Published on paper: 1991. Published online: 2024-10-19.
ISSN 1502-4873 (paper). ISSN 1891-5396 (electronic).
doi: https://doi.org/10.5324/fn.v12i0.6057.

Contribution to the fresh water Tardigrada from Barentsøya, Svalbard (78°30'N)

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Van Rompu, E. A. & De Smet, W. H., 1991. Contribution to the fresh water Tardigrada from Barentsøya, Svalbard (78°30'N). *Fauna norv. Ser. A 12:* 29—39.

Fifteen species and one subspecies of Tardigrada were found in the littoral zone of 18 fresh water bodies on the Talaveraflya. All taxa are new records for Barentsøya; *Hypsibius antarcticus* and *Macrobiotus dianeae* were not previously reported from Svalbard. A faunal survey (comprising 30 taxa) for all high arctic water bodies studied to date is given. The most frequently and numerously encountered fresh water species are *Isohypsibius granulifer* and *Hypsibius dujardini,* and to a lesser extent *Isohypsibius papillifer, I. papillifer bulbosus* and *Macrobiotus dianeae.*

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1. INTRODUCTION

The tardigrade fauna of Barentsøya (78°, 30'N, 76°, 21' E) has not been studied so far. In 1898 Richard reported *Macrobiotus macronyx* from Storfjorden. As stated by Ramazzotti & Maucci (1983) the latter is probably not a good species but merely an assemblage of *Dactylobiotus ambiguus* (Murr.) and *D. dispar* (Murr.).

In 1985 one of us (W.D.S.) had the opportunity to collect a small number of samples from submerged mosses in the Talaveraflya, on the occasion of a biological expedition of Antwerpen University to Svalbard. The results of the analyses are presented here.

2. MATERIALS AND METHODS

Eighteen fresh water bodies on the Talavera foreland in the southwestern part of the island were sampled. Plankton samples were collected with a plankton net with meshes of 40 μm width, by a horizontal haul from the shore. Permanently submerged mosses from the littoral zone were squeezed by hand. Fixation of the material was carried out with formalin up to a final concentration of 4%. The surface of the water bodies varied from 3 m^2 to 23.7 ha; their depth ranged from 5 to 50+ cm. All waters were fairly alkaline (pH generally >8) and oligo- to β-meso-ionic. Total hardness varied from very soft to very hard. More details about the sampling localities and physico-chemical analyses of the waters are to be found in De Smet (1992).

3. ANNOTATED SPECIES LIST

The species found are listed in Table 1, which shows their occurrence in the different water bodies. The nomenclature follows Ramazzotti & Maucci (1983) with minor modifications. General zoogeographical remarks were mainly taken from Ramazzotti & Maucci (1983) and Dastych (1988).

Some species were encountered in the plankton samples at low densities, varying from 1 to 4 specimens 100.1^{-1}. These were: *Amphibolus weglarskae* (loc. 49), *Diphascon conjugens* (loc.59), *D. pingue* (loc. 57), *D. scoticum* (loc. 42), *Hypsibius convergens* (loc. 57, 58), *H. dujardini* (loc. 42, 46, 49, 54, 55, 59), *Isohypsibius granulifer* (loc. 43, 52, 58), *Macrobiotus dianeae* (loc. 46, 49, 59) and *Echiniscus spitsbergensis* (loc. 55).

4. COMMENTS ON SPECIES

Amphibolus weglarskae (Dastych, 1972) Fig. 14a—c

Robust animals with brownish pigmentation. Large mouth cavity, surrounded by approximately 16 lamellae. Pharyngeal tube wide and straight. Oval bulbus with strong

Table 1 : Annotated species list

Locality	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	Freq.	N ind.
Echiniscidae																				
Echiniscus spitsbergensis	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1
Pseudechiniscus suillus	-	-	-	1	-	-	-	-	4	-	-	-	-	-	-	-	-	-	2	5
Macrobiotidae																				
Dactylobiotus dispar	2	-	2	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	4	7
Macrobiotus dianeae	-	1	12	-	4	-	-	24	-	17	15	-	14	-	2	-	-	3	9	92
M. echinogenitus	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1
Amphibolidae																				
Amphibolus weglarskae	-	-	-	-	4	-	-	2	-	-	-	-	-	3	1	-	-	-	4	10
Hypsibiidae																				
Diphascon conjugens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2
D. pingue	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	2
D. scoticum	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
D. stappersi	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Hypsibius antarcticus	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
H. convergens	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	-	1	3	6
H. dujardini	6	5	43	19	2	1	1	10	15	24	78	1	16	7	27	2	5	3	18	265
Isohypsibius granulifer	15	3	26	71	19	8	4	2	17	4	5	6	5	12	15	4	3	1	18	220
I. papillifer	1	2	5	-	-	-	-	-	-	-	-	5	-	1	1	-	-	-	6	15
I. papillifer bulbosus	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	2

Freq. = frequency of occurrence ; N ind. = number of individuals

apophyses and three macroplacoids; no microplacoids. The first two macroplacoids close together; the third with a flat dilatation at its end. Doubleclaws with crenated lunulae; this feature is most distinct in the lunula of the exterior claw of the IV pair of legs. Cold-stenothermic and hygrophilous. Distribution insufficiently known (Tatra Mountains in Poland, Italy, Norway, Greenland, Svalbard, Devon Island). Probably an arctic boreo-alpine element.

Dimensions: body le 336—671 μm; bulbus (specimen of 568 μm) le 79 μm, diam 64 μm; pharyngeal tube (specimen of 568 μm) le 81 μm, diam 18 μm.

