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Deep-water ascidians from the south-western Atlantic (RV *Dmitry Mendeleev*, cruise 43 and *Academic Kurchatov*, cruise 11)

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Thirty-four species of benthic Tunicata are recorded in the deep-water material collected from 255 to 8116 m from the south-western Atlantic, Scotia and Weddell seas. Maximum species diversity occurs at between 4000 and 6000 m. Unlike the north Atlantic, large forms predominate. However, that there are only a few species less than 5 mm is probably the result of the collecting method. Some species appear to form crowded populations of numerous specimens, as evidenced in the records of approximately 400 specimens of *Agnezia* at 7694–7934 m and 150 large specimens of *Dimeatus* at 5680–6145 m. Six new species are described, of which one is recorded from more than 8000 m. This is one of the greatest depths yet recorded for ascidians, the only other species recorded below 8000 m is *Situla pelliculosa* Vinogradova, 1969.

KEYWORDS: Tunicata, Ascidiacea, south Atlantic.

Introduction

Over several decades numerous deep-water expeditions were organized by the Institute of Oceanology (IOAN, Moscow) and a lot of material was collected from all the world's oceans; its collection of deep-water Tunicata may be considered as one of the best in the world. For many years this collection was curated by the late Dr N. G. Vinogradova and she published several well-known papers on Ascidiacea and numerous general papers concerning deep-water faunas. Nevertheless, most of the material collected is still undescribed, including those collected 20–40 years ago. In 1997, part of this material was transferred to Nadezhda Sanamyan, and the present paper is our fourth based on the collection of IOAN. The three previous papers were on deep-water ascidians from the north-west Pacific (Sanamyan and Sanamyan, 1998), southern Indo-Pacific Tunicata (Sanamyan and Sanamyan, 1999) and genus *Dimeatus* (Sanamyan, 2000). In this paper the ascidians described were collected in 1971–1972 (during cruise 11 of RV *Academic Kurchatov*) from the Scotia Sea, South Sandwich Trench and South Orkney Trench, and in 1989 (during cruise 43 of RV *Dmitry Mendeleev*), mainly from the Scotia and Weddell Seas, and one

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station each from the Argentine Basin and the Indian Ocean. Thirty-four species are recorded, three of them are identified only to genus, and six are new species.

The expedition journal contains records of the material collected during these cruises, but we failed to find many of these recorded specimens, including some that had preliminary identifications, probably by Vinogradova. For instance, *Octacnemus*, or even '*Octacnemus* in good condition' is recorded in the journal for stations 864, 874 and 4104, but we found only one specimen from station 874. There are several records in the journal for the genus *Bathypera*, but it is not present in the collection now. However, because some of the records in the journal are obviously erroneous (e.g. *Clavelina* from station 4097 at 3100 m), the information must be regarded generally as unreliable unless confirmed by the actual specimens and cannot be used to supplement the data presented in this paper.

The specimens were initially fixed in formalin and then transferred to ethanol; this method seems to be best for long-term storage of ascidians. Most specimens are in good condition now, apart from those damaged during dredging. The only negative effect of keeping specimens in ethanol is that in some solitary species with firm test and thin body (*Culeolus*, small Styelidae), the test becomes strongly adherent to the inner body so that much care should be taken to remove it.

As shown by Vinogradova (1962a), the number of known species of ascidians increases from 2000 m and becomes maximal between 4000 and 5000 m; no other groups have maximum species diversity at such a great depth. The present material was collected during specialized deep-water expeditions, so it cannot be used for general conclusions about species distribution. Nevertheless, it supports the above-mentioned fact: nine species were recorded at depths less than 1376 m; ascidians are totally absent between 1376 and 2960 m, and then the number of species increases rapidly with depth, most of them recorded between 4000 and 6000 m, and some are represented by numerous specimens. Most of the recorded species are large, especially conspicuous are all Octacnemidae (*Situla*, *Megalodicopia*, *Kaikoja*, *Octacnemus*) and several species of *Culeolus*. The present material contains no specimen less than 3 mm. Many such small species are known from the north Atlantic, and their absence from this collection from the south Atlantic is strange, and may be the result of the collecting method.

List of stations

RV *Academic Kurchatov*, cruise 11

South Sandwich Trench

866, 27–28 November 1971, 7694–7934 m, 55°06.4′S, 26°43.0′W.

867, 28 November 1971, 8004–8116 m, 55°14.0′S, 26°19.9′W–55°14.8′S, 26°14.7′W.

East of South Sandwich Trench

870, 29 November 1971, 4704–4680 m, 55°07.3′S, 25°02.9′W–55°08.0′S, 25°01.0′W.

West of South Sandwich Trench

874, 30 November 1971, 3700–3910 m, 55°49.6′S, 26°45.4′W–55°49.55′S, 26°45.2′W.

South Sandwich Trench

896, 5 January 1972, 5651–5530 m, 56°52.0′S, 24°59.0′W–56°51.1′S, 24°59.1′W.

South Orkney Trench

908, 10 January 1972, 5474–5465 m, 60°13.5′S, 44°10.6′W–60°12.9′S, 44°12.2′W.

Scotia Sea, between South Georgia and South Falkland Islands

914, 14 January 1972, 5650–6070 m, 56°21.0′S, 50°48.0′W–56°20.1′S, 50°47.9′W.

916, 14 January 1972, 4664–5631 m, 56°29.8′S, 50°51.0′W–56°29.0′S, 50°51.1′W.

East of South Falkland Islands

925, 16-17 January 1972, 2980–2960 m, 53°16.9′S, 54°53.6′W.

RV *Dmitry Mendeleev*, cruise 43

Central Indian Ocean

4077, 29 January 1989, 3285–3160 m, 17°32.5′S, 67°25.4′E–17°32.8′S, 67°24.0′E.

South Orkney Trench

4086, 2 March 1989, 6130–6420 m, 60°50.2′S, 41°10.6′W–60°50.3′S, 41°07.7′W.

4089, 3 March 1989, 5063–5470 m, 60°46′S, 41°03.4′W–60°48.3′S, 40°59.7′W.

4090, 4 March 1989, 6145–5680 m, 60°52′S, 40°58′W–60°52.7′S, 40°55.8′W.

4093, 5 March 1989, 3700–3970 m, 60°42.3′S, 41°14.4′W–60°43.6′S, 41°13.3′W.

South Shetland Islands, east of Mordvinov (Elephant) Island

4096, 8 March 1989, 255–285 m, 60°53.1′S, 55°46.4′W–60°53.2′S, 55°46.3′W.

South Shetland Islands, Bransfild Strait

4100, 11 March 1989, 1265–1376 m, 62°18.8′S, 56°59.3′W–62°20.4′S, 56°59.9′W.

North-east of the Weddell Sea

4102, 26 March 1989, 5145–5150 m, no co-ordinates.

4103, 29 March 1989, 4485–4520 m, 70°42.4′S, 15°38.4′W–70°42.7′S, 15°41.2′W.

South-east of South Sandwich Islands, Weddell abyssal plain

4104, 2 April 1989, 5110–5120 m, 62°36.36′S, 15°28.06′W–62°36.37′S, 15°32.69′W.

Argentine Basin

4109, 14 April 1989, 5225 m, 38°39.4′S, 48°10.4′W–38°40.3′S, 48°05.6′W.

Description of species

Synoicum georgianum Sluiter, 1932

(figure 1A)

Synoicum georgianum Sluiter, 1932: 11; Millar, 1960: 47; 1968: 9; Monniot, 1970: 333; Vasseur, 1974: 615; Monniot and Gaill, 1978: 155; Monniot and Monniot, 1983: 32.

Aplidiopsis georgianum: Kott, 1969: 73; 1971: 32.

Material examined. St. 4096, 255–285 m, about 30 colonies and fragments.

Description. The colonies consist of one or several small heads, not exceeding 1 cm diameter, arising on short stalks. The stalks are sharply marked off from the heads in some colonies, or the heads gradually taper to the substratum. Basal portion of colony and occasionally stalks covered by sand, otherwise surface is clear and sand is not present in internal layers of the test. Otherwise the test is transparent and colourless, reddish zooids clearly seen through it. One system made of four to seven zooids in each head.

