



New species and new records of freshwater Chaetonotida (Gastrotricha) from Sweden

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Abstract

Gastrotricha is a small phylum of acoelomatic aquatic invertebrates common in both marine and freshwater environments. The freshwater gastrotrich fauna of Sweden is poorly known and so far only 20 species have been reported. In this study two species, *Heterolepidoderma joermungandri* n. sp. and *H. trapezoidum* n. sp., are described as new to science. Moreover, 9 species are presented as new to the Swedish fauna. Additional taxonomic information is also given for 4 species previously reported from the country. In total 7 genera of two families, Chaetonotidae and Dasydytidae, are presented and the number of reported freshwater gastrotrichs from the country is increased to 31.

Key words: Chaetonotidae, Dasydytidae, Freshwater fauna, taxonomy

Introduction

Gastrotricha is a small phylum of acoelomate metazoans. They have been reported from all continents and at present about 765 nominal species are known. Gastrotrichs are among the smallest metazoans and some species can be as small as 70 µm in total body size. However, most freshwater species are larger and marine species can reach lengths up to 3.5 millimeters (Todaro & Hummon in Artois *et al.* 2011). The group is widely distributed and can be found in all aquatic environments. In the sea gastrotrichs can rank third in abundance after nematodes and harpacticoid copepods and in freshwater habitats they are among the top five most common taxa encountered (Balsamo & Todaro 2002). In marine habitats most species live interstitially, in fine to medium grained clean sand, where they constitute an important part of the meiofauna (Hummon 1982; Balsamo & Todaro 2002). Freshwater species are mostly epibenthic or epiphytic but can also live interstitially. Certain genera (e. g. *Haltidytes* Remane, 1936 and *Stylochaeta* Hlava, 1904) have adapted to a semi-planktonic lifestyle (Schwank 1990).

Gastrotricha is divided into two orders, Macrodasyida Remane, 1925 which is almost exclusively marine and Chaetonotida Remane, 1925, with both marine and freshwater representatives. Macrodasyidans are vermiform and possess anterior, posterior and often lateral and dorsal adhesive tubes. Chaetonotidans are, with very few exceptions, tenpin-shaped and usually have only two posterior adhesive tubes forming a bifurcated caudal end called the furca. Most species of freshwater Chaetonotida belong to the family Chaetonotidae Gosse, 1864, but the semi-planktonic family Dasydytidae is also well represented (Schwank 1990).

Classification of Gastrotricha is mainly based on morphology and ultrastructure. Morphometry of the body and in particular of some structures, such as the furca and the pharynx are important characters for species identification as well as distribution and shape of scales and spines. The drawback of these characters is that their range in rarely recorded species is virtually unknown. This is problematic when knowledge on intraspecific variability increases and overlaps in characters encompass species boundaries.

The Swedish gastrotrich fauna is poorly known compared to other well investigated countries in the same temperate region. In Poland 98 species have been recorded and from Germany around 90 species are known (Balsamo *et al.* 2008). A couple of years ago only 7 freshwater species, all belonging to Chaetonotidae, had been reported from Sweden (see Hofsten 1923; Schwank 1990). Känneby *et al.* (2009) described the new species *Ichthydium*

skandicum Kånneby, Todaro and Jondelius, 2009 and gave additional data on *I. diacanthum* Balsamo and Todaro, 1995, *I. squamigerum* Balsamo and Fregni, 1995 and *I. tanytrichum* Balsamo, 1982, as well as on the associated gastrotrich fauna, increasing the number of known freshwater species from Sweden to 20. Most Swedish species have so far been recorded from stagnant waters with *Sphagnum* spp. and *Lemna* spp.

The purpose of this study is to increase the knowledge of gastrotrich biodiversity in Sweden. Some species reported in this paper have already been found in Sweden (see Hofsten 1923; Kånneby *et al.* 2009) but were not thoroughly studied. Species of the genus *Chaetonotus* Ehrenberg, 1830 are not treated here and will be the subject of a forthcoming publication.

Material and methods

Gastrotrichs were collected from 2007 to 2010 from different habitats in Sweden; ranging from Skåne in the south to Lapland in the north (Figure 1). Collection was done with a plankton net with a mesh size of 25 µm or simply by collecting mosses, other vegetation and benthic material by hand. Samples were taken back to the laboratory and kept in aerated aquaria. Subsequently subsamples were taken from the aquaria and treated with 1% MgCl₂-solution to anaesthetize the animals. Individual gastrotrichs were extracted with a micropipette and studied alive. Pictures and documentation were made with a Nikon Eclipse 80i DIC microscope equipped with a Nikon Digital Sight DS-Fi1 digital camera. The description of species in this paper follows the convention of Hummon *et al.* (1992) where the position of certain morphological characters are given in percentage units (U) of total body length measured from anterior to posterior (distal end of the furca). In species descriptions columns refer to scale rows parallel to the longitudinal body axis while scale rows refer to the rows of scales perpendicular to the longitudinal body axis.

Abbreviations: AL, Adhesive tube Length; CL, Caudal appendages Length; DC, # Dorsal scale Columns; DR, # Dorsal scale Rows; DSL, Dorsal Spine Length; FL, Furca Length; MD, Mouth Diameter; NA, Not Available; PhL, Pharynx Length; PL, scale Peduncle Length; SCA, number of Segments on Caudal Appendages; SG1-4, Spine Group 1-4; TL, Total Length; TNC, Total Number of scale Columns; TS, Trunk Scale length x width; TSp, # Trunk Spines; VB, # Ventral Bars below pharynx; VC, # Ventral scale Columns; VR, # Ventral scale Rows; VSL, Ventral Spine Length; VTS, Ventral Terminal Scales length x width.

Results

In total 15 species from 7 genera of 2 families are reported in this paper. *Heterolepidoderma joermungandri* **n. sp.** and *H. trapezoidum* **n. sp.** are new to science. *Aspidiophorus oculifer* Kisielewski, 1981, *A. ophioidermus* Balsamo, 1982, *Haltidytes crassus* Greuter, 1917, *Heterolepidoderma macrops* Kisielewski, 1981, *H. ocellatum* (Metschnikoff, 1865), *Lepidochaetus zelinkai* (Grünspan, 1908), *Lepidodermella minor minor* (Remane, 1936), *Polymerurus nodicaudus* (Voigt, 1901) and *Stylocheata scirtetica* Brunson, 1950 are all new to the Swedish fauna. Moreover, additional information is given for *A. squamulosus* (Roszczak, 1936), *A. tetrachaetus* Kisielewski, 1986, *L. squamata* (Dujardin, 1841) and *P. rhomboides* (Stokes, 1887), all of which have been previously reported from Sweden. A list of all species reported from Sweden is presented in table 1.

Taxonomy

Order Chaetonotida Remane, 1925 [Rao & Clausen, 1970]

Suborder Paucitubulatina d'Hondt, 1971

Family Chaetonotidae Gosse, 1864 (*sensu* Leasi & Todaro, 2008)

Subfamily Chaetonotinae Kisielewski, 1991

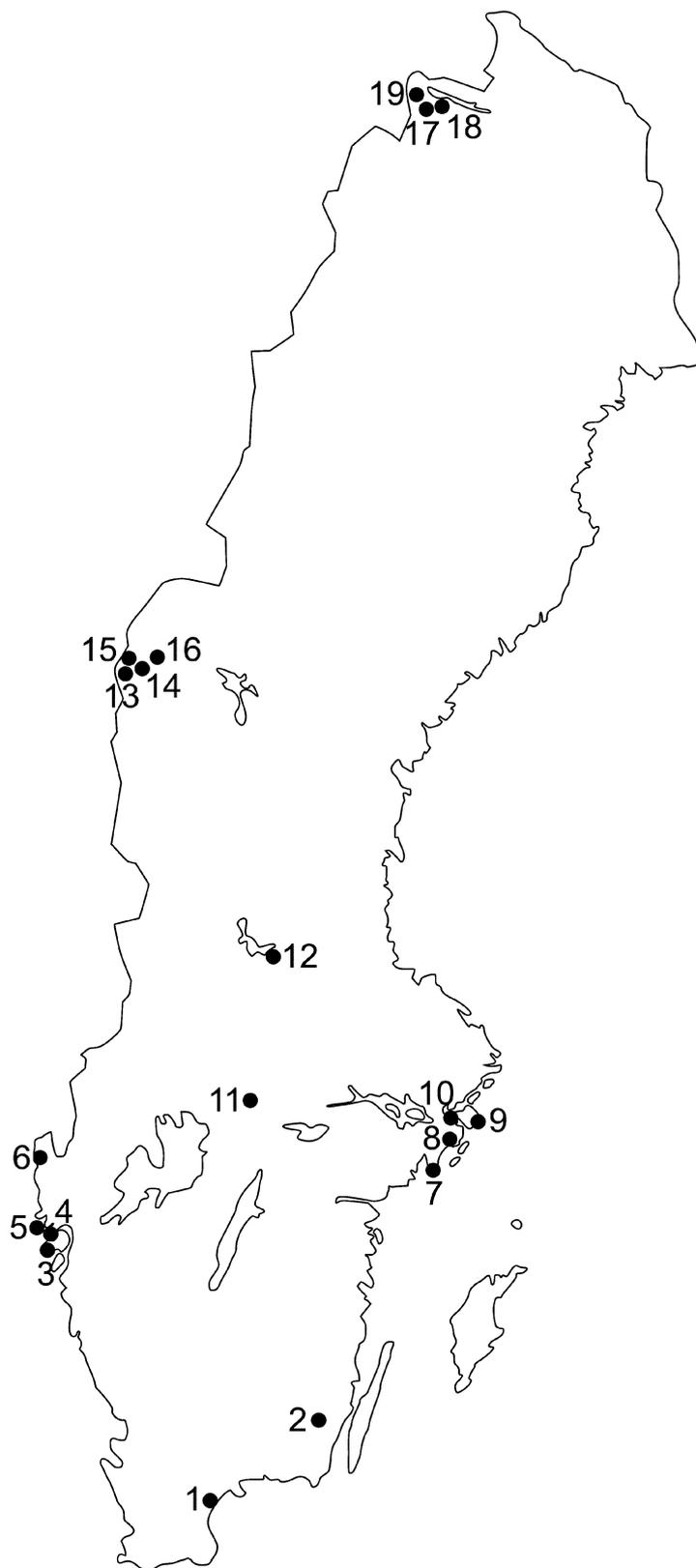


FIGURE 1. Map of Sweden showing the localities sampled in this study and by Kånneby *et al.* (2009). 1) Åhus, Skåne; 2) Nybro, Småland; 3) Islandsberg, Bohuslän; 4) Fiskebäckskil, Bohuslän; 5) Hällö and Skarvesäter, Bohuslän; 6) Saltö, Bohuslän; 7) Askö, Södermanland; 8) Lower Lake Rudan, Södermanland; 9) Runmarö, Stockholm archipelago; 10) Bergianska trädgården, Stockholm; 11) Lake Trösvattnet, Västmanland; 12) Lake Siljan, Dalarna; 13) Mount Snasahögarna, Jämtland; 14) Lake Ånnsjön, Jämtland; 15) Storlien W and Storlien E, Jämtland; 16) Highway E14 between Åre and Storlien, Jämtland; 17) Mount Njulla, Lapland; 18) Torneträsk and Abisko, Lapland; 19) Björkliden, *Sphagnum* spp. bogs and ditches at highway E10, Lapland.

TABLE 1. Freshwater gastrotrich records from Sweden. The reference to species descriptions and references to the Swedish records are provided. The localities presented in Figure 1 are also listed for each species.

