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Marine Macrostomida (Turbellaria) from Scandinavia and England

By EINAR WESTBLAD

With 11 Text-Figures

Preface

For about twenty years I have been trying to make an inventory of the Turbellarian fauna of the Swedish and Norwegian North Sea coasts. The results concerning the Acoels were published during the years 1940-1948. In recent years I have tried to make a similar inventory of the English coasts in order to obtain parallels. I have had the benefit of working at the biological stations at Millport (1948), Plymouth (1949), Cullercoats (n. Newcastle-upon-Tyne) and Port Erin (1950). A part of the collected material (Dalyellioida, Typhloplanoida) has been given to Prof. ALEX. LUTHER, who has already published this material (1948). Another part (Kalyptrorhynchia) has recently been given to Dr. TOR G. KARLING for working up. I hope to be able to work up the remaining groups — apart from the Polyclads, already treated by Prof. SIXTEN BOCK (1913) — during the next few years.

In this paper a beginning is made with the Macrostomida. Of its two head groups Macrostominae and Microstominae the former group plays a subordinate rôle in comparison with the latter under genuine marine circumstances¹, while the contrary prevails in brackish water, for instance the Baltic. While LUTHER (1947) described six *Macrostomum* species (in addition to a subspecies of *M. appendiculatum* and a variety of *M. tuba*) and a species of a new genus *Dolichomacrostomum* (*D. uniporum* n. sp.) from Tvärminne in the Gulf of Finland, there is only a *Microstomum* species, *M. lineare* (MÜLL.), definitely living in the Baltic. From the south part of the Baltic (Kiel) AX has recently (1951 a, b; 1952) reported three of those *Macrostomum* species found by LUTHER at Tvärminne, and further described two new species of the same genus, to which *Dolichomacrostomum uniporum* and four *Paromalostomum* species are added. Of the genus *Microstomum* he has only mentioned a "*Microstomum spec.*" (1951 a, p. 279). I have not recognized *Dolichomacrostomum uniporum* and the *Paro-*

¹ That is clear from RIEDEL's paper (1932) on the Greenland Macrostomida, also from STEINBÖCK's lists of the Turbellarian fauna of the Faroes (1931) and Iceland (1938) and from MARCUS's works on the Turbellaria of the Brazilian coast (1949, 1950, 1951, 1952). AX (1952) has recently pointed out that the genus *Macrostomum* is nearly lacking in the sublittoral sand bottoms at Kiel and in the eulittoral of the North Sea.

malostomum species with certainty either from the Scandinavian west coast or from the English coasts. But according to observations and sketches by KARLING a species of *Paromalostomum* (probably *P. dubium* BEAUCHAMP) is found in the Gullmar Fjord (Klubban, gravel at the shore line, 12.8. 1948).¹

Most of the Scandinavian Macrostomida were collected by me partly in the Gullmar Fjord (the Swedish west coast), partly on the Norwegian coast: Dröbak (Oslo Fjord 1935, 1936), Herdla (1924) and Bergen (1951), Tromsö (1936). Moreover, I have made use of the valuable notes, sketches and preserved material from Herdla (1934) and Kristineberg (1948) presented by my friend Dr. TOR G. KARLING.

Gen. *Macrostomum* O. SCHMIDT 1848

1. *Macrostomum appendiculatum* (O. FABR. 1826) GRAFF 1905

M. appendiculatum has not been stated with certainty as living on the Scandinavian west coast. On the other hand I have found it in tide pools diluted with more or less fresh water at the Isle of Man (England), both at the biological station at Port Erin (a crevice in the rocky shore containing the copepod *Tigriopus* for feeding of fish spawns), and at the adjacent place Port St. Mary (in July 1950). I have also found some specimens of this species near Plymouth (Salcombe estuary, in July 1949).

2. *Macrostomum curvituba* LUTHER 1947

Fig. 1.

In April 1943 I found in shell gravel at Kristinebergs zool. station a species of *Macrostomum* without eyes and, measuring outstretched 0.8-1 mm in length. I caught a specimen with a similar shape as early as August 1937 at a depth of 20-30 m (Brännskär, 12.8. 1937) during a short visit to Tvärminne biological station (Finland). In LUTHER's paper (1947) on the Finnish Macrostomida I find the closest resemblance as regards the copulatory stiletto in *M. curvituba* (l.c., figs. 39-45), though the shape of the anterior end, according to my figure from Kristineberg (fig. 1 A), reminds one more of *M. tuba* var. *minuta* in a more outstretched state (l.c., fig. 46). However, the skeleton drawing of the caudal end in sagittal section in Ax's paper (1951 a, fig. 3 b) is very accordant with my longitudinal sections from the Kristineberg specimens, particularly concerning the female antrum. The latter is divided into a larger, anterior, ciliated cavity with spermatozooids, and a smaller, posterior one without ciliae (fig. 1 C). The male apparatus too is very similar, but the seminal vesicle, placed in a transverse direction (fig. 1 D₁, D₂), is not as long and strongly curved as in Ax's figure.

Occurrence: the Baltic, Tvärminne (Luther l.c.), Kiel (Ax l.c.); the North Sea, Amrum (in brackish water (Ax l.c.); the Swedish west coast, Kristineberg, at Bökevik (in shell gravel; the author 19.4. 1943).

¹ KARLING has also found this species on the west coast of Jutland (Esbjerg, Fanö, fine sand, 1951).

