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### Deep-water ascidians from the North Atlantic (RV Academic Keldysh, cruise 46 and 49)

K. E. Sanamyan<sup>a</sup> & N. P. Sanamyan<sup>a</sup>

<sup>a</sup> Kamchatka Branch of the Pacific Institute of Geography ,  
Petropavlovsk-Kamchatsky, Russia

<sup>b</sup> Kamchatka Branch of the Pacific Institute of Geography ,  
Partizanskaya Str. 6, Petropavlovsk-Kamchatsky, 683000, Russia E-mail:

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## Deep-water ascidians from the North Atlantic (RV *Academic Keldysh*, cruise 46 and 49)

K. E. SANAMYAN & N. P. SANAMYAN

*Kamchatka Branch of the Pacific Institute of Geography, Petropavlovsk-Kamchatsky, Russia*

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### Abstract

Ascidians from two locations in the North Atlantic are discussed. Predominantly small specimens of five known species were taken by Sigsbi trawl in the vicinity of the wreck of the *Titanic* (the region referred to as the *Titanic* location), and two large specimens of a *Corynascidia* species were taken by manned submersible MIR-2 on the mid-Atlantic Ridge (the Charlie Gibbs Fracture Zone). Definitions of the species are reviewed and their relationships and intraspecific variations are discussed and revised.

**Keywords:** *Ascidacea*, *Cnemidocarpa bythia*, *Corynascidia suhmi*, *Culeolus suhmi*, *North Atlantic*, *Polycarpa albatrossi*, *Pyurella hernia*, *Styela calva*, *Tunicata*

### Introduction

The ascidians reported in the present paper were collected by two recent cruises of RV *Academic Keldysh* (cruise 46 and 49). They are deposited in the Institute of Oceanology, Moscow. The collection is small and the specimens have been assigned to already known species. However, in some cases these reflect significant intraspecific variations not previously reported. In the last three decades some of these (and many other) often small, convergent species have been recorded from abyssal waters in all oceans (see Monniot 1965, 1974, 1998; Monniot C and Monniot F 1968, 1970, 1973, 1974, 1977, 1982, 1985a, 1985b, 1988, 1994; Monniot et al. 1976), but newly recorded specimens usually have not been described and their intraspecific and age variations and species parameters often are neither documented nor understood.

### Station list

*RV Academic Keldysh*, cruise 46

The “*Titanic*” location. St. 4226: 41°43.14'N, 49°49.17'W, 3600–3630 m, “Sigsbi” trawl. St. 4234: 41°37.87'N, 49°38.55'W, 3162–3136 m, “Sigsbi” trawl. St. 4254: 41°39.46'N, 49°58.85'W, 3796–3780 m, “Sigsbi” trawl.

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Correspondence: Karen Sanamyan, Kamchatka Branch of the Pacific Institute of Geography, Partizanskaya Str. 6, Petropavlovsk-Kamchatsky, 683000, Russia. Email: [ascidiacea@sanamyan.com](mailto:ascidiacea@sanamyan.com)

*RV Academic Keldish, cruise 49*

*Mid-Atlantic Ridge, Charley Gibbs Fracture Zone. St. 4540: 52°47'N, 34°45'W, 4313 m, submersible MIR-2.*

*The "Titanic" location. St. 4569: 41°38.30'N, 49°37.26'W, 3182–3152 m, "Sigsbi" trawl.*

## Description of species

### *Corynascidia suhmi* Herdman, 1882

(Figure 1)

*Corynascidia suhmi* Herdman 1882, p 186; Hartmeyer 1924, p 19; Kott 1969, p 87; Millar 1988, p 1429; Monniot and Monniot 1994, p 22; Sanamyan and Sanamyan 2002, p 335.

*Corynascidia hartmeyeri* Monniot and Monniot 1994, p 23.v

### *Material examined*

Submersible MIR-2; st. 4540, 4313 m, two specimens.

### *Description*

Specimens, about 12 cm long, are in excellent condition. The test, as in all *Corynascidia* species, is thin, soft and transparent, and slightly thicker on the peduncle and on the top of the body. The peduncle is shorter than the body and distinctly demarcated from it. The apertures are on the short siphons on the side of the body. Body muscles and the position of the gut loop in the upper (distal) corner of the body (Figure 1C) are identical with the description of specimens of *C. suhmi* Herdman, 1882 from the South Orkney Trench (Sanamyan and Sanamyan 2002). Some details of the inner anatomy, however, are different. The inner surface of the atrial siphon has minute papillae visible only after staining. The tentacles are long and numerous, 150 or more. The prepharyngeal band is composed of two thick lamellae. The anterior lamella curves immediately behind the dorsal tubercle where it becomes higher and thicker, forming a small triangular papilla. The posterior lamella makes a thick-walled narrow V behind the dorsal tubercle. The dorsal lamina has a line of long dorsal languets. In one specimen 24–27 transverse rows of about 42–47 spiral infundibula, each with 1.5 to three coils are on each side of the branchial sac; another specimen has 32–36 transverse rows of about 47 spirals. Each spiral is crossed by two, three, or seldom more, thin radial vessels. About 60–63 entire inner longitudinal vessels are present on each side of the branchial sac, they are on long papillae arising from the transverse vessels.

The gut loop (Figure 1A) is distinctly displaced to the right side of the body. The well-defined small stomach is clearly demarcated from the intestine and oesophagus and has distinct longitudinal ridges. The long rectum ends with an anus of a characteristic shape, its two anterior lobes fringed with long finger-shaped lobes. The testis follicles spread around the proximal end of the tubular ovary in the gut loop. The gonoducts run together along the rectum, their openings close together near the anus.

### *Remarks*

The genus *Corynascidia* contains eight nominal species (four sessile and four stalked). Six are known from the southern hemisphere, one was recorded in the Bering Sea and one in