Species	Reference to species description	Reference to Swedish records	Distribution (refer to Figure 1)
Family Chaetonotidae			
<i>Aspidiophorus oculifer</i>	Kisielewski, 1981 p. 84–86, Fig. 12	This study	18
<i>Aspidiophorus ophiodermus</i>	Balsamo, 1982 p. 294–295, Fig. 3, 4C, D	This study	4, 8
<i>Aspidiophorus squamulosus</i>	(Roszczak, 1936) p. 109. Roszczak, 1968 p. 66–68, Fig. 42	Fauna Europaea; This study	1
<i>Aspidiophorus tetrachaetus</i>	Kisielewski, 1986 p. 141–143, Fig. 2	Kånneby <i>et al.</i> (2009); This study	4, 14
<i>Chaetonotus armatus</i>	Kisielewski, 1981 p. 46–49, Fig. 5	Kånneby <i>et al.</i> (2009)	14
<i>Chaetonotus benacensis</i>	Balsamo & Fregni, 1995 Fig. 3, 7A	Kånneby <i>et al.</i> (2009)	12
<i>Chaetonotus chuni</i>	Voigt, 1901 p. 37–38. Voigt, 1904 p. 143–145, Fig. 48, 52	Schwank (1990)	?
<i>Chaetonotus heideri</i>	Brehm, 1917 p. 315–316	Kånneby <i>et al.</i> (2009)	14
<i>Chaetonotus hystrix</i>	Metschnikoff, 1865 p. 451, Fig. 7	Kånneby <i>et al.</i> (2009)	12
<i>Chaetonotus longispinosus</i>	Stokes, 1887 p. 565, Fig. 8–10	Schwank (1990)	?
<i>Chaetonotus mutinensis</i>	Balsamo, 1978 p. 114–118, Fig. 6	Kånneby <i>et al.</i> (2009)	10
<i>Chaetonotus macrochaetus</i>	Zelinka, 1889 p. 335–337, Fig. 7–10	Hofsten (1923)	Jämtland
<i>Chaetonotus maximus</i>	(Ehrenberg, 1831) p. 153, Fig. 6	Hofsten (1923)	Jämtland
<i>Chaetonotus oculifer</i>	Kisielewski, 1981 p. 38–41, Fig. 2	Kånneby <i>et al.</i> (2009)	16
<i>Chaetonotus polyspinosus</i>	Greuter, 1917 p. 50–52, Fig. 3	Kånneby <i>et al.</i> (2009)	14
<i>Chaetonotus schultzei</i>	Metschnikoff, 1865 p. 451	Schwank (1990)	?
<i>Heterolepidoderma joermungandri</i> n. sp.	This study	This study	5
<i>Heterolepidoderma macrops</i>	Kisielewski, 1981 p. 71–73, Fig. 9	This study	5, 18, 19
<i>Heterolepidoderma ocellatum</i>	(Metschnikoff, 1865) p. 451, Fig. 1	This study	3, 4, 6, 7
<i>Heterolepidoderma trapezoidum</i> n. sp.	This study	This study	13
<i>Ichthydium diacanthum</i>	Balsamo & Todaro, 1995 p. 18–19, Fig. 9	Kånneby <i>et al.</i> (2009)	16
<i>Ichthydium skandicum</i>	Kånneby <i>et al.</i> , 2009 p. 27–30, Fig. 1, 2	Kånneby <i>et al.</i> (2009)	16
<i>Ichthydium squamigerum</i>	Balsamo & Fregni, 1995 p. 171–172, Fig. 6, 7C	Kånneby <i>et al.</i> (2009)	10, 11, 12
<i>Ichthydium tanytrichum</i>	Balsamo, 1982 p. 292–294, Fig. 2, 4B, 6	Kånneby <i>et al.</i> (2009)	14
<i>Lepidochaetus zelinkai</i>	(Grünspan, 1908) p. 226–228, Plate 18, Fig. 1	This study	4, 5, 7, 9, 13, 18, 19
<i>Lepidodermella minor minor</i>	Remane, 1936 p. 71, 194. Fig. 66A, B. Kisielewski, 1981 p. 78–79	This study	4
<i>Lepidodermella squamata</i>	(Dujardin, 1841) p. 569, Plate 18, Fig. 7–8	Hofsten, 1923; This study	1, 2, 4, 5, 11, 15, 17, 18, 19
<i>Polymerurus nodicaudus</i>	(Voigt, 1901) p. 193–194. Voigt, 1904 p. 134–137, Fig. 42A–D	This study	8, 10
<i>Polymerurus rhomboides</i>	(Stokes, 1887) p. 561–562, Fig. 31–35	Kånneby <i>et al.</i> (2009); This study	11
Family Dasydytidae			
<i>Haltidytes crassus</i>	(Greuter, 1917) p. 67–68, Fig. 16	This study	2
<i>Stylochaeta scirtetica</i>	Brunson, 1950 p. 336–338. Fig. 7, 8, 31	This study	2

Genus *Aspidiophorus* (Voigt, 1903)

Aspidiophorus oculifer Kisielewski, 1981

(Figure 2)

Localities. A small pond close to lake Torneträsk at Abisko Scientific Research Station, Abisko, Lapland (N 68° 21' 19"; E 18° 49' 21").

Material. 1 specimen. TL, 120 µm; FL, 15 µm; AL, 6 µm; PhL, 30 µm; MD, 4 µm; DC, 19–20; DR, 40–42; VC, 9–10; TS, 3–4 x 3 µm; VTS, 10 x 4 µm; PL, 0.5–1 µm.

A small sized and rather stout species with five-lobed head and a pair of ocellar granules. Hypostomium weakly developed. Adhesive tubes short, stocky and thick, ending in a notch. Anterior sensory bristles apparently absent, posterior sensory bristles anchored by double keeled scales. Dorsal scales are rhomboidal with rounded edges and increase in size towards the posterior end. Ventral interciliary field with a pair of spined terminal scales and 9–10 columns of keels; scales apparently not developed. Ventral ciliation in two longitudinal bands not merging on the head, however a short longitudinal band of ciliary rows is present behind the mouth. Pharynx slightly swollen at both ends. The Swedish specimen was in parthenogenetic phase and agrees well with literature data.

Previously recorded from Germany (Schwank 1990), Italy (Balsamo 1990), Poland (Kisielewski 1998), Russia (Tretjakova 1991) and Brazil (Kisielewski 1991).

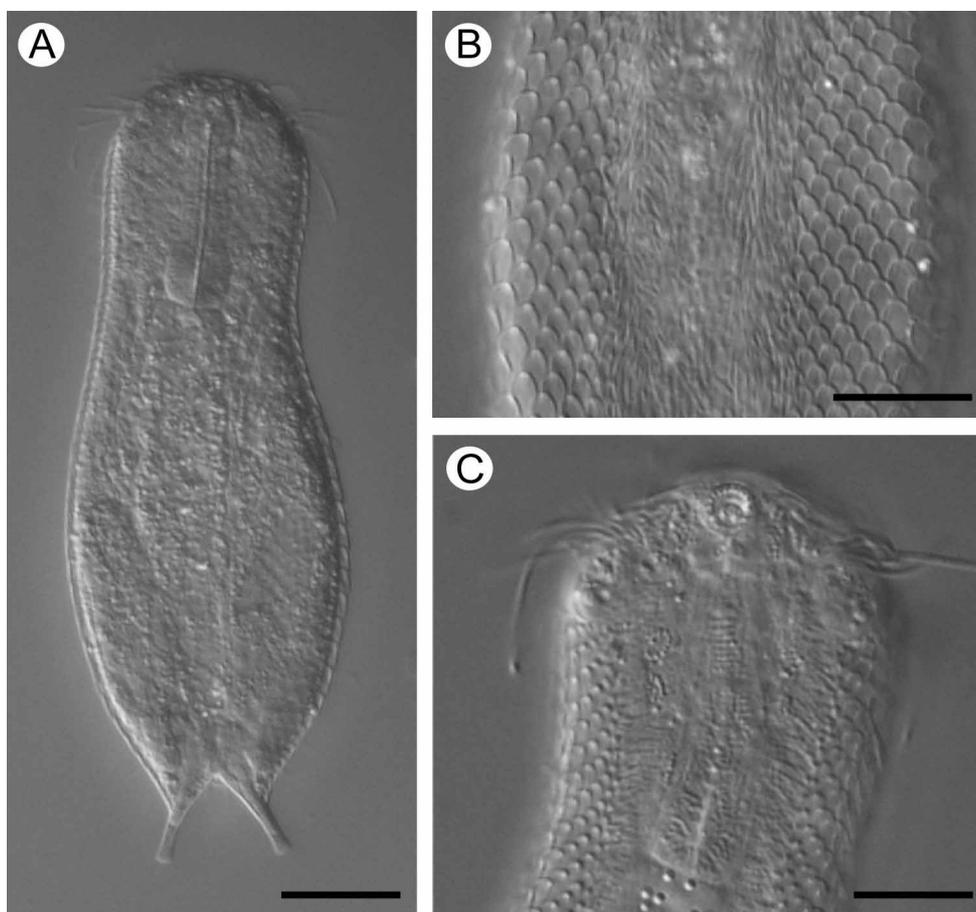


FIGURE 2. *Aspidiophorus oculifer*. A) Habitus. B) Ventral view, showing ventrolateral scales, ciliation and interciliary area. C) Ventral view showing shape of pharynx and mouth. Scale bars: A, 20 µm; B and C, 10 µm.

Aspidiophorus cf. *oculifer*

Localities. *Sphagnum* spp. Bog at Highway E10, Lapland (N 68° 26'02"; E 18° 15'01").

Material. 1 specimen. TL, 110 µm; FL, 12 µm; AL, 6 µm; PhL, 27–28 µm; MD, 3–4 µm; DC, 19–20; DR, 36–38; VC, NA; TS, 3–4 x 3–4 µm; VTS, 9–10 x NA µm; PL, 0.5–1 µm.

The specimen of *Aspidiophorus* cf. *oculifer* agrees well with the description of *A. oculifer* above and data from the literature. However, the Swedish specimen disagrees with the description of *A. oculifer* in that it lacks a pair of ocellar granules. The lack of ocellar granules alone does not justify describing *A. cf. oculifer* as a new species. Ocellar granules have been reported to be either present or absent in different populations of the same species (e. g. *Heterolepidoderma ocellatum*) (Schwank 1990; Fregni *et al.* 1998).

***Aspidiophorus ophiodermus* Balsamo, 1982**

(Figure 3)

Localities. Artificial ponds, Fiskebäckskil, Bohuslän (N 58° 14' 39"; E 11° 27' 16"); Among *Lemna* sp., Lower Lake Rudan, Handen, Södermanland (N 59° 09' 27"; E 18° 07' 31").

Material. 3 specimens. TL, 160–180 µm; FL, 18–20 µm; AL, 9–10 µm; PhL, 35–41 µm; MD, 5 µm; DC, 40–45; DR, 49–51; VC, ~10; VTS, 8 x 4–5 µm; PL, 0.5 µm.

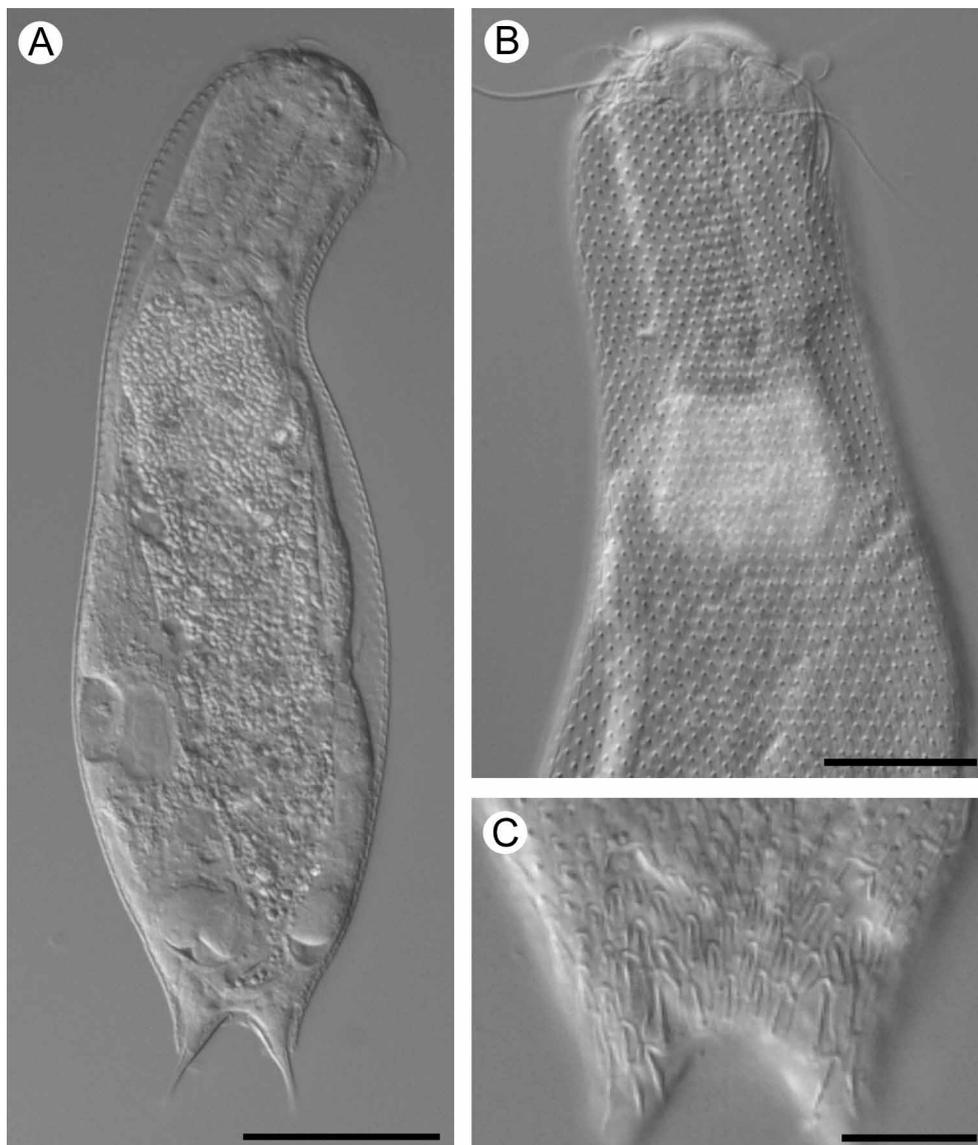


FIGURE 3. *Aspidiophorus ophiodermus*. A) Habitus. B) Dorsal view showing distribution of stalked scales. C) Dorsal view showing distribution and shape of scales of the furcal base. Scale bars: A, 50 µm; B, 20 µm; C, 10 µm.

A rather slim and elongated species with rounded to weakly three-lobed head. Cephalion well developed. One pair of cephalic ciliary tufts with one cilium considerably longer than the others. Two pairs of dorsal sensory bris-

cles. The dorsal scales are longitudinal elliptical and keeled. The posteriormost scales are keeled but not pedunculated and larger than the others. Ventral interciliary field with a pair of large suboval keeled terminal scales and approximately 10 columns of keeled scales; their borders could not be seen. Ventral ciliation in two longitudinal bands that are further divided on the head, but not merging. Pharynx widens towards the pharyngeal intestinal junction. The Swedish specimens, all in parthenogenetic phase with large eggs, fall within the ranges of literature data but are in general larger than most previously recorded specimens. The anteriormost part of the intestine has a granulated appearance, also recorded in Polish specimens (Kisielewski 1986).