Svalbard records: Bjørnøya (Van Rompu & De Smet 1988).

Dactylobiotus dispar (J. Murray, 1907) Fig. 6a—b

Large animals with two lateral humps on the back. Bulbus with two macroplacoids, the first divided in the middle, where a distinct broadening is localised. There is a connection between the first and second macroplacoid. Large doubleclaws connected at their base by a bridge, which is build up of two branches. Hydrophilous. A cosmopolitan element.

Dimensions: body le 337—637 μm; bulbus (specimen of 426 μm) le 50 μm, diam 45 μm; pharyngeal tube (specimen of 426 μm) le 44 μm, diam 8 μm.

Svalbard records: Prins Karls Forland (Murray 1907 sub *Macrobiotus dispar*).

Diphascon conjugens (Thulin, 1911) Fig. 4a—c

Bulbus almost spherical, pharyngeal tube slightly curved and of nearly the same length as the bulbus. No ring annulation at the end of the pharyngeal tube. Doubleclaws very different in length and shape. Euryhygric form. An arctic-alpine subelement with holarctic range.

Dimensions: body le 243 μm; bulbus le 26 μm, diam 25 μm; pharyngeal tube le 36 μm, diam 4 μm.

Svalbard records: Spitsbergen (Dastych 1985).

Diphascon pingue (Marcus, 1936) Fig. 2a—c, 10a—b

One specimen (loc. 57) that should traditionally be classified as *D. alpinum* Murr. sensu Petersen (1951) (Fig. 10a—b) and one (loc. 44) belonging to *D. pingue* (Fig. 2a—c) was found. Pilato & Binda (1977) discussed the problem of the inexactly described *alpinum* group and suggested that the form with microplacoid and septulum should be treated as *D. pingue*. This view is followed by Dastych (1984, 1985, 1988). In his antarctic material Dastych (1984) recognized two varieties on the basis of a comparison of the size of