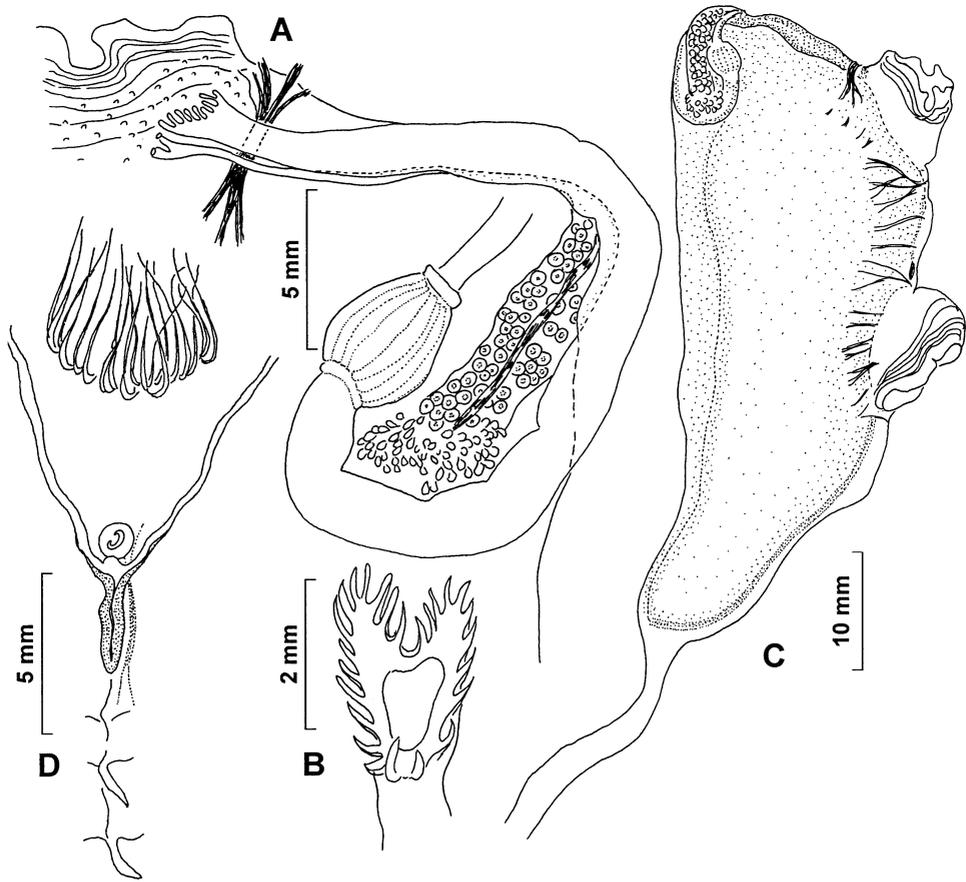


Figure 1. *Corynascidia suhmi* Herdman, 1882. (A) Gut loop and inner surface of the atrial siphon; (B) anal margin; (C) body including top of the stalk removed from the test; (D) internal view of antero-dorsal mid line (branchial tentacles, prepharyngeal groove, dorsal tubercle and anterior part of dorsal lamina).

the North Atlantic ( $61^{\circ}50'N$ ,  $56^{\circ}27'W$ ). The North Atlantic specimens, initially identified by Hartmeyer (1924) as *C. suhmi* Herdman, 1882, were considered a distinct species, *C. hartmeyeri* Monniot and Monniot, 1994, characterized by its plain-edged dorsal lamina. In almost all features, except the dorsal lamina, the present specimens conform to the description of *C. hartmeyeri*, and the geographic region is the same. The figure reproduced by Monniot and Monniot (1994) shows only the upper portion of the dorsal lamina which appears to be of about the same height as the prepharyngeal band. The structure resembling a low thick-walled lamina just behind the dorsal tubercle, as in the present specimens (Figure 1D), and in some other species (*C. lambertae* Sanamyan and Sanamyan, 2002 and especially *C. vinogradovae* Sanamyan, 1998), tends to confirm the view that other features, such as the dorsal languets would be similar in the specimens assigned to *C. hartmeyeri*. The plain dorsal lamina is so unusual for *Corynascidia*, all other species having dorsal languets, that there is some doubt that the feature was correctly observed or interpreted.

The characteristic shape of the anus with the margin fringed with the long papillae is a second feature distinguishing the present specimens from *C. hartmeyeri*, which has "large anus without lobes" (Monniot and Monniot 1994, p 24). We observed a similar lobed and

papillated anus on perfectly preserved species of *C. suhmi*, *C. vinogradovae* and *C. herdmani* (see Sanamyan 1998; Sanamyan and Sanamyan 2002), although the original description of *C. herdmani* states that the anus is smooth (Ritter 1913). However, if the terminal portion of the rectum is contracted, the anal border appears to be smooth (as in *C. lambertae*). Thus, there seems to be no justification for keeping *C. hartmeyeri* as a separate species.

The present specimens differ from the southern specimens of *C. suhmi* in the number of transverse rows of stigmata. However, rows appear to be added with the growth of the specimens and two of the present specimens show relatively large variations (24–27 and 32–36 rows in the specimens of about the same size, and the number reported for *C. suhmi* by Sanamyan and Sanamyan 2002 was about 60 rows). Differences in number of branchial spirals and internal longitudinal vessels or papillae could be more significant, although more data are needed to confirm this. Herdman's original figure of *C. suhmi* shows about two internal longitudinal vessels for one spiral (Herdman 1882, Plate 25, Figure 6). This number was confirmed by Sanamyan and Sanamyan (2002) in specimens from the South Orkney Trench. The present specimens (as well as in *C. hartmeyeri* type specimens), have about three papillae per two stigmata. There is also a difference in the shape of the prepharyngeal band, posterior lamella of which makes a narrow V behind the dorsal tubercle in the present species—a structure apparently not present in southern specimens of *C. suhmi*, but again, this needs to be confirmed in more material. A similar structure was reported for *C. lambertae*.

The two remaining pedunculate *Corynascidia* species (*C. herdmani* and *C. lambertae*) have a different orientation of the body, and the position of the gut loop, the siphons being more or less on the sides of the top of the body and the gut loop orientated vertically with the pole directed down. This appears to be a stable specific feature and is not affected by the size of the specimen, *C. lambertae* being a relatively small (4 cm) species, while known specimens of *C. herdmani* are from 9 to 20 cm long.

### *Cnemidocarpa bythia* (Herdman, 1881)

(Figures 2, 3)

*Styela bythia* Herdman 1881, p 63; 1882, p 151.

*Cnemidocarpa bythia*: Millar 1959, p 194; Monniot and Monniot 1973, p 432; 1974, p 752; 1977, p 313; 1982, p 113; 1985b, p 27; Monniot 1998, p 552; Sanamyan and Sanamyan 2002, p 340.

#### *Material examined*

St. 4226, 3600–3630 m, five specimens; st. 4254, 3796–3780 m, one specimen.

#### *Description*

Unlike many small deep-water Styelidae, that are almost impossible to distinguish without dissection, this species has constant and distinctive external features. The body is hemispherical or short and cylindrical, 3–4 mm in diameter and height and always is attached to solid objects such as stones or polychaete tubes. Some specimens have test hairs, on the basal part of the body, only in the places in contact with the sand or mud, where the specimen is attached to an object smaller than the base of the body. Otherwise the test has neither the hairs nor attached sand, although it is covered by crowded minute (0.025 mm) papillae or granules. Sessile apertures are on opposite sides of the upper surface.