Previously recorded from Great Britain (Martin 1990), Italy (Balsamo 1983), Poland (Kisielewski 1998), Russia (Tretjakova 1989) and Brazil (Kisielewski 1991).

***Aspidiophorus squamulosus* (Roszczak, 1936)**

(Figure 4)

Localities. Gravel pit, Åhus, Skåne (N 55° 55' 43"; E 14° 15' 08").

Material. 1 specimen. TL, 208 µm; FL, 21 µm; AL, 10–11 µm; PhL, 50 µm; MD, 15 µm; DC, 28; DR, 43; VC, ~12; TS, 4 x 4 µm; PL 0.5–1 µm.

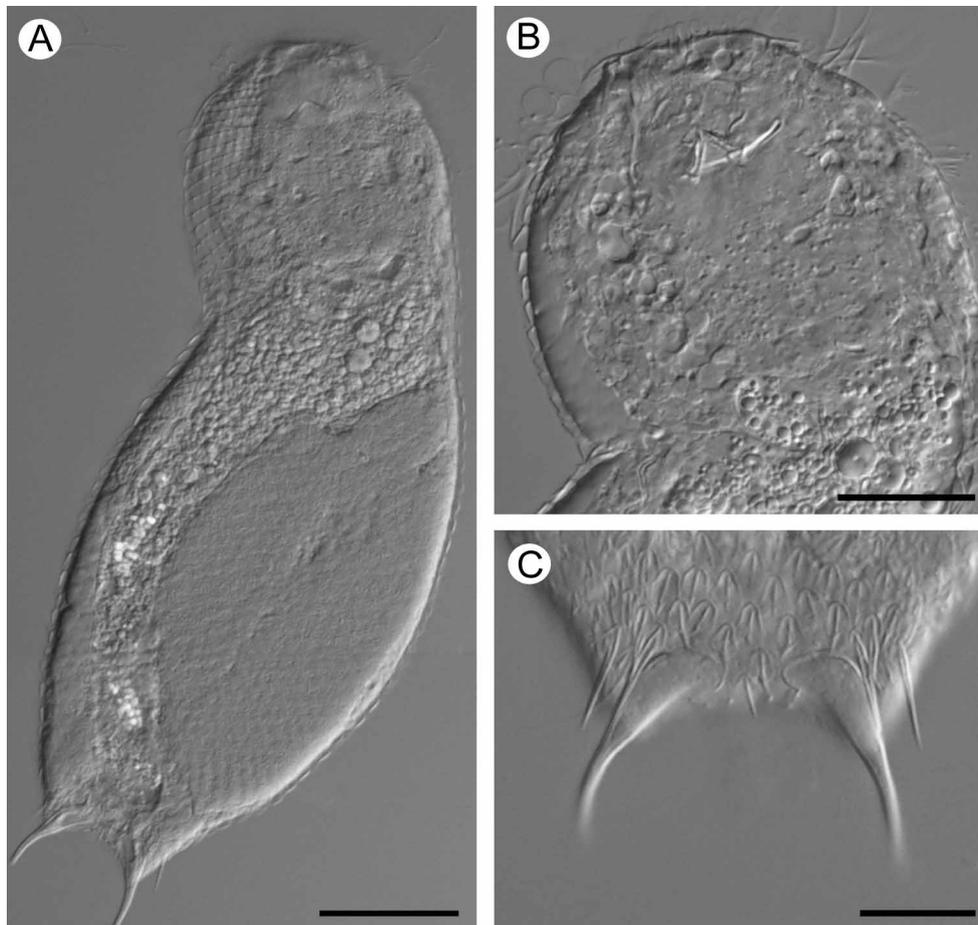


FIGURE 4. *Aspidiophorus squamulosus*. A) Habitus. B) Pharynx with cuticular reinforcements. C) Dorsal view of the furcal base showing distribution of scales and spines. Scale bars: A, 50 µm; B, 20 µm; C, 10 µm.

A large sized species with five-lobed head. Hypostomium well developed as a transverse cuticular bar. The dorsal scales are rhomboidal in shape. Three pairs of simple straight spines are present dorsally at the base of each furcal branch. In the Swedish specimen the middle spine is the shortest, which is in contrast to Roszczak (1969) and Schwank (1990) but in accordance with Kisielewski (1986). Moreover, the number of dorsal scale columns is approximately 28, which is in contrast to Schwank (1990) who states that there are 12–15 dorsal columns. This may be explained by the extremely compressed state under which the Swedish specimen was recorded. However,

the total number of columns (including ventrolateral) are 45 and in accordance with Polish specimens found by Kisielewski (1986). The posterior trunk region is covered by apparently non-pedunculated keeled scales. In the caudal bifurcation some of these scales can be seen to carry short spines, perhaps corresponding to the bristles reported by Kisielewski (1986). Ventral interciliary area covered by alternating rows of keels. Ventral ciliation in two longitudinal bands; whether they merge on the head could not be seen. Pharynx, with cuticular reinforcements (Figure 4B), widens towards the pharyngeal intestinal junction.

Previously reported from Denmark (Grilli *et al.* 2010), Italy (Balsamo & Tongiorgi 1995), Poland (Kisielewski 1998) and Sweden (Kånneby *et al.* 2009).

***Aspidiophorus tetrachaetus* Kisielewski, 1986**

(Figure 5)

Localities. Lake Ånnsjön, Jämtland (N 63° 15' 35"; E 12° 26' 51"); Small rockpool, Fiskebäckskil, Bohuslän (N 58° 14' 39"; E 11° 27' 16").

Material. 4 specimens. TL, 128–140 µm; FL, 16–17 µm; AL, 10–11 µm; PhL, 27–29 µm; MD, 5 µm; DC, 14–18; DR, 32–38; VC, ~8; VTS, 8–9 x 4 µm; PL, 0.5–1 µm.

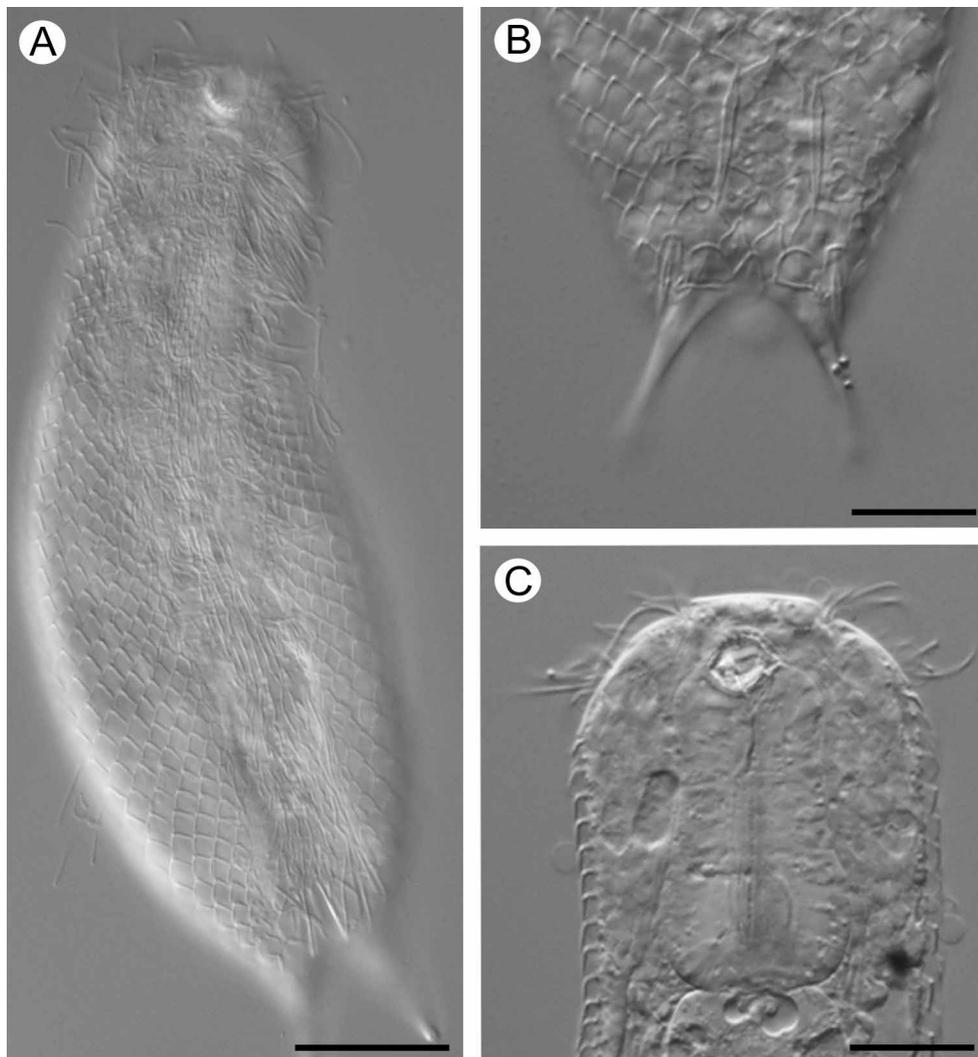


FIGURE 5. *Aspidiophorus tetrachaetus*. A) Ventral view. B) Dorsal view of scales and spines of posterior trunk region. C) Shape of pharynx. Scale bars: A, 20 µm; B and C, 10 µm.

A small sized species with weakly five-lobed head. Two pairs of sensory bristles; anterior pair anchored by papillae and posterior pair by double keeled scales. Dorsal scales are rhomboidal in shape with weakly rounded edges. Two pairs of characteristic simple spines are present in the posterior trunk region. Each spine of the longer

anterior pair is 10–12 μm in length and anchored by a scale with keels on either side of the spine base. The shorter posterior pair reaches 5–6 μm in length and is anchored by smaller scales just at the base of the furca. Interciliary field with approximately 8 columns of keels which can be followed up at least halfway the length of the pharynx. Paired ventral terminal keeled scales that widens toward the distal end. Ventral ciliation in two longitudinal bands not merging on the head. Pharynx, broad with large terminal swellings, posterior swelling larger than anterior.

Previously reported from Poland (Kisielewski 1998), Russia (Tretjakova 1989) and Sweden (Kånneby *et al.* 2009).

Genus *Heterolepidoderma* Remane, 1927

Heterolepidoderma joermungandri n. sp.

(Figures 6, 7)

Type locality. *Sphagnum* spp. rock pool, Skarvesäter, Bohuslän, Sweden (N 58° 14' 23''; E 11° 22' 08'').

Type material. Photographs of five specimens, available at the Swedish Museum of Natural History, Stockholm, Sweden. Accession numbers: Holotype, SMNH Type-8134; Paratypes, SMNH Type-8135 – SMNH Type-8138.

Etymology. The species is named after the scaly Midgard serpent, believed to encircle the earth in Nordic mythology.

Diagnosis. Small species, 94–105 μm in total length. Body width 20–22 μm , 20–22 μm , 32–37 μm and 12 μm at head, neck, trunk and base of furca, respectively. Five-lobed head with cephalion and well developed hypopleuria. Anterior sensory bristles anchored by papillae, posterior sensory bristles anchored by double keeled scales. Straight furca, 13–15 μm in length, with rather thin adhesive tubes pointing slightly outward at distal end. Dorsal body surface covered by keeled scales distributed in 21–22 columns with 22–23 scales in each. Columns converging in the narrow parts of the body. Ventral interciliary area with keels and 1 to 2 pairs of larger keeled scales with simple spines. Ventral ciliation in two separate longitudinal bands. Mouth subterminal. Pharynx 27–29 μm in length, with anterior and posterior swellings and two cuticular reinforcements.

Description. *Heterolepidoderma joermungandri* n. sp. is a small-sized species, 94–105 μm in total body length. Head five-lobed, epipleuria barely visible while hypopleuria are well developed. Cephalion 12 μm in width. Two pairs of cephalic ciliary tufts, two cilia are considerably longer than the rest and reach lengths of up to 16 μm . Ocellar granules absent.

Body width 20–22 μm at the head (U8–9), 20–22 μm at the neck (U31–33), 32–37 μm at the trunk (U64–67) and 12 μm at the base of the furca (U88–90). Head slightly delimited from trunk by neck constriction that gradually widens into the trunk, which reaches its greatest width around U65–70. The trunk then tapers into a straight furca 13–15 μm in length with rather thin adhesive tubes, 7–8 μm in length, pointing slightly outward at their distal ends. Anterior and posterior sensory bristles present, anterior pair anchored by papillae at U24–25 and posterior pair anchored by double keeled scales at U82–86.

Dorsal body surface covered by 21–22 columns of 22–23 keeled scales with visible edges. The total number of columns is 34–38. The median column of dorsal scales is straight, except in the narrowest part of the neck region where it is replaced by two columns of diagonally arranged scales, while the columns on either side converge toward the narrower parts of the body. Just at the base of the furcal branches a pair of large rounded scales is present and just posterior to these on the inner edge of each furcal branch is an additional pair of keeled scales. The dorsal scales are hemi-elliptical in shape, 5–6 μm in length and 2–3 μm in width; with a prominent keel approximately 0.5 μm in height. The head and neck scales are more rhomboidal in shape, 4 μm in length and 2–3 μm in width. The interciliary area is covered by 7–10 columns of keels, scales apparently not developed, which can be followed past the pharyngeal intestinal junction. The posteriormost row (including terminal scales) consists of 2–4 larger keeled scales, approximately 5 μm in length, with a simple spine. Ventral ciliation in two separate longitudinal bands, not merging on the head.

