiotus hufelandi*, was previously reported from sub-Antarctic islands. Remarks on taxonomy and distribution of the recorded taxa are presented.

Keywords: Tardigrada, Antarctica, check-list.

### I n t r o d u c t i o n

Recent years are characterised by growing interest in tardigrades inhabiting Antarctic terrestrial and freshwater ecosystems (Jennings 1975, 1976a, 1976b, 1979; Heywood 1977; Sudzuki 1979; Everitt 1981; Dastych 1984; McInnes & Ellis-Evans 1987; Usher & Dastych 1987; Gardiner & Pidgeon 1987; Miller et al. 1988). However, our knowledge about their taxonomy and distribution in this region is still very inadequate, and is particularly poor with relation to East Antarctica. This present paper reports on material collected from East and West Antarctica, and brings some new data to that question.

### M a t e r i a l s a n d M e t h o d s

Through the courtesy of members of the West German Antarctic Expeditions, I have received several moss samples, which contained 195 specimens of tardigrades, belonging to eight taxa. The mosses were collected from two localities:

1. The Antarctic Peninsula, in the area of the British Faraday Station (65° 12,9'S: 64° 06,9'W). Mosses and lichens from stones in vicinity of the station. Collected by G. Hartmann; 27 and 28 November, 1987 (7 samples).

2. East Antarctic, Wilkes Land. The Clark Peninsula, Whitney Point: area of the Australian Casey Station, near abandoned Wilkes Station (66° 17'S: 110° 32'E). Collected by L. Kappen, 16 and 30 December, 1986. Mosses from gneissic rocks (mostly *Schistidium antarcticum*) and from granite rock (*Grimmia antarctici*) at Bailey Peninsula, about 1 km W of Casey Station (3 samples).

Tardigrades were extracted by the method described in Dastych (1985). Observations and measurements (phase and interference contrast) were carried out on specimens mounted in Faure's medium. Data on the general distribution of the species described, was taken from Ramazzotti and Maucci (1983), unless otherwise stated. All specimens are deposited in the Zoological Institute and Zoological Museum, in the University of Hamburg.

### Species list

#### *Echiniscus jenningsi* Dastych, 1984

1 specimen (♂): Faraday Station.

The body is 210 µm long. The length of appendage A is 237 µm long, and its width at its base, above cirrophore, is 2.7 µm. Papilla cephalica is 6 µm long, and the length of cirri interni 13 µm, and cirri externi 30 µm long. The length of claws on IV pair of legs is 17.5 µm. The gonopore oval, measures 5.1 x 3.5 µm.

The species is only recorded from the maritime Antarctic, ie. the Antarctic Peninsula and its offshore islands (Jennings 1976a, 1976b (as *E. capillatus*); Dastych 1984; McInnes & Ellis-Evans 1987; Usher & Dastych 1987). The presence of males in this species, as well as in the whole genus *Echiniscus*, previously considered a purely parthenogenetic taxon, is discussed in Dastych (1987).

#### *Pseudechiniscus suillus* (Ehrenberg, 1853)

8 specimens (3 ♀, 3 juv., 2 undet.): Casey Station.

The body is 116-182 µm long. Granules on the dorsal surface (short pillars in the cuticle) were up to 1 µm in diameter. In most cases individual granules were connected with very delicate striae, forming characteristic net-like pattern. However, specimens from the same sample showed some variation, and one was found without the striae, and in another this pattern was restricted to the head plate. The head and terminal plates were very poorly faceted. The posterior edge of the pseudosegmental plate, was found in two specimens to have poorly formed roundish folds, and in other specimens the edge was straight. The ventral side was covered with very small granulation (0.3-0.5 µm), arranged in regular bands, and forming a net with irregularly shaped mesh, as described in Dastych (1984). There are no spines on the first pair of legs, though papillae are present on the fourth pair. Internal claws have a thin, sharp and strongly downwards bent spine. Claws of the IV leg are 9 µm long in the largest specimen.

The striation connecting dorsal granules has been personally noted in specimens of *P. suillus* from Tanzania, South Africa and Marion Island (unpublished data). The taxonomic value of this distinctive characteristic is unknown. *P. suillus* is characterised by great individual variability, and this is, among the other things, is one reason for the extreme taxonomic confusion prevailing in the *P. suillus*-complex. This group is in urgently need of a thorough revision. *P. suillus* is considered cosmopolitan, and has been reported from Antarctica by Murray (1910: "Graham Land and islands", as *E. arctomys*; see pages 103 and 126) and recently from the South Shetland Islands and Enderby Land (Dastych 1984).