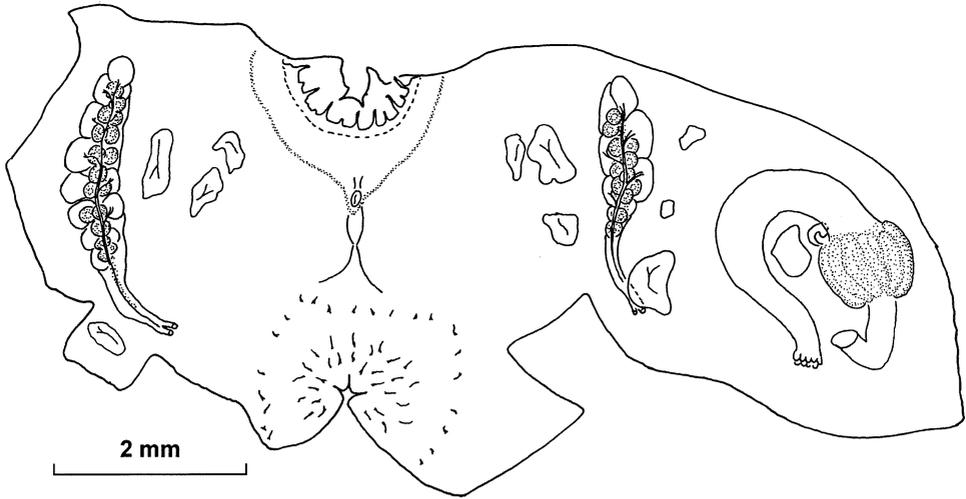


Figure 2. *Cnemidocarpa bythia* (Herdman, 1881). Specimen opened along ventral mid line, branchial sac removed.

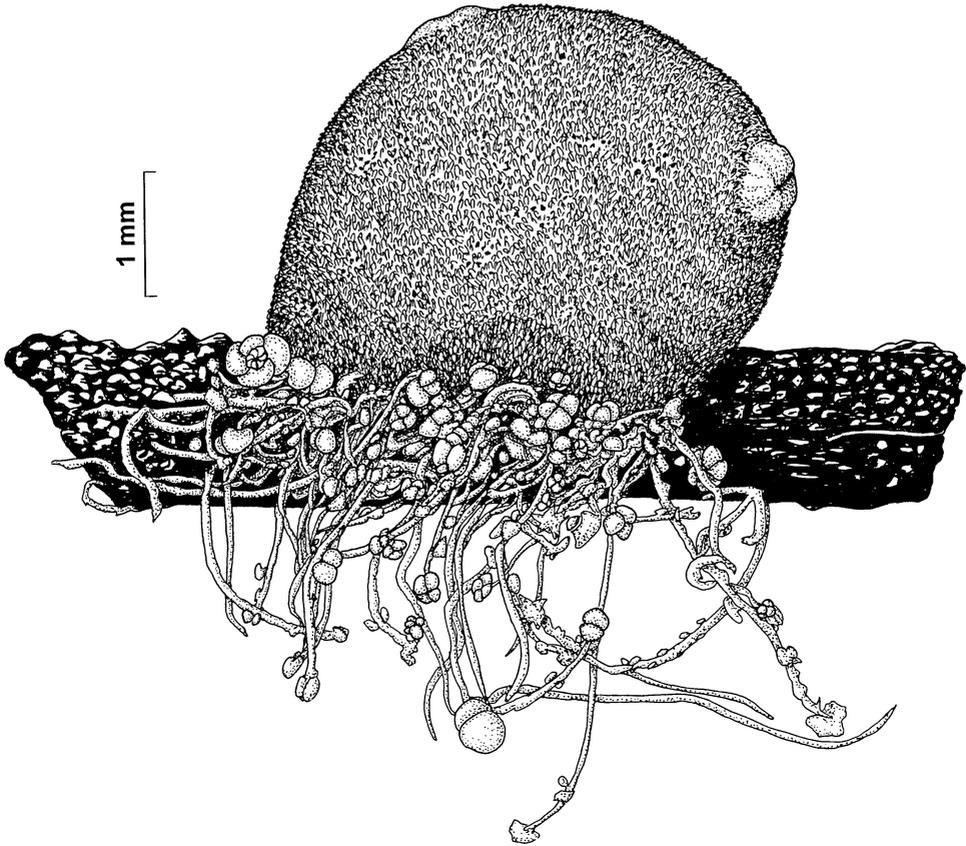


Figure 3. *Cnemidocarpa bythia* (Herdman, 1881). External view.

Internal features are also stable. The number of branchial tentacles in the present specimens (13 or 14) is almost exactly the same as in South Atlantic specimens (Sanamyan and Sanamyan 2002). The atrial velum is short and possibly reduced in places, but the ring of atrial tentacles is complete, although they are relatively sparse. The test lining the internal surface of the atrial siphon has short papillae different in structure from the atrial tentacles and from the papillae on the remainder of the test; they are not present on the test lining the branchial siphon. The prepharyngeal band makes a shallow V around the minute dorsal tubercle, which has a simple vertical slit. The neural ganglion is halfway between the siphons. The dorsal lamina has numerous languets. Only three folds of the branchial sac are well formed, the fourth (most ventral) fold is almost flat. The branchial formula of the figured specimen is: E10(10)(10)(15)DL(12)(10)(11)7E.

About 13 transverse rows of short stigmata, some rows are crossed by parastigmatic vessels. On the left the most ventral row contains oblique stigmata, but protostigmata were not detected. The stomach is distinctly demarcated from the oesophagus and the gut, and has a large curved caecum; the number of longitudinal folds, about 14, is higher than reported previously for South Atlantic specimens (Sanamyan and Sanamyan 2002). The anal border is distinctly lobed. One elongate gonad with long gonoducts is on each side of the body. The testes are more mature than the ovaries: the right gonad has more than 10 large male follicles in two conspicuous rows between the ovary and the body wall and projecting from the sides of the ovary, the left gonad has six similarly placed follicles. Several, mostly large, endocarps are on each side of the body around the gonads, and one is in the gut loop.

#### *Remarks*

The holotype of this species is from the waters south of Australia, it is 2 cm long (much larger than the Atlantic specimens), and has “extremely numerous” longitudinal branchial vessels (Herdman 1882, p 151). Such large specimens were also recorded from the Pacific sector of Antarctica, but never in the Atlantic (Monniot and Monniot 1982). The specimens from the Tasman Sea and Kermadec Trench (Millar 1959) have a plain-edged anal margin and a little more numerous longitudinal branchial vessels. As suggested previously (Sanamyan and Sanamyan 2002), south-west Pacific specimens with a smooth anal border, and specimens from the Atlantic with a lobed anal margin may belong to different species. This is supported by the present specimens. Sanamyan and Sanamyan (2002) suggested that the presence of protostigmata separate Atlantic and Tasman Sea species. However, protostigmata occur only occasionally in this species and are not a valid distinguishing character and at this stage the records appear to represent a single species. Nevertheless, most recent published records lack descriptions and further data may indicate that the Atlantic specimens are a separate species.

The species has been recorded in the North and South Atlantic, south from Kerguelen Island, south from Australia, the Ross Sea, Kermadec Trench and northern Peru.

#### ***Polycarpa albatrossi*** (Van Name, 1912)

(Figures 4, 5)

*Pandocia albatrossi* Van Name 1912, p 579.

*Polycarpa albatrossi*: Van Name 1945, p 256; Monniot and Monniot 1968, p 10; 1970, p 320; 1974, p 750.