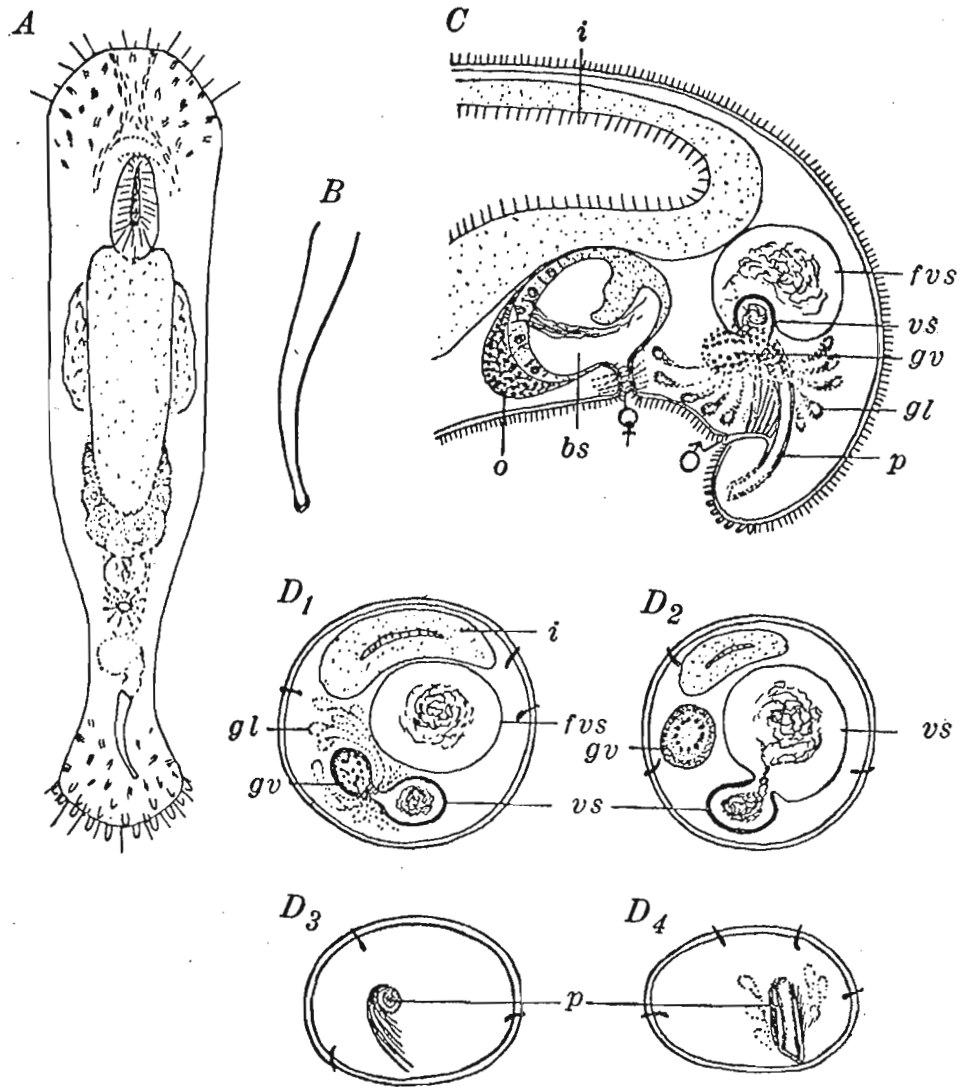


Fig. 1. *Macrostomum curvituba* LUTHER. A habitus (in living state), B the copulatory stiletto, C the posterior end in sagittal section, D₁-D₄ transverse sections through the posterior end. Abbreviations see p. 407.

3. *Macrostomum balticum* LUTHER 1947

Fig. 2.

The appearance of my few specimens from the Swedish west coast (fig. 2) is very reminiscent of the figure that LUTHER reproduces (l.c., p. 14) from KARLING's sketches, though the copulatory tube (80 μ in length) is somewhat more curved in my sketch. Probably my specimens were not quite developed sexually, since the false seminal vesicle in my sketch as well as in my slides of sectioned specimens is not as big as in LUTHER's figure. KARLING has found this species at Kristineberg too, and his sketch of its copulatory stiletto corresponds better to the figures in LUTHER's paper.

Occurrence: the Baltic, Tvärminne (LUTHER l.c.); the North Sea, List/Sylt and Amrum (AX 1951 a); the Swedish west coast, the Gullmar Fjord: Fiskebäckskil (in a ditch connected with the Gullmar Fjord, and with a salt content of 12.25 per mille at the time of collection; the author 6.8. 1950), a sandy bay towards Gåsö ränna (in sand at the shore; KARLING 17.8. 1948).

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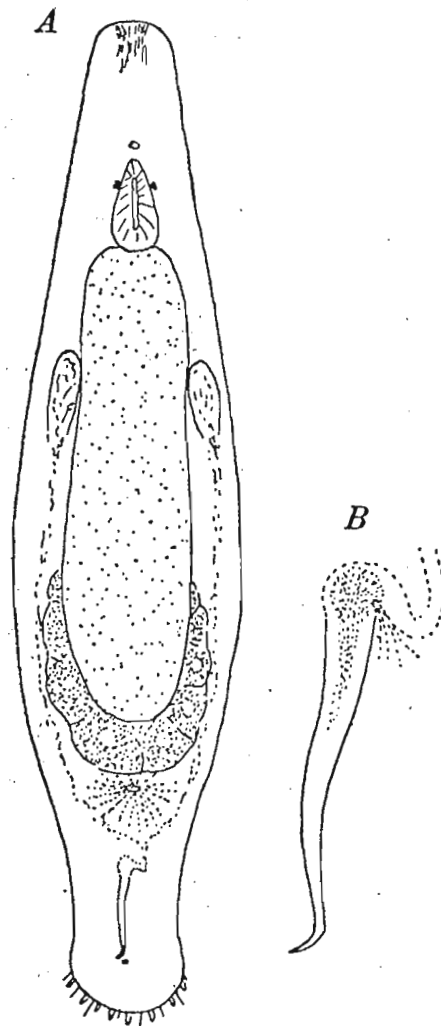


Fig. 2. *Macrostomum balticum* LUTHER. A habitus (in living state), B the copulatory stiletto.

4. *Macrostomum rubrocinctum* AX 1951 a

Fig. 3.

For many years — since the beginning of the thirties — I have caught a *Macrostomum* species, c. 1.75–2 mm in length, in *Zostera* and mud in the bays of Kristineberg and Fiskebäckskil in the Gullmar Fjord. This species is characteristic owing to a violet pigmentation round the anterior end in front of the eyes, and a couple of pigment streaks at the dorsal side behind each of the eyes, while the colour is whitish or \pm yellowish brown owing to the intestinal content of diatoms. Otherwise it reminds one of *M. appendiculatum* with regard to the appearance of the copulatory tube with a length of c. 75 μ , accordingly about double the size of that in *M. appendiculatum*. The anterior as well as the posterior ends are richly provided with rhabdite packets, sensory ciliae (45–50 μ in length), and — at the caudal end — 12–14 μ long adhesive papillae. During recent years it has disappeared from the original find places or has been much more rare than formerly, probably in connection with the disappearance of the *Zostera* vegetation during the forties. Instead

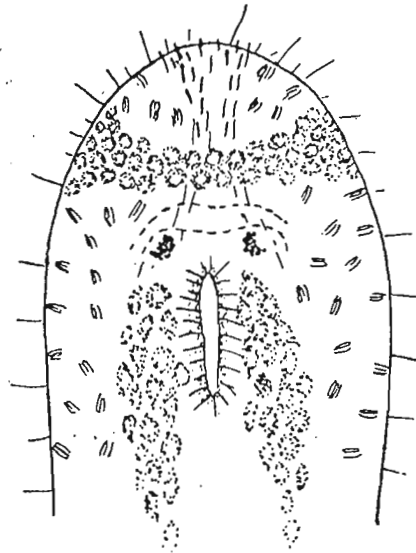


Fig. 3. *Macrostomum rubrocinctum* Ax. The anterior end from the dorsal side.

it has been found abundantly (without any other Turbellaria!) in the innermost deep hollow of the longish bay of Fiskebäckskil, nowadays nearly separated from the other part of this bay by silting up, and with a black mud bottom, smelling strongly of sulphuretted hydrogen, and filled up with masses of green algae (*Ulva* etc.). In the inner parts of the Gullmar Fjord (for instance Strömmarna), where the *Zostera* vegetation is still relatively abundant, it can be found in fairly large quantities too. It is obviously a polysaprob organism.