*Macrobiotus cf. hufelandi* Schultze, 1833

33 specimens, 8 embrionated eggs: Farady Station.

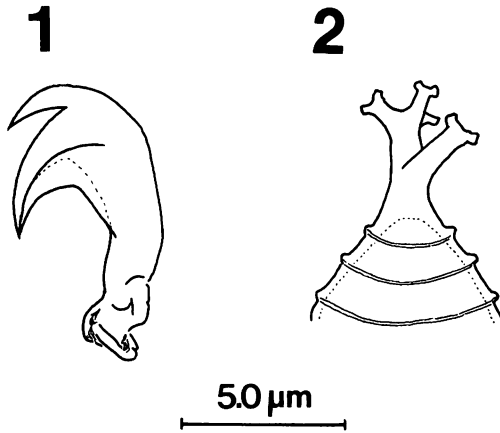
Length of the body 170-473  $\mu\text{m}$ . The armature of buccal cavity as described in Pilato (1972), buccal apparatus as depicted in Dastych (1984). The claws are relatively small, more "V" than "Y" shaped, with large accessory spines on the primary branches (Fig. 1). Diameter of the eggs with processes is up to 88  $\mu\text{m}$ , up to 74  $\mu\text{m}$  without. The processes are 5  $\mu\text{m}$  high, the bases 3.5 to 4.0  $\mu\text{m}$  in diameter. The edge of the apical disc has 10-11 small teeth. There are 25-28 processes around the circumference of an egg. Between the processes, the surface of the egg is covered by a delicate net, composed of mesh up to 1  $\mu\text{m}$  in diameter, but more usually about 0.8  $\mu\text{m}$ . The specimens, and eggs, are almost identical to those found in South Georgia (Dastych 1984).

Recent karyological studies of *M. hufelandi* from Italy (Bertolani 1982) revealed the presence of at least three sibling species within this super-taxon. A tentative description of these species, by Bertolani, with only very general remarks on their identification, does not help the discussion of the specimens referred to in this paper as *M. cf. hufelandi*. *M. hufelandi* is generally considered a cosmopolitan species, and has already been reported from the sub-Antarctic islands of Kerguelen, St. Paul, and South Georgia (Richters 1908a, and Dastych 1984). This report of *M. hufelandi* from the Antarctic Peninsula, represents the southernmost record of this super-species.

*Macrobiotus furciger* Murray, 1907

33 specimens, 5 eggs. Farady Station.

The body is 296-732  $\mu\text{m}$  long. The legs, particularly the IV pair, are covered with very tiny, and usually regular granules. The granules, up to 0.3  $\mu\text{m}$  in diameter, are sometimes poorly formed, or grouped in irregularly shaped bands or "plates". Other characters are described in Dastych (1984). The eggs are large, up to 102  $\mu\text{m}$  in diameter including processes, up to 89  $\mu\text{m}$  without. The processes are 7-8  $\mu\text{m}$  high and 6-7  $\mu\text{m}$  in diameter at the bases. They are smooth, and without pores. The shape and form of the processes and egg surface are illustrated in Dastych (1984: Fig. 8a, Phot. 10). Two aberrant eggs were found, in this study, with 2-4 transverse thickenings around the processes (Fig. 2).



Figs. 1-2: *Macrobiotus* cf. *hufelandi* Schultze, 1833: 1- claw of the fourth pair of legs; *Macrobiotus furciger* Murray, 1907: 2- aberrant process of egg.

*M. furciger* is characterised by remarkable individual variability (l. c.) and has been recorded from many localities in the Northern and Southern Hemisphere. In the Antarctic Region it has been reported from the South Orkney Islands, the South Shetland Islands and the Antarctic Peninsula (Murray 1906; Richters 1908b: in both cases as *M. furcatus*; Jennings 1976a, 1976b; Heywood 1977; Dastyh 1984; McInnes & Ellis-Evans 1987; Usher & Dastyh 1987). Similar species or this taxon, named "*M. furciger*?" has been recorded from the Vestfold Hills in East Antarctica (Miller et al. 1988).

*Hypsibius arcticus* (Murray, 1907)

38 specimens, 3 embrionate eggs: Casey Station.

The body is 125-330  $\mu\text{m}$  long. Specimens and eggs, found in this study, agree with the description of those found in South Shetland Islands (Dastyh 1984).