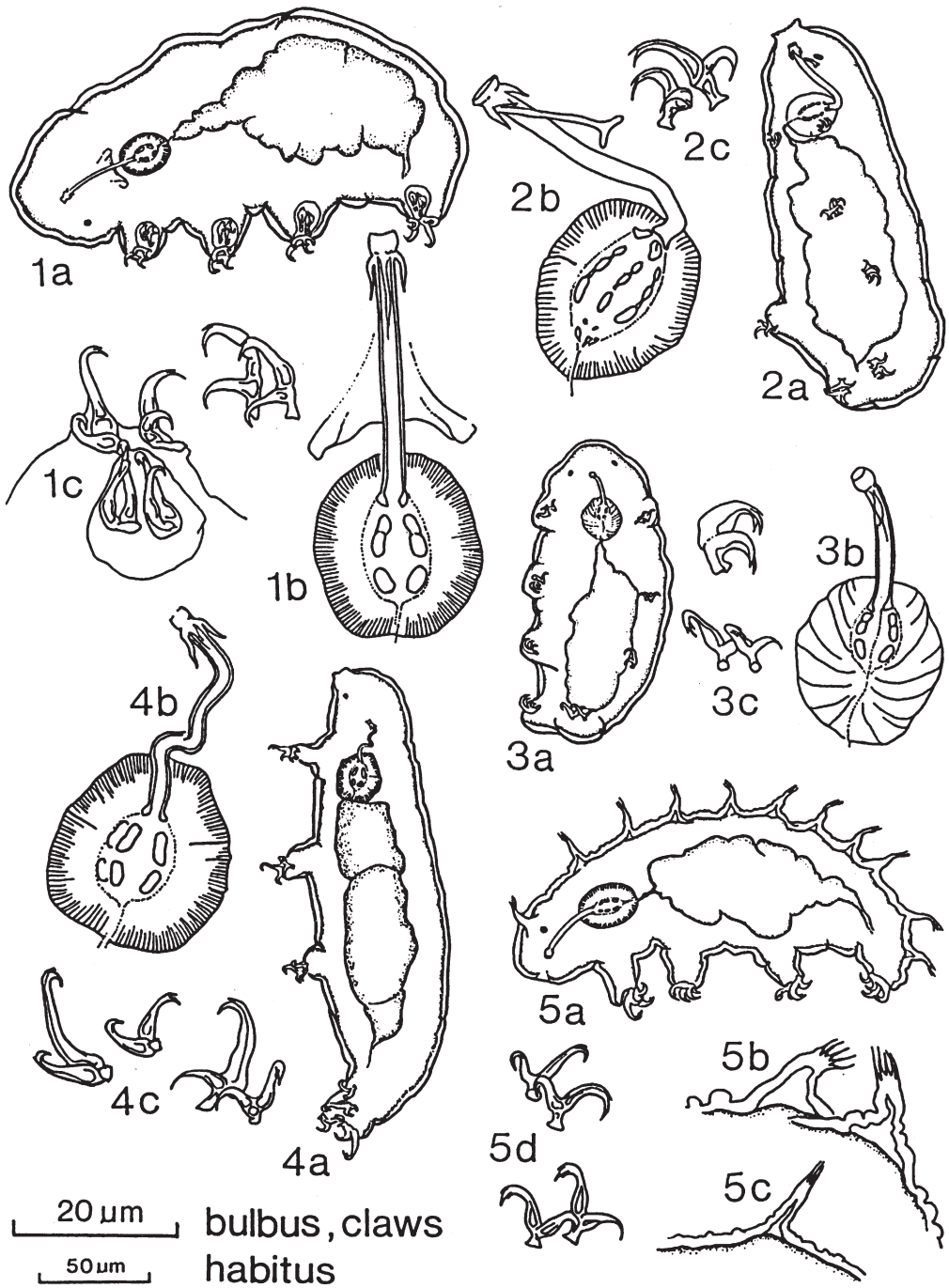

Fig. 1—5. 1 *Hypsibius convergens:* a general view, b buccal apparatus, c claws of leg IV; 2 *Diphascon pingue* type B: a general view, b buccal apparatus, c claws of leg IV; 3 *Hypsibius antarcticus:* a general view, b buccal apparatus, c claws of leg IV; 4 *Diphascon conjugens:* a general view, b buccal apparatus, c claws of leg IV; 5 *Isohypsibius papillifer:* a general view, c papillae, d claws of leg IV, b papillae of *Isohypsibius papillifer bulbosus.*

a series of organs. Variety A (corresponding with the *alpinum* form) differs from variety B (*pingue* form) by its slightly greater dimensions of the body, the longer and narrower pharyngeal tube, the shorter mouth tube and the shorter macroplacoids forming a shorter row. Considering the views and results of the above mentioned authors we classified our specimens as *D. pingue* variety A and B. The species is considered hygrophilous and eurythermic ; cosmopolitan.

Dimensions:

— Variety A: body le 238 μm; bulbus le 28 μm, diam 20 μm; pharyngeal tube le 57 μm, diam 2 μm.
— Variety B: body le 195 μm; bulbus le 24 μm, diam 19 μm; pharyngeal tube le 34 μm, diam 3 μm.

Svalbard records: Bjørnøya (Van Rompu & De Smet 1988, variety A sub *Diphascon alpinum),* Edgeøya (De Smet *et al.* 1988 variety A sub *D. alpinum*), Prins Karls Forland? (Murray 1907 sub *D. alpinum*), Spitsbergen (Weglarska 1965 sub *Hypsibius (D) alpinus;* Dastych 1985).

Diphascon scoticum J. Murray, 1905 Fig. 7a—b

A single specimen showing the typical features of the species. Bulbus a little broader than usual. Distinct ring annulations. Doubleclaws different in size and shape. An euryhygric and cosmopolitan element.

Dimensions: body le 319 μm; bulbus le 48 μm, diam 36 μm; pharyngeal tube le 79 μm, diam 4 μm.

Svalbard records: Edgeøya (De Smet *et al.* 1988), Prins Karls Forland (Murray 1907), Spitsbergen (Murray 1907, Richters 1911a, Weglarska 1965 sub *Hypsibius (D.) scoticus* (J. Murray), Dastych 1985).

Diphascon stappersi Richters, 1911 Fig. 11a—b

A single specimen. Almost spherical bulbus with three macroplacoids, increasing in length from the first to the third; small microplacoid. Pharyngeal tube with ring annulations. Doubleclaws rather similar in shape and length. The distribution of this dubious species is insufficiently known: Svalbard, Poland.

Dimensions: body le 220 μm; bulbus le 28 μm, diam 26 μm; pharyngeal tube le 37 μm, diam 3 μm.

Svalbard records: Bjørnøya (Richters 1911b), Hopen (Richters 1911a), Spitsbergen (Richters 1911a).

Hypsibius antarcticus (Richters, 1904) Fig. 3a—c

A single specimen. Typical bulbus with the macroplacoid row localised in the first half of the bulbus; two macroplacoids, the first one distinctly divided into two; no microplacoid. Doubleclaws not very different in shape and length. Known from Antarctica, Poland (?), Rumania, Czechoslovakia, Sweden, Norway and Greenland.

Dimensions: body le 160 μm; bulbus le 21 μm, diam 18 μm; pharyngeal tube le 19 μm, diam 2 μm.

Hypsibius convergens (Urbanowicz, 1925) Fig. 1a—c

Short oval bulbus with two broad macroplacoids; the first twice as long as the second, with a distinct division in the middle; the second thick and broad, rounded at the ends. Doubleclaws resembling those of *Hypsibius dujardini.* An euryhygric and cosmopolitan species.

Dimensions: body le 127—244 μm; bulbus (specimen of 197 μm) le 17 μm, diam 14 μm; pharyngeal tube (specimen of 127 μm) le 25 μm, diam 2 μm.

Svalbard records: Spitsbergen (Weglarska 1965, Dastych 1985).

Hypsibius dujardini (Doyère, 1840) Fig. 8a—b

Typical specimens. All specimens found with large and distinct microplacoids. Aquatic and hygrophilous; cosmopolitan.

Dimensions: body le 114—372 μm; bulbus (specimen of 318 μm) le 28 μm, diam 22 μm; pharyngeal tube (specimen of 318 μm) le 32 μm, diam 2 μm. Specimen of 372 μm with 4 eggs (82—93 μm x 55—58 μm).

Svalbard records: Bjørnøya (Van Rompu & De Smet 1988), Edgeøya (De Smet *et al.* 1988), Spitsbergen (Von Goes 1862 sub *Macrobiotus dujardinii* Doy. (?), Richters 1911a sub *Makrobiotus Murrayi* Richt., Weglarska 1965, Dastych 1985, De Smet *et al.* 1987).