The zooids are strongly contracted and small, about 4–7 mm long. The branchial siphon is short, with six rather indistinct rectangular lobes. The atrial siphon has longer anterior and shorter posterior lips, both with three short lobes. The branchial sac in many zooids is filled by relatively large sand grains, suggesting that branchial openings were widely opened when the specimens were collected. There are 13 rows of about 26–29 stigmata. The stomach wall is smooth, without any kind of areolation.

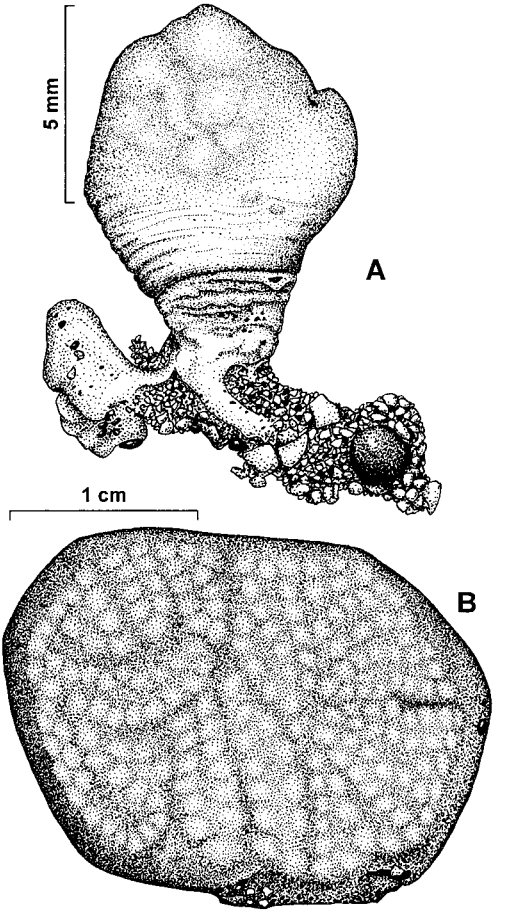

FIG. 1. (A) *Synoicum georgianum* Sluiter, 1932; (B) *Aplidium radiatum* (Sluiter, 1906), top view.

Remarks. The present record is within the known geographic range of the species. It is known from the Patagonia Shelf, South Georgia, South Shetland Islands, Antarctic Peninsula, Kerguelen, Wilkes and Adelie Lands.

Aplidium radiatum (Sluiter, 1906)
(figures 1B, 2)

Psammaplidium radiatum Sluiter, 1906: 25.
Sidnyum radiatum: Monniot, 1978: 10 (synonymy and type revision); Monniot and Monniot, 1983: 30.
Macroclinum pererratum Sluiter, 1912: 458.
Sidnyum pererratum: Monniot, 1978: 14 (synonymy and type revision); Monniot and Monniot, 1983: 31.
Not *Synoicum pererratum*: Millar, 1982: 15.

Material examined. St. 4096, 255–285 m, 40 colonies.

Description. The smaller colonies, 1–1.5 cm in diameter, are nearly spherical or hemispherical, the larger, up to 3 cm in greatest diameter, are oval in outline and relatively flat, no more than 1 cm in height (figure 1B). The brittle test is densely

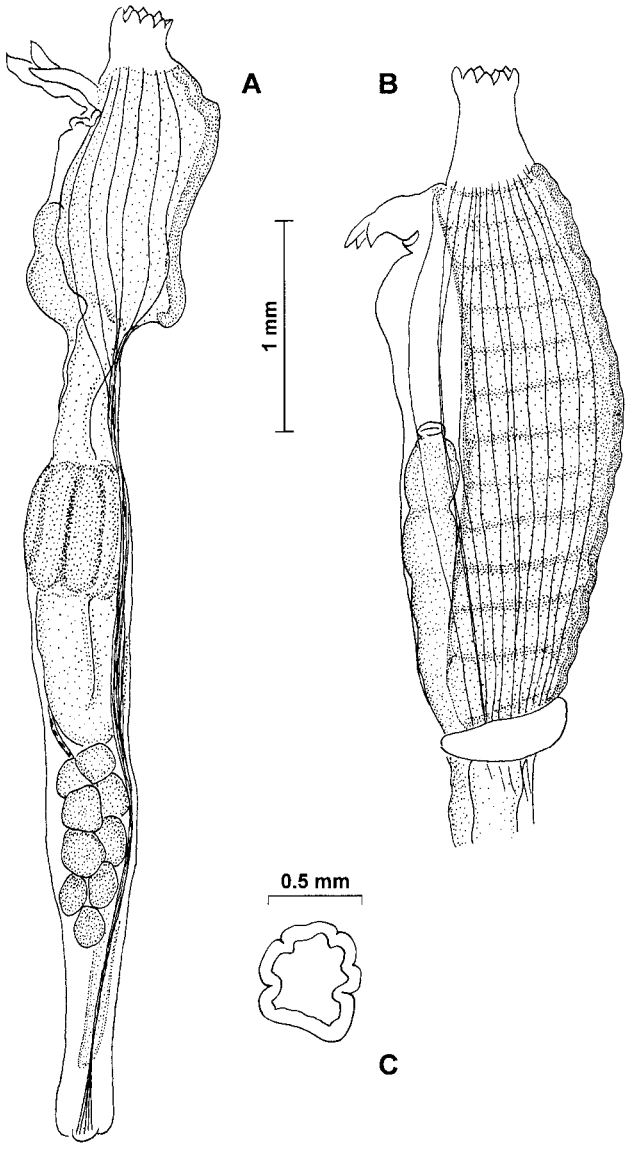

FIG. 2. *Aplidium radiatum* (Sluiter, 1906): (A, B) zooid; (C) cross-section of the stomach.

impregnated with sand. Vertical zooids open on the upper surface of the colony. They are not visible through the test but their position sometimes is marked by a low elevation of the test. Rather irregular radial rows of zooids are distinguishable on some colonies.

The zooids are usually 4–5 mm long, but are smaller in the contracted state. Thorax, abdomen and postabdomen are of about equal length in most zooids (1.2–1.5 mm), but relaxed thorax may be much larger (up to 3 mm long). The branchial siphon has eight triangular pointed lobes. A large and wide atrial languet extends out from the small atrial aperture and divides into three long lobes. Thin longitudinal muscles are widely spaced on the thorax, and form two bands continuing

along ventral side of abdomen and postabdomen. The branchial sac has 12 rows, with 16–18 stigmata per half row, but stigmata were counted only in one well-expanded zooid. The stomach is in the middle of the abdomen and has five or six rather regular but sometimes indistinct flattened folds. A group of large male follicles is in the anterior half of the postabdomen.

An unusual elongated horizontal body sometimes curves around the ventral surface at the top of the oesophageal neck (figure 2B). It has its own thin membraneous wall and is filled by granules of unknown nature. We have examined similar bodies only once previously, in poorly preserved undescribed *Aplidium* from the north-west Pacific, but in those specimens the bodies were present in all zooids.

Remarks. All zooids examined have eight lobes of the branchial siphon and are identical to those redescribed by Monniot (1978) from the type material of *A. radiatum*. Zooids from type colonies of *A. pererratum* have fewer stigmata per row (14) but otherwise they are identical with those of *A. radiatum*. Colonies of these two species were treated as very similar by Monniot and Monniot (1983), although they described hemispherical cushions in *A. radiatum* and flattened oval masses in *A. pererratum*. This is not a valid difference, both types and intermediate forms are present in our material from st. 4096. These species are obviously conspecific and we do not support the opinion of Monniot and Monniot (1982) that they should be treated as distinct because the larva of *A. pererratum* is not known.

We examined many colonies collected on the New Zealand Plateau, from close to the location of ?*Synoicum pererratum*: Millar, 1982 and conforming exactly to his description and figure (Millar, 1982, figure 4a, b). The zooids have six branchial lobes and therefore belong to another species.

The species with eight-lobed branchial siphon were usually included in *Sidnyum* Savigny, 1816, but it was synonymized with *Aplidium* by Monniot and Monniot (1987) (see also Kott, 1992a). Nakauchi (1986) discussed the problem of the genus *Sidnyum*. It was pointed out that the type species of this genus, *S. turbinatum* Savigny, 1816, according to the original description of the branchial siphon has six lobes, so the only character that differentiates both genera is invalid. Most probably, however, the six-lobed instead of eight-lobed siphon was indicated in the original description of *S. turbinatum* by mistake, and several species with the eight-lobed branchial siphon were synonymized with the *S. turbinatum* (*Circinalium concrescens* Giard, 1872; *Parascidium crispum* Huitfeldt-Kaas, 1896).