In the paper of Ax (l.c., p. 281) I have refound this animal called *M. rubrocinctum*. As Ax points out it is very characteristic of this species that it moves very swiftly at this, constantly rotating round its longitudinal axis — often in vertical direction — and that it is very capable of resting against putrefaction. As a completing of Ax's figure of the animal (l.c., fig. 1 a, p. 282) I reproduce the characteristic frontal end in stronger magnification (fig. 3).

Occurrence: the Baltic, Kiel Bay (common in swimming algae masses; Ax l.c.); the Swedish west coast, the Gullmar Fjord (the author).

5. *Macrostomum pusillum* Ax 1951 a

I have found for many years another *Macrostomum* species, remarkably common at Kristineberg's zool. station. KARLING has also found it there, as well as at Herdla and the west coast of Jutland. The copulatory tube reminds one in its appearance of that of *M. appendiculatum* too, but the size of this animal is much smaller, as its species name points out (fully outstretched only c. 0.6–0.8 mm in length). The colour is white with a slightly yellowish intestine, often containing diatoms. The animal mostly lives on sandy beaches but also in mud. In 1919 I refound this species on the English coast near Plymouth.

The species in question is so characteristic that I could recognize it again by Ax's description and figures (l.c., pp. 283–285). There is only one of his details, which I have not been able to recognize from my specimens. According to him (p. 284) there are 6–8 bud-like thickenings inside the wall of the copulatory tube, which he

has always found in his specimens, but which could not have been joined to the tube because displaced from their normal position by the stronger pressure of the cover glass. I suppose that those formations are simply secretion droplets from the gland of the granular gland vesicle, which happened to stick into the cuticular tube.¹

Occurrence: the Baltic, the Kiel Bay (common in fine sand, pure or rich in detritus, in the littoral region; Ax l.c.); the North Sea, Amrum (Ax l.c.), Esbjerg (Fanö, in sand at the shore; KARLING 3.7. 1951); the Scandinavian west coast, Kristineberg (the author), Herdla (Oöysund, shell sand at 10 m depth; KARLING 6.8. 1934); the English south coast (common in mud in the Yealm Estuary near Plymouth 22.7. 1949; the author).

Gen. *Microstomum* O. SCHMIDT 1848

1. *Microstomum spiriferum* n. sp.

(? *M. groenlandicum* LEVINSEN 1879)

· Fig. 4.

This species — c. 1.5 mm in length (living state) — is easy to recognize by its strongly spirally twisted, cuticular penis (fig. 4 C). *M. groenlandicum*, described by LEVINSEN (1879) is the only *Microstomum* species with such a penis type. Unfortunately he has not left a single figure of this animal and its anatomy. His description — “the pairing organ was a narrow, cylindrical, chitinous body provided with several torsions, ending with a little plate- or spoon-shaped part” (translated into English by the author) — is the only thing indicating that *M. groenlandicum* is perhaps identical with *M. spiriferum*. He found such a pairing organ only in a few specimens. On the other hand he found a red spot in the most proximal part of the body², indicating that his specimens were possibly identical with *M. rubromaculatum*, the copulatory organ of which is unknown as yet. The latter species lives among algae, and from LEVINSEN's preface (l.c., p. 4) it is clear that his species was found just in this biotope, while *M. spiriferum* lives exclusively on mud bottoms at greater depths.

The colour is pale reddish yellow, owing to ± richly pigment cells in the dorsal side. The ciliated pits too are forming conspicuously reddish eye spots ± running into each other dorsally (fig. 4 A, B). Rhabdite packets (c. 25–30 μ in length) and nettle cells (c. 15 μ) are common — the latter lacking in LEVINSEN's species — particularly in the anterior and posterior ends. On the other hand adhesive papillae are totally lacking (frequent in GRAFF's “*M. groenlandicum*”, but not mentioned by LEVINSEN). The animals are often consisting of two zooids, sometimes with a vestige of a further transverse division of the proximal zooid. They show a fairly great vivacity with an even, gliding movement on the mud surface.

This species differs in anatomical respects from all other *Microstomum* species in its two female ducts and orifices, both connected with the ovary (fig. 4 D). The anterior, ciliated one corresponds to the common vagina, but here obviously serving only as an oviduct, i.e. a discharging duct of the fecundated ovum. The posterior

¹ According to KARLING's observations from Esbjerg, however, there are four thickenings on the inside of the cuticular tube.

² His description on this point — “eye spots are lacking, but there is a red spot in the most proximal part of the body” (translated by the author) — cannot be interpreted as GRAFF (1905, pp. 106–107) does, who found a species off Bergen (Norway) provided with a red spot upon the brain (in italics by the author of this paper).