Isohypsibius granulifer Thulin, 1928 Fig. 12a—e

In our samples the majority (53%) of the individuals had small tubercles. However we also observed a small number of specimens

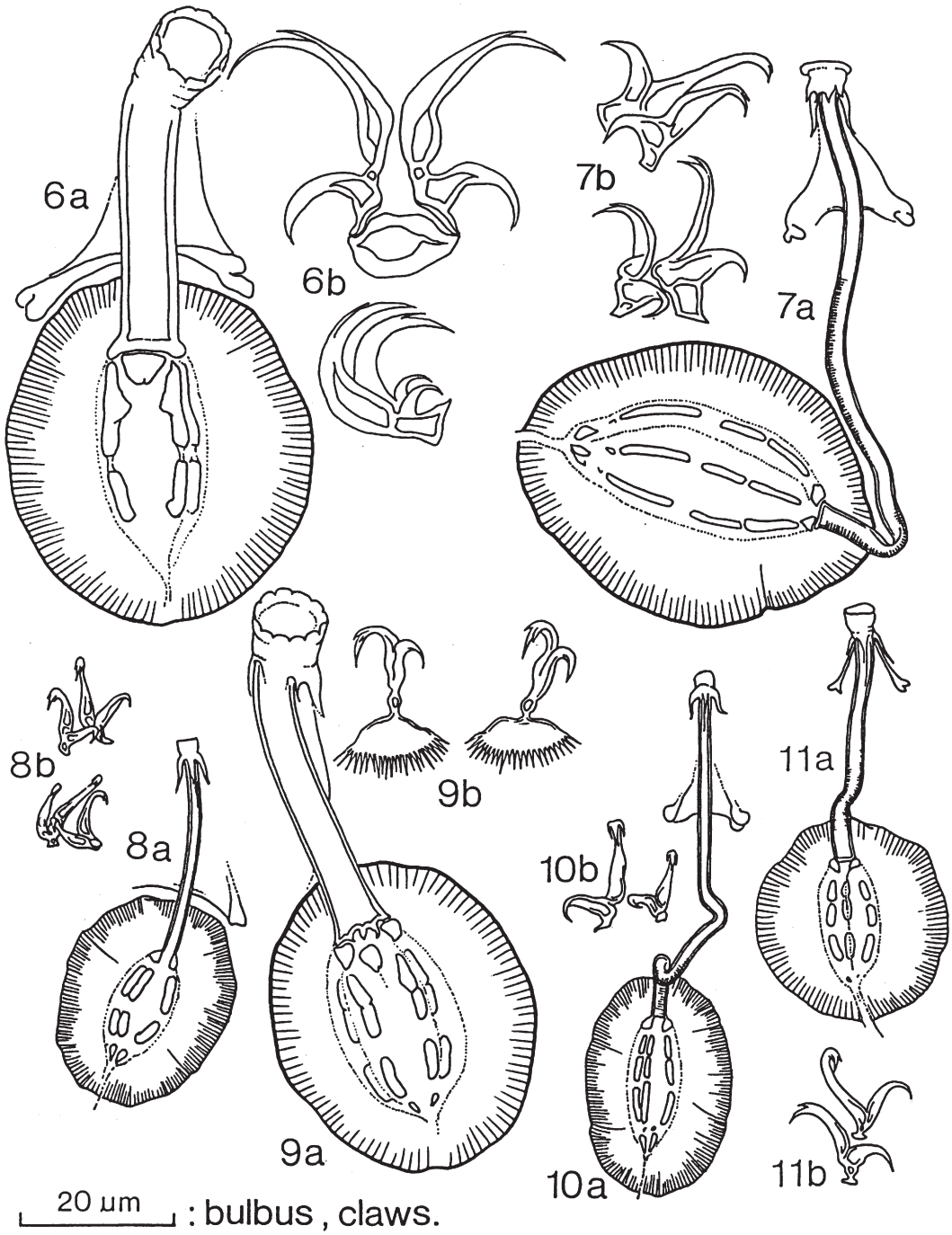

Fig. 6—11. 6 *Dactylobiotus dispar:* a buccal apparatus, b claws of leg II; 7 *Diphascon scoticum:* a buccal apparatus, b claws of leg IV; 8 *Hypsibius dujardini:* a buccal apparatus, b claws of leg IV; 9 *Macrobiotus echinogenitus:* a buccal apparatus, b claws of leg IV; 10 *Diphascon pingue* type A: a buccal apparatus, b claws of leg IV; 11 *Diphascon stappersi:* a buccal apparatus, b claws of leg IV.

with large tubercles (24%) and animals that completely lacked granulation (23%). Bulbus with three macroplacoids; the third is always the longest, situated at a distance from the two others, which are close together.

Concerning the position of these marcroplacoids, three configurations and transitions between them could be distinguished. In a first and most frequently observed configuration, the second macroplacoid is smaller or equal in size to the first one (Fig. 12b); both macroplacoids are in close contact. In many other cases (Fig. 12a) the placoids gradually increase in length, from the first to the third. The third configuration (Fig. 12c) is characterized by a tendency of the first two macroplacoids to fuse. Big doubleclaws, external and internal not so different in size and shape. A hydrophilous species with cosmopolitan distribution.

Dimensions: body le 107—443 μm; bulbus (specimen of 348 μm) le 38 μm, diam 31 μm, pharyngeal tube (specimen of 348 μm) le 48 μm, diam 4 μm. Specimen of 350 μm with 4 eggs (72—74 μm x 63—67 μm).

Svalbard records: Bjørnøya (Van Rompu & De Smet 1988), Edgeøya (De Smet *et al.* 1988). A specimen similar to *I. granulifer* was reported from Spitsbergen by Dastych (1985).

Isohypsibius papillifer (J. Murray, 1905) Fig. 5a—c

The papillae are conical without hemispherical swelling at their base. Each papilla with maximum four stiff hairs at its top. A few individuals intermediate between the nominate type and *I. papillifer bulbosus.* A cosmopolitan element.