Mouth subterminal, 4–5 μm in diameter; pharynx 27–29 μm in length with anterior and posterior swellings. Anterior region of pharynx reinforced by two cuticular rods just behind the mouth. Pharyngeal intestinal junction at U31–32. Intestine straight, anus situated at U87.

All observed specimens were adults in parthenogenetic phase.

Taxonomic remarks. *Heterolepidoderma* consists of 34 nominal species of which 20 are freshwater and 14 marine or brackish. Two species, *H. fallax* Remane, 1936 and *H. loripes* Martin, 1981, are considered *species inquirendae* (Balsamo *et al.* 2009).

Heterolepidoderma joermungandri **n. sp.** shows morphological characteristics found in both freshwater and marine species of the genus. *Heterolepidoderma jureiense* Kisielowski, 1991 and *H. dimentmani* Kisielowski, 1999 are freshwater species with cuticular reinforcements in the anterior part of the pharynx. The latter species can be separated from *H. joermungandri* **n. sp.** by its pronouncedly five-lobed head; moreover, the pharynx has two pairs of cuticular rods and an additional pair of cuticular granules compared to a single pair of cuticular rods and the absence of an additional pair of cuticular granules in *H. joermungandri* **n. sp.**

The pharynx in several marine species is reinforced with cuticular elements: *Heterolepidoderma axi* Mock, 1979, *H. clipeatum* Schrom, 1972, *H. contectum* Schrom, 1972 and *H. foliatum* Renaud-Mornant, 1967 all have hydrofoil scales which are absent in *H. joermungandri* **n. sp.** Marine species without hydrofoil scales but with cuticular reinforcements in the pharynx are *H. armatum* Schrom, 1966, *H. arenosum* Kisielowski, 1988, *H. hermaphroditum* Wilke, 1954 and *H. istriatum* Schrom, 1972. *H. armatum* and *H. istriatum* are of a similar size but have fewer dorsal scale columns, 16–17 and 12–13 respectively vs. 21–22 and a different arrangement of head lobes compared to *H. joermungandri* **n. sp.** *H. arenosum* can be separated from the new species on the basis of possessing large ocellar granules and a longer furca and *H. hermaphroditum* on the basis of its clearly five-lobed head. *H. caudosquamatum* Grilli, Kristensen and Balsamo, 2009, a brackish species described from Denmark, has hydrofoil scales and a lower total number of scale columns.

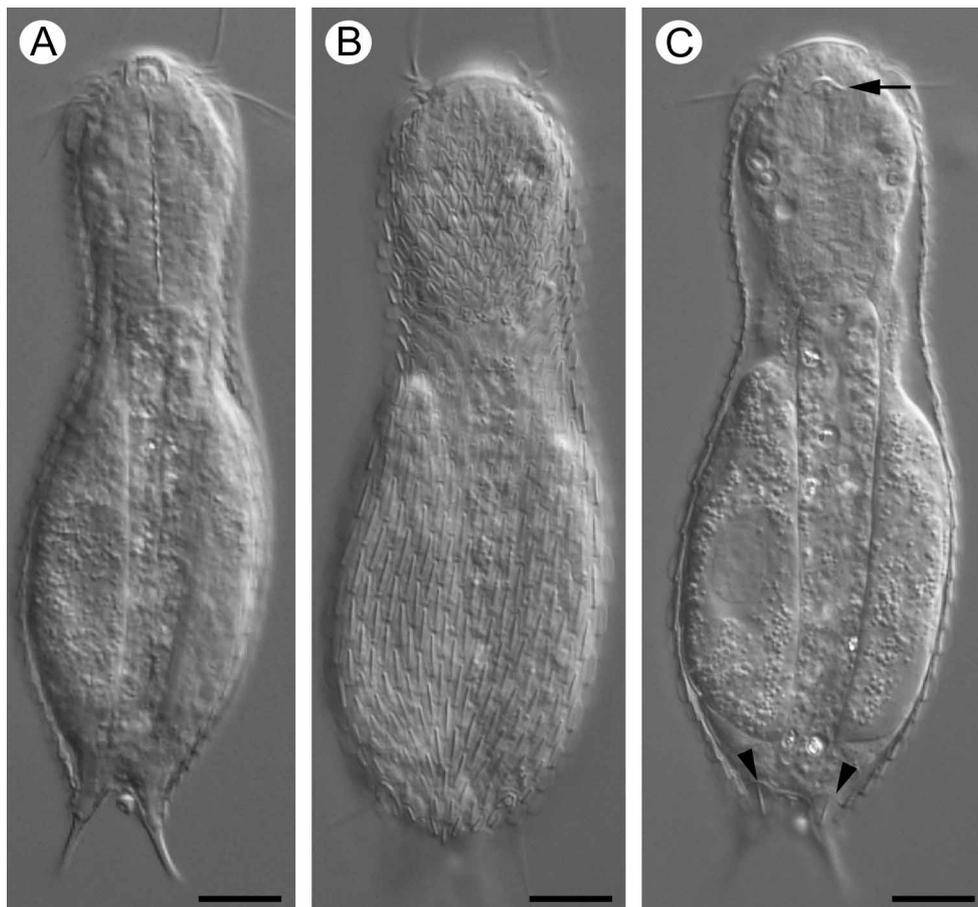


FIGURE 6. *Heterolepidoderma joermungandri* **n. sp.** A) Habitus. B) Dorsal view of distribution and shape of scales. C) Habitus, arrow indicates cuticular reinforcement of pharynx and arrow heads indicate scales of the furcal base. Scale bars: A–C, 10 μ m.

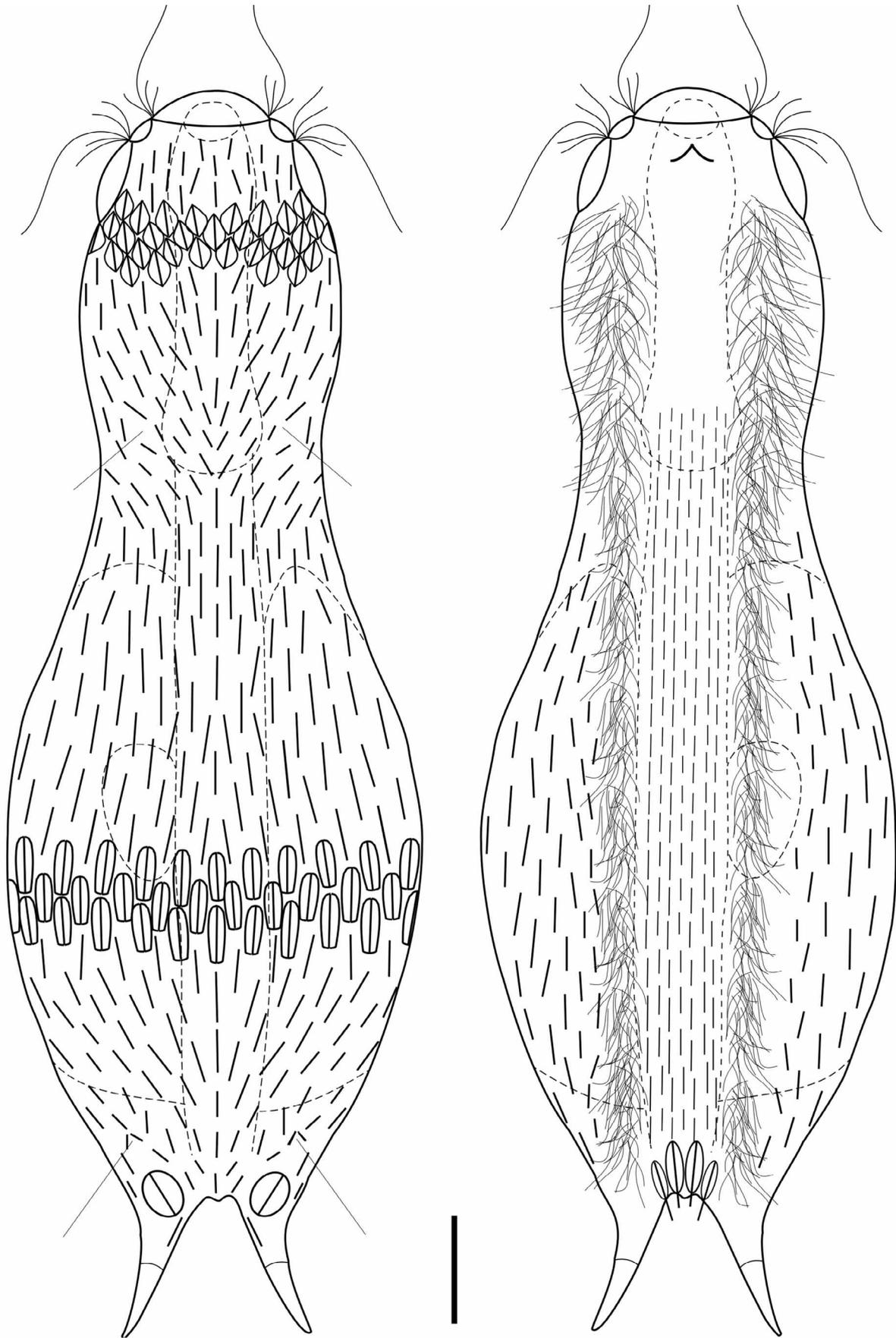


FIGURE 7. Schematic drawing of *Heterolepidoderma joermungandri* n. sp. Dorsal view to the left and ventral view to the right. Scale bar: 10 μ m.

Of all the hitherto discussed species, *H. joermungandri* n. sp. seems morphologically most closely related to *H. jureiense*. Both species have similar body shapes and morphological and morphometric characters. However, *H. jureiense* has hydrofoil scales, which are absent in *H. joermungandri* n. sp., and has so far only been reported from Brazil.

***Heterolepidoderma macrops* Kisielewski, 1981**

(Figure 8)

Localities. Freshwater *Sphagnum* spp. rockpool, Hällö (N 58° 20' 00"; E 11° 12' 50"); A small pond close to lake Torneträsk at Abisko Scientific Research Station, Abisko, Lapland (N 68° 21' 19"; E 18° 49' 21"); Among moss, Björkliden, Lapland (N 68° 24' 25"; E 18° 41' 36").

Material. 5 specimens. TL, 143–150 µm; FL, 17 µm; AL, 10 µm; PhL, 33–37 µm; MD, 4 µm; DC, 27–33; DR, 30; TS, 5 x 1–2 µm; VTS, 4.5 x 2.5 µm.

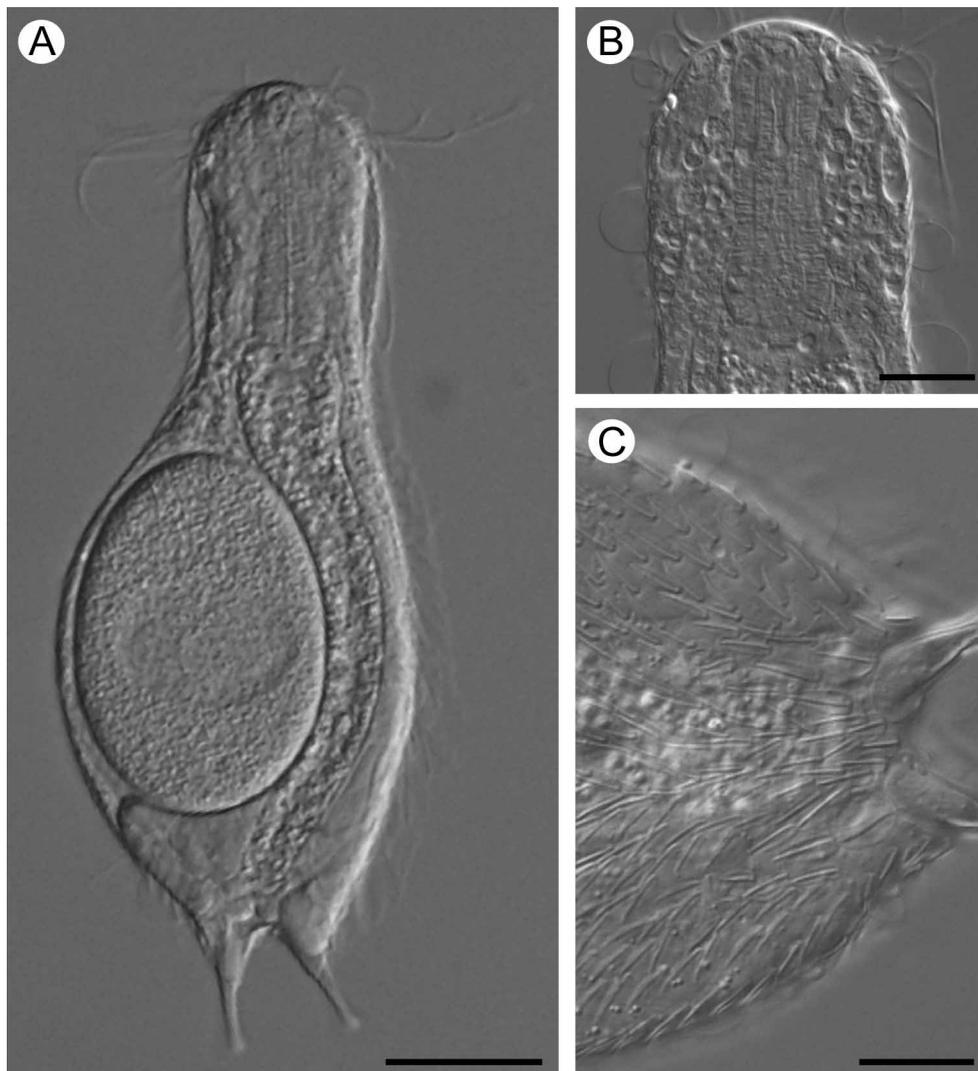


FIGURE 8. *Heterolepidoderma macrops*. A) Habitus. B) Shape of pharynx and ocellar granules. C) Dorsal view of posterior trunk region showing distribution of scales. Scale bars: A, 20 µm; B, 15 µm; C, 10 µm.