*Hypsibius arcticus* is one of the most common, and most often recorded tardigrades in the Antarctic (Murray 1910; Morikawa 1962; Dougherty & Harris 1963; Dougherty 1964; Everitt 1981; Dastyh 1984; McInnes & Ellis-Evans 1987; Usher & Dastyh 1987). It presumably has continous distribution, in non-glaciated areas, around the whole Antarctic region. The species is also considered a cosmopolitan taxon. However, recent unpublished personal observations, based on re-discovered type-material of *Hypsibius antarcticus* (Richters, 1904) indicate that all records of *H. arcticus* in Antarctica, are in fact the records of *Hypsibius antarcticus* (Richters), previously insufficiently described to modern standards. The redescription of the latter taxon and the assessment of taxonomic status of *H. arcticus*, is currently in progress.

*Diphyscon chilense langhovdense* (Sudzuki, 1964)

17 specimens: Casey Station.

Length of the body 98-176  $\mu\text{m}$ . This sub-species is characterised by a long and very thin (up to 0.8  $\mu\text{m}$ ) tube, a relatively small roundish pharynx, with three rounded macroplacoids and small microplacoid (Dastyh 1984).

*D. chilense langhovdense* is known from both Continental and Maritime Antarctic (Sudzuki 1964; Jennings 1976a, 1976b; Dastyh 1984) and as *D. alpinum* (Murray) has been listed from New Zealand (Horning et al. 1978: see Dastyh 1984). It is considered the common opinion about the cosmopolitan nature of *D. chilense* (Plate 1888), as well as the species itself should be revised. Presumably *D. chilense langhovdense* is a synonym of the former taxon. Unfortunately the type-material of *D. chilense* can not be traced, and recently the type-specimens of *D. chilense langhovdense* have also been lost (Dr. Sudzuki in litt. 1988).

*Diphascoen pingue* (Marcus, 1936)

64 specimens: Faraday Station.

The body is 182-324  $\mu\text{m}$  long. All specimens belong to the morphotype described by Dastych (1984) as "variety A", to distinguish it from the other very similar population ("variety B"), with which is sympatric on the South Shetland Islands. The morphotype "B" also occurs on South Georgia. If these two morphometrically well separated populations (l. c.) belong to two different species, then the "variety B" represents a new taxon. The morphotype "A" was recently re-discovered in the maritime Antarctic (Usher & Dastych 1987), and is very similar to "typical" *D. pingue*, originally described by Marcus (1936) and later re-described by Argue (1972). This taxon is partly conspecific with *D. alpinum* (Murray, 1906), and both these, and related species, are a source of great confusion in the literature. For the sake of taxonomic stability Pilato & Binda (1976) proposed to abandon the name *D. alpinum* (see comment in Dastych 1984).

Jennings (1976a, 1976b) recorded *D. pingue* (as a mixed taxon of *D. pingue* and *D. alpinum*) from South Georgia, the maritime Antarctic and the Antarctic Peninsula and offshore islands. Heywood (1977) reported *D. pingue* from Alexander Island, and McInnes & Ellis-Evans (1987) again found this species-complex, in the Signy Island lakes, identifying it as *D. pingue/chilenense*. Both *D. pingue* and *D. alpinum* are known as cosmopolitan taxa and the latter has already been reported from the Antarctic (Richters 1908b; Murray 1906, 1910; Dougherty & Harris 1963).

*Milnesium tardigradum* Doyère, 1840

1 specimen (♀): Faraday Station.

The body is 850  $\mu\text{m}$  long. All secondary claw bases are triple branched. This cosmopolitan species is already known from the maritime and continental Antarctic (Richters 1908a, 1908b, 1908c; Murray 1910; Sudzuki 1964; Jennings 1976a, 1976b; Heywood 1977; Dastych 1984; McInnes & Ellis-Evans 1987; Usher & Dastych 1987).

## D I S C U S S I O N

Tardigrades from the areas studied in this paper were relatively unknown. Jennings (1976b) made limited notes about the tardigrades from the locality of Faraday Station, and Thomas (1965) reported an unidentified species, of the genus *Macrobiotus*, in the region of Clark Peninsula. In the area of Casey Station, three species (*Pseudechiniscus sullus*, *Hypsibius arcticus* and *Diphascoen chilense langhovdense*) occurred in the mosses collected from both gneissic and granite rocks. Seven of the eight species in the above list have already been found in the Antarctic Region. One taxon, a representative of the super-species *Macrobiotus hufelandi* was hitherto only reported from sub-Antarctic islands, and was unknown from continental Antarctica. Four taxa (*P. sullus*, *H. arcticus*, *D. chilense langhovdense* and *Mil. tardigradum*) are widely distributed in Antarctica and are recognised as cosmopolitan species. However, *Mil. tardigradum* is the only species, in this group, that does not at present raise serious doubts about

its taxonomic status.