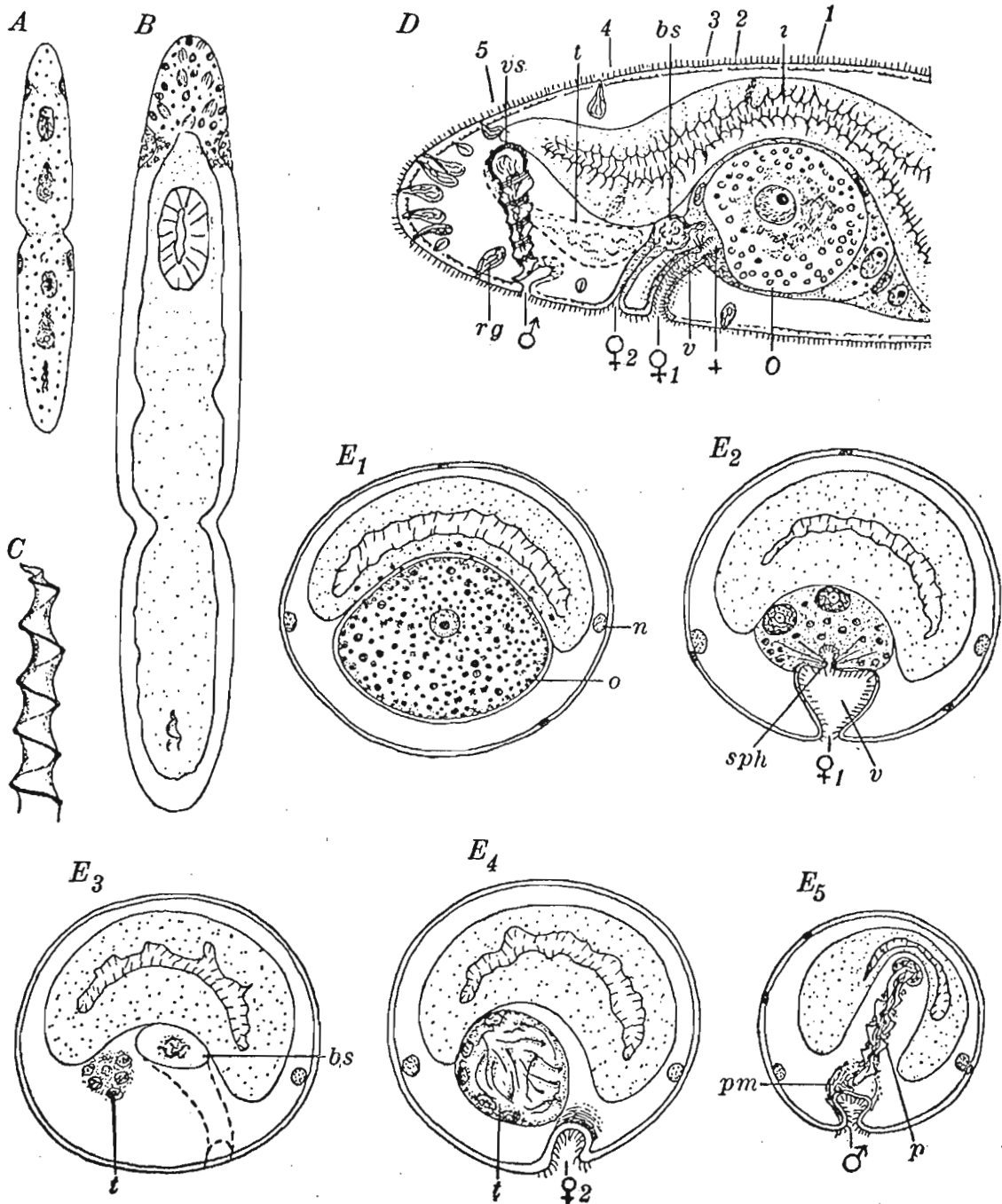


Fig. 4. *Microstomum spiriferum* n. sp. A specimen with two zooids quite before division, B specimen in the first stage of division, stronger magnified (pharynx, ciliated pits, ovary etc. undeveloped; pigment and rhabdite glands denoted only in the anterior end), C penis stiletto, D the posterior end in sagittal section, E₁-E₅ the posterior end in transverse sections (E₂ combination of 4 sections) corresponding to the lines 1-5 in D. Abbreviations see p. 407, + a chamber.

female duct in its turn serves as a copulatory organ, in its ovarian part containing spermatozoids while the outer part is shut and obviously only opens at the copulation. The orifice of the anterior duct in the ovary consists of a little ciliated chamber (fig. 4 D, E₂), separated from the oviduct by a sphincter, while radial dilator muscles

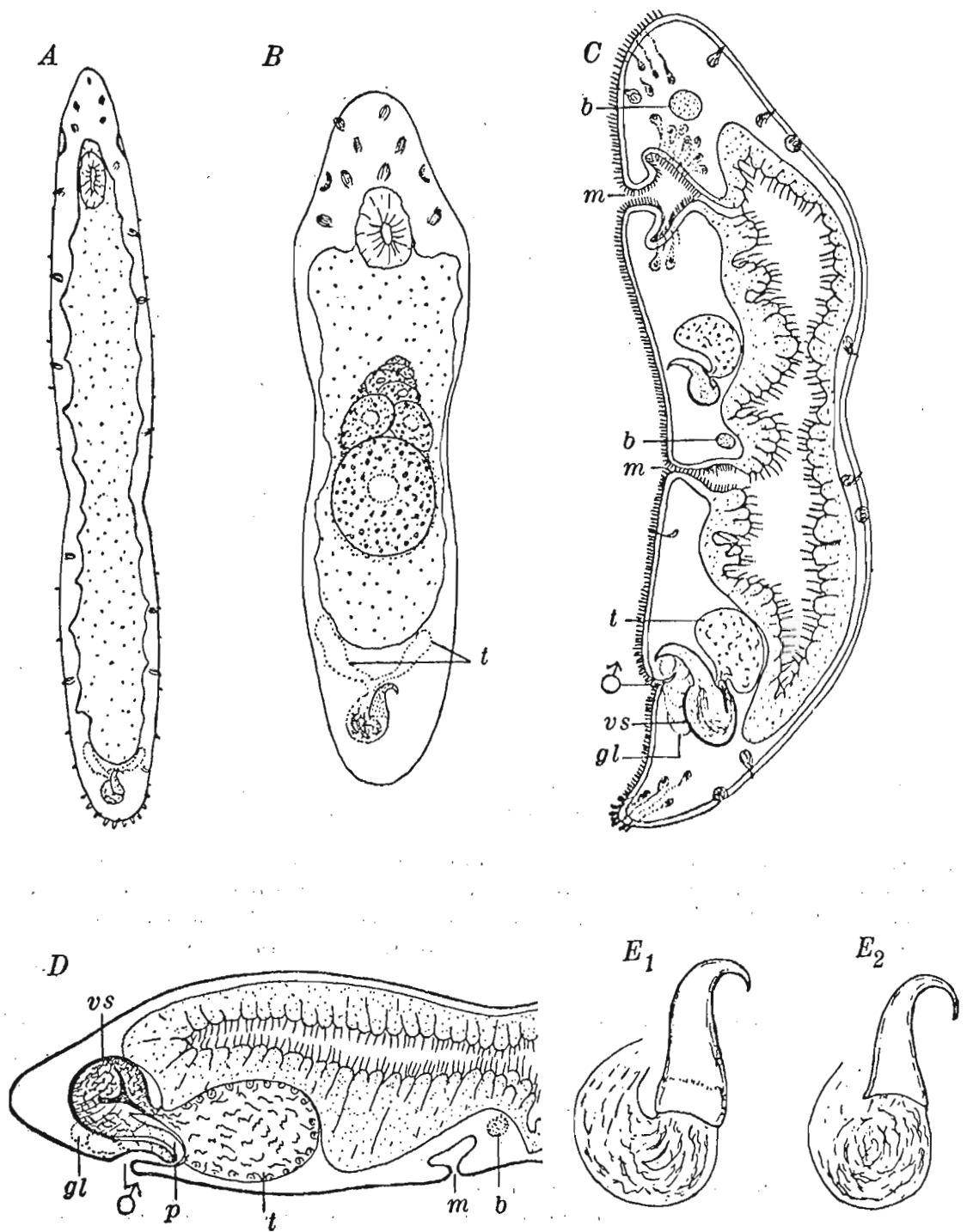


Fig. 5. *Microstomum hamatum* n. sp. A habitus (specimen from Bergen 13.8. 1951), B specimen with developed ovary (squeezed under cover glass; Plymouth 30.6. 1949); C sagittal section (Blyth 26.6. 1950), D posterior end in sagittal section (Bergen 13.8. 1951), E₁-E₂ poni stiletos (E₁ from Plymouth, E₂ from Blyth). Abbreviations see p. 407.