Pharyngodictyon mirabile Herdman, 1886
(figure 3)

Pharyngodictyon mirabile Herdman, 1886: 152; Monniot and Monniot, 1985b: 14.
?*Pharyngodictyon mirabile*: Kott, 1969: 45.
?*Polycitor fungiformis* Millar, 1970: 106.

Material examined. St. 916, 4664–5631 m, one colony.

Description. Mushroom-shaped colony has a thick and short, obliquely growing stalk expanded supporting a terminal flat disk about 14 mm in diameter and expanding to a hemispherical base 16–12 mm diameter and 13 mm high. The colony is attached to the substratum by the whole flat lower surface. The test is grey, hard and contains dispersed minute sand grains. The zooids open over the entire upper

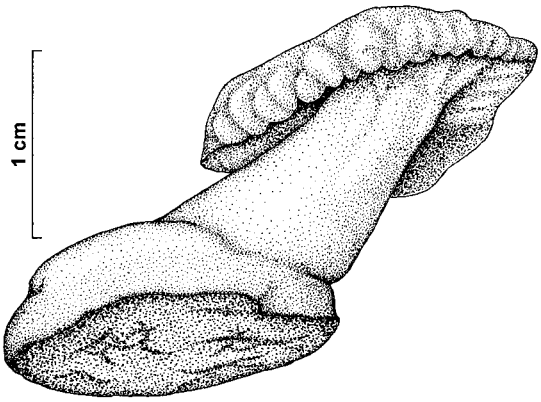

FIG. 3. *Pharyngodictyon mirabile* Herdman, 1886. Colony.

surface of the disk, although most of them are confined to its margin. They are small, 2–4 mm long, strongly contracted and damaged, and their detailed structure cannot be determined. The thorax forms a right angle with the abdomen. The branchial siphon is terminal, well developed and has six indistinct lobes; the atrial aperture is close to the posterior end of the thorax but its shape cannot be determined. About six thick longitudinal muscles arising on the branchial siphon on each side of the thorax. Twenty tentacles were counted in one zooid only; they are long, laterally flattened at the base, arranged in two circles, and may project from the branchial siphon. The prepharyngeal band is as high as the first transverse vessel. The branchial sac has five transverse vessels with triangular dorsal languets displaced to the left from mid-dorsal line. Transverse vessels are connected by thin longitudinal strips, but their number and arrangement is obscured. The stomach has approximately ten longitudinal folds. Most zooids are no longer connected with their postabdomens, which are situated in the stalk of the colony and filled by parenchymatous tissue. Gonads are not present.

Remarks. Although the zooids are in poor condition, the specimen can be identified more or less certainly with the type species of the genus, *P. mirabile*, on the basis of the colony shape, and the structure of the thorax with five transverse branchial vessels. This is the fourth record of this species, the previous three were from the south-west Indian Ocean (type locality), from the south-east Atlantic, Cape Basin (Monniot and Monniot, 1985b) and South Orkney Islands (Kott, 1969). Millar (1982) re-examined the holotype and found five transverse branchial vessels. According to him, *P. mirabile*: Kott, 1969, is another species, while Kott (personal communication) believes that it was assigned correctly: 'Perhaps I mistakenly counted an extra transverse vessel. The shape of colony, albeit arborescent, is so like yours and Herdman's, and so is the orientation of the zooids—to accommodate the posterior position of the atrial siphon'.

Polycitor fungiformis Millar, 1970, an abyssal species recorded from the Argentine Basin, has some features similar to the present species. It had no gonad and it is unclear why it was assigned to *Polycitor*. Millar (1970: 107) reported five rows of stigmata, 'the stigmata are elongated in a dorsoventral direction'. His figure 6D suggested that there are no true stigmata; the branchial sac seems to be similar to those of *Pharyngodictyon*, it probably has only transverse branchial vessels connected by one longitudinal bar.

Ritterella chetvergovi sp.n.
(figure 4)

Material examined. St. 916, 4664–5631 m, one colony. Holotype 1/1042.

Description. The colony is 12 mm in greatest diameter near the base, and 8 mm in height. It consists of a wide oval basal part and a short, upright, flat-topped zooid-bearing column (figure 4A). The superficial layer of the test is fragile, coated by minute sand grains and can be easily removed. Sand grains coat the whole surface apart from small areas above the thorax of the zooids. The inner test is soft, transparent, without embedded sand. It contains small blue pigment granules, persisting after 29 years of storage in alcohol; the granules are also present in zooids, especially in the stomach folds. The colony contains few vertical zooids forming a single circle in the zooid-bearing column. Branchial and atrial siphons of each zooid open separately on the top of the sides of the column. The branchial opening is on the short, protruding siphon directed toward the base of the colony, and a sessile atrial opening is above it. There is a central stem of firm test in the zooid-bearing column; many other species with cylindrical lobes and zooids arranged in a single circle have similar supporting stems.

The zooids are thick, about 6 mm long in contracted state (figure 4B). Most are in rather poor condition and only a few can be examined. A wide, nearly rectangular

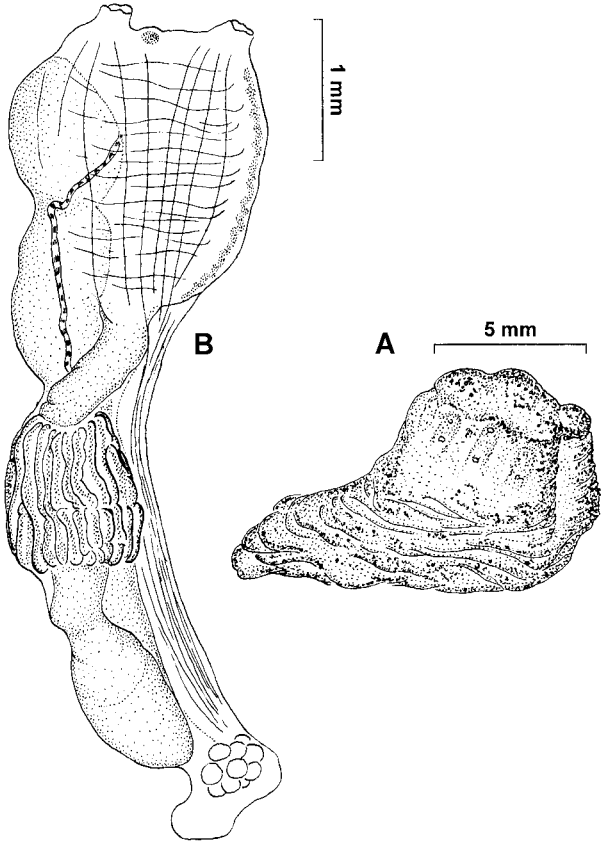

FIG. 4. *Ritterella chetvergovi* sp. n.: (A) colony; (B) zooid.

thorax is slightly shorter than the abdomen. About ten widely separated longitudinal muscles are on each side of the thorax and form a ribbon on the ventral side of the abdomen. There are numerous thin transverse thoracic muscles. The branchial and atrial openings are on short siphons at the top of the thorax. They are well removed from each other and both have six rather indistinct lobes. About 30 long and thick tentacles may reach the bottom of the contracted thorax or protrude outside from the branchial siphon. Such long tentacles are present in other colonial deep-water species without true stigmata (e.g. *Pharyngodictyon* and *Protoholozoa*). The present species, however, has true narrow longitudinal stigmata arranged into ten rows. There are about ten stigmata per half row in the middle of the branchial sac, but apparently no more than five stigmata in most posterior row, although they cannot be counted exactly. Rows of stigmata are separated by nine raised transverse vessels, each with a long dorsal languet. Each row is crossed by a parastigmatic vessel. Parastigmatic vessels are as high as transverse vessels separating rows of stigmata, and at first view the branchial sac appears to have much more numerous rows of stigmata.

The abdomen is a little curved ventrally by contraction of ventral muscle ribbon. The oesophagus is of moderate length. The large symmetrical cylindrical stomach is in the middle of the abdomen and has about 20 raised longitudinal and more or less regular folds. The intestine is filled by mud and its subdivision into regions is unclear. A stem of parenchymal tissue, apparently epicardium, continues from the bottom of the branchial sac to the end of the abdomen along its ventral side.