Tardigrades are commonly present in the Antarctic terrestrial and freshwater habitats, and were found in five of the ten samples in this study. All three samples from Casey Station yielded tardigrades (3 taxa, as listed above), a rather different result from the report by Miller et al. (1988), who studied tardigrades from the Vestfold Hill (68° 35'S, 78° 00'), also located in Eastern Antarctica. The authors (l. c.) found four tardigrade species (*H. allisoni*, *D. puniceum*?, *M. furciger*?, *P. novaezealandiae*) in only 25 % of the 491 samples examined. It is interesting to note that no taxon, from the Miller et al. (1988) survey, was found at Casey Station, and the spectrum of their species list indicates a closer relationship to the fauna of New Zealand (Horning et al. 1978), than to the tardigrade fauna of other sites in East Antarctica. It is also curious that the above authors did not recover one of the most common Antarctic tardigrades *H. arcticus* from this study of the Vestfold Hills, although it constitutes a significant element of freshwater fauna (Everitt 1981) in this area, and is known to occur in mosses.

These comments reflect our limited knowledge about tardigrades of the Antarctic region, and in particularly the area of East Antarctica, and indicates the need for more detailed studies of the ecology and taxonomy of these animals in the Antarctic Region.

#### A c k n o w l e d g e m e n t s

I wish to thank Prof. Dr. G. Hartmann (Hamburg) and Prof. Dr. L. Kappen (Kiel) who collected the material and Dr. G. Rack and Prof. Dr. H. Strümpel for kind provision of laboratory space, and facilities at the Zoological Institute and Zoological Museum, in the University of Hamburg. I should also like to thank Miss Sandra McInnes (British Antarctic Survey, Cambridge) for corrections to the English manuscript.

#### Z u s a m m e n f a s s u n g

Acht Tardigraden-Taxa aus sechs Gattungen (*Echiniscus*, *Pseudechiniscus*, *Macrobiotus*, *Hypsibius*, *Diphyscon* und *Milnesium*) wurden in Moosen und Flechten in der Umgebung der Faraday Station und Casey Station (Antarktis) gefunden. Sieben dieser Taxa waren bereits aus der Antarktis bekannt, ein Vertreter der Superspezies *Macrobiotus hufelandi* bisher nur von den subantarktischen Inseln. Weiterhin werden Angaben zur Taxonomie und Verbreitung dieser Taxa gemacht.

#### R e f e r e n c e s

- Argue, C. W., 1972: Tardigrades from New Brunswick, Canada. 2. - Can. J. Zool., 50: 87-94. Ottawa.
- Bertolani, R., 1982: Cytology and reproductive mechanisms in tardigrades. - In: D. R. Nelson (ed.), Proc. Third Int. Symp. Tardigrada, East Tennessee State Univ. Press, pp. 93-114. Johnson City.

