

Rhabdocoela (Platyhelminthes) from the Weddell Sea (Antarctica) with the description of eight new species

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ABSTRACT. In this contribution we present eleven species of Rhabdocoela (Platyhelminthes) collected during the Antarktis VII/4 (Epos leg. 3) expedition. Six of them belong to the family Trigonostomidae (Typhloplanoida). Five of these are new to science: *Trigonostomum messoplanoides* n. sp., *Proxenetes trispinosus* n. sp., *Messoplana globulifera* n. sp., *M. minuta* n. sp. and *M. spiralis* n. sp. All the species can be recognised from congeneric species by the shapes of their stylets. *Ceratopera axi* (Riedl, 1954) Den Hartog, 1964 also was found and is discussed briefly. The other five species belong to the family Polycystididae (Eukalyptorhynchia). Three of them are new to science and belong to the genus *Austrorhynchus* Karling, 1952: *A. magnificoides* n. sp., *A. antarcticus* n. sp. and *A. biserratus* n. sp. They differ from other *Austrorhynchus* species in having a triangular shape of the accessory organ of the male system. Particular differences in shape of the stylet and accessory organ clearly distinguish each of the new species. Unlike the other two species, *A. antarcticus* lacks a hook on the stylet. The genus *Austrorhynchus* is briefly discussed. The collected material of *Gyatrix hermaphroditus* Ehrenberg, 1831 and *Porrocystis assimilis* (Levinsen, 1879) Karling, 1952 is also briefly discussed.

KEY WORDS: Turbellaria, Rhabdocoela, Typhloplanoida, Trigonostomidae, Eukalyptorhynchia, Polycystididae, Weddell Sea, Antarctica.

INTRODUCTION

The first thorough survey of Turbellaria from Antarctic and subantarctic waters can be found in WESTBLAD (1952). Apart from giving a history of research on South Polar Turbellaria, this author discussed and described all the Turbellaria collected in subantarctic waters during the Swedish Antarctic Expedition (1901-1903), except for the Kalyptorhynchia. This latter group was dealt with by KARLING (1952). No more work was done on Antarctic or subantarctic Turbellaria after 1952, except for the splitting of *Austrorhynchus pectatus* Karling, 1952 into different species by BRUNET (1965) and KARLING (1977). This raised the number of species in the (sub) Antarctic region from 60 to 64.

This contribution presents the rhabdocoelan Turbellaria from the southern part of the Weddell Sea collected during

leg 3 of "European Polarstern Study" (12 January 1988 - 10 March 1989). Sample localities include transects off Halley Bay and Kapp Norvegia, some localities off Vestkapp and around Mount Spiess. As such it represents the first findings of Typhloplanoida and Kalyptorhynchia in real Antarctic waters. Apart from the species described, a number of other species were found of which the material is so bad that an accurate description is impossible. Some of these were species of Eukalyptorhynchia from about 2000 m deep, the greatest depth at which Kalyptorhynchia have ever been found. These specimens were collected in Halley Bay, between 74°09.5'S 029°41.4'W and 74°08.0'S 030°03.3'W with an Agassiz trawl. Preliminary results can be found in DAHMS et al. (1990).

MATERIAL AND METHODS

The samples were taken with different gear, but Turbellaria were almost exclusively found in samples

taken with the Agassiz trawl or a multicorer. A large amount of sediment brought in with the trawls was filtered over a net of 80 µm mesh width and the animals were picked out from the remaining filtrate, still containing sediment and kept on ice.

Collected animals were first studied alive and whole mounted. The movements of the ship did not allow accurate observations at magnifications higher than 25x and made photographing impossible. Moreover, the animals are very sensitive to temperatures above 0°C. Therefore, study of the living animals had to be done very quickly. No specimens could be gathered for sectioning, except for some specimens of *Porrocystis assimilis* (Levinsen, 1879) Karling, 1952.

All hard structures (stylet, bursal appendage) are measured along their central axis.

Type material will be deposited in the collection of the Research Group Zoology of the Limburgs Universitair Centrum (LUC), Diepenbeek, Belgium.

SAMPLING LOCALITIES

The following list enumerates all the localities where the species mentioned in this paper were collected. A list of all the sampling localities of the expedition can be found in DAHMS et al. (1990).

Loc.1: Kapp Norvegia. Station 223; between 71°14.2'S 012°35.9'W and 71°14.9'S 012°40.8'W; 380-384 m deep (25/01/1989).