Not *Polycarpa albatrossi*: Millar 1959, p 195.

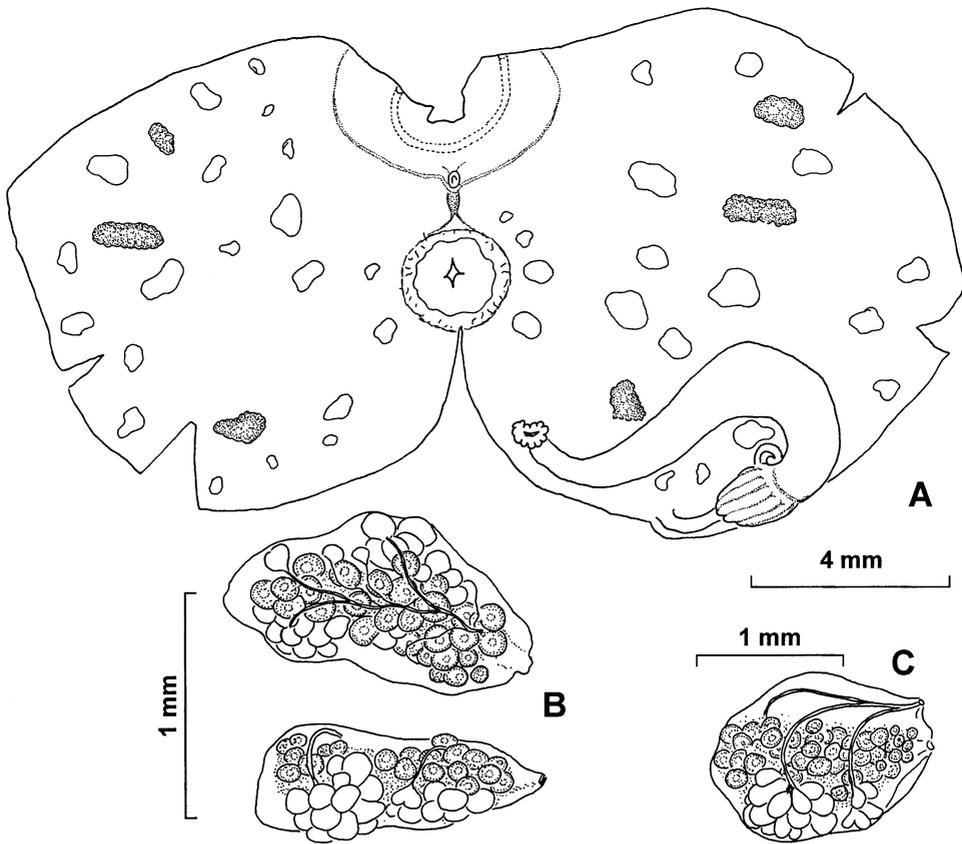


Figure 4. *Polycarpa albatrossi* (Van Name, 1912). (A) Specimen opened along ventral mid line; branchial sac removed; (B) gonad, top and lateral view; (C) gonad of another specimen.

#### *Material examined*

St. 4254, 3796–3780 m, 12 specimens.

#### *Description*

The specimens are almost globular or slightly flattened dorso-ventrally, 8–10 mm in diameter, not attached. Thin test hairs are not strongly branched and in general do not form such a dense mat as on some other deep-water species. Sand grains and foraminiferans firmly attached to the test hairs form a solid layer over the sides of the body, but are sparse on the proximal (ventral) side and almost absent on the dorsal side around and between the siphons. The low wide siphons on the upper surface are entirely free from foreign matter. Siphons are close together but not in contact with each other, they are always separated by a narrow area covered by sand. There are about 45 large simple branchial tentacles, sometimes projecting from the branchial siphon. The prepharyngeal band is a high and thick lamella with a shallow groove on the free edge, making almost a perfect circle without a dorsal V. The small dorsal tubercle has a transverse or C-shaped slit. The neural ganglion is just posterior, and close, to the dorsal tubercle, halfway between the siphons. Slender atrial tentacles arise from the base of the atrial velum, but not from its

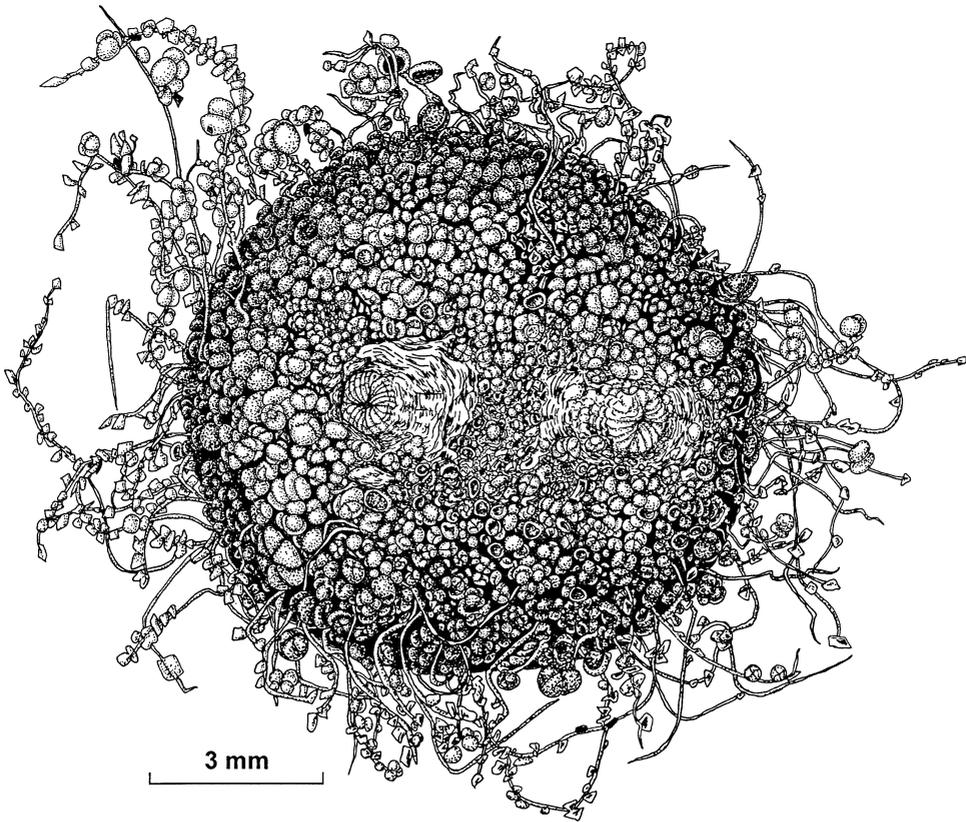


Figure 5. *Polycarpa albatrossi* (Van Name, 1912). External view from top.