Mid sized species with rounded to five-lobed head, characterized by two large ocellar granules. Two pairs of dorsal sensory bristles, posterior pair anchored by double keeled scales. Dorsal body surface covered by elongated elliptical keeled scales without spines. Scales are ordered parallel to the body outline except for the median column which is more or less straight. Interciliary area naked except for two keeled ventral terminal scales. Ventral ciliation

in two longitudinal bands that are further divided on the head, but do not merge. Pharynx with weak swellings at both ends. The number of dorsal columns and the length of Swedish specimens are close to or just above the upper limit of literature data.

Previously recorded from France (Kisielewski 1998), Germany (Schwank 1990), Poland (Kisielewski 1998), Russia (Tretjakova 1989) and perhaps United States and Japan (Schwank 1990).

***Heterolepidoderma ocellatum* (Metschnikoff, 1865)**

(Figure 9)

Localities. Among *Sphagnum* spp., Saltö, Bohuslän (N 58° 52' 21"; E 11° 07' 34"); Freshwater *Sphagnum* spp. rockpool, Kristineberg, Bohuslän (N 58° 14' 50"; E 11° 26' 22"); Freshwater *Sphagnum* spp. rockpool, Islandsberg, Bohuslän (N 58° 12' 38"; E 11° 25' 09"); Small pond, Askö, Södermanland (N 58° 49' 23"; E 17° 38' 32").

Material. 14 specimens. TL, 114–127 µm; FL, 14–15 µm; AL, 7–8 µm; PhL, 31–34 µm; MD, 4–5 µm; DC, 14–17; DR, 20–22; TS, 5–6 x 2–3 µm; VTS, 5–6 x 2–3.

A relatively small sized species, with five-lobed head and a pair of ocellar granules. Sporadic absence of ocellar granules have been reported in some populations (Schwank 1990; Fregni *et al.* 1998). Two pairs of sensory bristles present, each of the posterior pair anchored by a double-keeled scale. Dorsal body surface covered by elongated elliptical keeled scales, smaller in size in head and neck regions. Interciliary area naked except for a pair of keeled terminal scales and 1–2 transverse rows of 3–4 keeled scales. Pharynx with small swellings at both ends.

Two of the Swedish specimens were in post-parthenogenetic phase with X-organ and sperm present (Figure 9A). Another peculiarity is that several specimens had more or less well developed short ventrolateral spines. In one specimen, the area between the edges of the posterior lateral parts of the scale appeared to be depressed giving the appearance of a tri-lobed scale. The keels were not modified in this part but instead gave the impression of a short spine. Whether the keel was actually in contact with the depressed area could not be determined.

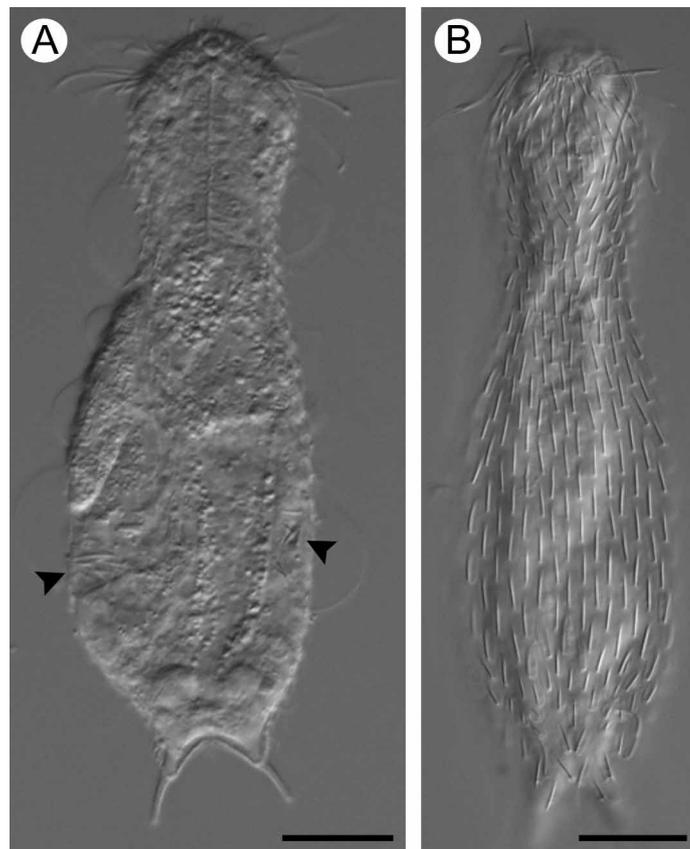


FIGURE 9. *Heterolepidoderma ocellatum*. A) Habitus, arrowheads indicate spermatozoa. B) Dorsal view, showing distribution of scales. Scale bars: 15 µm.

This species is widely distributed in Europe (see e. g. Greuter 1917; Mola 1932; Remane 1935–36; Valkanov 1937; Rudescu 1967; Martin 1981; Schwank 1990; Kisielewski 1998) and is also reported from Canada (Schwank 1990), United States (Schwank 1990), Japan (Saito 1937) and Brazil (Kisielewski 1991).

***Heterolepidoderma trapezoidum* n. sp.**

(Figures 10, 11)

Type locality. Small stream, Mount Snasahögarna, Jämtland, Sweden (N 63° 12' 39''; E 12° 18' 19'').

Type material. Photographs of one specimen, available at the Swedish Museum of Natural History, Stockholm, Sweden. Accession number: Holotype, SMNH Type-8139.

Etymology. This species is named after its peculiar head-shape which from the dorsal side resembles an isosceles trapezoid.

Diagnosis. Body length 133 μm , body width 31 μm , 20 μm , 38 μm and 9 μm at head, neck, trunk and base of furca respectively. Head with well developed hypopleuria and well delimited from trunk by a constricted neck. Posterior trunk region greatly reduced in width. Furca straight, 14 μm in length, with adhesive tubes pointing slightly outward at their distal ends. Anterior sensory bristles absent, posterior sensory bristles present. Dorsal body surface covered by suboval to round scales, with poorly developed edges, distributed in 16–17 columns with 22–24 scales in each. Dorsal scales absent above anterior part of pharynx, scales on either side of this area are hemi-elliptical and arranged diagonally relative to the longitudinal body axis. Ventral interciliary area naked except in the posterior part where thin, smooth, round, reduced and overlapping scales are present. Pharynx without swellings, 37 μm in length.

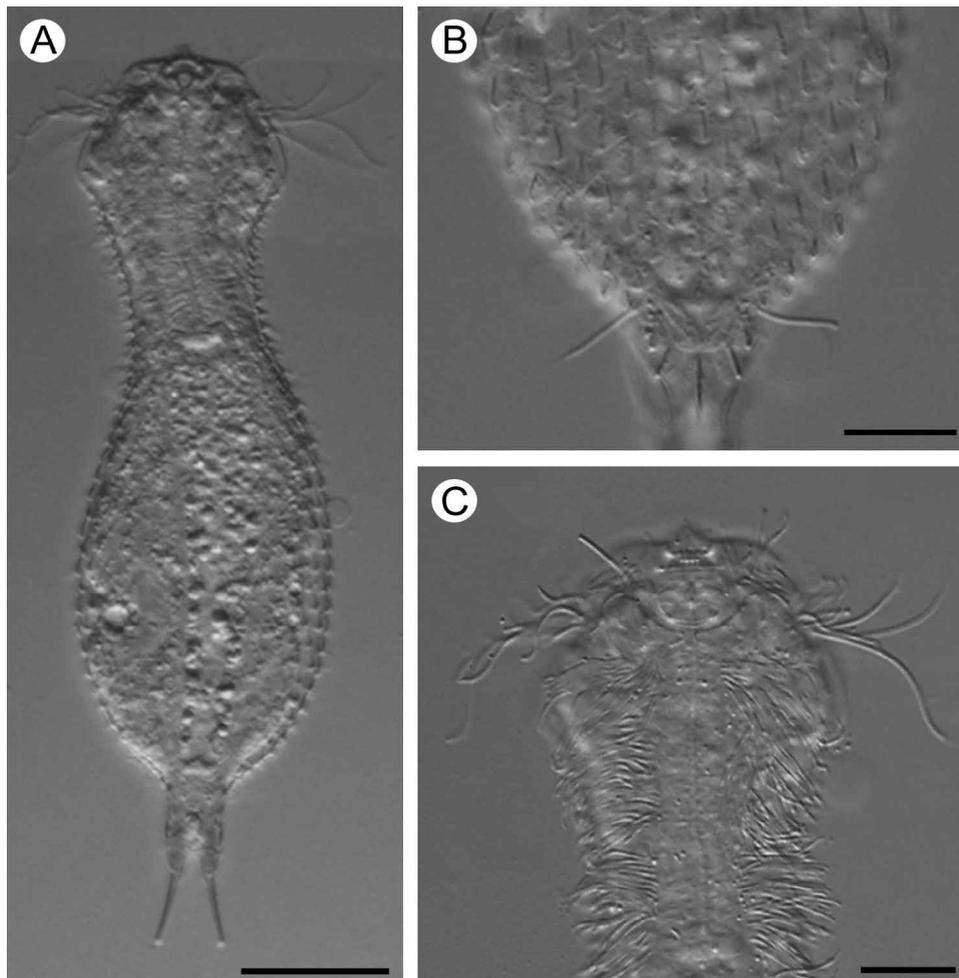


FIGURE 10. *Heterolepidoderma trapezoidum* n. sp. A) Habitus. B) Dorsal view of scales and anterior part of furcal base. C) Ventral view of head and neck region showing ventral ciliation and the smooth kidney-shaped hypostomium. Scale bars: A, 20 μm ; B and C, 10 μm .

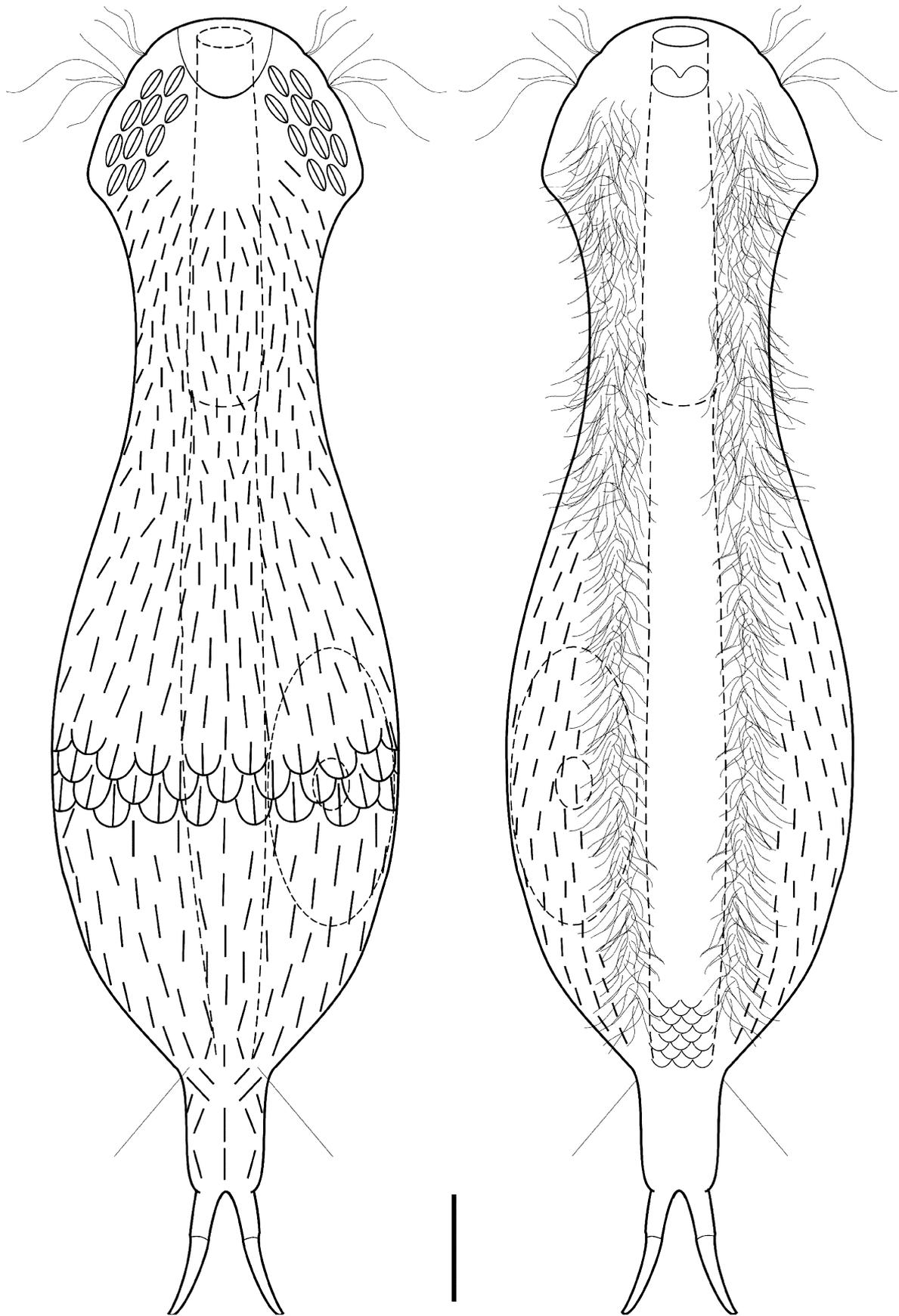


FIGURE 11. Schematic drawing of *Heterolepidoderma trapezoidum* n. sp. Dorsal view to the left and ventral view to the right. Scale bar: 10 μ m.