- Dastyh, H., 1984: The Tardigrada from Antarctic with description of several new species. - Acta zool. cracov., **27**: 377-436. Kraków.
- Dastyh, H., 1985: West Spitsbergen Tardigrada. - Acta zool. cracov., **28**: 169-214. Kraków.
- Dastyh, H., 1987: Two new species of Tardigrada from the Canadian Subarctic with some notes on sexual dimorphism in the family Echiniscidae. - Entomol. Mitt. zool. Mus. Hamburg, **8**: 319-334. Hamburg.
- Dougherty, C. E., 1964: Cultivation and nutrition of micrometazoa. II. An Antarctic strain of the tardigrade *Hypsibius arcticus* (Murray, 1907) Marcus, 1928. - Trans. Amer. Microsc. Soc., **83**: 7-11. Menasha.
- Dougherty, C. E. & Harris, L. G., 1963: Antarctic Micrometazoa: Fresh-Water Species in the McMurdo Sound Area. - Science, **140**: 497-498.
- Everitt, D. A., 1981: An ecological study of an Antarctic freshwater pool with particular reference to Tardigrada and Rotifera. - Hydrobiologia, **83**: 225-237. Hague.
- Gardiner, G. R. & Pidgeon, R. W. J., 1987: Structure and function of terrestrial Antarctic communities with special reference to Tardigrada. - 1986-87 Australian Antarctic Research Program (Antarctic Division, Kingston, Tasmania), 78-80.
- Heywood, R. B., 1977: A limnological Survey of the Ablation Point area, Alexander Island, Antarctica. - Phil. Trans. r. Soc., **279**: 34-54. London.
- Horning, D., Schuster, R. O., Grigarick, A., 1978: Tardigrada of New Zealand. - New Zealand J. Zool., **5**: 185-280.
- Jennings, P., 1975: The Signy Island terrestrial reference sites: V. Oxygen uptake of *Macrobiotus furciger* J. Murray (Tardigrada). - Brit. Antarct. Surv. Bull., **41** and **42**: 161-168. Cambridge.
- Jennings, P., 1976a: The Tardigrada of Signy Island, South Orkney Islands, with note on the Rotifera. - *ibid.*, **44**: 1-25.
- Jennings, P., 1976b: Tardigrada from the Antarctic Peninsula and Scotia Ridge Region. - *ibid.*, **44**: 77-95.
- Jennings, P., 1979: The Signy Island terrestrial reference sites: X. Population dynamics of Tardigrada and Rotifera. - *ibid.*, **47**: 89-105.
- Marcus, E., 1936: Tardigrada. - Das Tierreich, **66**: 1-340. Berlin-Leipzig.
- McInnes, S. J. & Ellis-Evans, J. C., 1987: Tardigrades from maritime Antarctic lakes. - In: R. Bertolani (ed.), Biology of Tardigrades. Selected Symposia and Monographs, U. Z. I., **1**: 111-123. Modena.
- Miller, J. D., Horne, P., Heatwole H., Miller, W. R., Bridges, L., 1988: A survey of the terrestrial Tardigrada of the Vestfold Hills, Antarctica. - (Ferris J. M., Burston H. R., Johnstone G. W., Bayly I. A. E., eds.), 197-208. Dodrecht.



- Morikawa, K., 1962: Notes on some Tardigrada from the Antarctic Region. - In: Biological Results of the Japanese Antarctic Research Expedition, **17**: 1-7. Hukusima.
- Murray, J., 1906: Scottish National Antarctic Expedition: Tardigrada of the South Orkneys. - Trans. R. Soc. Edinburgh, **45**: 323-334. Edinburgh.
- Murray, J., 1910: Tardigrada. - In: J. Murray (ed.), British Antarctic Expedition 1907-09. Reports on the scientific investigations., **1**: 83-185. London.
- Pilato, G. & Binda, M. G., 1977: Precisazioni e rettifiche alla descrizione di alcune specie di Tardigradi (seconda nota). - *Animalia*, **4**: 35-51. Catania.
- Pilato, G., 1972: Structure, Intraspecific Variability and Systematic Value of the Buccal Armature of Eutardigrades. - *Z. f. zool. System. u. Evolutionsf.*, **10**: 65-78. Hamburg.
- Ramazzotti, G. & Maucci, W., 1983: Il phylum Tardigrada. - *Mem. Ist. Ital. Idrobiol.*, **41**: 1-1012. Pallanza.
- Richters, F., 1908a: Die Fauna der Moosrasen des Gaussbergs und einiger südlicher Inseln. - *Deut. Südp. Exped.*, **9**: 259-302. Berlin.
- Richters, F., 1908b: Moosbewohner. - *Wiss. Ergebn. Schwed. Südp.-Exped.*, **6**: 1-16. Stockholm.
- Richters, F., 1908c: Antarktische Tardigraden. - *Zool. Anz.*, **31**: 915-916. Leipzig.
- Sudzuki, M., 1964: On the microfauna of the Antarctic Region. I. Moss-water community at Langhovde. - *JARE sci. Rep., ser. E.*, **19**: 1-41. Tokyo.
- Sudzuki, M., 1979: On the microfauna of the Antarctic region. III. Microbiota of the terrestrial interstices. - *Natn. Inst. Polar Res. Memoirs., Spec. Iss.*: 104-126.
- Thomas, C. W., 1965: On population in antarctic meltwater pools. - *Pacif. Sci.*, **19**: 515-521.
- Usher, M. B. & Dastych, H., 1987: Tardigrada from the maritime Antarctic. - *Brit. Antarct. Surv. Bull.*, **77**: 163-166. Cambridge.

Anschrift des Verfassers:

Dr. Hieronim Dastych, Oppelner Str. 30, D-2000 Hamburg 70.