Loc.2: Halley Bay. Station 229; between 75°14.9'S 026°12.5'W and 75°15.5'S 026°16.5'W; 500-509 m deep (29/01/1989). Very thin layer of flocculent sand with stones.

Loc.3: Halley Bay. Station 230; samples from different localities around 75°14.0'S 26°70.0'W; around 265 m deep, (30/01/1989). Very hard sediment.

Loc.4: Halley Bay. Station 234; 75°52.5'S 027°45.6'W, 416m deep, (30/01/1989).

Loc.5: Halley Bay. Station 235; 75°10.6'S 027°35.4'W; 399 m deep (31/01/1989). Very thin flocculent layer of fine sand with stones.

Loc.6: Halley Bay. Station 241; between 75°07.1'S 027°59.5'W and 75°04.7'S 028°00.4'W; 457-462 m deep (01/02/1989). Upper 2 cm very fine sand, between 2 and 7 cm sand and deeper coarse sand with pebbles.

Loc.7: Halley Bay. Station 245; between 74°39.7'S 029°41.6'W and 75°40.4'S 029°37.2'W; 483m deep, (02/02/1989). Upper 2 cm with Bryozoa, deeper medium sand with gravel.

Loc.8: Halley Bay. Station 248; between 74°39.9'S 029°31.3'W and 74°39.3'S 029°34.4'W; 599-600 m deep (03/02/1989). Less Bryozoa than in Loc. 7 with small stones, between 5 and 12 cm coarse sand. At 12 cm medium sand. Deeper stiff clay.

Loc.9: Halley Bay. Station 258; between 74°40.2'S 029°36.6'W and 74°38.9'S 029°42.6'W; 484-509 m deep (09/02/1989).

Loc.10: Vestkapp. Station 271; between 73°17.0'S 020°59.4'W and 73°16.4'S 020°54.6'W; 352-399 m deep (12/02/1989).

Loc.11: Kapp Norvegia. Station 277; between 71°40.0'S 012°35.9'W and 71°39.8'S 012°34.9'W; 405-407 m deep (16/02/1989). Small stones.

Loc.12: Kapp Norvegia. Station 284; between 71°12.0'S 013°14.0'W and 71°12.2'S 013°16.8'W; 402-412 m deep (18/02/1989).

Loc.13: Kapp Norvegia. Station 291; between 71°06.1'S 012°33.5'W and 71°05.9'S 012°34.8'W; 499-515 deep (19/02/1989).

Loc.14: Mt. Spiess. Station 312; between 54°43.9'S 000°06.3'E and 54°47.7'S 000°05.3'E; 320-471 m deep (03/03/1989).

DESCRIPTIONS

Trigonostomum messoplanoides n. sp.

(Fig. 1)

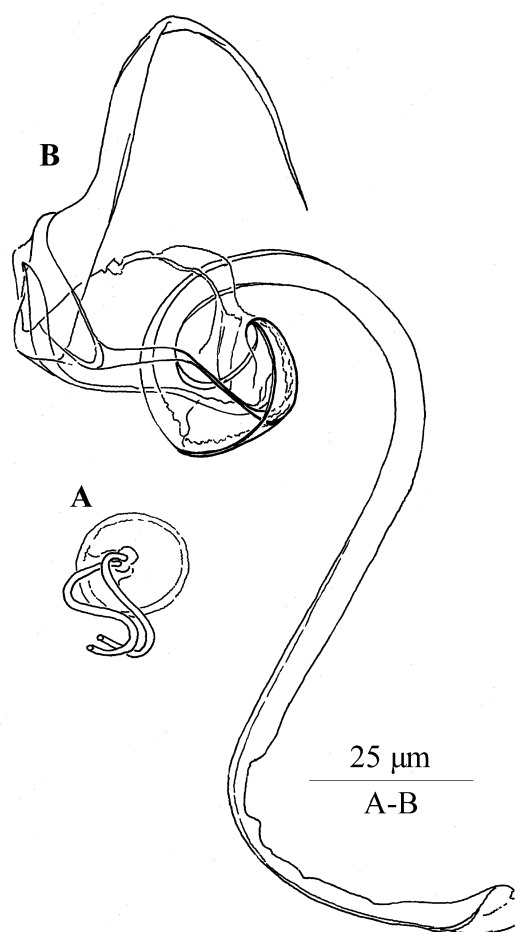


Fig. 1. – *Trigonostomum messoplanoides* n. sp. –
A. Bursal appendage. – B. Copulatory organ

Type locality. Loc.13.