Description. *Heterolepidoderma trapezoidum* n. sp. is a mid-sized species, 133 µm in total body length. Head appears three-lobed but is weakly five-lobed, shaped as an isosceles trapezoid. Cephalion 14 µm in width, epipleuria barely visible while hypopleuria are large and well developed. Hypostomium present as a smooth kidney-shaped plate just behind the mouth. Two pairs of cephalic ciliary tufts present. The cilia of the posterior tufts are approximately 20 µm in length and those of the anterior tufts 5–8 µm in length. Ocellar granules absent.

Body width 31 µm at the head (U14), 20 µm at the neck (U26), 38 µm at the trunk (U60) and 9 µm at the base of the furca (U81–87). Head well delimited from trunk by a constricted neck, which gradually widens into the trunk. The posterior trunk region is drastically reduced in width from 38 µm at U60 to 9 µm at U81, into a tapered furca base. The furca is more or less straight, 14 µm in length. Adhesive tubes 11 µm in length, almost parallel, pointing slightly outward at their distal ends. Anterior sensory bristles apparently absent, posterior sensory bristles anchored by papillae at U82.

Dorsal body surface covered by suboval to round keeled partially overlapping scales distributed in 16–17 columns with 22–24 scales in each column. The edges of the scales are poorly developed and may be partly fused with the cuticle. The dorsal part of the head above the pharynx and down half the length of the pharynx naked. The number of scales per column was counted from the posterior end of this naked area. The scales situated laterally on either side of the naked portion are hemi-elliptical, half as wide as long and diagonally arranged relative to the longitudinal body axis. The median dorsal scale column is straight while the columns on either side tend to diverge, progressively approaching parallelism with the lateral body outline. Just anterior of the caudal cutting there are two medial keeled scales. The base of the furca also bears two pairs of dorsal keeled scales diagonally arranged relative to the longitudinal body axis, the outer pair being half the size of the inner pair. Two pairs of larger keeled dorsolateral scales are also present on the furca. Ventrolaterally in the anterior portion of the body, the keels form short stout spines. These spines become progressively fused with the scales towards the posterior end. The posterior part of the ventral interciliary area with apparently weakly developed, rounded, smooth, reduced, partially overlapping scales. Ventral ciliation in two separate longitudinal bands not merging on the head.

Mouth terminal, 4 µm in diameter. Cylindrical pharynx, 37 µm in length, widens slightly towards the pharyngeal intestinal junction which is situated at U30. Intestine straight, anus at U80.

The observed specimen was an adult in parthenogenetic phase.

Taxonomic remarks. The new species can be affiliated with either *Heterolepidoderma* or *Chaetonotus*. In *Chaetonotus*, *C. silvaticus* (Varga, 1963), has a similar body shape to *Heterolepidoderma trapezoidum* n. sp., with a constricted neck and a tapering caudal section. However, *C. silvaticus* has a much greater number of dorsal scales, distributed in 28–32 columns with 50–60 scales in each compared to 16 columns with 22–24 scales in each for *H. trapezoidum* n. sp. Moreover, the adhesive tubes of *C. silvaticus* are significantly longer and of different shape than in *H. trapezoidum* n. sp. The new species has short ventrolateral spines that progressively fuse with the scales towards the posterior end. The dorsal scales are keeled without spines and in absence of further evidence (e. g. molecular data) this species is provisionally considered a member of *Heterolepidoderma*. *H. trapezoidum* n. sp. can be separated from all hitherto described species of the genus on the basis of its elongated furcal base and the presence of a dorsal apparently naked region above the pharynx. Of the described species within the genus *H. trapezoidum* n. sp. seems closest to *H. famailensis* Grosso & Draht, 1991 and *H. longicaudatum* Kisielewski, 1979. *H. famailensis* has a somewhat similar head-shape with small epipleuria and a kidney-shaped hypostomium. *H. longicaudatum* has similar trunk scales and a naked fairly elongated furcal base.

Genus *Lepidochaetus* Kisielewski, 1991

Lepidochaetus zelinkai (Grünspan, 1908)

(Figure 12)

Localities.: Small stream, Mount Snasahögarna, Jämtland (N 63° 12' 39"; E 12° 18' 19"); Small pond, Askö, Södermanland (N 58° 49' 23"; E 17° 38' 32"); Freshwater rockpool among *Sphagnum* spp., Hällö, Bohuslän (N 58° 20' 03"; E 11° 12' 50"); Artificial ponds, Fiskebäckskil, Bohuslän (N 58° 14' 39"; E 11° 27' 16"); Freshwater rockpool, Runmar, Stockholm archipelago (N 59° 17' 22"; E 18° 47' 56"); Small lake, Highway E10, Lapland (N 68° 20' 53"; E 19° 02' 16"); *Sphagnum* spp. Bog at Highway E10, Lapland (N 68° 26' 04"; E 18° 14' 53"); Pond south of Lake Torneträsk, Abisko, Lapland (N 68° 21' 19"; E 18° 49' 21").

Material. 8 specimens. TL, 242–309 μm ; FL, 30–35 μm ; PhL, 50–62 μm ; MD, 9–12 μm ; DC, 10–12 DR, 35–36 VC, 6–8.

Long and slender species, with hammer-shaped, three- to five-lobed head, with large cephalon. Dorsal scales are elliptical to heart-shaped and partially overlapping. Three pairs of long rigid bifid spines and a single median bifid spine, all in posterior dorsal trunk region overshooting the furcal branches, are characteristic of the species. The other dorsal spines are simple or, especially in the posterior trunk region, have less well developed denticles. Interciliary area is covered by oval keeled scales carrying short simple spines, except for the terminal end which is covered by a couple of larger scales with longer spines. The Swedish specimens fall well within the ranges presented in the literature.

This species is widely distributed in Europe (see e. g. Grünspan 1908; Greuter 1917; Rudescu 1967; Martin 1981; Schwank 1990; Balsamo & Tongiorgi 1995; Kisielewski 1998) and is also reported from Japan (Sudzuki 1971), Korea (Lee & Chang 2000), Canada (Schwank 1990), Argentina (Grosso 1976) and Brazil (Kisielewski 1991).

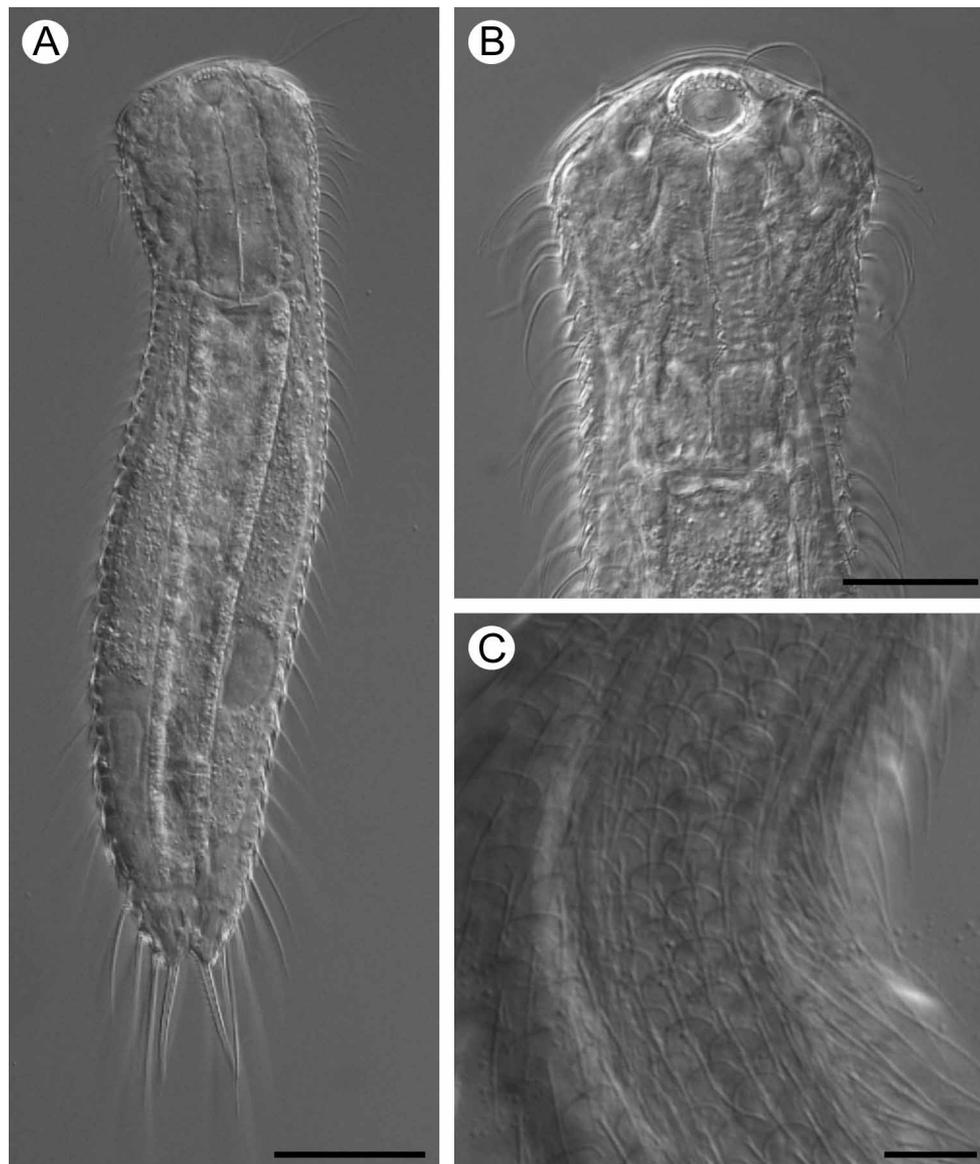


FIGURE 12. *Lepidochaetus zelinkai*. A) Habitus. B) Shape of pharynx and mouth. C) Dorsal view of mid-trunk region showing distribution of spined scales. Scale bars: A, 40 μm ; B, 20 μm and C, 10 μm .

Genus *Lepidodermella* Blake, 1933

Lepidodermella minor minor Remane, 1936

(Figure 13)

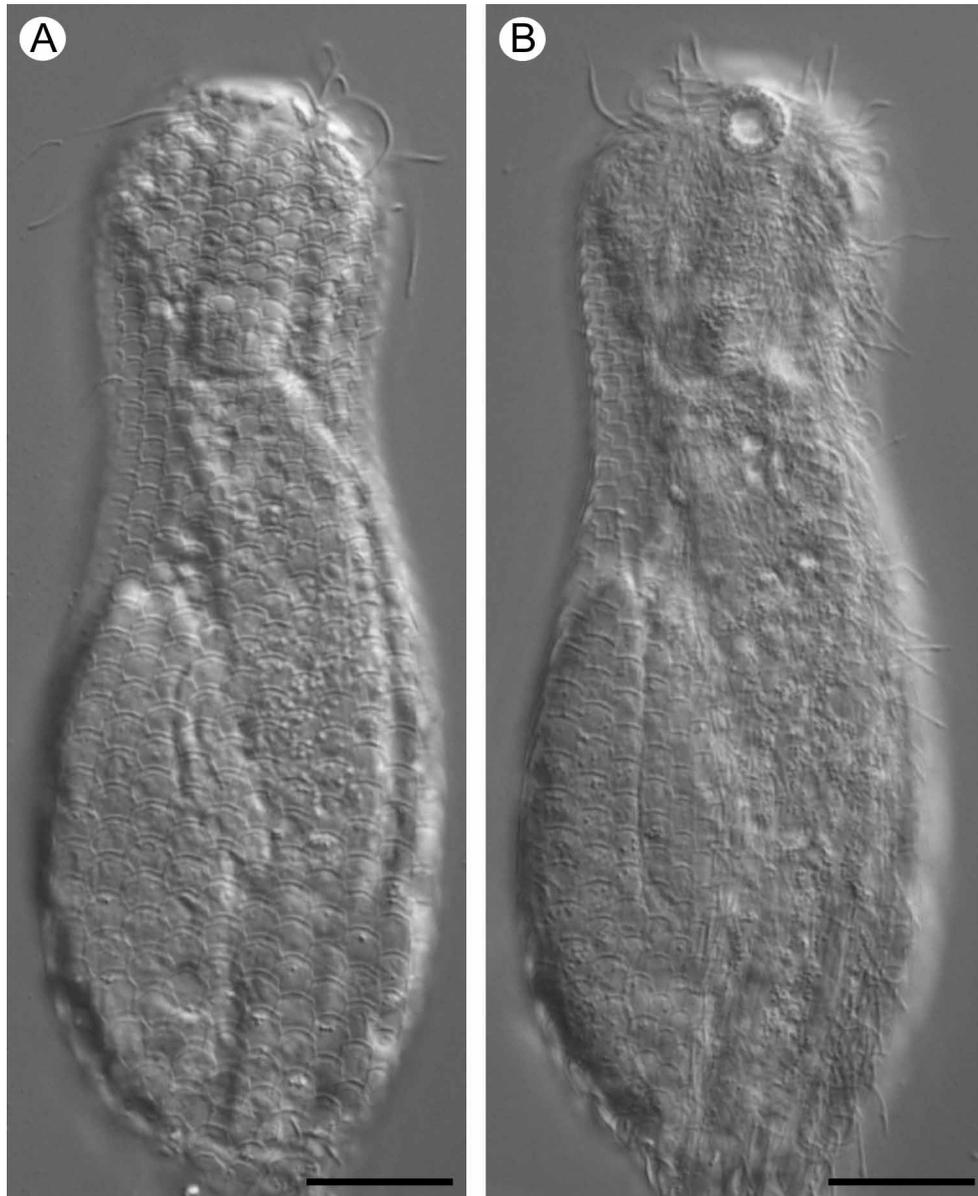


FIGURE 13. *Lepidodermella minor minor*. A) Dorsal view. B) Ventral view. Scale bars: 20 μ m.