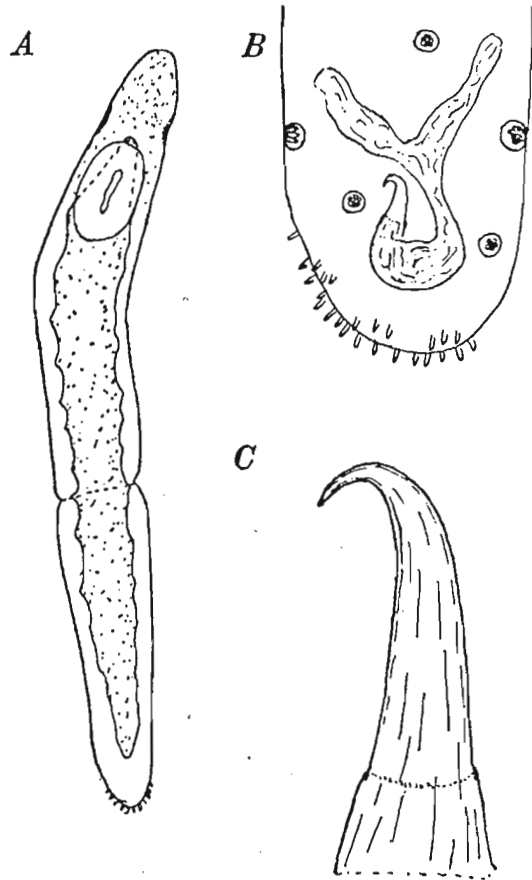


Fig. 6. *Microstomum hamatum* n. sp. A habitus, B the posterior end, C the penis stiletto (Hordla 1934; KARLING del.).

Occurrence: Norway: Herdla (Amphioxus sand at 5-10 m depth between Oøy and Blomøy; KARLING 1934), the biological station of Bergen University (black bottom at some meters depth at Mariholmen; the author 1951). England: Plymouth (the harbour at c. 40 m depth; the author 1949), Blyth (the harbour at c. 10 m depth; the author 1950), at both localities in black mud.

3. *Microstomum septentrionale* SABUSSOW 1899

(Syn. ? *M. papillosum* GRAFF 1892

? *M. ornatum* ULIANIN 1870)

Figs. 7, 8.

This species is characterized above all by its copulatory organ. The latter consists of a curved penis stiletto shaped like a scythe varying in length between 51-68 μ (according to KARLING's notes, see fig. 8), and by the spacious, ciliated male atrium, stretching a good way in front of the genital orifice, both characters accordant with SABUSSOW's figures (l.c., pl. II, figs. 18, 19). It is not improbable that SABUSSOW's species is identical with ULIANIN's *M. ornatum* — with which S. earlier (1897) identified his species¹ — as well as with GRAFF's *M. papillosum*. The differences between *M. septentrionale* and *ornatum*, pointed out by SABUSSOW (pp. 181-182),

¹ According to GRAFF 1913, p. 43.

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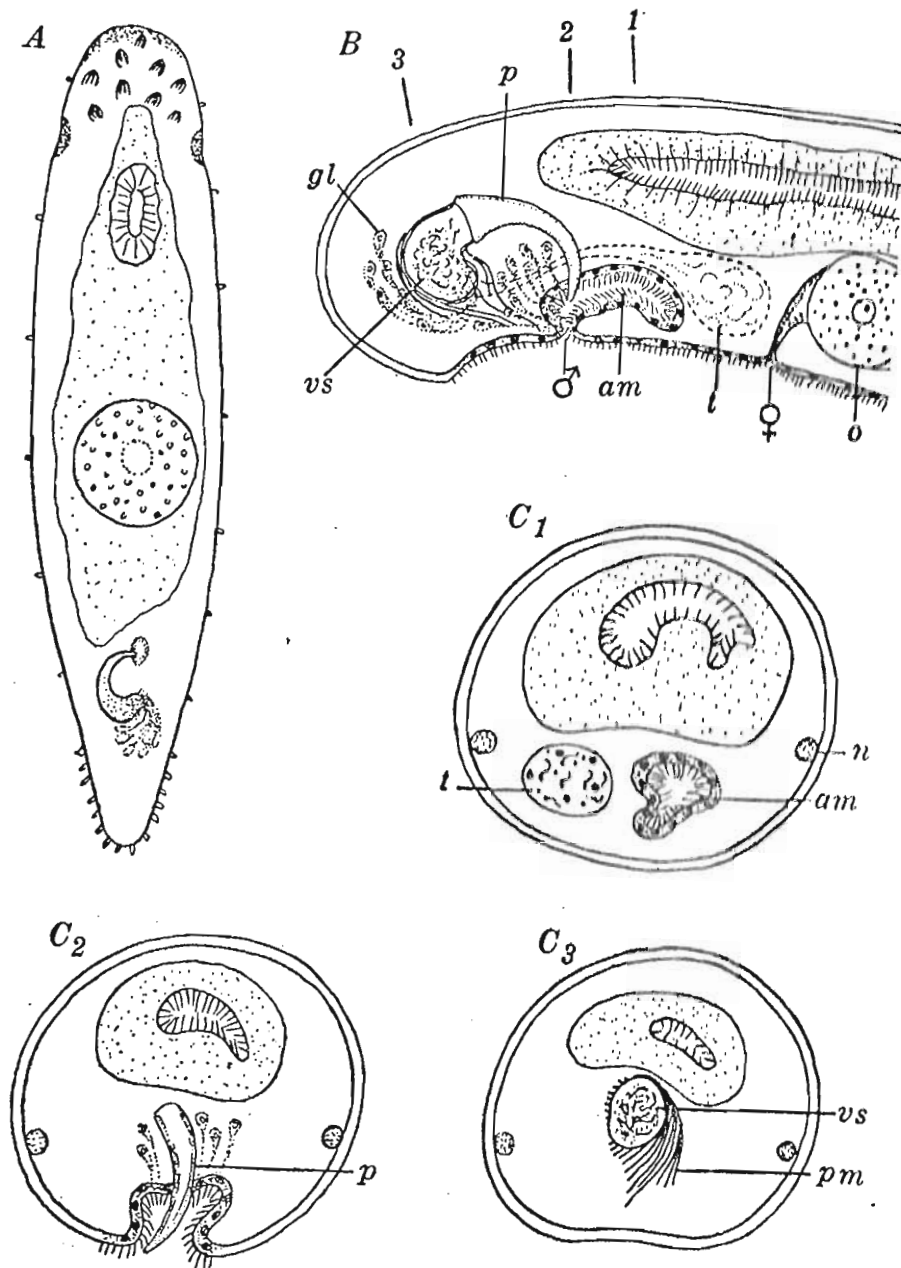