margin. The dorsal lamina is plain edged. Each side of the branchial sac has four unequal folds: the first (dorsal) and the third folds are always high, while the second and the fourth (ventral) folds are shallow and sometimes flat, indicated only by a group of longitudinal vessels. Only occasionally is a longitudinal vessel between the folds. Branchial formula of three specimens (high folds are in bold): E1(4)**1(9)**(7)(11)DL(10)(6)(12)(5)E; E(6)(**11**)(9)(12)DL(10)(9)(11)(6)E; E(5)(9)(7)(10)DL(9)1(6)(9)(5)E

Stigmata are in about 16–19 transverse rows, many crossed by parastigmatic vessels. All are longitudinal (protostigmata are not present). The stomach has about 14 well-marked longitudinal folds and a large curved caecum. The anal margin is lobed. Usually three gonads are on each side, but one specimen had five gonads on the left side. Gonads on each side of the body are irregularly spaced, in a row halfway to three-quarters of the way down each side of the body, each gonad placed at right angles to the antero-posterior axis of the body, its short duct directed toward the atrial aperture (Figure 4). Mature gonads are 1.25–1.5 mm in length, male and female openings are inconspicuous and almost sessile, not visible without staining. The female opening is terminal, the male opening is a short distance from it on the upper surface of the anterior half of the gonad. Male follicles numerous, forming clusters between the oocytes and the body wall, sometimes slightly projecting from the sides. Numerous endocarps distributed evenly on the whole inner body wall including the space inside the gut loop. The size of the endocarps varies from specimen to specimen; some individuals have endocarps larger than are shown in Figure 4A.

*Remarks*

Only two descriptions of *Polycarpa albatrossi* exist: the original description based on several specimens recorded in the north-west Atlantic near the coast of the USA (Van Name 1912, 1945), and a more recent redescription based on specimens collected almost exactly in the same location (Monniot and Monniot 1968). The main features documented for the species are several, but not numerous, gonads (instead of giving the exact number, Van Name 1945 reported that gonads are not so numerous as in *Polycarpa fibrosa*, and Monniot and Monniot 1968 recorded only that the gonads are always more numerous on the right side than the left); endocarps are numerous, and only the first and third branchial folds are perfectly developed. The present specimens show some differences from the Monniot and Monniot (1968) description. They are generally more like the specimens described by Van Name, the number of longitudinal branchial vessels in our specimens and the specimens described by Van Name (1912) are twice that in the smaller specimens described by Monniot and Monniot (1968). The main difference is in the structure of the gonads which in Monniot's specimens have only three large male follicles in each, while the present specimens always have numerous small male follicles. There are several other records of this species, but they lack descriptions, stating only that the specimens conform exactly to existing accounts and thus cannot be used to clarify the range of variation.

Unlike many other deep-water species *Polycarpa albatrossi* has a limited distribution and has been recorded only from the north-east Atlantic. Recorded depth range is 2496–3761 m.

*Styela calva* Monniot, Monniot and Millar, 1976

(Figures 6, 7)

*Styela calva* Monniot, Monniot and Millar, 1976, p 1196; Millar 1982, p 172; Monniot and Monniot 1985a, p 296; 1985b, p 28; 1988, p 423.

*Material examined*

St. 4569, 3182–3152 m, three specimens.

*Description*

The specimens are slightly flattened dorso-ventrally or laterally. Their greatest dimension is 4.5–6 mm. Test hairs with attached sand grains form a dense mat on the ventral half of the body, while the upper (dorsal) side is devoid of any outgrowths, although the whole body is covered by a solid layer of sand grains and foraminiferans. Apertures are widely separated, at opposite ends of the upper surface on inconspicuous sessile siphons. About 19 short branchial tentacles arise from the margin of a short branchial velum. The prepharyngeal band has a short, narrow but distinct dorsal V. The dorsal tubercle has a simple, vertical slit. The neural ganglion is just posterior and close to the dorsal tubercle, halfway between the siphons. The dorsal lamina is plain edged. The atrial velum, very short dorsally, has a large triangular laminar expansion on the left side, opposite to the intestine. The corresponding place on the right side of the atrial velum is damaged, but according to Monniot et al. (1976, Figure 15) this species has two triangular expansions on the ventral side, on the left and the right. Slender, short atrial tentacles are evenly distributed along the atrial velum. They were not found to be in two bunches opposite the genital opening as described by Monniot et al. (1976). Tentacles are not present on the triangular expansion

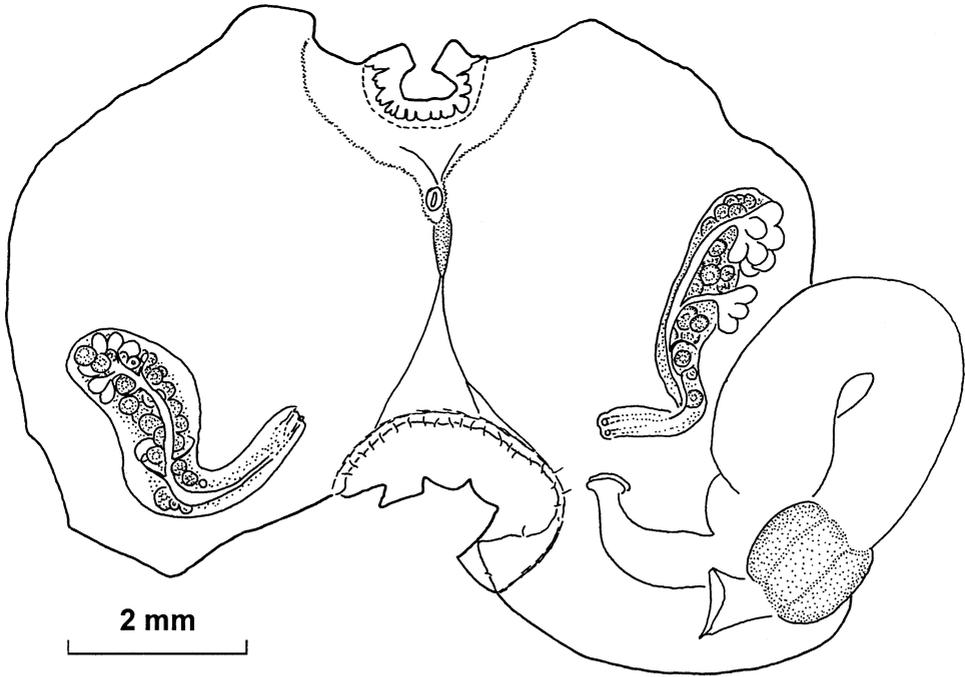


Figure 6. *Styela calva* Monniot, Monniot and Millar, 1976. Specimen opened along ventral mid line; branchial sac removed.