Material. One specimen studied alive and whole mounted (in bad condition) (holotype LUC nr. 207).

Etymology. The stylet bears a strong resemblance to the stylets found in species of the genus *Messoplana* Den Hartog, 1966.

Description

The specimen measures 0.4 mm in whole mount. The pharynx is situated in the first half of the body. The copulatory organ is characterised by a very large prostate vesicle. The stylet is about 225 µm long, tubiform, and proximally curved. A 75 µm-long flagelliform spine is attached to the proximal end of the stylet. As such, the whole stylet resembles the stylets of some *Messoplana* species more than it does that of the other *Trigonostomum* species.

The bursal appendage consists of two straight tubes that are fused at the base. It is only 22 µm long.

Discussion

Although the shape of the stylet suggests a *Messoplana* species, this animal can easily be identified as a *Trigonostomum* species by the position of the pharynx and the clearly visible triangular ventral invagination (“proboscis”) in front of the brain. The latter was obvious in the living animal as well as in the whole mount.

***Proxenetes trispinosus* n. sp.**

(Fig. 2)

Type locality. Loc. 8

Material. Two specimens studied alive and whole mounted, one of them designated holotype (LUC nr. 201), the other paratype (LUC nr. 202).

Etymology. The species name refers to the three distal spines of the stylet.

Description

Pharynx approximately in the middle of the body. One pair of eyes and well-developed rhabdite tracts present.

The sclerotized parts of the copulatory organ consist of (1) the curved stylet, (2) the thin-walled mantle surrounding the proximal semicircular part of the stylet (less obvious in the paratype), and (3) three slim spines that are attached to the mantle near the proximal base of the stylet. The stylet is 20-22 µm wide proximally and 80-83 µm long, ending distally in a sharp point. The three spines measure 56, 53 and 42.5 µm long in the holotype and 52.5, 46 and 52 µm long in the paratype. At their bases, the spines are approximately 3.5 µm wide.

The bursal appendage has a thick wall showing faint striae. It is 35 µm long and consists of a basal single tube without a ring. Distally it splits into two tubes of about 20 µm. In the paratype the base measures 29 µm and the distal tubes 11.5 µm.

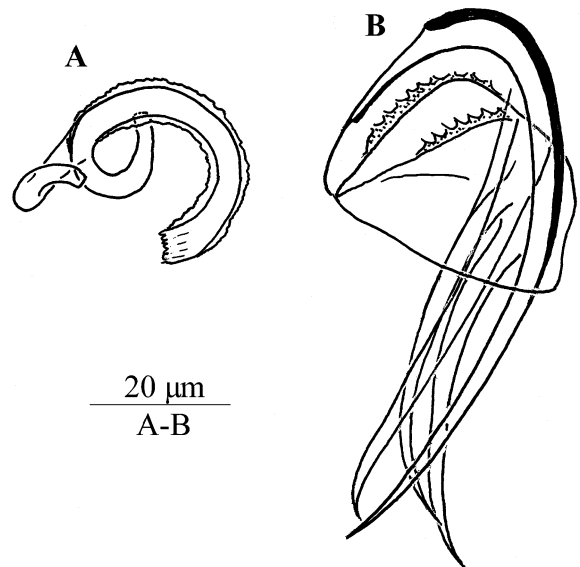


Fig. 2. – *Proxenetes trispinosus* n. sp. – A. Bursal appendage. – B. Copulatory organ

Discussion

The stylet shows some peculiarities that suggest a relationship with the species of the subgenus *Paraxenetes* Ax, 1971. Shared features are the semicircular proximal part of the stylet surrounded by the mantle, and the mantle showing a number of distal spines that reach the distal tip of the stylet (see AX, 1971).

This new species differs from the other two species of the subgenus in the relatively short and thick distal tubes of the bursal appendage. In the other two species they are more slender and much longer than the single basal tube. In *P. (Paraxenetes) quadrispinosus* Den Hartog, 1966 the mantle around the stylet bears four short spines proximally as well as distally. The proximal spines are lacking in *P. (Paraxenetes) ampullatus* Ax, 1971 and *P. (Paraxenetes) trispinosus*. In *P. ampullatus* there is only one short distal spine, while there are three spines in *P. trispinosus*. These three spines resemble this of *P. ampullatus*, but are inserted more at the proximal end of the stylet. Moreover, the stylet is much smaller in *P. ampullatus*, being only ± 45 µm long.

***Messoplana globulifera* n. sp.**

(Fig. 3)

Type locality. Loc.2

Other localities. Loc.4, Loc.6.