The small sac with gonads is just under and somewhat to the left of the pole of the gut loop. Few large male follicles are in a compact bunch, ovary not present.

Remarks. The species seems to have a true postabdomen and therefore should be assigned to *Ritterella*. Although the postabdomen is small and inconspicuous, and its presence may be doubted, it resembles that in such species as *Aplidium circumvolutum* (Sluiter, 1900) in which the posterior abdomen (with bunched testis follicles) gets pulled up behind the thorax when the strong muscle bands contract.

A similar species was assigned to *Polycitor* by Millar (1970) (see remarks under *Pharyngodictyon mirabile*). The present species does not appear to belong to *Polycitor*, which has a long oesophagus, and gonads usually are clearly within the gut loop.

Ritterella has not been recorded previously from below 460 m and the present record from more than 5000 m is the first from the abyssal waters. The only previously known Antarctic species of *Ritterella* was *R. mirifica* Monniot and Monniot, 1983. It differs from the present species by numerous features, including number of tentacles, stomach folds, length of postabdomen.

Etymology. The species is named after Alexander Chetvergov.

Sycozoa sp.
(figure 5)

Material examined. St. 4100, 1265–1376 m, more than 30 colonies.

Description. Most colonies are attached to the test of *Corella eumyota* Traustedt, 1882. The colonies consist of small heads arising on long, thin, hard and usually unbranched stalks. Basally the stalk has numerous relatively thick rhizoids spread over the substratum. The heads of all colonies are in sheets (figure 5A). The zooids are large, up to 9 mm long. The atrial aperture is large, the thoracic wall is seen

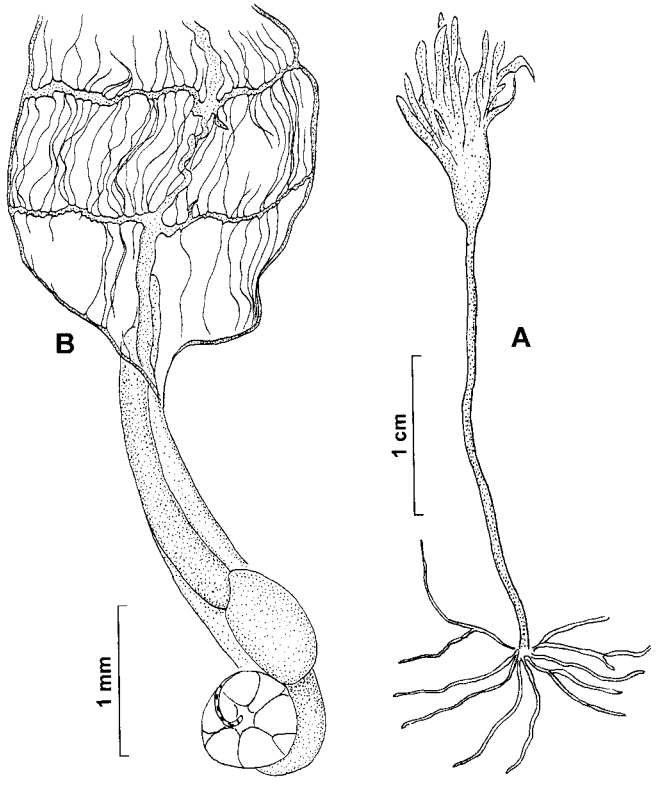

FIG. 5. *Sycozoa* sp.: (A) colony; (B) zooid, the thorax is dissected along the endostyle and only distal half of the branchial sac is present.

only just below the branchial aperture and along the endostyle, but it may have been stripped off when zooids were removed from the tunic. There are no true stigmata. There are three transverse branchial vessels, connected to one another and to the anterior and posterior pharyngeal wall by long thin unciliated membraneous strips (figure 5B). About 20 such modified stigmata are in each half row. Parastigmatic vessels are not present. The abdomen is long and narrow, the smooth-walled stomach is in its distal third. Seven to ten large male follicles form a compact protruding mass beside the gut loop. The larval trunk is 0.4 mm in diameter and 0.8 mm long, and the tail makes two complete circles around it.

Remarks. Unfortunately all the colonies are much disintegrated; only few of them contain zooids, and it not possible to provide a complete description of this interesting species, which seems to be distinct from other known species of *Sycozoa*. The present specimens resemble some other species of *Sycozoa*, particularly the widely distributed *S. sigillinoides* Lesson, 1830. Corresponding features are the shape of colony, long tail of the larva, large number of stigmata per row. In the present specimens, however, the stigmata appear to be non-ciliated and are very long, and such stigmata are not known in other species of this genus. The branchial sac resembles that of *Distaplia megathorax* Monniot and Monniot, 1982, but the latter species has parastigmatic vessels and a relatively short oesophagus.

This is the first record of the genus below 500 m.

Protoholozoa pedunculata Kott, 1969
(figure 6)

Protoholozoa pedunculata Kott, 1969: 35; Monniot and Monniot, 1983: 103.

Material examined. St. 916, 4664–5631 m, one colony.

Description. The colony much resembles Kott's (1969) original drawing. The complete peduncle is about 65 mm long, its diameter is only 5 mm below the head and gradually increases toward the proximal end, where a flat attachment area is 25 mm in diameter. The head, 40 mm in height and 35 in greatest diameter, is an inverted and somewhat laterally flattened cone with a more or less flat top. The transparent test is soft but relatively firm. White opaque zooids are in vertical or oblique rows, up to six in each row.

The zooids are contracted, most of them are 9–13 mm long, but near the base

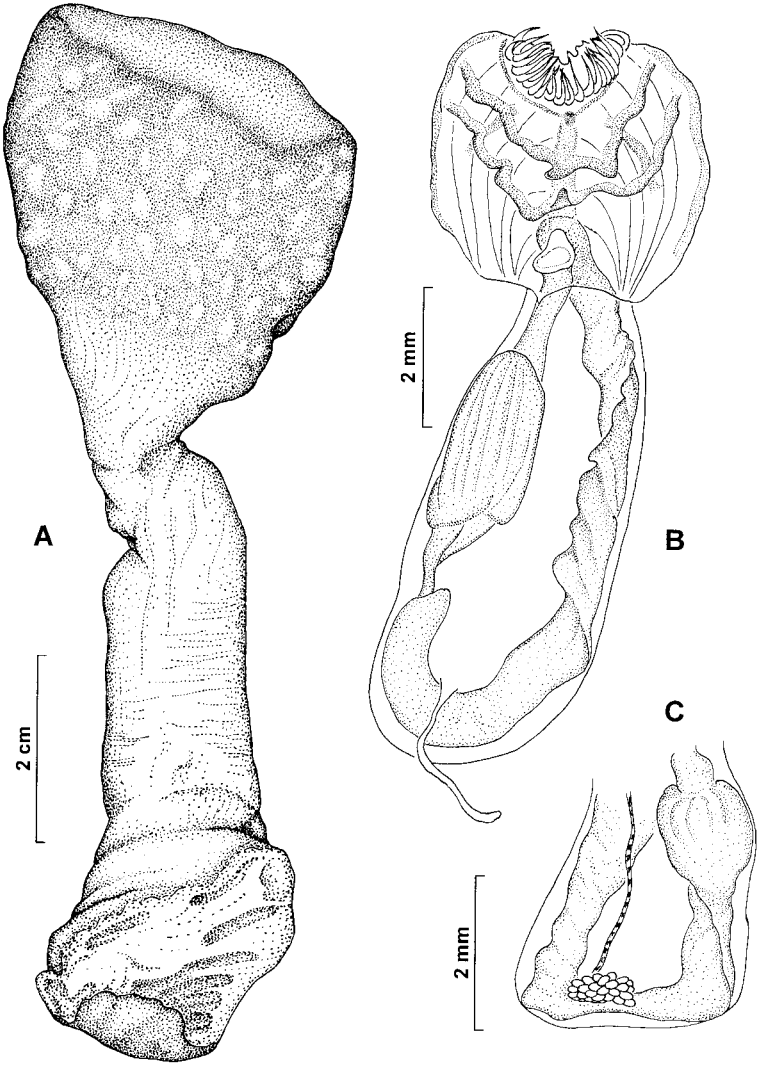

FIG. 6. *Protoholozoa pedunculata* Kott, 1969: (A) colony; (B, C) zooid.

of the head they are much smaller, 2–3 mm long. Both apertures are on the flattened dorsal side of the thorax, on short wide siphons. The branchial aperture is some distance down from the top of the thorax, the atrial is near its posterior end. Siphonal margins are not even, although the lobes are indistinct and in most zooids difficult to count, but at least in one zooid both siphons have six distinct lobes. Thoraces are parallel to the surface of the colony. The abdomina may be curved ventrally and sometimes are nearly at right angles to the thorax and the surface of the colony, but many zooids are straight. Longitudinal muscles extend from the branchial siphon (five or six), the intersiphonal region (one to three) and the atrial siphon (several thinner bands) and along the thorax toward its posterior ventral corner where they form a single band along the ventral side of the abdomen. Twenty-three branchial tentacles were counted in two zooids, they are unusually long and thick, all of the same size. There are only two transverse branchial vessels; on each side of the thorax they are connected by one short external longitudinal bar. The stomach has internal longitudinal folds obscured in most zooids by strong contraction of the abdomen. Gonad consists of a compact mass of numerous small male follicles, one or two ova in the gut loop.