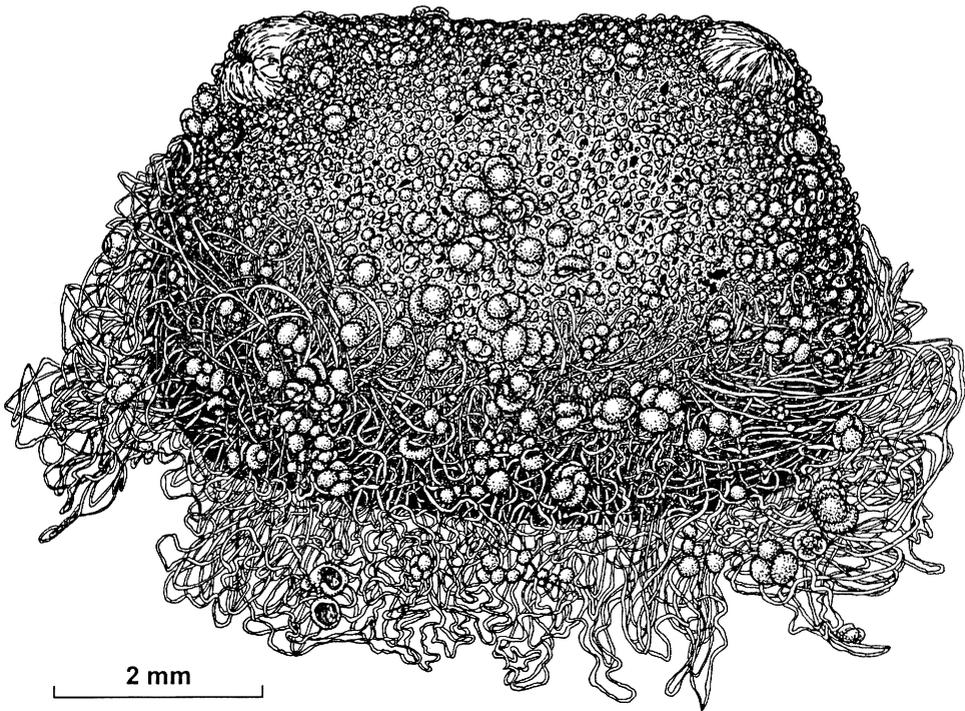


Figure 7. *Styela calva* Monniot, Monniot and Millar, 1976. External view from the side.

of the velum. The branchial sac is damaged; apparently it has only three folds, the most ventral (fourth) fold being reduced. Each fold has about eight longitudinal vessels. The gut forms a closed narrow loop. The intestine is filled by fine particles and is very thick; the small, almost globular stomach has six to eight poorly defined longitudinal folds; and the anal border is bilobed and smooth. A pyloric caecum was not detected. One elongate gonad is on each side. Male follicles are in bunches between the ovary and the body wall and projecting slightly from the sides of the ovary. Gonoductal openings are close together, each at the end of short gonoducts at the distal end of each gonad. The gonoducts and the distal part of each gonad turn dorsally toward the atrial aperture, almost at right angles to its proximal end. Distinct endocarps are not present, but the pallial wall has a low, cushion-like delamination of the epithelium. Similar structures are probably present in the specimens described by Monniot et al. (1976, p 1197), since they wrote that “the body wall has a tendency to delaminate possibly as a result of fixation”.

#### *Remarks*

The most significant distinctive features of this species are the absence of the endocarps and the characteristic shape of the atrial velum. The smooth bilobed anus and the “delaminated” cushions of the pallial epithelium are also characteristic. The latter feature is not a result of fixation as was supposed by Monniot et al. (1976). The original description of this species is based on many (about 40) specimens from the north-east and south-east Atlantic, and on one specimen from the Tasman Sea. The latter specimen, geographically distant from all others, was chosen as the holotype, although the reason for this selection is not explained. It is not known which specimen is figured in the original description, the Tasman Sea specimen or one from the Atlantic (Monniot et al. 1976, Figure 15). Further records include specimens from the north-east, central and south-east Atlantic, north and central Indian Ocean.

#### *Culeolus suhmi* Herdman, 1881

(Figure 8)

*Culeolus suhmi* Herdman 1881, p 86; Sanamyan and Sanamyan 2002, p 350 (synonymy).

#### *Material examined*

St. 4226, 3600–3630 m, four specimens; st. 4234, 3162–3136 m, two specimens; st. 4254, 3796–3780 m, four specimens; st. 4569, 3182–3152 m, three specimens.

#### *Remarks*

Most specimens are small, body length 1–3.5 cm. They do not differ significantly from the larger specimens from the central Atlantic (Sanamyan and Sanamyan 2002). The main distinguishing features of the species are the complete ring of papillae encircling the posterior end of the body, and the presence of usually two gonads on each side. The presence of three gonads on the right previously was suggested to be an abnormality (Sanamyan and Sanamyan 2002), but it may be a normal variation since one of the dissected specimens of the present material also has three gonads on the right side. Two of them are in one line suggesting that one gonad has divided into two (Figure 8B).