Material. Three specimens were studied alive and whole mounted, one of them designated holotype (LUC nr. 203).

Etymology. The species name refers to the globular part of the bursal appendage.

Description

Animals approximately 0.6 mm in length (whole mounts) without eyes. The living specimens are opaque

grey. The adenal rhabdites are organised in two long tracts in the frontal part of the body. The pharynx is situated in the second half of the body.

The hard parts of the copulatory organ are very hard to study in the thick whole mounts. The stylet proper is 55 - 72 μm long ($m = 60$; $n = 3$), proximally bent, with a thicker convex side. The accessory spine is straight or curved, 41 - 50 μm long ($m = 45$; $n = 3$). A common basal piece connects stylet and accessory stylet. In living animals and less squeezed animals, the convex sides of the accessory and prostate stylets lie closer to each other than observed in the whole mounts.

The large seminal receptacle is connected to the common genital atrium by a muscular bursal canal. The bursal appendage is a single tube, 94 - 98 μm ($m = 96$; $n = 2$) long and about 4 μm broad. In its middle it has a ± 17 μm long swollen part, which is twice as broad as the rest of the tube. There is no ring-like structure at the base of the bursal appendage where it leaves the seminal receptacle.

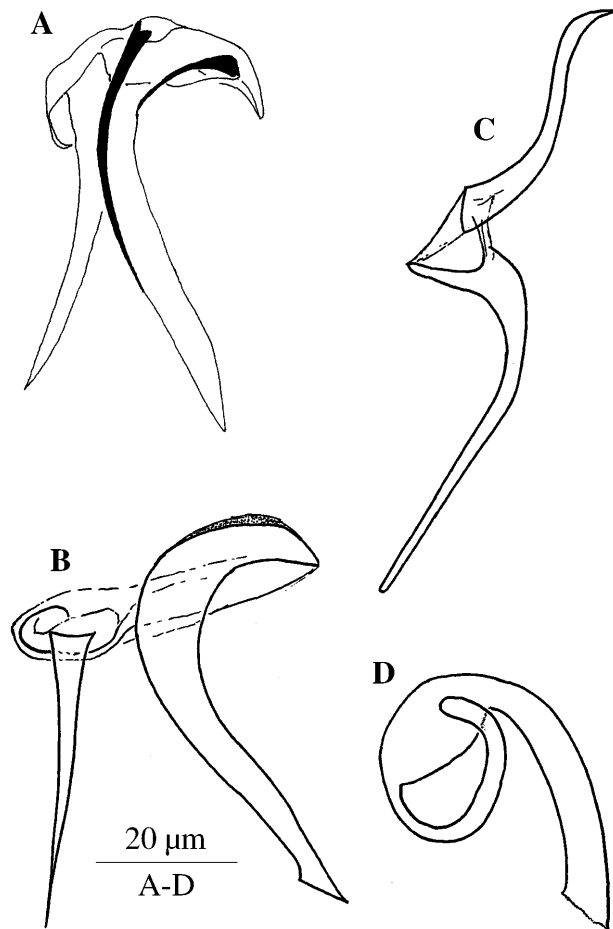


Fig. 3. - *Messoplana globulifera* n. sp. - A. Copulatory organ of a slightly squeezed living animal. - B, C. Copulatory organs from whole mounts (C. from the holotype). - D. Bursal appendage.

***Messoplana minuta* n. sp.**
(Figs 4A, 4B)

Type locality. Loc.10.

Material. Two specimens studied alive and whole mounted. One whole mount designated holotype (LUC nr. 204), the other paratype (LUC nr. 205).

Etymology. The species name refers to the very small stylet.

Description

Animals 0.3-0.4 mm long (whole mount) with two eyes that are widely separated from each other. The pharynx is situated in the middle of the animal.

The prostate vesicle is much smaller than the seminal vesicles. The stylet is rather thin-walled, slightly bent in the proximal half. The accessory spine is a thick-walled hook attached to the proximal base of the prostate stylet. The stylet is 32 μm long in both specimens; the hook is about 20 μm long.

The seminal receptacle is about the same size as the seminal vesicles. In the paratype it shows a weak constriction (not found in the holotype). The spiralled, tubiform bursal appendage, measuring 53 μm in the holotype and 58 μm in the paratype, gradually tapers towards the fecundatorium. Distally it splits into two short tubes that are 1/5 as long as the total length of the bursal appendage. The base of the bursal appendage at the seminal receptacle lacks a ring.