Localities. Small stream, Fiskebäckskil, Bohuslän (N 58° 14' 51''; E 11° 27' 04'').

Material. 1 specimen. TL, 130 μ m; FL, 16 μ m; AL, 9 μ m; PhL, 25 μ m; MD, 6 μ m; DC, 11; DR, 35–36; VC, Na; TS, 5 x 5 μ m; VTS, Na.

Lepidodermella minor minor is an insufficiently described species. The head is indistinctly five-lobed. Two pairs of cephalic sensory ciliary tufts, the posterior pair longer than the anterior pair. Two pairs of sensory bristles are present, the posterior pair anchored by double-keeled scales. The dorsal side is covered by rounded pentagonal to hexagonal scales. Because the anterior and posterior parts of two subsequent scales in a column overlap, all scales show a more or less well developed double anterior edge which is more prominent in the posterior trunk region. The specimen was in rather bad shape, and the ventral side could not be sufficiently studied, but the keels of the ventral terminal scales were nevertheless barely visible. Mouth subterminal, pharynx very short and rather thick connected via the pharyngeal intestinal junction (at U23) to the straight intestine. The Swedish specimen did not

show the cuticular teeth present in German and Polish specimens (see Kisielewski, 1981). However, it follows the morphological and morphometric data presented by Kisielewski (1981) very well and it is therefore considered *L. minor minor*.

Previously reported from Germany (Remane 1935–36) and Poland (Kisielewski 1998).

***Lepidodermella squamata* (Dujardin, 1841)**

(Figure 14)

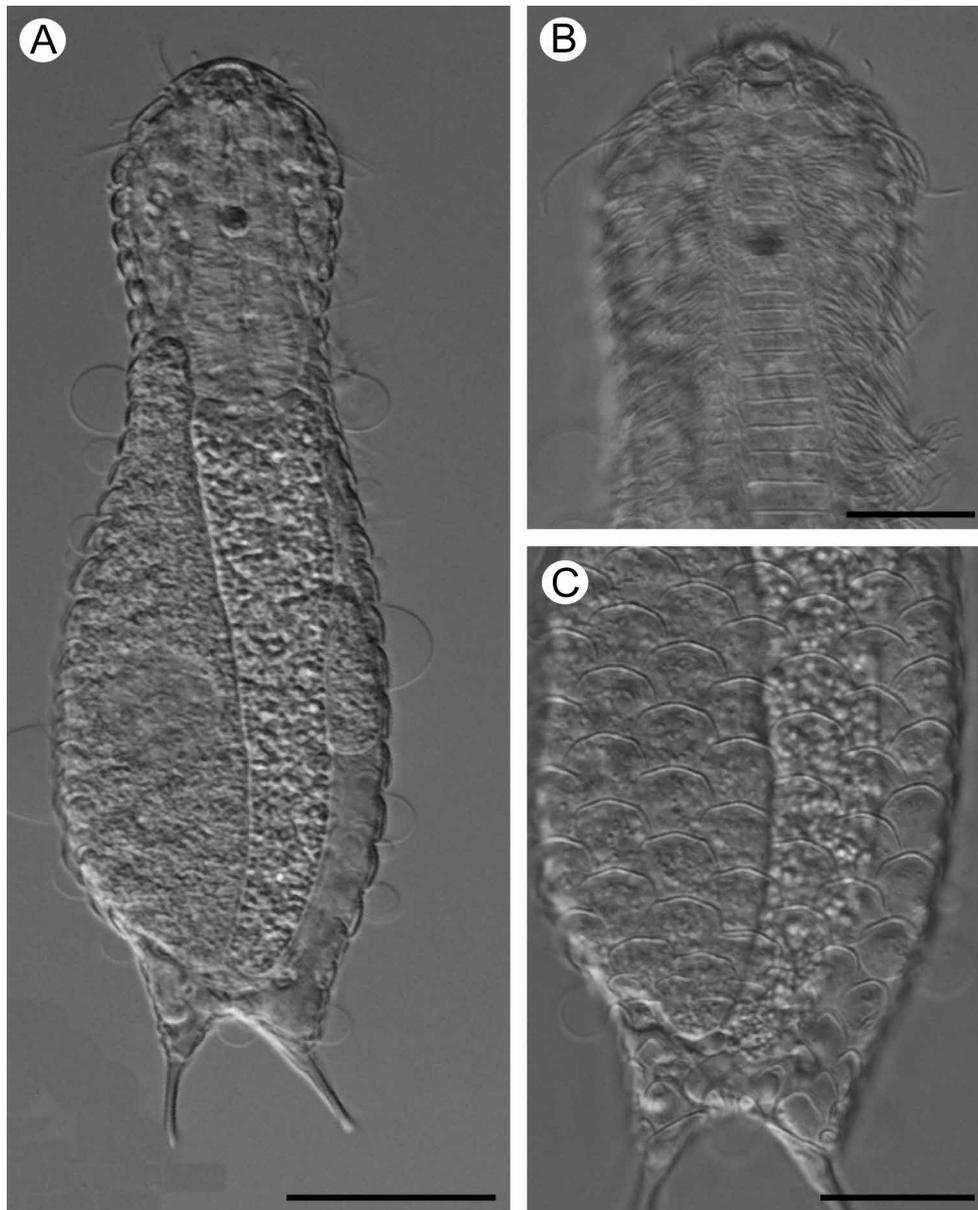


FIGURE 14. *Lepidodermella squamata*. A) Habitus. B) Ventral view of head and neck region showing the transverse scales of the intercalary area. C) Dorsal view of trunk showing shape and distribution of scales. Scale bars: A, 30 μm ; B, 15 μm ; C, 20 μm .

Localities. Pond, Storlien W, Jämtland (N 63° 19' 06''; E 12° 05' 22''); Pond, Storlien E, Jämtland (N 63° 18' 42''; E 12° 06' 43''); Lake Trösvattnet, Västmanland (N 59° 33' 21''; E 14° 29' 23''); Gravel pit, Åhus, Skåne (N 55° 55' 45''; E 14° 15' 08''); Small stream, Fiskebäckskil, Bohuslän (N 58° 14' 51''; E 11° 27' 05''); Freshwater Rockpool among *Sphagnum* spp., Hållö, Bohuslän (N 58° 20' 00''; E 11° 12' 50'') Artificial pond, Nybro, Småland (N 56° 44' 56''; E 15° 54' 14''); Ditch at Abisko Scientific Research Station, Abisko, Lapland (N 68° 21' 11''; E 18° 48' 54''); Meadow west of Abisko Scientific Research Station, Abisko, Lapland (N 68° 21' 18''; E 18° 48' 40'');

Among *Sphagnum* spp., Mount Njulla, Lapland (N 68° 21' 36''; E 18° 43' 02''); Roadside ditch, Highway E10, Lapland (N 68° 25' 45''; E 18° 18' 17''); *Sphagnum* spp. Bog at Highway E10, Lapland (N 68° 26' 04''; E 18° 14' 53'').

Material. 14 specimens. TL, 155–179 µm; FL, 18–24 µm; AL, 12–15 µm; PhL, 46–52 µm; MD, 4–7 µm; DC, 7–9; DR, 28–30; VC, 5; VB, 20–24; TS, 6.5–8 x 6.5–9 µm; VTS, 12–14 x 6–7 µm.

Small to mid sized species with weakly five-lobed head. Hypostomium with two hooks. Dorsal head and trunk surface covered by smooth scales with either rounded or squared posterior edge; in the neck region the scales are more rectangular. The species is easily separated from the other species of the genus by a longitudinal series of more than 20 transverse cuticular plates below the pharynx and part of the anterior intestine. Interciliary area of the trunk with five columns of smooth more or less rounded quadrangular scales, or rounded equally sized scales. If interciliary scales are of different sizes, those of the medial column are the largest while the scales of the other columns decrease in size towards the ciliary bands. A pair of large keeled terminal scales and several smaller round scales are present ventrally at the posterior end. Ventral ciliation in two separate longitudinal bands. Pharynx gradually widens towards the pharyngeal intestinal junction. The Swedish specimens fall within the ranges of previously reported literature data.

A very common species widely distributed in Europe (see e. g. Marcolongo 1910; Greuter 1917; Remane 1935–36; Valkanov 1937; Rudescu 1967; Martin 1981; Schwank 1990; Kisielewski 1998) and also reported from India (Naidu & Rao 2004), Japan (Saito 1937; Sudzuki 1975), Korea (Lee & Chang 2000), Israel (Kisielewski 1999), East Africa (Daday 1910), Canada (Schwank 1990), United States (see e. g. Brunson 1950; Evans 1993) Brazil (Kisielewski 1991), Uruguay (Cordero 1918) and Argentina (Grosso & Draht 1984).

Genus *Polymerurus* Remane, 1927

Polymerurus nodicaudus (Voigt, 1901)

(Figure 15)

Localities. Pond with water lilies, Bergianska Trädgården, Stockholm (N 59° 22' 07''; E 18° 02' 41''); Among *Phragmites* sp. and *Typha* sp., Lower Lake Rudan, Handen, Södermanland (N 59° 09' 27''; E 18° 07' 31'').

Material. 3 specimens. TL, 540–590 µm; FL, 120–140 µm; PhL, 90–112 µm; MD, 14–23 µm; SCA, 20–21; DC, 20–22; VR, ~55; VC, 12–14.

Large elongated species with three-lobed head. Cephalion and hypostomium well developed, the latter forming a transverse concave bar behind the mouth. Furca long with adhesive tubes divided into 20–21 segments. Dorsal body surface covered by pentagonal to hexagonal spined scales. Spines suddenly increase in length posterior of the caudal cutting. Interciliary area covered by smaller scales, similar in shape to the dorsal ones, with short simple spines that increase in length towards the posterior end. Ventral ciliation in two longitudinal bands connected by a thin transverse ciliated band just behind the hypostomium. Pharynx widens towards the pharyngeal intestinal junction. The Swedish specimen falls within the ranges of previously reported literature data.

This species is widely distributed in Europe (see e. g. Marcolongo 1910; Valkanov 1937; Rudescu 1967; Martin 1981; Schwank 1990; Kisielewski 1998) and is also reported from India (Naidu & Rao 2004), Israel (Kisielewski 1999), Japan (Saito 1937; Sudzuki 1975), Korea (Lee & Chang 2000), Canada (Schwank 1990), United States (Bryce 1924; Davison 1938), Brazil (Kisielewski 1991) and Australia (Hochberg 2005).

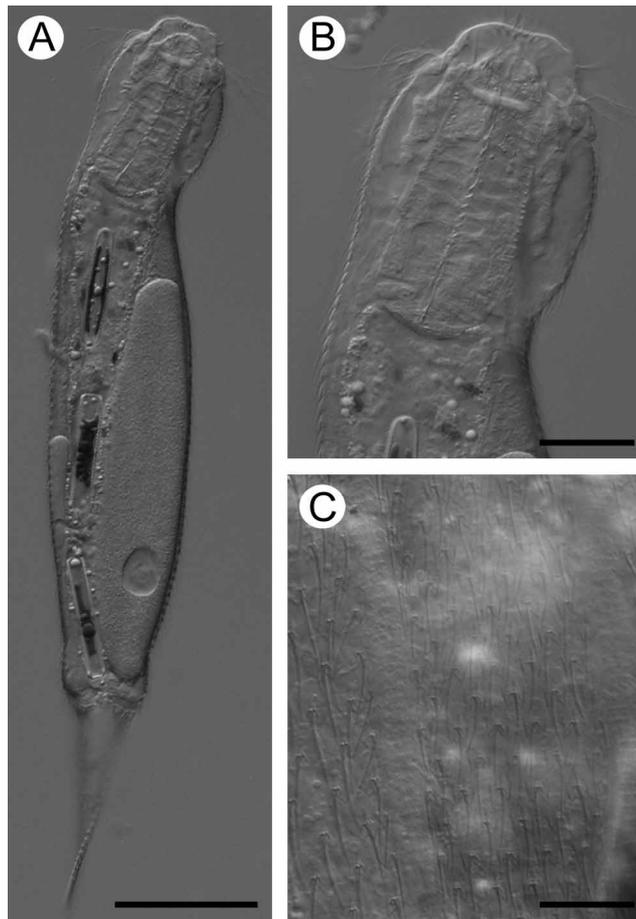


FIGURE 15. *Polymerurus nodicaudus*. A) Habitus. B) Shape of pharynx, mouth and hypostomium. C) Ventral view showing ventrolateral spined scales and the spined scales of the interciliary area. Scale bars: A, 100 µm; B, 40 µm; C, 15 µm.