Fig. 7. *Microstomum septentrionale* SABUSSOW. A habitus, B the posterior end in sagittal section, C₁-C₃ the posterior end in transverse sections corresponding to the lines 1-3 in fig. B. Abbreviations see p. 407.

seem to me quite too accidental and trifling. ULIANIN's description of *M. ornatum* thirty years previously, belongs to an early stage of Turbellarian research, when section methods were still not used. His fairly schematic figures of his species (i.e., pl. IV, figs. 2, 3) do not give a sure idea of the differences between *M. ornatum* and *septentrionale*. *M. ornatum* must be struck out from the "safe" species for the present until it has been refound again at its original find place (the Black sea, among seaweed in the Ravine of Paniot and the Bay of Kilenbalka). His sketch



Fig. 8. *Microstromum septentrionale* SABUSSOW. The copulatory stiletto (1120 ×, Herdla 7.8. 1934; KARLING del.).

of the "female" (l.c., fig. 3) seems to me particularly absurd, according to which the ovary is situated in the hindmost part of the body, and the development of the eggs seems to take place from behind forwards instead of the contrary. (But according to his text — p. 42 — the ovary has a short efferent duct, which opens outwards at the posterior end of the body.) — *M. papillosum* also belongs to the dubious species (p. 407). It is perhaps identical with *M. septentrionale*, the only one of these three "species", which has been examined with section methods, and therefore guaranteed as a "safe" species. In any case I cannot find any positive differences between the description of the animals and the appearance of the penis stilettos in *M. septentrionale* and *papillosum*, as reproduced in BÖHMIG's (1889) and STEINBÖCK's (1938) figures.

M. septentrionale is one of the smallest species of this genus. According to SABUSSOW (l.c.) its length is 0.75–1 mm. I have measured living specimens of 0.6–0.8 mm in length, usually consisting of two zooids. The intestine has the same colour in my specimens from the Gullmar Fjord as SABUSSOW states as being characteristic of his species. In some of my specimens — not in all of them — the anterior end had an orange yellow pigment (fig. 7 A). The posterior end is rounded with a little point as S. states, but provided with adhesive papillae, sparsely scattered over the whole body. My specimens have no lobated testicle, while S. says that the testicle consists of two lobes (l.c., pl. II, fig. 20). It is possible that my specimens were in an earlier or later stage of the male development than that described by S., since the testicle in my specimens is very small (fig. 7 B, C₁) in comparison with S.'s figures. There are muscle fibres attached to the wall of the seminal vesicle going obliquely to the male orifice, and there are plenty of glands discharging their secretion partly into the vesicle, partly into the male atrium.

Occurrence: ? the Black Sea (ULIANIN l.c.); Kola Peninsular (Ljetnaja Guba, among Conferva in the littoral region; SABUSSOW l.c.); ? Adria (BÖHMIG l.c.); ? Iceland (STEINBÖCK l.c.); the Scandinavian west coast: ? Sartorøy (GRAFF 1882), Herdla (Kværnepollen; KARLING 1934), the Gullmar Fjord (in the Fucus-Ascophyllum zone at Gåsövik etc.; the author 1943).

4. (?) *M. jenseni* RIEDEL 1932

(Syn. ? *M. tortipenis* STEINBÖCK 1938)

Fig. 9.

According to RIEDEL (l.c., p. 77) *M. jenseni* has been found in two quite different biotopes during STEINBÖCK's and REISINGER's Greenland expedition, viz. partly in coarse sand respectively the Hydroid vegetation (Engelskhavn and Godhavn), partly in mud from 250–300 m depth (Disco Bay). That seems rather singular, as

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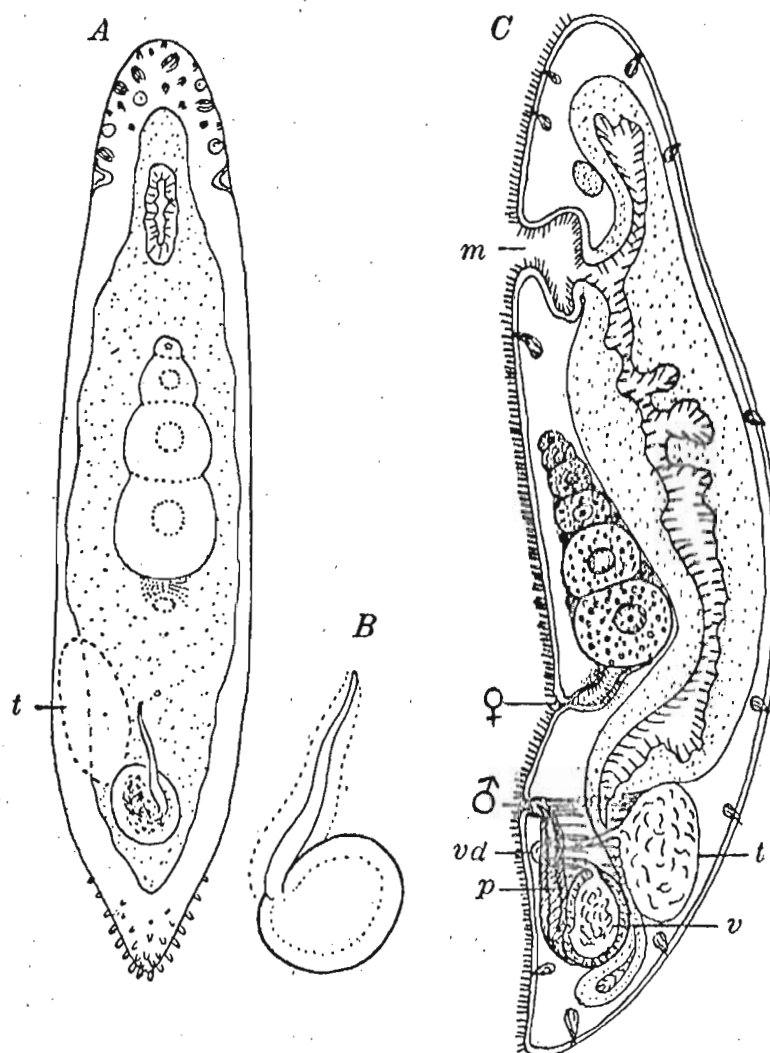


Fig. 9. *Microstomum* (?) *jenseni* RIEDEL. A habitus, B the male copulatory apparatus (the dotted lines around the penis stiletto denoting the muscle sheath), C sagittal section: Abbreviations see p. 407.

the different species of this genus have their fixed biotopes, either in the littoral region or in mud at \pm great depths. However, STEINBÖCK (l.c., p. 7) has described a species from Iceland, which he calls *M. tortipenis*, the penis type of which is quite in accordance with the Greenland form, and captured in fine sand and shallow water, thus reminiscent of one of the Greenland localities (compare fig. 11 in RIEDEL's paper and fig. 4 c in STEINBÖCK's). Unfortunately he has not given any description of the anatomy of his animal, necessary for proposing a new species nowadays.