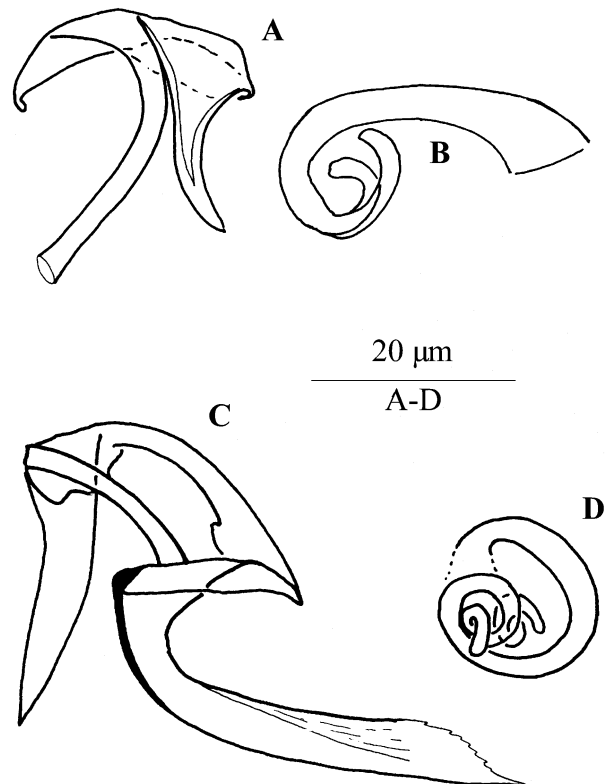


Fig. 4. - *Messoplana minuta* n. sp. - A. Copulatory organ. - B. Bursal appendage. - *Messoplana spiralis* n. sp.: C. Copulatory organ. - D. Bursal appendage.

***Messoplana spiralis* n. sp.**
(Figs 4C, 4D)

Type locality. Loc.9.

Material. One whole mounted individual (holotype LUC nr. 206).

Etymology. The species name refers to the characteristic spiral bursal appendage.

Description

There are no observations on the living animal available because the animal was too damaged after extraction. There are no eyes.

The thin-walled stylet is 52 μm long. Proximally it bends 90°. The accessory stylet is a 27 μm long massive spine. Stylet and spine are connected by a \pm 27 μm long basal part. As in *M. globulifera*, this basal part probably is very flexible, giving the stylet different appearances depending on how hard the specimen is squeezed.

The tubiform bursal appendage is strongly spiralled. It is 46 μm long. At its proximal end it is very thin-walled. Distally it splits into two tubes, which are \pm 1/4 of the total length of the appendage long. There is no basal ring where the bursal appendage leaves the seminal receptacle.

Discussion

The three new species here described differ from the other *Messoplana* species by the absence of a ring at the base of the bursal appendage where it leaves the seminal receptacle. This is unique within the genus *Messoplana* and even within the Trigonostominae. This feature could be put forward as a likely synapomorphy for the three species described above.

The stylets of the three new species are all of the same basic construction: a relatively short and curved stylet with a curved hook attached to its base. The convex sides of hook and stylet face each other. This stylet construction is shared with other representatives of the genus e.g. *M. canariensis* Ehlers & Ehlers, 1980 and *M. floralis* Ehlers, 1974.

M. globulifera is unique within the genus as it has a single tubiform bursal appendage. Split bursal appendages are found in all of the other *Messoplana* species, in species of the genus *Proxenetes* and in some species of the genus *Trigonostomum*.

***Ceratopera axi* (Riedl, 1954) Den Hartog, 1964**

Proxenetes axi Riedl, 1954

Ceratopera bifida Ehlers & Ax, 1974

New localities. Weddell Sea: Loc.9. La Réunion: Cap la Houssay, on short algae in the surf zone, 30/10/1992.

Distribution. Gulf of Naples and Sicily (Italy) (RIEDL, 1954); Galapagos (EHLERS & AX, 1974); Falkland Islands and California (KARLING, 1986).

Material. Observations on living specimens and two whole mounts (one from each new locality).