Dimensions: body le 111—281 μm; bulbus (specimen of 226 μm) le 22 μm, diam 16 μm; pharyngeal tube (specimen of 226 μm) le 20 μm, diam 2 μm. Specimen of 281 μm with 2 eggs (59—61 μm x 45—48 μm).

Svalbard records. Spitsbergen (Richters 1911a sub *Makrobiotus papillifer* Murr.).

Isohypsibius papillifer bulbosus (Marcus, 1928) Fig. 5b

One specimen with characteristic large hemispherical swelling at the base of the papillae and four to six stiff hairs at the top of the processes. In a sample from Bjørnøya the papillae displayed only 2—4 stiff hairs. A cosmopolitan element.

Dimensions: body le 142 μm.

Svalbard records: Bjørnøya (Van Rompu & De Smet 1988).

Macrobiotus dianeae Kristensen, 1980 Fig. 13a—e

Hyaline animals. Oval bulbus with three macroplacoids. No microplacoids. The first two macroplacoids are very close together, touching each other. The third macroplacoid has a typical rounded satellite-like expansion at the end. Pharyngeal tube wide with strong apophyses. Mouth cavity surrounded by ca. 10 lamellae. Doubleclaws of the *echinogenitus*-type; large smooth lunulae. All morphological features showed little variation. The species was described from a warm homothermic spring on Disko Island, West Greenland by Kristensen (1982). We (unpublished) found the species in aquatic habitats from W. Greenland (Søndre Stromfjord), Devon and Little Cornwallis Island (N.W.T., Canada) and Tanzania (Kilimanjaro).

Macrobiotus echinogenitus Richters, 1904 Fig. 9a—b

One specimen with the typical features of the species. Large lunulae with up to 25 long pointed spines. An euryhygric species with northern holarctic distribution (arctic-boreo-alpine).

Dimensions: body le 292 μm; bulbus le 42 μm, diam 34 μ; pharyngeal tube le 48 μm, diam 6 μm.

Svalbard records. Bjørnøya (Richters 1911b), Edgeøya (De Smet *et al.* 1988), Hopen (Richters 1911a), Prins Karls Forland (Murray 1907), Spitsbergen (Richters 1904, 1911a), Weglarska 1965, Dastych 1985).

Echiniscus spitsbergensis Scourfield, 1897 Fig. 15a—b

There is some controversy about the specific status of *E. spinuloides* Murr. and *E. spitsbergensis.* Iharos (1961) considered them to be good species. Ramazzotti & Maucci (1983) have doubts about the species status of the two types, but prefer to treat them separately until much more evidence is available. Both species were synonymized by Marcus (1936), who considered *E. spinuloides* to be the adult of *E. spitsbergensis.* De Coninck (1939) found intermediate forms between the *spinuloides* and *spitsbergensis* type and considered them synonymous. This view was sustained by Petersen (1951) who, on the basis of his Greenland material, obser-