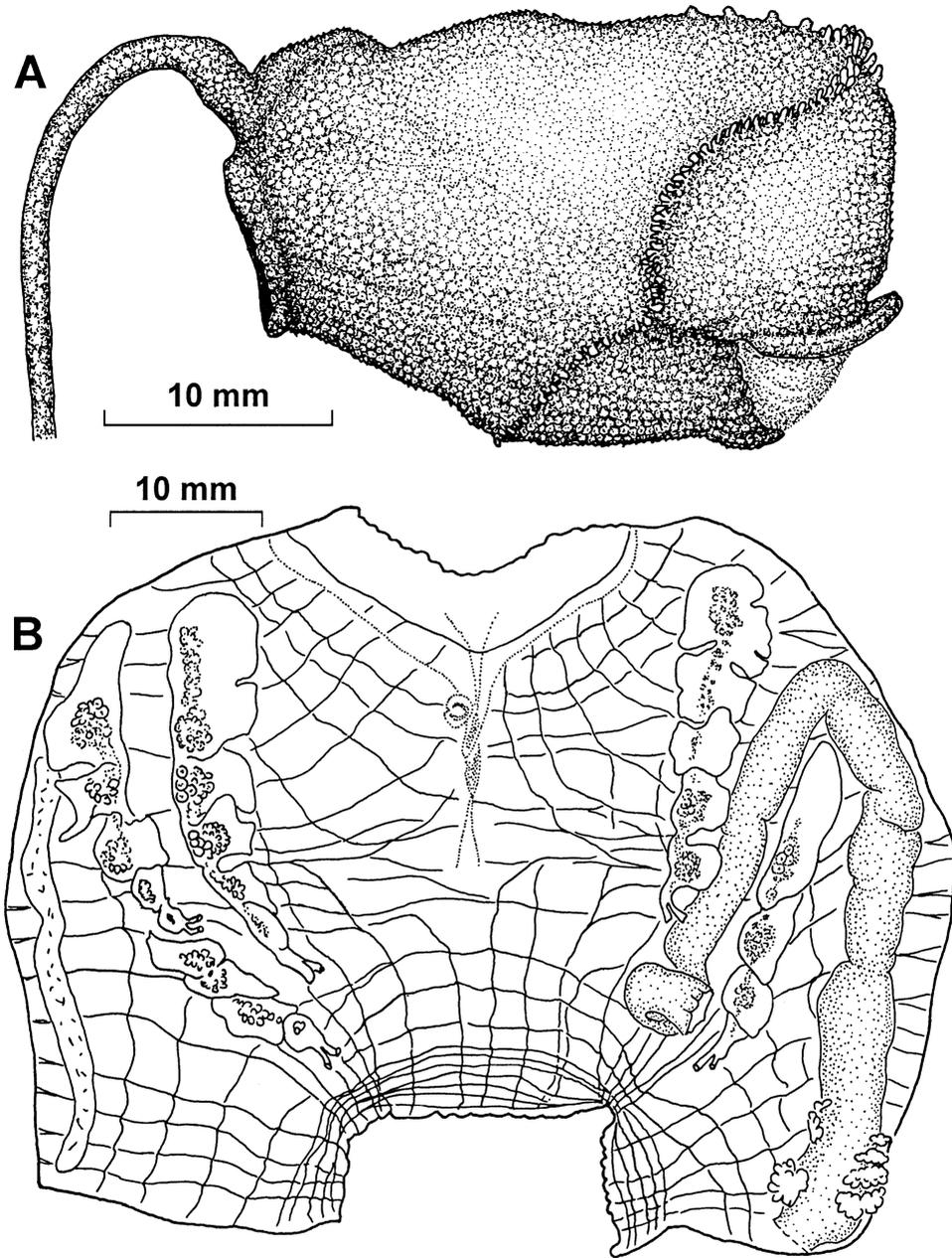


Figure 8. *Culeolus suhmi* Herdman, 1881. (A) Intact specimen (whole stalk not shown); (B) specimen opened along ventral mid line; branchial sac removed to show gut, gonads and muscles.

The genus *Culeolus* comprises about 20 species, many of which are widely distributed in the deep waters of all oceans and many are common, but only one species, *C. suhmi*, was recorded in the North Atlantic. This species has also been recorded in the central Atlantic and in the Indian Ocean; the depth range is 2695–5312 m.

*Pyurella hernia* Monniot and Monniot, 1973

(Figures 9, 10)

*Pyurella hernia* Monniot and Monniot 1973, p 447.

*Microcosmus hernius*: Monniot 1974, p 1346.

*Material examined*

St. 4569, 3182–3152 m, one specimen.

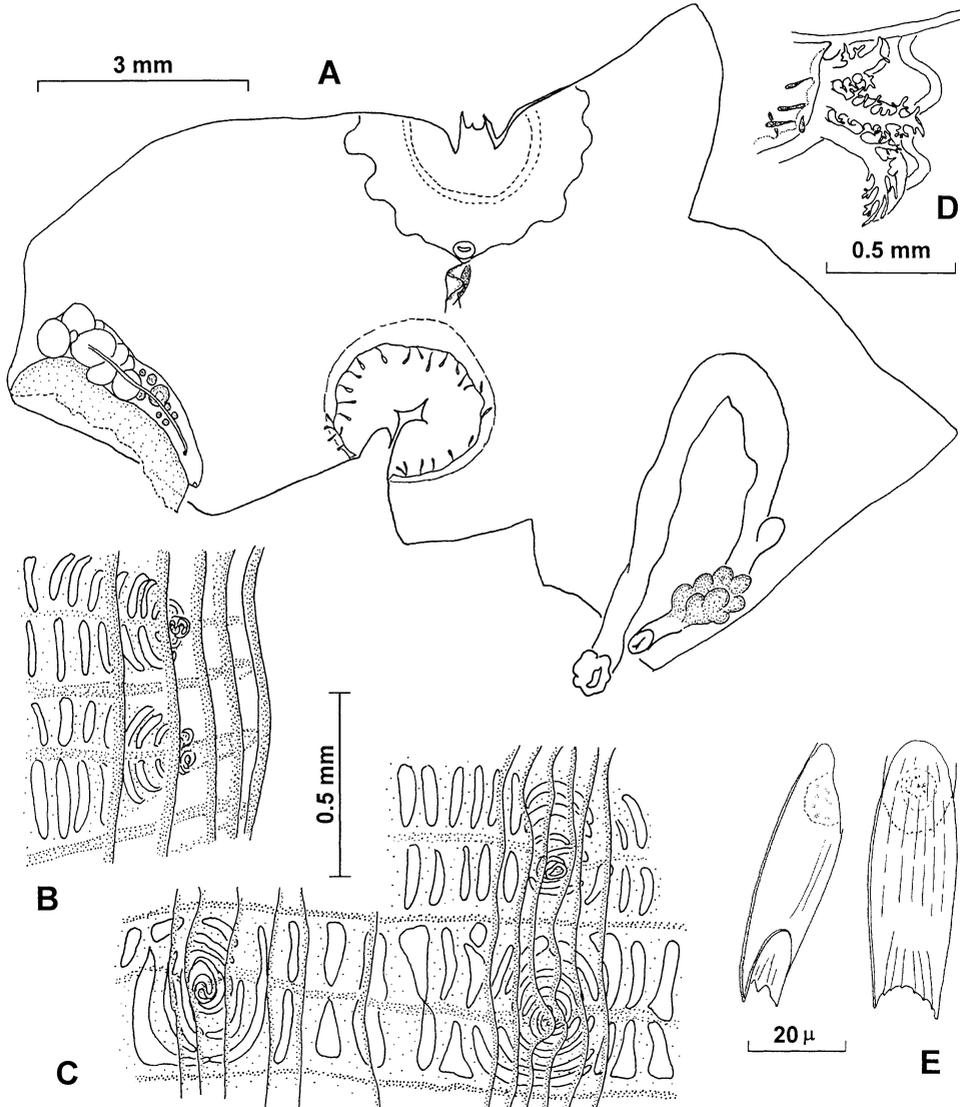


Figure 9. *Pyurella hernia* Monniot and Monniot, 1973. (A) Specimen opened along ventral mid line; branchial sac removed; (B, C) details of the branchial sac; (D) branchial tentacles; (E) siphonal spines.