Discussion

The stylet of the specimen from the Weddell Sea is 124 μm (86 μm if measured as in EHLERS & AX, 1974). The stylet of the Réunion specimen is 105 μm (74 μm) long. The bursal appendage is not visible in the whole mounted specimen from the Weddell Sea. In the specimen of La Réunion it is 77 μm long and (apparently) distally not split. One of the differences between *C. axi* and the "*C. bifida*" mentioned by EHLERS & AX (1974), apart from the split bursal appendage, is the length of the stylet. In *C. axi* it measured 90 μm , in *C. bifida* 70 μm . The measurements on our material lie in between. The length of the stylet in the La Réunion specimen is close to that of *C. bifida*, but the bursal appendage is not split. KARLING (1986) considered *C. bifida* a junior synonym of *C. axi*. He based this conclusion on the variability in length and shape of the stylet between different populations and on the fact that the distal split in the stylet is mostly very difficult to observe. Our observations support KARLING's (1986) point of view.

***Austrorhynchus magnificoides* n. sp.**
(Figs 5A, 5B)

Type locality. Loc.12.

Other localities. Loc.14.

Material. Observations on four living animals that were all whole mounted. One of the whole mounted specimens designated holotype (LUC nr. 208), two others designated paratypes (LUC nr. 209 & 210).

Etymology. The name refers to the overall resemblance with *A. magnificus* Karling, 1952.

Description

Animals of \pm 0.7 mm long, without eyes. The internal organisation as seen on living animals is identical to that of other *Austrorhynchus* species.

The sclerotized parts of the male organ consist of a prostate stylet and an accessory stylet (further called A-organ as in KARLING, 1977). The prostate stylet is double-walled, with the inner stylet restricted to the tubiform part of the outer stylet. The tube is straight, almost double the length of the basal funnel. The stylet is 45-50 μm long ($m = 47$, $n = 4$). A large hook is present at the transition of funnel to tube, and is obviously a protrusion of the outer stylet. The hook is 15 - 20 μm long ($m = 19$, $n = 4$). The A-organ is a triangular plate. It is 88 -101 μm long ($m = 92$, $n = 4$) and 45 - 52 μm broad ($m = 49$, $n = 4$) at its broadest, proximal end. In this end there is a deep slit, resulting in a division of the proximal end into a pronounced style and foot (terminology of KARLING, 1977, see our figure 5B). The style is connected to the foot by a rather thin bridge, leaving a "window" in the A-organ. One side of the A-organ is

combed and tapers into the flagellum, which itself is combed up to its most distal, swollen end.

***Austrorhynchus biserratus* n. sp.**
(Figs 5C, 5D)

Type locality: Loc.9.

Material: Observations on one living animal that was whole mounted (holotype LUC nr. 212).

Etymology: the species name refers to the two combed parts of the A-organ: bi (Lat.): double, serratus (Lat.): serrated.

Description

Animals of 0.6 mm long, with two eyes. The internal organisation as seen on living animals is identical to that of other *Austrorhynchus* species.

The double-walled stylet is 31 µm long. The tubiform part of the stylet is straight, a little longer than the basal