The Scandinavian species lives exclusively on mud bottoms from a few meters to about 100 meters depth, and it is generally twice as big (c. 1.2–1.4 mm in length) as the Greenland and Iceland forms (0.6–0.8 mm). This species seems to undergo transverse division very seldom. I have observed such a specimen only on one occasion. The sexual reproduction is surely the typical mode of propagation in this species. The same seems to be the case in the Greenland form, while STEINBÖCK reports having found a specimen with 4 zooids in his *M. tortipenis*. Its colour is

whitish with a faint reddish yellow intestine. The epithelium has rhabdite packets and nematocysts scattered over the whole body, big and small ones of both sorts. The intestine has a big praeoral blind sac, but I have never observed any posterior blind sacs, such as RIEDEL has described in the Greenland form (l.c., fig. 1). Such blind sacs are surely only accidental by the — generally — unpaired, big, dorsal testicle pressing the posterior part of the intestine together, so that only the side parts of the intestine are obvious in the "quetsch" slides. The caudal end of the animal has plenty of adhesive papillae (fig. 9 A) lacking in other parts of the body.

The testicle is unpair in my specimens, and always situated in the *dorsal* part of the caudal end, while RIEDEL reports that its position is highly varied, sometimes above or in front of the seminal vesicle, sometimes at the side of the latter. It is exceptionally big, and there are plenty of muscle fibres attaching to its ventral tunica propria, going partly to the back part of the intestinal muscle membrane, partly to the inner circular muscles of the penis sheath. It is imaginable that the varying position of the testicle in the Greenland material depends on a different contraction of these muscle fibres. I have never found such testicle muscles in other *Microstomum* species, where the testicle is always situated at the *ventral* side, beneath the intestine. The seminal duct makes a coil round the proximal part of the penis sheath, characteristic of this species, and debouches in the anterior part of the seminal vesicle. According to RIEDEL the seminal vesicle is provided with gland cells debouching in its anterior wall, which I cannot find in my slides. Its wall, remarkably thick (c. 10 μ), consists of muscle fibres plaited in one another in different directions, not arranged in three layers (inner longitudinal, intermediate circular, and outer longitudinal fibres) as RIEDEL says (l.c., p. 58). Its inner volume is exceptionally large — c. 70 μ in length (between the orifices of the seminal duct and the penis tube) and 55 μ in transverse section in one of my specimens. It is attached by sparse muscle fibres to the testicle dorsally, and to the penis sheath ventrally. The latter is extremely muscular — according to RIEDEL (l.c., p. 59) "ganz unbedeutend" (!) — consisting of an inner stratum of fine circular fibres and an outer thick layer of obliquely or slightly spirally running muscles. The penis tube is maximum c. 150 μ long (living specimens) — according to RIEDEL only 80 μ long —, debouching into the posterior ventral part of the seminal vesicle with a narrow, vertical part and going forward with its proximal end projecting into the small male atrium. — There is nothing worth mentioning about the *female* apparatus and its oviduct. It has the usual structure. All animals are well-developed with regard to the male as well as to the female apparatus.

Occurrence: Greenland and Iceland (RIEDEL and STEINBÖCK; see above!); the Scandinavian west coast: the Gullmar Fjord, fairly common on mud bottoms from the inner parts (Gullmarsvik, Saltkälle Fjord etc. at c. 60–80 m depth) to the outer parts (Gåsö rämma at c. 40 m depth); Herdla (Kværnepollen in mud; the author 1924).

5. *Microstomum rubromaculatum* GRAFF 1882

(Syn. ? *M. groenlandicum* LEVINSEN 1879)

Fig. 10.

M. rubromaculatum has a characteristic broad frontal end with a reddish brown pigment of small grains in the frontal epithelium cells. This animal propagates exclusively by transverse fission, it seems, usually forming 2–3 mm long chains of 4

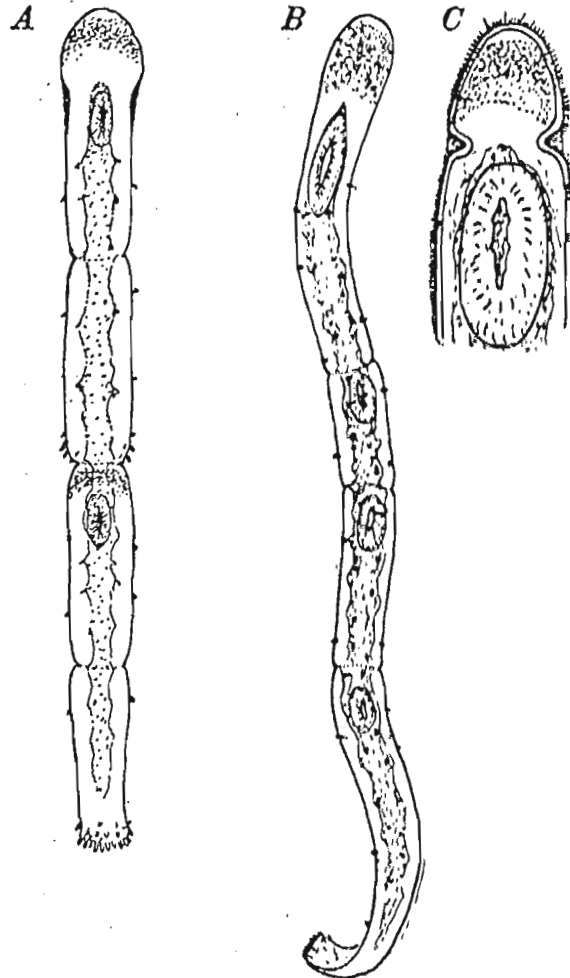


Fig. 10. *Microstomum rubromaculatum* GRAFF. A a specimen from Kristineberg (the author del.), B-C specimens from Herdla, C the anterior end stronger magnified (Herdla 7.8. 1934; KARLING del.).

zooids (as many as 8 according to GRAFF). The unlacing occurs in the middle part of the chain, as is clear from the posterior half developing its characteristic pigment already in the fore end, while the proximal half has its adhesive papillae already developed in its caudal end (fig. 10 A). The small processes resembling papillae in the other parts of the animal consist only of rhabdites forcing their way out from their gland cells.

This species belongs to the many *Microstomids*, of which the genital organs are not known. If LEVINSEN's *M. groenlandicum* would be identical with GRAFF's *M. rubromaculatum*, as I have supposed (p. 396), L. would have really observed genital organs in this species. However, it is better to strike out LEVINSEN's dubious species and retain that of GRAFF.