***Polymerurus rhomboides* (Stokes, 1887)**

(Figure 16)

Localities. Lake Trösvattnet, Västmanland (N 59° 33' 21"; E 14° 29' 23").

Material. 1 specimen. TL, 273 µm; FL, 80 µm; PhL, 50 µm; MD, 13 µm; DC, 20–22; DR, >50; SCA, 18; TS, 6–7 x 3; VC, 10.

Large elongated species with three-lobed head and well developed cephalion and pleuria. Hypostomium well developed as a transverse bar behind the subterminal mouth. Furca very long, divided into 18 segments. Body covered by oval smooth stalked scales without spines. Interciliary area covered by smaller scales similar in shape to the dorsal ones. Ventral ciliation in two longitudinal bands. Pharynx widens towards the pharyngeal intestinal junction. The Swedish specimen falls within the ranges of previously reported literature data.

This species is widely distributed in Europe (see e. g. Marcolongo 1910; 1914; Mola 1932; Valkanov 1937; Rudescu 1967; Martin 1981; Schwank 1990; Kisielewski 1998) and is also reported from Israel (Kisielewski 1999), Japan (Saito 1937), Korea (Lee & Chang 2000); Cameroon (Togouet Zébaz *et al.* 2007), Canada (Schwank 1990), United States (Stokes 1887; Davison 1938; Anderson & Robbins 1980), Argentina (Grosso 1975; Grosso & Drahg 1983), Brazil (Kisielewski 1991) and Australia (Hochberg 2005).

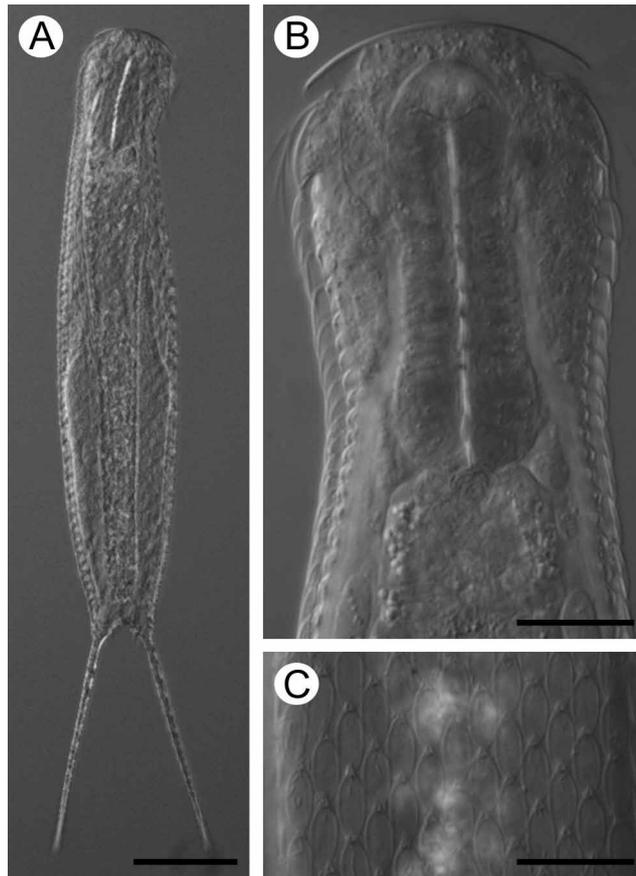


FIGURE 16. *Polymerurus rhomboides*. A) Habitus. B) Shape of pharynx and cephalion. C) Dorsal view of mid-trunk showing scales. Scale bars: A, 50 µm; B and C, 20 µm.

Family Dasydytidae Daday, 1905

Genus *Haltidytes* Remane 1936

Haltidytes crassus (Greuter, 1917)

(Figure 17)

Localities. Artificial pond, Nybro, Småland (N 56° 44' 89"; E 15° 54' 27").

Material. 4 specimens. TL, 97–130 µm; PhL, 35–40 µm; DSL, 100–120 µm; VSL, 120–162 µm.

This species is characterized by three pairs of ventral spines; the posterior pair is the longest. Dorsally five pairs of spines are present; the anterior three pairs originate ventrolaterally while the posterior two pairs originate from the ventral side. Interciliary area naked. Locomotory ciliation in two longitudinal bands, each band further divided into tufts, and three semi-circular bands on the head. The Swedish specimens correspond well to the specimens found in Poland (Kisielewski, 1981) and Denmark (Grilli *et al.*, 2010).

Previously reported from Italy (Balsamo & Tongiorgi 1995), Romania (Rudescu 1967), Russia (Preobrajenskaja 1926; Tretjakova 1991), Switzerland (Greuter 1917), Denmark (Grilli *et al.* 2010), Canada (Schwank 1990), Brazil (Kisielewski 1991) and Argentina (Grosso 1973; Grosso & Drahg 1983).

Genus *Stylochaeta* Hlava, 1904

***Stylochaeta scirtetica* Brunson, 1950**

(Figure 18)

Localities. Artificial pond, Nybro, Småland (N 56° 44' 56''; E 15° 54' 14'').

Material. 2 specimens. TL, 175 µm; CL, 5 µm; PhL, 33 µm; MD, 10 µm; SG1, 160 µm; SG2, 70–100 µm; SG3, 80–90 µm; SG4, 20 µm.

Large sized species with three-lobed head and a thin cephalion. At the posterior end two short styli are present each carrying three setae/bristles, of which one is much longer than the other two. Four pairs of spine groups are present, originating ventrally or ventrolaterally. The three anterior groups consist of spines with two denticles, while the spines of the posteriormost spine group have only one denticle with a small bifurcation at their ends. From anterior to posterior each group consists of 3, 3, 2 and 1 spine/s. The first group is situated in the neck region and has the longest spines. Spines of group 2 and 3 are of approximately equal length. The single spine of the last group is much shorter than those of the anterior groups. Locomotory ciliature consists of five ventral ciliary tufts and three pairs of semi-circular ciliary tufts on the head. Pharynx short but with strong posterior swelling.

Previously reported from Germany (Schwank 1990), United States (Brunson 1950; Schwank 1990) and Canada (Schwank 1990).

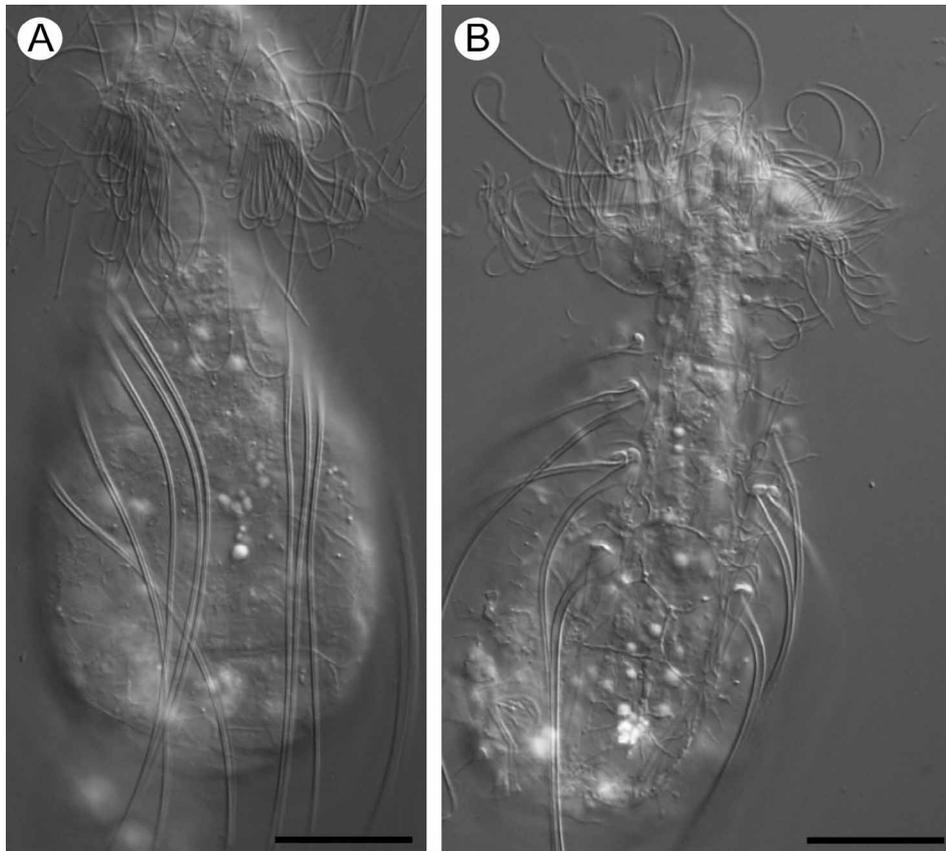


FIGURE 17. *Haltidytes crassus*. A) Dorsal view. B) Ventral view showing insertion of spines. Scale bars: A and B, 20 µm.

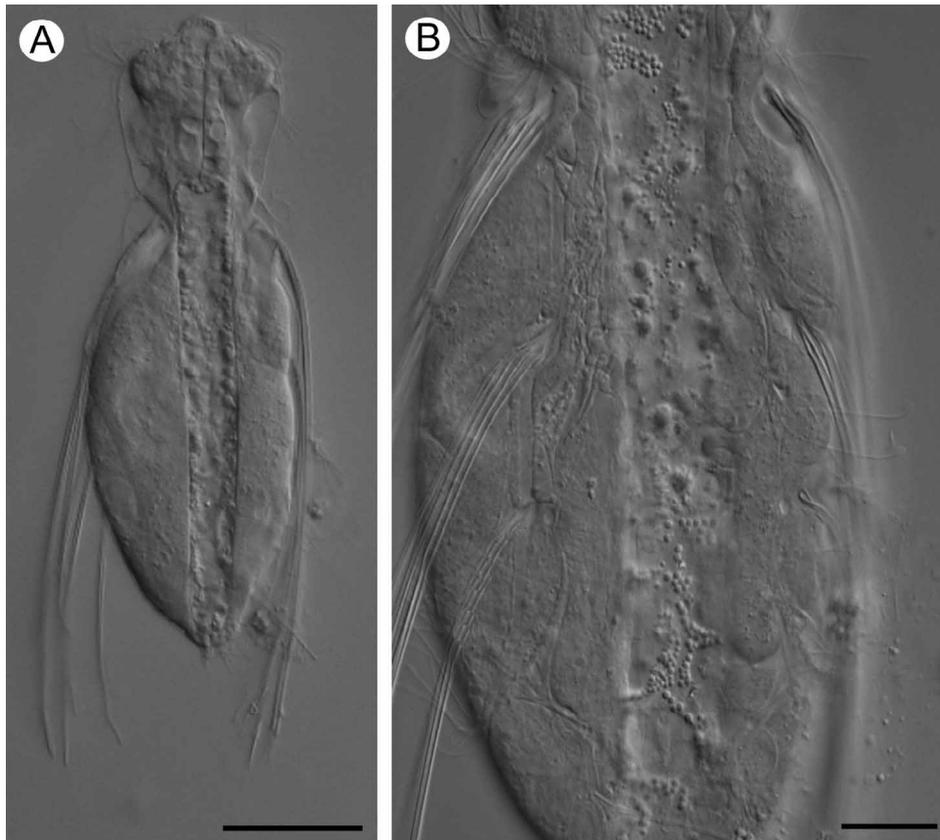


FIGURE 18. *Stylochaeta scirtetica*. A) Habitus. B) Ventral view showing insertion of four of the five pairs of spine groups. Scale bars: A, 40 μm ; B, 15 μm .

Discussion

This study presents two new species of *Heterolepidoderma*, *H. joermungandri* **n. sp.** and *H. trapezoidum* **n. sp.** Moreover, the first Swedish records of *Aspidiophorus oculifer*, *A. ophiodermus*, *Heterolepidoderma macrops*, *H. ocellatum*, *Lepidochaetus zelinkai*, *Lepidodermella minor minor*, *Polymerurus nodicaudus*, *Haltidytes crassus* and *Stylochaeta scirtetica* are presented, increasing the number of known freshwater gastrotrichs in Sweden to 31.

From a biogeographical point of view the known number of freshwater Gastrotricha from Sweden is still low compared to other well investigated countries. Many of the Swedish species share characters in common with their Polish conspecifics. The Polish gastrotrich fauna is one of the best known in the world with 98 recorded freshwater gastrotrichs (see e.g. Kisielewski 1981; 1998). Sweden hosts a wide variety of habitats common to temperate and boreal areas and is known for its lakes and wetlands, and compared to Poland, the country can be hypothesized to harbor well above 100 freshwater species.

Both apparently cosmopolitan species and species with a limited geographic distribution were found during this investigation. *L. squamata* and *L. zelinkai* are considered more or less cosmopolitan species, and they were found at 12 and 8 sites respectively, out of a total of 29 investigated sites. *L. zelinkai* is a good candidate for barcoding and phylogeographic studies within Chaetonotidae since it is common and can be identified with a good dissecting microscope. Species found in Sweden with a more restricted distribution are members of *Aspidiophorus*, *Heterolepidoderma*, *Lepidodermella* and *Stylochaeta*.

Future faunistic and taxonomic studies of Swedish Gastrotricha should focus on the freshwater interstitial, larger lakes and lotic waters.

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