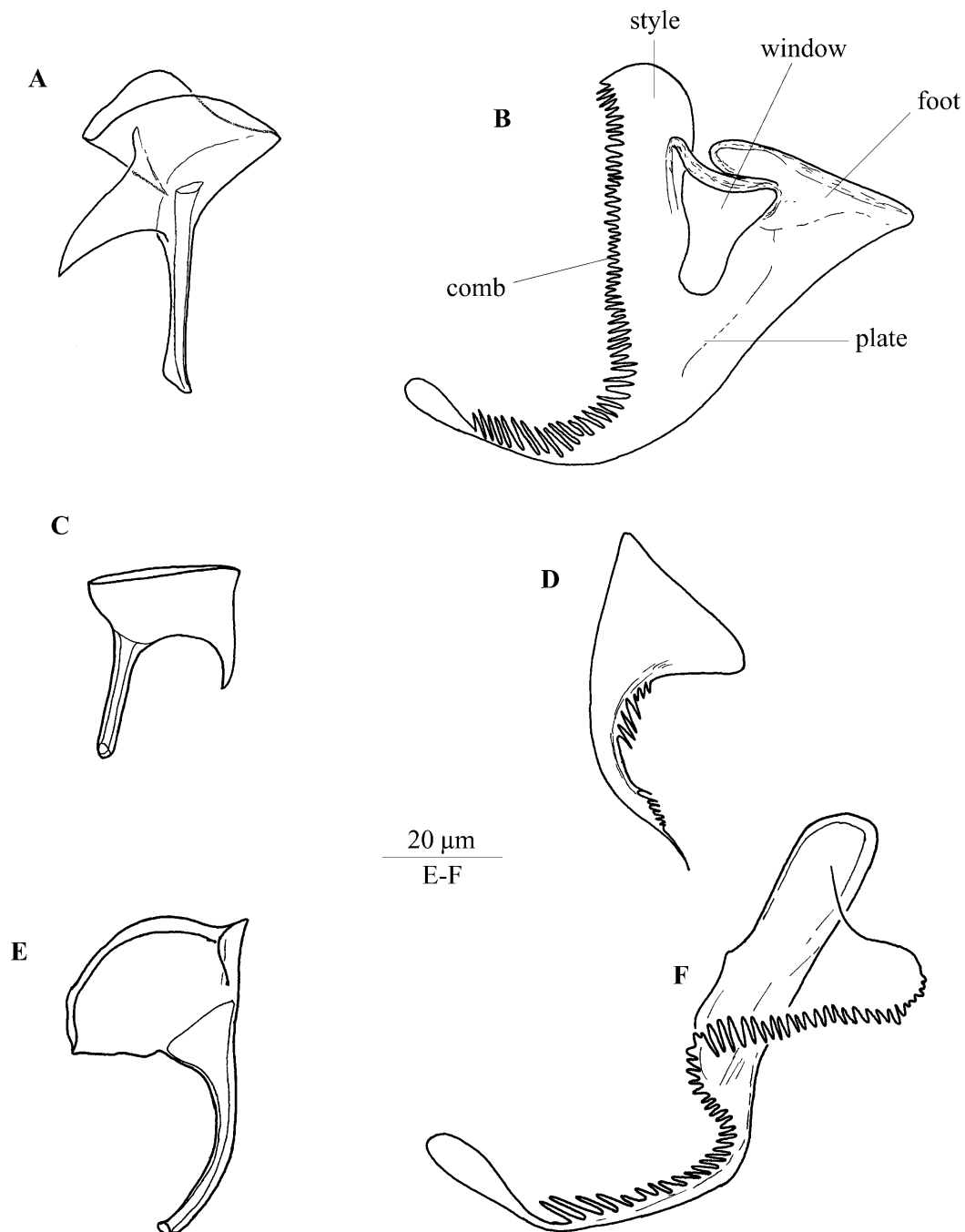


Fig. 5. – Stylets and A- organs of the *Austrorhynchus* species – A, B. *A. magnificoides* n. sp. – C, D. *A. biserratus* n. sp. – E, F. *A. antarcticus* n. sp.

funnel. Distally, the basal funnel is exceptionally broad (27 μm) bearing a 13 μm long hook. Tube and hook are widely separated from each other. The A-organ is rather small; being only 60 μm long and 32 μm broad at its broadest (proximal) end. It is a simple triangular plate, with a long curved, pointed distal end. One side has two separate combed parts, one almost in the middle, the other at the distal tip. Proximally there is no division into a stylet and a foot.

***Austrorhynchus antarcticus* n. sp.**

(Figs 5E, 5F)

Type locality. Loc.1.

Material. Observations on one living animal that was whole mounted (holotype LUC nr. 211).

Etymology. The name refers to Antarctica.

Description

Animals of 0.8 mm long, without eyes. The internal organisation as seen on the living animal is identical to that of other *Austrorhynchus* species.

The double-walled stylet is 53 μm long. The slightly curved tubiform part is twice as long as the basal funnel. The internal stylet is restricted to the tubiform part. There is no hook. The shape of the A-organ is obscured by the fact that it is folded in its proximal part. It is 121 μm long. Apparently it is basically triangular in shape. The combed side tapers into the flagellum, which itself bears a comb to its most distal swollen end.

Discussion

The three species described above are the first to be found in real Antarctic waters, the ones mentioned by KARLING (1952) being from the Falklands and South Georgia, and apart from *A. magnificus* they are the first from deep (> 100m) sublittoral habitats. They differ from all of the other *Austrorhynchus* species by having a triangular A-organ with a combed side that tapers into the flagellum. As a result, a free flagellum is not seen (uncertain for *A. antarcticus*: see above). Of the three species described above, the most complicated A-organ is found in *A. magnificoides*. It is most comparable with that of *A. magnificus* Karling, 1952, but is substantially smaller (92 μm long in *A. magnificoides*, 190-220 μm in *A. magnificus* see KARLING, 1977). Moreover, in *A. magnificus* the combed side of the plate stops abruptly. This gives the A-organ a more rectangular shape and leaves the short uncombed flagellum free. Although similar in shape, the prostatic stylets of *A. magnificus* and *A. magnificoides* differ greatly in dimensions. The 47 μm of *A. magnificoides* is comparable with lengths of the stylets of congeneric species, whereas the stylet of *A. magnificus* is exceptionally long as noticed by KARLING (1952) (up to 170 μm). In both species, the stylet bears a hook. This hook is relatively much longer and more heavily built in *A. magnifi-*

coides than in *A. magnificus* (40 % of the stylet in the former species, $\pm 10\%$ in the latter).