Occurrence: the Mediterranean (Naples), France (Concarneau), Ireland (Galway, Dublin, 2 m depth; SOUTHERN 1936), the Faroes (Vaag Fjord, mud at 2 m depth; STEINBÖCK 1931), Iceland (n. Isafjörður, sand and algae at 1-2 m depth; STEINBÖCK 1938); the Scandinavian west coast: the Gullmar Fjord (Gåsövik, Fiskebäckskil etc. among seaweed; the author); Herdla (the Kvaernepoll current; KARLING 1934).

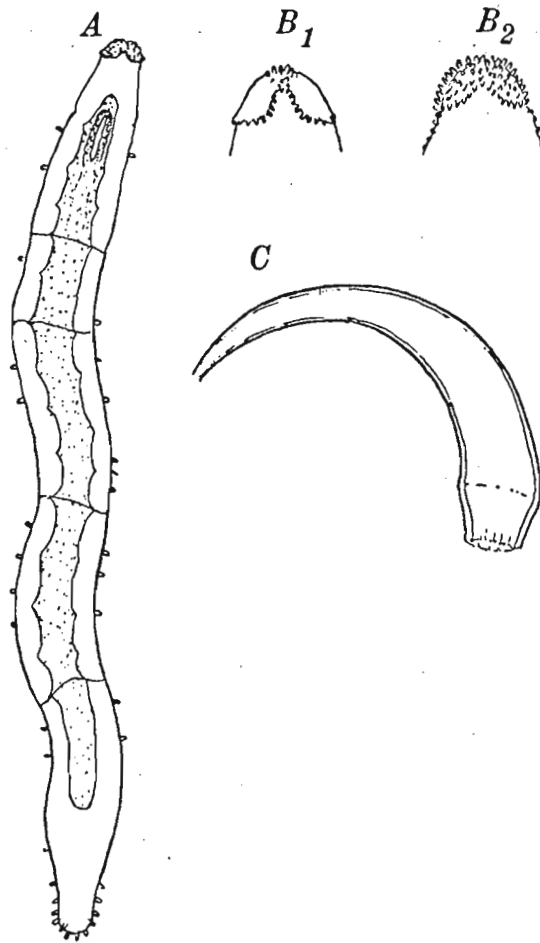


Fig. 11. *Microstomum papillosum* GRAFF. A specimen in living state, B₁-B₂ the anterior end stronger magnified, C penis stiletto (1120 ×, Herdla 6.8. 1934; KARLING del.).

6. ? *Microstomum papillosum* GRAFF 1882

(Syn. ? *M. ornatum* ULIANIN 1870)

? *M. septentrionale* SABUSSOW 1899)

Fig. 11.

In the Gullmar Fjord one often finds a thread-like, 1.5-2 mm long, white *Microstomum* species consisting of 2-4 zooids, without genital organs, and living among algae at the shore line, often exposed by waves. It lacks the broad frontal end and the reddish pigment characterizing *M. rubromaculatum*. KARLING has found a similar form at Herdla among Hydroids on Laminaria (the Kvernepoll current), but provided with two characteristic bows of adhesive papillae at the proximal end, inside which there is a big rhabdite field with rhabdites projecting from the surface of the epithelium (fig. 11 B₂). He has also found a c. 60 μ long penis stiletto in this species, similar to that in *M. septentrionale*, but narrower, and with the proximal part curved inwards (fig. 11 C).

This species belongs to the many ± dubious *Microstomum* species — in this case perhaps identical with *M. septentrionale* — the anatomy and development of which must be studied closer for getting enlightenment as to their species character. Per-

haps many of the species hitherto described are simply varieties (modifications) of the same species, partly owing to the exclusively asexual propagation, partly to the different outer conditions in regard to temperature, salt content, depth, exposure to light and waves etc.

Among those dubious *Microstomum* species I reckon *M. lucidum*, *mundum* and *davenporti* to mention only the marine, North Atlantic species. In addition the Mediterranean *M. melanophthalmum* (STEINBÖCK 1933, p. 9-10) as well as the Greenland species *M. dermatophthalmum* (RIEDEL, l.c.) — not to mention the still more dubious *M. mortenseni* (RIEDEL, l.c.) — must undergo a closer investigation to be reckoned as "safe" species. MARCUS (1950, 1951) has described 5 new South Atlantic *Microstomum* species, but in only two of them — *M. trichotum* and *gabriellae* — has he found sexual organs.

Among the North Atlantic marine *Microstomum* species hitherto described I cannot reckon more than the following: *M. septentrionale*, *M. jenseni*, *M. rubromaculatum* and — with some hesitation — *M. papillosum*. The following new species described in this paper should be added: *M. spiriferum*, *M. hamatum* (= ? *M. trichotum* MARCUS, see p. 398).

SUMMARY

Four species of the genus *Macrostomum* and one species of *Paromalostomum* (p. 392) have been found up to now on the Scandinavian west coast, and two *Macrostomum* species on the coasts of England, all of them previously known from different parts of the Baltic (Tvärminne, Kiel). Only one of the *Macrostomum* species, *M. pusillum*, is common under purely marine conditions, while the other species (*M. appendiculatum*, *M. curvıtuba*, *M. balticum* and *M. rubrocinctum*) seem to prefer brackish (and calm) water.

Six species of the genus *Microstomum* are found on the Scandinavian west coast, two of them — *M. spiriferum* and *M. hamatum* — new to science (the latter species eventually identical with *M. trichotum* MARCUS, described from the coast of Brazil), and found by the author also on the coasts of England (*M. rubromaculatum* besides being formerly known from the coasts of Ireland). *M. spiriferum* and *M. hamatum* are sublittoral forms, living on mud bottoms (the latter also found on sand bottoms). This is also valid for *M. (?) jenseni*, while the other *Microstomum* species — *M. septentrionale*, *M. rubromaculatum* and *M. papillosum* — are genuine littoral forms, generally living among brown algae at the shores.

Abbreviations

<i>am</i>	male atrium	<i>p</i>	penis stiletto
<i>b</i>	brain	<i>pm</i>	protractor muscle
<i>bs</i>	bursa seminalis	<i>rg</i>	rhabdite gland
<i>ds</i>	seminal duct	<i>sph</i>	sphincter muscle
<i>fs</i>	false seminal vesicle	<i>v</i>	vagina
<i>gl</i>	gland	<i>vd</i>	vas deferens
<i>gv</i>	gland vesicle	<i>vs</i>	seminal vesicle
<i>i</i>	intestine	<i>t</i>	testicle
<i>m</i>	mouth	♀	(♀ ₁ , ♀ ₂) female gonopore(s)
<i>n</i>	nerve stem	♂	male gonopore
<i>o</i>	ovary		

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Corrections. In fig. 1 D₂ (p. 393) *vs* should be altered to *fvs*, in fig. 4 D (p. 397) the letter *O* to *o*, and in fig. 9 C (p. 403) *v* to *vs*.

Tryckt den 6 mars 1953

Uppsala 1953. Almqvist & Wiksells Boktryckeri AB