Remarks. The genus *Protoholozoa* contains six species, four of which have been recorded only once. Kott (1992b) suggested that many features used to distinguish species, particularly the number of transverse branchial vessels, may be variable. All known specimens of *P. pedunculata*, including the present one, have two vessels, and this feature seems to be stable.

The species is known from the Scotia Sea, Antarctic Peninsula and south-east Pacific Basin.

Situla rebainsi Vinogradova, 1975
(figure 7)

Situla rebainsi Vinogradova, 1975: 297.

Material examined. St. 4093, 3700–3970 m, two specimens.

Description. Both specimens are in good condition and their shape and structure are identical, although one specimen is much larger than the other. The body shape is peculiar: two branchial lips are widely open and almost symmetrical. The body resembles a flat oval disk attached to the substratum by a long peduncle (figure 7A). The disk of the larger specimen is 10×5 cm, the peduncle is 16 cm long and 1.5–2 cm thick; and the smaller specimen has a disk 5.5×2.5 cm and peduncle 7×0.8–1 cm. The peduncle is attached to the right side of the outer surface of the ventral lip and has a tuft of hair-like outgrowths on its proximal end. The atrial aperture is on a short dome-shaped siphon on the outer surface of the disk and somewhat displaced to the left from the mid-dorsal line. The test is soft, transparent and covered by sparse minute papillae and by fine mud particles, especially on the proximal half of the peduncle.

Circular muscle fibres are thin, more or less regularly spaced on the branchial lips and gathered together between the lips. The most marginal circular muscles meet together at the lip corners and form a fan of short thick radial muscle bands. Such arrangement of muscles resembles those of *Octacnemus*. Radial muscles are fine, sparse and dividing into several thin terminal branches. The atrial siphon has thin radial and circular muscles. No muscles present on peduncle.

The branchial sac occupies the central half of the disk. Branchial tentacles are

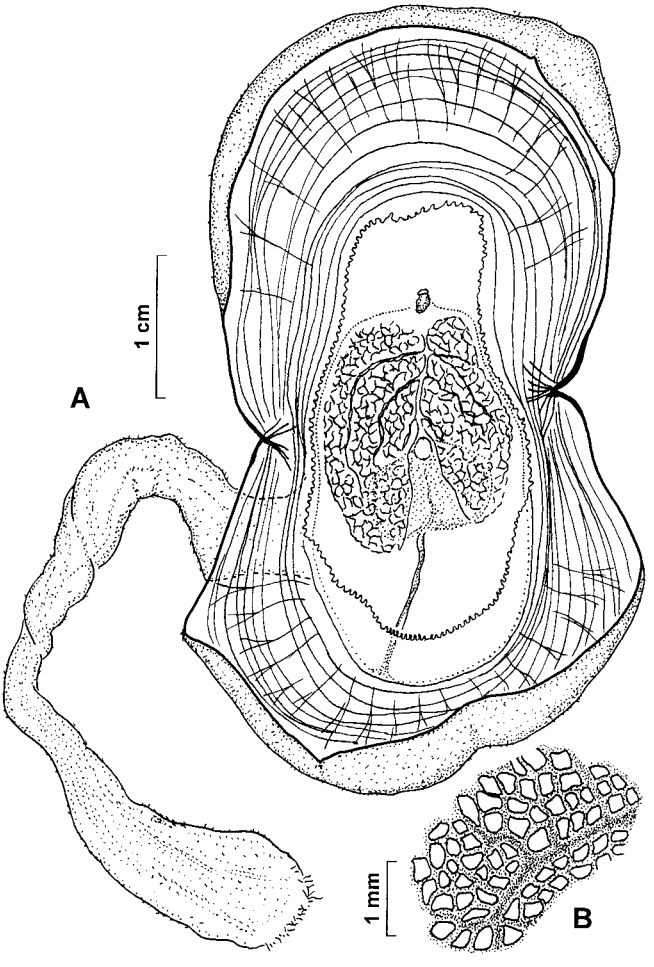

FIG. 7. *Situla rebainsi* Vinogradova, 1975: (A) intact specimen; (B) branchial perforations.

in the characteristic more or less elliptical single series (figure 7A), far from the branchial sac dorsally and ventrally and close to it laterally. Ventrally they are on the free upper rim of a high velum (or ventral pocket). The tentacular line has weak inflexions on the level of the upper rim of the perforated zone of the branchial sac and on its most dorsal point. The leaf-like tentacles are 0.5 mm long in the small specimen and up to 1 mm long in the large one. Dorsal and lateral tentacles have small finger-like offshoots or papillae on their outer surface, but these were not detected on tentacles on the ventral velum. The prepharyngeal groove is an oval line, close to the perforated zone of the branchial sac dorsally and laterally; ventrally it is on the bottom of the ventral pocket and far from the perforated zone. Sensory papillae were not detected on the branchial sac.

The stigmata are crowded and large (0.25–0.4 mm in diameter, and up to 0.5 mm in larger specimen). They form a ring around the visceral mass interrupted ventrally. The perforated zone occupies about one-third of the surface of the branchial sac. The branchial tissue is thin, its structure is not as complicated as in other species of

Situla. A well-developed dorsal lamina and three transverse vessels are on each side of the branchial sac. The visceral mass has the usual structure.

Remarks. The present species was previously known only from the single specimen described from the South Sandwich Trench from 5530–5651 m. Vinogradova's (1975) original and very particular description allows us, without any doubts, to identify the two present specimens from the Orkney Trench as *S. rebainsi*, although there are some differences. In the type specimen the body gradually tapers to the short peduncle, which is five times shorter than the body, and the body is not so flat and disk-shaped as in our specimens. Ampullae on the branchial tentacles were apparently overlooked by Vinogradova, they become visible only after staining and are absent on the ventral tentacles. Such ampullae are characteristic for *S. galeata* Monniot and Monniot, 1991, *Megalodicopia rineharti* (Monniot and Monniot, 1989) and were found in some tentacles of *Kaikoja multitentaculata* (Vinogradova, 1975).

Megalodicopia rineharti (Monniot and Monniot, 1989)
(figures 8, 9)

Situla rineharti Monniot and Monniot, 1989a: 19; 1991: 391.

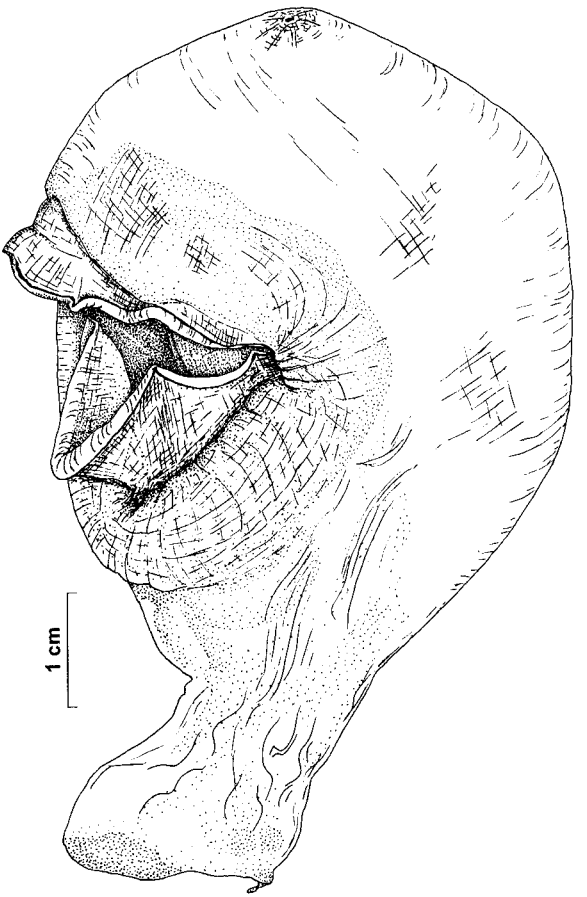

FIG. 8. *Megalodicopia rineharti* (Monniot and Monniot, 1989). Intact specimen.