The A-organ in *A. biserratus* is one of the most simple found in the genus, being a simple triangular plate. It is unique in having two separate combed parts on one of its sides. Furthermore, the wide separation between the tubiform part of the stylet and the hook has not been observed in any of the other *Austrorhynchus* species, where the hook is found attached to the base of the tube.

We cannot say anything definitive about the A-organ of *A. antarcticus*, but it is reminiscent of that of *A. magnificoides*. *A. antarcticus* differs clearly, however, from that species in lacking a hook on the stylet. It shares this feature with three other species of the genus: *A. pectatus* Karling, 1952, *A. pacificus* Karling, 1977 and *A. galapagoensis* Artois & Schockaert, 1999. Although the A-organ of the only specimen of *A. antarcticus* is not very clear, it surely differs from that of these three species. Therefore we conclude that *A. antarcticus* is a separate taxon.

***Gyratrix hermaphroditus* Ehrenberg, 1831**

(Fig. 6)

Locality. Loc.11.

Distribution. Cosmopolitan and euryhaline species.

Material. Observations on one living animal that was whole mounted.

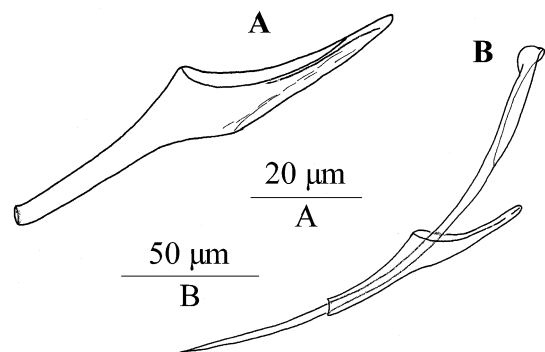


Fig. 6. – *Gyratrix hermaphroditus* Ehrenberg, 1831. – A. Sheath. – B. Stylet with sheath.

Discussion

For some time, detailed research has shown this species to be a complex of sibling species of very complicated constitution (CURINI-GALLETTI & PUCCINELLI, 1989, 1990, 1994, 1998). The stylet of the only individual found is 157 μm long. The sheath is 38 μm long with a rather short stalk of 36 μm . The stalk tapers towards its proximal tip. These dimensions lie within the range as given for the species by KARLING & SCHOCKAERT (1977). Only the stalk appears to be exceptionally short, even shorter than the sheath. Most probably, the Antarctic population represents yet another species within the complex. It is eyeless. Lack of eyes has previously been observed in only one other

marine population (Galapagos) (see ARTOIS & SCHOCKAERT, 2000).

***Porrocystis assimilis* (Levinsen, 1879) Karling, 1952**

Localities. Loc.3, Loc.4, Loc.7, Loc.9, Loc.12, Loc.13.

Distribution. Found in extreme southern and northern waters. Gauss-station (south-east from Kerguelen), 350 m deep (REISINGER, 1926). South Georgia and the Falklands 12-30m (different localities) (KARLING, 1952). Chile, two littoral localities at the north coast of Chiloé, (MARCUS, 1954). Arctic localities: West-Greenland (Egedesminde and Jacobshaven) (LEVINSEN, 1879); Greenland: Godthaab and Godhavn (STEINBÖCK, 1932).

Material. Observations on living animals. Several whole mounts from the different Weddell Sea localities. Nine specimens serially sectioned; in very bad condition.

Discussion

The only differences from the descriptions of KARLING (1952) and MARCUS (1954) that we observed in our material are the dimensions of the hard parts in the male atrial system. The stylets of our animals measured 86-113 µm (m = 104, n = 8). This is a little larger than the measurements found in literature: 60-80 µm (KARLING 1952) and 48 µm (MARCUS 1954). The hooks in our material are 26-40 µm long (m = 30 ; n = 8) with a basal plate of 25-31 µm long (m = 27, n = 9). This is more or less the same as mentioned by KARLING (1952) (21-27 µm long basal plate with a slightly shorter hook), but longer than measured by MARCUS (1954) on the material from Chile (hook 20 µm, basal plate 11 µm).

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