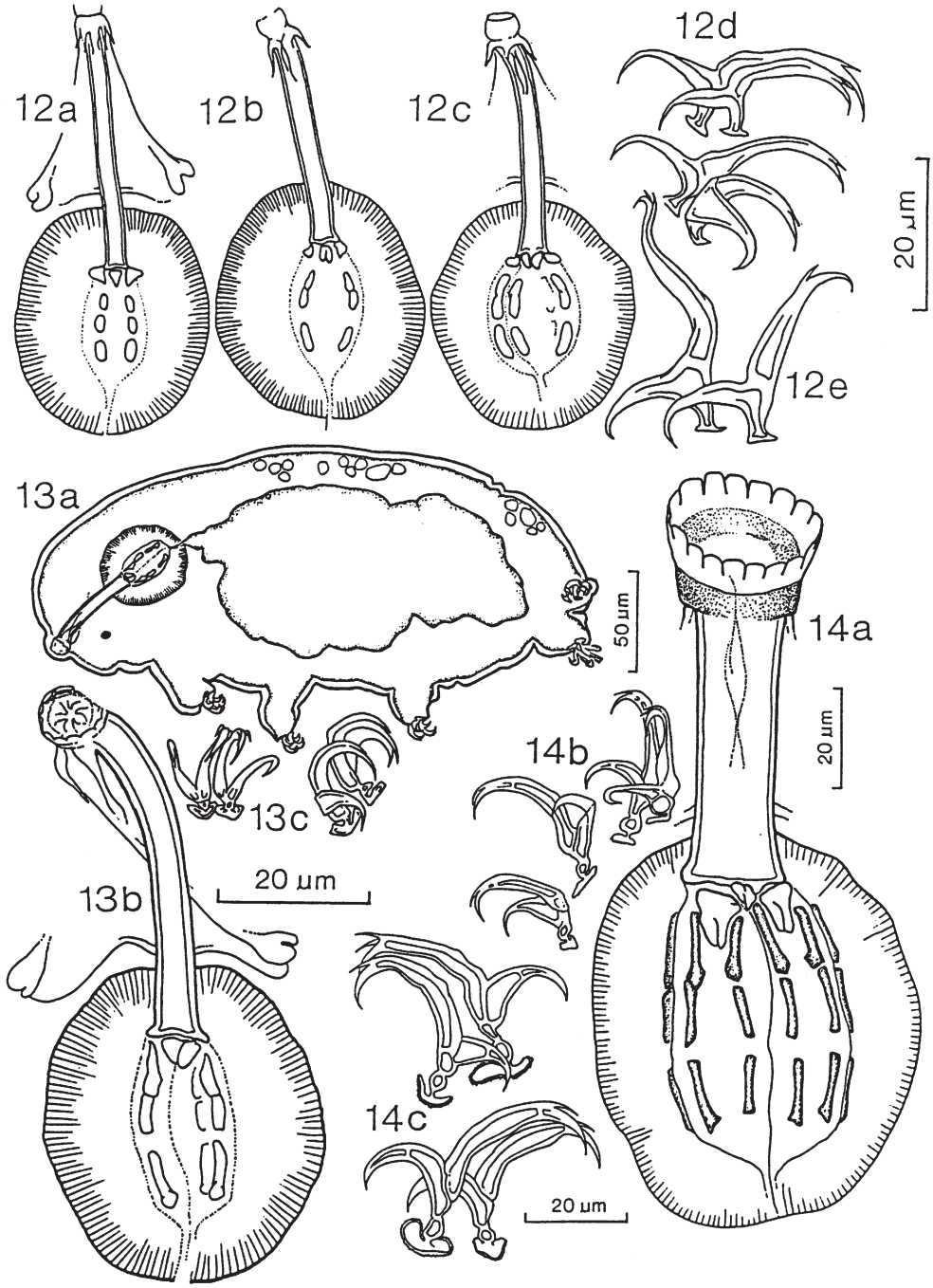

Fig. 12—14. 12 *Isohypsibius granulifer:* a, b, c, buccal apparatus, d claws of leg III, e claws of leg IV; 13 *Macrobiotus dianeae:* a general view, b buccal apparatus, c claws of leg IV; 14 *Amphibolus weglarskae:* a buccal apparatus, b claws of leg II, c claws of leg IV.

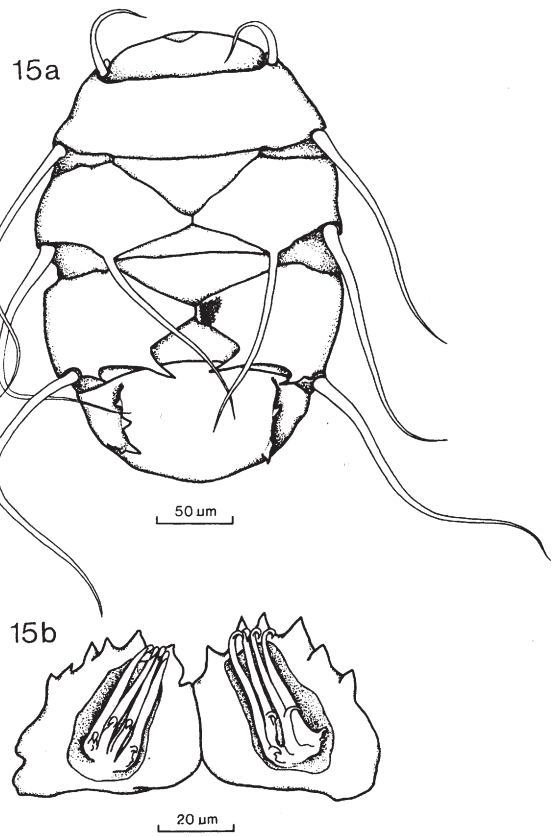

Fig. 15. *Echiniscus spitsbergensis:* a general view, b claws of leg IV.

ved an immense variation, for each of the features used as a specific character. Maucci (1985) synonymizes the two types. The single specimen we found on Barentsøya shows the typical morphological features of the *spinuloides* type: the presence of three or four strongly developed spines at E; the long jags at B, C and D; the short spine at D' and the strongly developed spine at D^d. It is an eurihygric from with holarctic distribution.

Dimensions: body le 320 µm.

Svalbard records: The *spinuloides* type was hitherto not recorded. *E. spitsbergensis* is known from Bjørnøya (Richters 1911b), Hopen (Richters 1911a), Ryke Yseøyane (Richters 1904) and Spitsbergen (Scourfield 1897, Richters 1903, 1904, 1911a, Bryce 1922, Weglarska 1965, Dastych 1985).

Pseudechiniscus suillus (Ehrenberg, 1853) Fig. 16

The specimens seen belong to the f. *facettalis* Petersen, 1951. It is a small animal with distinct facetting of the head and terminal plate. The specimens found have the terminal plate with strongly pronounced lateral facetting. A cosmopolitan species.

Dimensions: body le 206—272 µm. Specimen of 272 µm with 2 eggs (89—96 µm x 83—87 µm).

Svalbard records: the f. *facettalis* was hitherto not recorded. *P. suillus* is reported from Prins Karls Forland (Murray 1907, sub *Echiniscus mutabilis* Murr.) and Spitsbergen (Richters 1911a, Weglarska 1965, Dastych 1985).