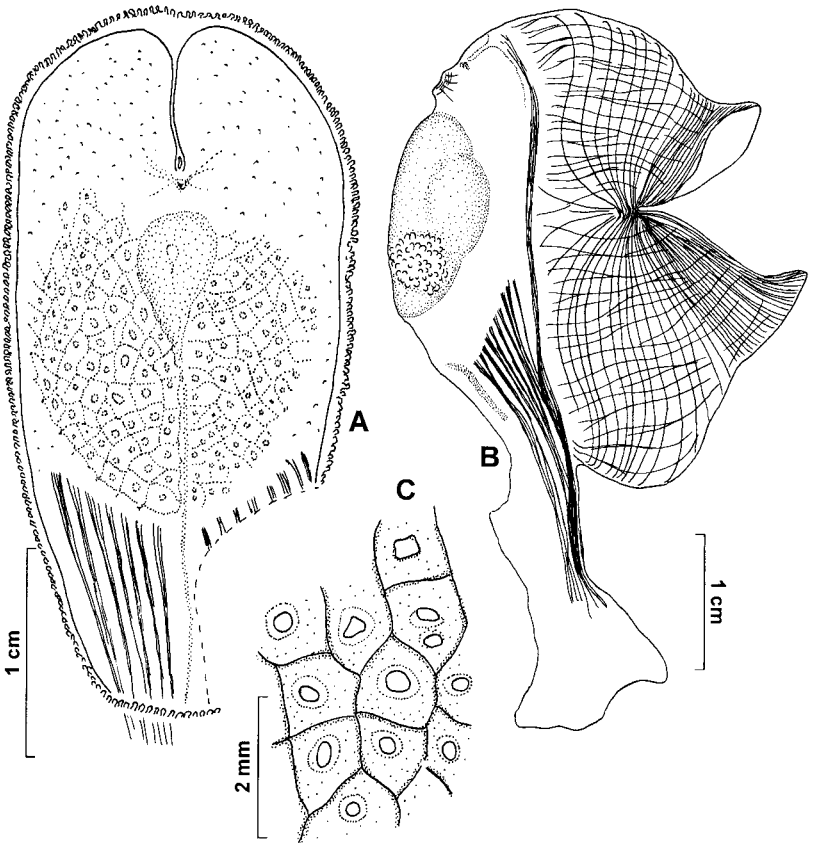

FIG. 9. *Megalodicopia rineharti* (Monniot and Monniot, 1989): (A) branchial sac; (B) body removed from the test; (C) branchial perforations.

Material examined. St. 4093, 3700–3970 m, one specimen.

Description. The single specimen (figure 8) is about 8 cm high and 4 cm wide. The oval and laterally flattened body tapers to a distinct short peduncle that is about 1.5 × 1.5 cm and has a flat attachment area on its end. The glossy transparent test is thin (no more than 0.5 mm), cartilaginous, free from any kind of outgrowth and, unlike other species of *Situla*, is more or less rigid. The test on two oral lips and around them is wrinkled and somewhat thinner than around the rest of the body. A few sparse foraminiferans, hydrozoans and polychaetae tubes are attached to the test surface. The terminal atrial aperture is small and inconspicuous. The oral aperture, in the middle of the body side, has two equal lips, and is closed in the preserved specimen.

Circular and radial muscles form a dense network with nearly rectangular meshes on the branchial lips (figure 9). Circular muscles are crowded around the margin of each lip and gathered together at the corners of the branchial siphon (where the lips meet). Fine circular and radial muscles are on the atrial siphon. A circular ribbon of muscle fibres encircles the body dorsally and laterally at the level of the oral tentacles; dorsal fibres are much thinner than the lateral. The ribbon is interrupted ventrally, its two free extremities ending abruptly near the end of the peduncle. Strong longitudinal muscles on the ventral side of the body extend from the level

of the ventral margin of the perforated area of the branchial sac and form a wide ribbon running along each side of the peduncle.

The branchial sac has the shape of a shallow wide cup with a flat bottom. Leaf-like oral tentacles, each with a small finger-like offshoot, are arranged in an oval (figure 9A) on a low rim. The rim slightly increases in height ventrally, but does not form the deep ventral 'pocket' found in *Situla*. The prepharyngeal band is close to the ring of tentacles and has a long narrow dorsal indentation. Numerous low inconspicuous papillae are on the dorsal and lateral sides of the branchial sac, between the prepharyngeal band and the stigmata. Papillae were not detected on the ventral side of the branchial sac. The oesophageal opening is on the anterior third of the branchial sac, and the perforated area is limited to its central third, below the oesophagus opening. The stigmata are large, oval and not numerous (figure 9A, C). The retropharyngeal groove runs from the oesophageal opening to the ventral limit of the perforated area. The endostyle is in the posterior third of the branchial sac.

The gut forms an almost circular loop.

Remarks. The holotype of this species from the Galapagos Islands has a short but distinct peduncle (see Monniot and Monniot, 1989a, figure 2F). In the present specimen the peduncle is much longer, and this is the only difference between this specimen and the description of the type.

Monniot and Monniot (1989a: 22) had some doubts to which genus the species should be assigned, to *Situla* or to *Dicopia*, and they decided that 'the Galapagos species is closer to *Situla*'. In another paper (Monniot and Monniot, 1991) this species was described as *Situla*, but the figure caption refers to '*Dicopia rineharti*'. Although the cup-like branchial sac of *M. rineharti* is intermediate between the flat one of *Situla* and the cone-shaped branchial sac of *Dicopia* or *Megalodicopia*, this species has the muscular stalk characteristic of *Megalodicopia* and lacks the ventral 'pocket' characteristic of *Situla*.

Megalodicopia rineharti resembles *M. hians* Oka, 1918, the type species of *Megalodicopia*, recently redescribed by Sanamyan (1998), but it differs in the size and position of the perforated zone of the branchial sac, the shape of the tentacles and the prepharyngeal groove and in some other characters.

Kaikoja multitentaculata (Vinogradova, 1975)
(figure 10)

Situla multitentaculata Vinogradova, 1975: 290.

Material examined. St. 4103, 4485–4520 m, one specimen.

Description. The single specimen is in poor condition and it is not possible to provide a complete description. There is a distinct hollow cylindrical peduncle about 2–3 cm wide and 12 cm long with a tuft of hair-like processes on the area of attachment. The shape of the body is obscured, the thin soft test being cut in many places. It is about 20 × 15 cm when expanded. The body is a thin flat disk, badly damaged and no longer attached to the test. Continuous circular muscle bands are around the periphery of this disk, radial muscles are absent. Circular muscles extend somewhat beyond the line of the tentacles, but do not reach the prepharyngeal groove. Tentacles on a low but distinct velum are elongate, leaf-like, numerous and crowded. Some of them have a hemispherical ampulla near the base (figure 10A). Dorsally, the prepharyngeal band is far from the branchial sac and from the row of

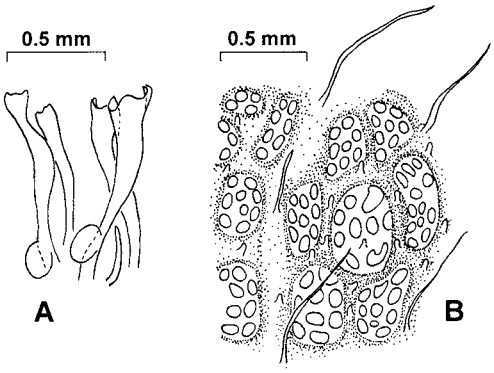

FIG. 10. *Kaikoja multitentaculata* (Vinogradova, 1975): (A) tentacles; (B) branchial perforations and papillae.

tentacles, and has a long narrow indentation. The entire surface between the tentacles and the branchial sac is covered by sensory papillae. Lateral and ventral parts of the disk are damaged and their structure obscured. The branchial sac is in shreds. Its entire surface is covered by two kinds of papillae: evenly distributed, short, flattened papillae, and long narrow papillae confined mainly to large vessels (figure 10B). The latter resemble the branchial papillae of some Agneziidae. The shape of the perforations and the net of thick and thin anastomosing branchial vessels appears to resemble closely that of *Benthascidia michaelseni* Ritter, 1907, as shown in the photograph reproduced by Monniot (1998, figure 3E) (but *B. michaelseni* lacks branchial papillae). The oesophageal opening is surrounded dorsally and on the left side by a dense tuft of long, crowded papillae.