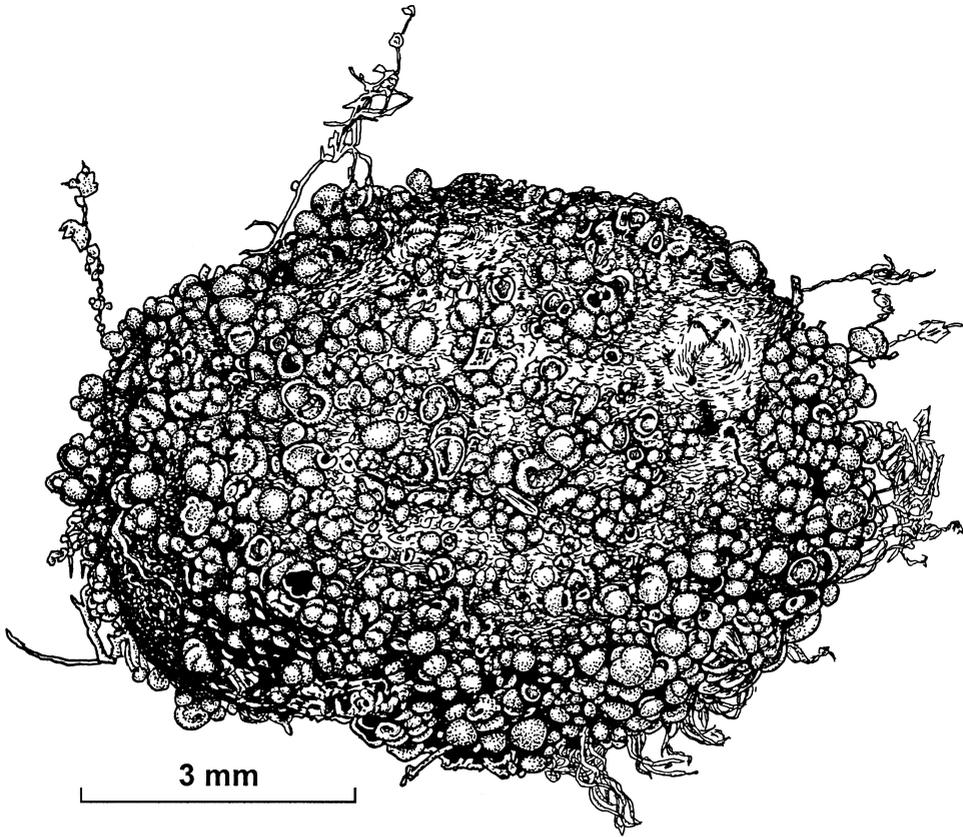


Figure 10. *Pyurella hernia* Monniot and Monniot, 1973. External view.

#### *Description*

The body of the single examined specimen is oval, slightly depressed dorso-ventrally, not attached, 7 mm in height and 9 mm wide. Fine test hairs are sparse and present mainly on the ventral half of the body. Globigerina shells are attached to the test, but foreign particles are relatively sparse and do not form a solid layer as in many other deep-water species. The areas of the test which are free from adherent matter are thin and semitransparent. Apertures are on sessile four-lobed siphons on the upper surface of the body; the distance between the siphons is not large, but they are not in contact with each other. Minute, 0.050–0.055 mm long and 0.013–0.014 mm wide, siphonal spines are crowded on the test inside and around the siphons (Figure 9E).

The musculature is characteristic of the Pyuridae, consisting of numerous evenly spaced longitudinal bands radiating from the siphons and numerous similarly spaced circular siphonal muscles, and, on the lower half of the body, transverse bands encircling the body. The branchial velum is not high, but is unusually thick and muscular. A circle of small simple papillae is on the outer side of the branchial velum; papillae arise from the base of the velum and, occasionally, from the inner surface of the branchial siphon. Atrial tentacles are of the same structure as the simple papillae on the branchial velum, they are short, clavate and equally spaced on the margin of the atrial velum. The atrial velum is higher dorsally and makes a perfect circle. There are about 20 large and a number of small

branchial tentacles of at least three orders, with closely set branches of the first order, and short branches of the second order. The prepharyngeal band consists of two lamellae and makes deep undulations but does not form a dorsal V enclosing a peritubercular area. The dorsal tubercle has a simple transverse slit, the ganglion is just posterior, halfway between the siphons. The dorsal lamina has a plain edge. Five high, well-marked folds are on each side of the branchial sac. Only one longitudinal vessel is between the folds: E1(9)1(10)1(10)1(10)1(11)1DL1(11)1(10)1(10)1(10)1(11)E.

Five primary transverse branchial vessels divide the branchial sac into six transverse double rows of longitudinal stigmata between the folds and six infundibulae of curved and coiled stigmata in the folds. Each double row is crossed by a thinner secondary transverse vessel. Straight short and longitudinal stigmata are between the folds, but in folds they curve around projecting cones or infundibulae.

The gut forms a narrow, straight horizontal loop. The stomach is the same diameter as the intestine; the liver pouches are relatively flat and not much branched, projecting from around the stomach. A characteristic flattened pouch or diverticulum projects from the ventral side of the intestine about halfway up the ascending limb of the gut loop. The anus has a thick, slightly wrinkled margin. One straight gonad is on the right of the kidney across the postero-ventral corner of the body. Five or six large round male follicles overlie the proximal half of the ovarian tube, which contains a few small oocytes. The oviduct is thick and not very long, the male opening is on a short papilla in the middle of the oviduct. No traces of a left gonad were detected, even after staining.

A sheet of thin tissue that may be a damaged renal sac or hypertrophied heart lies along the ventral side of the gonad, near the endostyle. Endocarps are not present.

### Remarks

*Pyurella hernia* is the type of the monotypic genus *Pyurella* Monniot and Monniot, 1973. The original description of this species is based on two mature and two immature specimens from near the Azores Islands, at 1200 m and 1700–1776 m (Monniot and Monniot 1973). Monniot (1974) recorded another specimen from the same region but from a shallower depth (220 m), this specimen had a gonad on each side and based on this feature the species was transferred to the genus *Microcosmus*.

The present specimen differs significantly from the specimen described by Monniot and Monniot (1973) in the structure of the branchial sac in that they did not detect branchial infundibulae and spiral stigmata, which are conspicuous in the present specimen. However, other, reliable and unique characters are present in both, namely the unusual large pouch on the intestine, a ring of simple papillae inside the ring of the branchial tentacles, the number of branchial folds, the presence of only one gonad on the right side and the structure of the gonad with few large male follicles. Despite the differences in the branchial sac it appears that the specimens are conspecific.

The taxonomic position of this species is problematic. Although the spiral stigmata occur in some pyurid genera, the presence of two stigmata on the top of infundibula is a feature more characteristic for the Molgulidae (Monniot 1965). Unfortunately it is not possible to determine in the present specimen whether the organ between the gonad and endostyle is a molgulid renal sac or a hypertrophied heart characteristic for some pyurid genera (but not for *Microcosmus*). Presence of the siphonal spines suggests that the species was correctly assigned to Pyuridae, but we believe it is more accurately placed in *Pyurella*, the genus originally created for this species, rather than in *Microcosmus*. In general, the spiral stigmata

are not characteristic for *Microcosmus*, only young specimens of some *Microcosmus* species may have them (Monniot 1965). In the present species we see the opposite condition: smaller specimens described by Monniot and Monniot (1973) and Monniot (1974) have no spirals, while the present specimen, which is larger, has very distinct spirals. Also, as it appears from the present material, the absence of the left gonad is not an anomaly.

It is possible that *Pyurella* is identical to *Anomopera* Hartmeyer, 1923, an imperfectly known genus assigned by its author to the Molgulidae and containing a single species *A. ingolfiana* Hartmeyer, 1923. But the single known specimen of *A. ingolfiana* has a different gut (including a stomach clearly demarcated from the oesophagus and intestine), and only four branchial folds (see Hartmeyer 1923, Plate 1, Figures 2–4), that clearly distinguish it from the present species.

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