5. X-BODIES

Almost all specimens of *Dactylobiotus dispar* and three of the *Hypsibius dujardini* were infected with X-bodies (Fig. 17). These are ellipsoidal corpuscules with a barrel-shaped mid-piece filled with cytoplasm and apparently empty hemispheres at each end. They

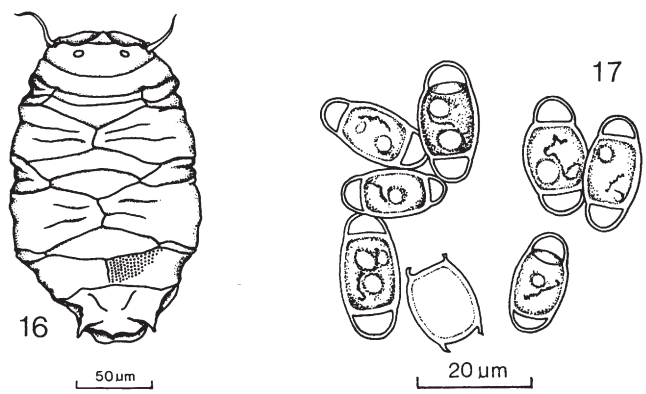

Fig. 16—17. 16 *Pseudechiniscus suillus* f. *facettalis:* general view. 17 X-bodies.

measure 20 μm x 10 μm (10 specimens). Similar X-bodies were found in *Diphascon spitzbergense* Richt. from Spitsbergen and reported as «parasitischen Protozoen» by Richters (1904) and from Greenland as a «microsporidian of the genus *Pleistophora*» by Petersen (1951). Weglarska (1970) found X-bodies in an individual of *Amphibolus smreczynskii* (Wegl.) (reported as «fungi?») originating from Axel Heiberg Island (N.W.T., Canada), and Hallas (1977) encountered them in a few specimens of *Hypsibius dujardini* and *Diphascon scoticum* from Finland. The latter author concluded that the X-bodies seem to be restricted to Eutardigrada living in humid or wet arctic or subarctic environments.

6. SURVEY OF THE ARCTIC FRESH WATER TARDIGRADA

Fresh water Tardigrada are defined as species living in water bodies that do not dry up. They may inhabit submerged vegetation (mosses, algae and other aquatic plants), interstitial water, sapropel, etc. The study of arctic fresh water Tardigrada has largely been neglected. Richard (1898) mentioned *Macrobiotus macronyx* (taxonomically uncertain) from Barentsøya, Hopen and Spitsbergen. Olofsson (1918) reported unidentified species occurring at low numbers in 11 of the 29 water bodies (pools, ponds, ponds, lakes, etc.) he studied on Spitsbergen. Tardigrade positive samples respectively belonged to moss vegetation (8), bottom deposits (5) and plankton (4). In a small collection of interstitial samples (5) from Spitsbergen, Mihelcic (1971) encountered *Macrobiotus richtersi* J. Murr. and *Hypsibius (I) augusti* J. Murr.. Tardigrada accounted for 52% of the metazoan faunal assemblages. From Axel Heiberg Island (N.W.T., Canada, latitude 79°30'N) Weglarska (1970) and Weglarska & Kuc (1980) listed *Amphibolus smreczynskii* (Wegl.), *Echiniscus blumi* Richt. and *E. spitsbergensis* Scourf. among algae and submerged mosses. The results of our research on aquatic material of mainly submerged vegetation from Spitsbergen, latitude 78°45'N (De Smet *et al.* 1987), Edgeøya, latitude 77°05'N (De Smet *et al.* 1988), Bjørnøya, latitude 74°30'N (Van Rompu & De Smet 1988), Barentsøya (this paper), Devon Island,

Table 2 : Occurrence of arctic fresh water Tardigrada*

	Barentsøya		Bjørnøya		Edgeøya		Spitsbergen		Devon Isl		L. Cornwallis		TOTAL	
Number of water bodies	18		6		11		2		6		4		47	
frequency - *Number*	f	*N*	f	*N*	f	*N*	f	*N*	f	*N*	f	*N*	f	*N*
Amphibolus smreczinskii (Wegl.)	-	-	-	-	1	*1*	-	-	-	-	-	-	1	*1*
A. weglarskae (Dast.)	4	*10*	1	*2*	-	-	-	-	1	*1*	-	-	6	*13*
Dactylobiotus ambiguus (Murr.)	-	-	3	*4*	1	*1*	-	-	-	-	-	-	4	*5*
D. dispar (Murr.)	4	*7*	-	-	-	-	-	-	1	*3*	1	*1*	6	*11*
Diphascon conjugens (Thul.)	1	*2*	-	-	-	-	-	-	-	-	-	-	1	*2*
D. pingue (Marc.)	2	*3*	1	*4*	1	*3*	-	-	-	-	-	-	4	*10*
D. recamieri Richt.	-	-	-	-	-	-	-	-	1	*2*	-	-	1	*2*
D. scoticum Murr.	1	*1*	-	-	1	*1*	-	-	-	-	-	-	2	*2*
D. spitzbergense Richt.	-	-	2	*2*	1	*1*	-	-	-	-	-	-	3	*3*
D. stappersi Richt.	1	*1*	-	-	-	-	-	-	-	-	-	-	1	*1*
Echiniscus spitsbergensis Scourf.	1	*1*	-	-	-	-	-	-	2	*14*	1	*2*	4	*17*
Hypsibius antarcticus Richt.	1	*1*	-	-	-	-	-	-	-	-	-	-	1	*1*
H. convergens Urb.	3	*6*	-	-	-	-	-	-	2	*12*	1	*6*	6	*24*
H. dujardini (Doy.)	18	*265*	5	*82*	6	*60*	1	*6*	4	*18*	4	*63*	38	*494*
Isohypsibius cf. canadensis (Murr.)	-	-	-	-	-	-	-	-	1	*1*	-	-	1	*1*
I. granulifer Thul.	18	*220*	6	*169*	7	*424*	-	-	5	*20*	3	*19*	39	*852*
I. papillifer (Murr.)	6	*15*	-	-	-	-	-	-	-	-	1	*3*	7	*18*
I. papillifer bulbosus (Marc.)	2	*2*	2	*7*	-	-	-	-	4	*10*	1	*14*	9	*33*
I. schaudinni (Richt.)	-	-	-	-	-	-	-	-	1	*1*	-	-	1	*1*
I. tetradactyloides (Richt.)	-	-	-	-	-	-	-	-	1	*1*	1	*1*	2	*2*
Macrobiotus dianeae Krist.	9	*92*	-	-	-	-	-	-	2	*8*	2	*10*	13	*110*
M. echinogenitus Richt.	1	*1*	-	-	1	*1*	-	-	-	-	-	-	2	*2*
M. harmsworthi Murr.	-	-	-	-	-	-	-	-	-	-	1	*1*	1	*1*
M. hufelandi Schul.	-	-	1	*1*	-	-	-	-	-	-	-	-	1	*1*
M. pullari Murr.	-	-	-	-	1	*3*	2	*20*	-	-	-	-	3	*23*
Pseudechiniscus suillus (Ehr.)	2	*5*	-	-	-	-	-	-	2	*7*	-	-	4	*12*
spec. innom.	-	-	-	-	-	-	-	-	-	-	2	*3*	2	*3*