Remarks. The species was previously known only from a single specimen from the South Sandwich Trench. Monniot (1998) designated it as a type species of *Kaikoja* Monniot, 1998, distinguished from *Situla* by 'disappearance of the radial musculature, reducing the ability to close the mouth on prey, and the disappearance of the dorsal lamina' and from *Benthascidia* by the presence of long branchial papillae (Monniot, 1998: 551). However, *Situla pelliculosa* Vinogradova, 1969, the type species of *Situla*, does not have the ability to close its mouth on prey, and has weakly developed radial musculature, and thus these features cannot be used for separating *Kaikoja* from *Situla*. Monniot (1998: 550) supported the hypothesis that the cluster of papillae at the oesophagus entrance is a condensed dorsal lamina because 'no branchial differentiation exists dorsally close to the oesophagus'. However, the dorsal lamina was figured and described in the detailed original description of *S. multitentaculata* as a low continuous band, running from the dorsal margin of the perforated zone of the branchial sac to the oesophagus opening. In the present specimen this region of the branchial sac is damaged and cannot be examined. In our opinion, it is unlikely that these papillae are remains of the dorsal lamina. Thus, the only significant feature separating *Kaikoja* from *Situla* is the presence of branchial papillae in *Kaikoja*.

The related genus *Benthascidia*, based on two specimens, which were recently redescribed by Monniot (1998), is probably intermediate between *Kaikoja* and *Situla*, or it may be congeneric with *Situla*. The structure of this genus is too poorly known to determine its exact taxonomic relationships.

Octacnemus kottae sp. n.
(figures 11, 12A–C)

Material examined. St. 874, 3700–3910 m, one specimen. HOLOTYPE KIE 1/1027.

Description. The species resembles an enlarged zooid of Octocorallia, rather than an ascidian (figure 11A). It has a distinct cylindrical peduncle of uniform diameter 8–9 mm and about 3 cm long, and a flattened oral disk (= branchial siphon) with a crown of eight triangular lobes. The test is thin and transparent. The peduncle has a tuft of crowded, unbranched hair-like outgrowths at its proximal end to which sand particles are attached. The oral disk is more or less symmetrical. Its central part is almost completely circular, about 15–16 mm in diameter and all eight lobes are of about the same length (14–18 mm), thus the total diameter of the oral disk is about 4.5 cm. The elongate triangular oral lobes have pointed tips, their bases are about half their length. Eight low elevations of the test are on the central part of the disk close to the base of each lobe and with attached sand grains. No structures corresponding to these elevations are on the body wall. The lobes have lateral pinnules, as in *O. ingolfi* Madsen, 1947, about 25–20 on each side.

The branchial aperture is close to the dorsal margin of the oral disk. The sessile

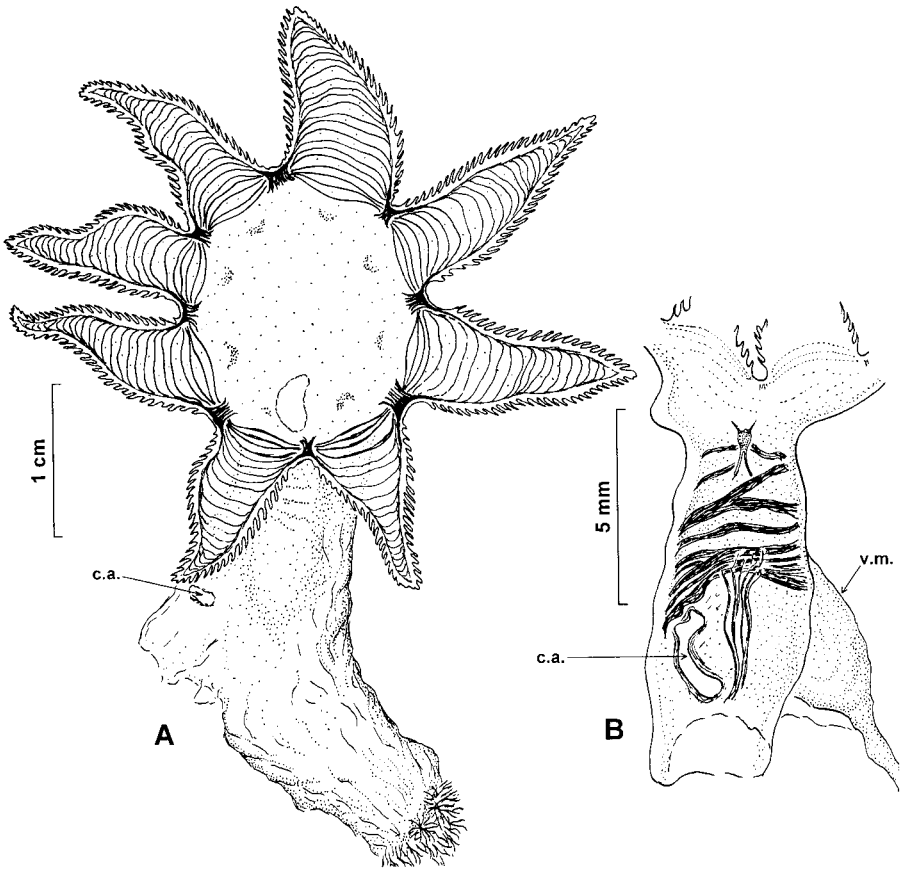

FIG. 11. *Octacnemus kottae* sp. n.: (A) intact specimen; (B) dorsal area between branchial and atrial apertures (c.a., cloacal aperture; v.m., visceral mass).

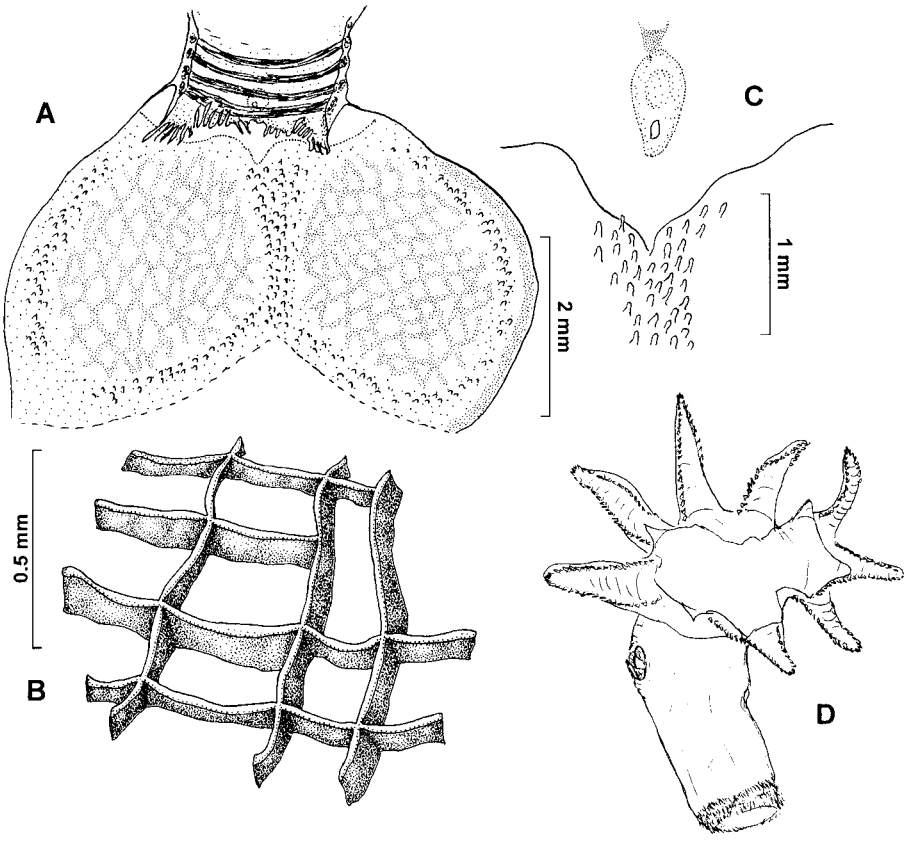

FIG. 12. (A–C) *Octacnemus kottae* sp. n.: (A) branchial sac opened ventrally; (B) branchial perforations (schematic); (C) dorsal area. (D) *Octacnemus* sp.: empty test (drawing of N. G. Vinogradova).

atrial aperture is a small oval opening on the dorsal surface of the distal half of the peduncle. The body and the test around this aperture are damaged and cannot be examined properly, but apparently there are no atrial lobes or other test outgrowths in this region.