* To this list should be added Macrobiotus richtersi Murr. and Isohypsibius augusti (Murr.) from Spitsbergen (Mihelčič 1971) and Amphibolus smreczinskii (Wegl.), Echiniscus blumi Richt. and E. spitsbergensis Scourf. from Axel Heiberg Island (N.W.T., Canada) (Węglarska 1970, Węglarska and Kuc 1980).

latitude 75°00'N and Little Cornwallis Island (N.W.T., Canada) latitude 75°35'N (unpublished) are summarized in Table 2.

Altogether we found 27 taxa based on a total number of 1645 individuals sampled in 47 different fresh waters. After addition of the species mentioned by Weglarska & Kuc (1980) and Mihelcic (1971) the number of aquatic tardigrade taxa from high arctic fresh water habitats adds up to 30. These are represented by eight genera (the unidentified species left out of consideration): *Echiniscus* (2 spp), *Pseudechiniscus* (1 sp), *Amphibolus* (2 spp), *Dactylobiotus* (2 spp), *Diphascon* (6 spp), *Hypsibius* (4 spp), *Isohypsibius* (5 spp and 1 subsp.), *Macrobiotus* (6 spp). A restricted number of species is frequently found and is generally present in large numbers: the frequency (defined as the ratio of the number of samples with the species concerned to the total number of aquatic samples) of the predominant taxa is as follows: *Isohypsibius granulifer* 83%, *Hypsibius dujardini* 81%, *I. papillifer* 15% and *I. papillifer bulbosus* 19% (together 34%), *Macrobiotus dianeae* 28%, and *Amphibolus weglarskae, Dactylobiotus dispar, Hypsibius convergens* each 13%. The frequency of the remainder of the species is less than 10%. It is also apparent from Table 2 that differences in species assemblages exist, the underlying causes of which (physicochemistry of the water, species of moss inhabited, morphometry of water body, etc.) are not clear at this stage of knowledge. Moreover it is evident that a detailed study of other fresh water microhabitats will reveal specific assemblages. Examining 204 tardigrade positive samples from interstitial habitats of lakes and rivers from Northern Europe (Finland, Norway, Sweden, Denmark, Poland) Mihelcic found fourteen species of which only four (*Dactylobiotus ambiguus, D. dispar, Hypsibius convergens, H. dujardini*) are in common with the species from the submerged vegetation we studied. The predominant species, both with regard to the number of individuals and frequency of occurrence, of the interstitial habitats were *Hypsibius convergens, Isohypsibius augusti* and *Macrobiotus richtersi.*

7. CONCLUDING REMARKS

Sixteen taxa of Tardigrada have been found in samples from aquatic habitats (submerged mosses and plankton). The number of taxa in each sample is low and ranges from 2 to 7. Tardigrades were scarcely present in plankton samples at very low densities averaging 0.3% of the total number of the whole faunal assemblage. This erratic occurrence in the plankton must be ascribed to convective and wind mixing in the shallow habitats, and is proof of a passive means of dispersion that could play a role in habitat colonization.

The submerged moss samples always contained tardigrades at relatively low numbers. They were also poorly represented in comparison with the other animal taxa and contribution from 1.0 to 10.6% (average 4%) of the total micrometazoan densities (average values of the other groups: Rotifera 67%, Nematoda 18%, Cladocera 7%, Copepoda 2%, others 2%).

Concerning their geographical distribution, the species met with are divided into four groups, viz. cosmopolitan elements (*Dactylobiotus dispar, Diphascon scoticum, D. pingue, Hypsibius convergens, H. dujardini, Isohypsibius papillifer, I. papillifer bulbosus, Pseudechiniscus suillus),* a holarctic species (*Echiniscus spitsbergensis*), 4 arctic-boreo-alpine elements (*Amphibolus weglarskae, Diphascon conjugens, Macrobiotus dianeae, M. echinogenitus*) and two species with insufficienty known distribution (*Diphascon stappersi, Hypsibius antarcticus*). Two species (*Hypsibius antarcticus, Macrobiotus dianeae)* were not previously reported from Svalbard. The most frequent and numerically dominant species proved to be the cosmopolitan *Isohypsibius granulifer* and *Hypsibius dujardini.*

ACKNOWLEDGEMENTS

We are grateful to Mrs. R. Pype for typing the manuscript; Prof. Dr. D. K. Ferguson corrected the English text. The expedition was supported by the National Foundation for Scientific Research and the State University of Antwerp.

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Received 8 June 1991