The arrangement of muscles on the oral disk is the same as in other species of the genus. The circular muscles are confined to the oral lobes and regularly spaced. The radial muscles form short thick bunches between the lobes. There are few, thin and sparse radial muscles on the oral lobes. Most of the surface of the central disk lacks muscles. Thick, short transverse muscles are present on the dorsal side of the body wall between branchial and atrial apertures, and a bunch of thinner longitudinal muscles is present on the right side of the atrial aperture (figure 11B). Fine circular muscles are around the margin of the atrial opening. The branchial opening continues into the short thick-walled siphon, which opens into the branchial cavity through a high velum. The thick circular muscles of this siphon (figure 12A) correspond to the circular muscles of the branchial siphon of other ascidians. The test on the internal surface of this siphon has thin but pronounced longitudinal folds.

The numerous, crowded, simple branchial tentacles are on the free edge of the velum. The prepharyngeal band is a distinct groove on the epithelium, it is far from

the tentacles and makes a well-marked dorsal V. The large oval dorsal tubercle is far anterior from the tip of the dorsal V and has a large oval opening. The small triangular ganglion is close to the dorsal tubercle and anterior to it. The ganglion is relatively superficial in the body wall and it is seen more readily from the outside the body wall. The dorsal lamina is absent and is replaced by numerous raised, crowded papillae. Similar papillae are also present on both sides of the endostyle and the retropharyngeal groove, and a few are present between the prepharyngeal band and the perforated zone of the branchial sac. The papillae are not present between the prepharyngeal band and the tentacles, or on the perforated part of the branchial sac. The perforated zone occupies a large part of the branchial sac. The perforations are large, 0.25–0.5 mm, and formed by a net of intersecting branchial vessels. The vessels are high, flattened laterally and more or less straight. They intersect at right angles, and therefore the perforations are more or less rectangular (figure 12B).

Internal organs form a compact visceral mass with a short posterior extension. They are in a poor condition and cannot be examined in detail. In the fixed specimen the visceral mass occupies only the upper half of the peduncle.

Remarks. The present species most closely resembles *O. ingolfi*, especially in the presence of lateral pinnules on the oral lobes. The latter species was originally described from one somewhat damaged specimen from south Greenland. To save that specimen, Madsen (1947) did not dissect it and his description referred mostly to external features, while the internal organs were described only by inspection through the transparent test. Monniot and Monniot (1973) assigned two specimens (one of which was juvenile) from the north-east Atlantic to *O. ingolfi* and provided a detailed description. The Monniots' specimen corresponds closely to the present one in many features, but differs in the structure of the dorsal lamina, which is a main feature distinguishing the two species. This organ was described and figured by Monniot and Monniot (1973) as a low continuous plain-edged lamina, and resembles the dorsal lamina of many other ascidians. In the present species such a dorsal lamina is not present, and the mid-dorsal area of the branchial sac is covered by papillae, which are also present on other parts of the branchial sac but were not present in the Monniots' specimen. There are some differences in the shape of the oral lobes, the shape of the stigmata, the presence of atrial lobes in the north Atlantic specimens, but none of these seem to be really significant. *Octacnemus ingolfi* was further recorded from the north and south Atlantic, Indian Ocean and from the south-western Pacific, but none of these descriptions referred to internal anatomy of the specimens, and it is possible, that some of these records belong to other species.

All the other species of *Octacnemus* and *Polyoctacnemus* have no pinnules on the oral lobes and therefore are obviously distinct from *O. kottae*. Among them *O. zarcoi* Monniot and Monniot, 1984 resembles the present species in the absence of the dorsal lamina and presence of papillae on the mid-dorsal line of the branchial sac. The structure of the branchial perforations of *O. zarcoi* is similar, but more complex than the present species. Similar papillae are distributed over the whole inner branchial wall of *O. alatus* Monniot and Monniot, 1985 but are not present in either *O. bythius* Moseley, 1876 or *O. vinogradovae* Sanamyan and Sanamyan, 1999.

At our disposal is a figure of another specimen of *Octacnemus*, drawn by Dr N. G. Vinogradova, which has not been published previously (figure 12D). The caption under the figure is: '*Octacnemus*, empty test (the separated body exists), st.

5612, 8200–8050 m'. This station is from the Kurile-Kamchatka Trench (*Situla pelliculosa* Vinogradova, 1969 was described from this station). This specimen resembles *O. kottae* in the presence of pinnules on the oral lobes, shape of the peduncle and position of the sessile atrial opening. Unfortunately we failed to find this specimen in the collection of the Institute of Oceanology.

Etymology. The species is named after Dr Patricia Kott.

Agnezia abyssa sp. n.
(figures 13, 14)

?*Agnesia* sp.: Monniot and Monniot, 1982.

Material examined. St. 866, 7694–7934 m, about 400 specimens; st. 867, 8004–8116 m, 16 specimens. HOLOTYPE KIE 1/1028 (st. 866).

Description. The specimens are 4–9 mm high and 3–6 mm in greatest diameter,

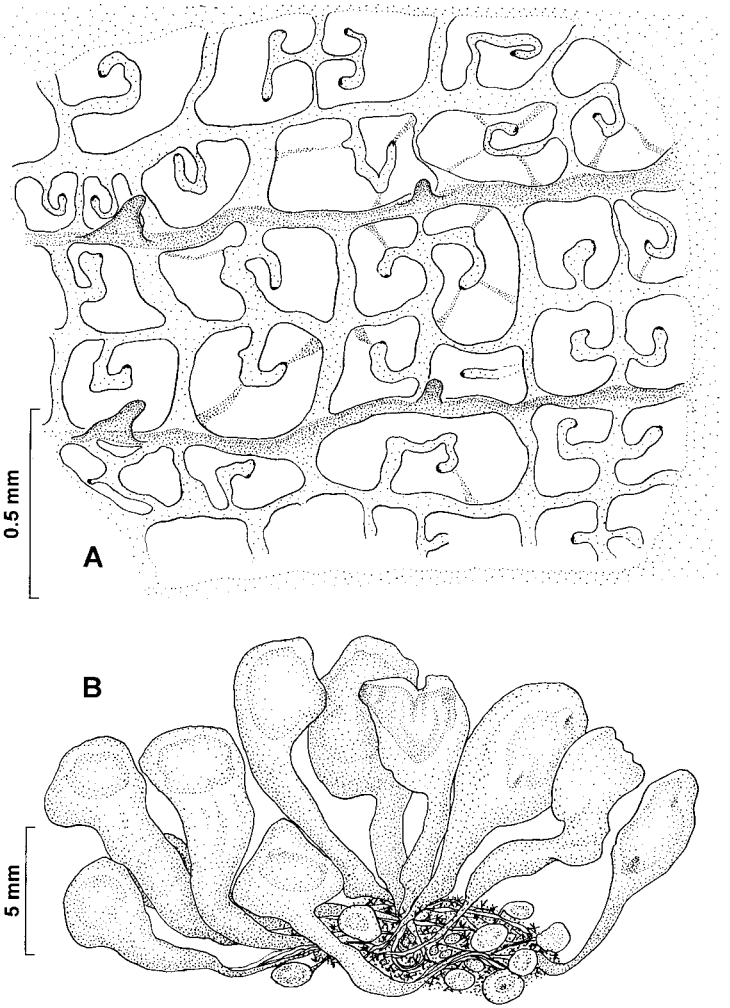

FIG. 13. *Agnezia abyssa* sp. n.: (A) whole left side of the branchial sac of the holotype: (B) intact specimens.

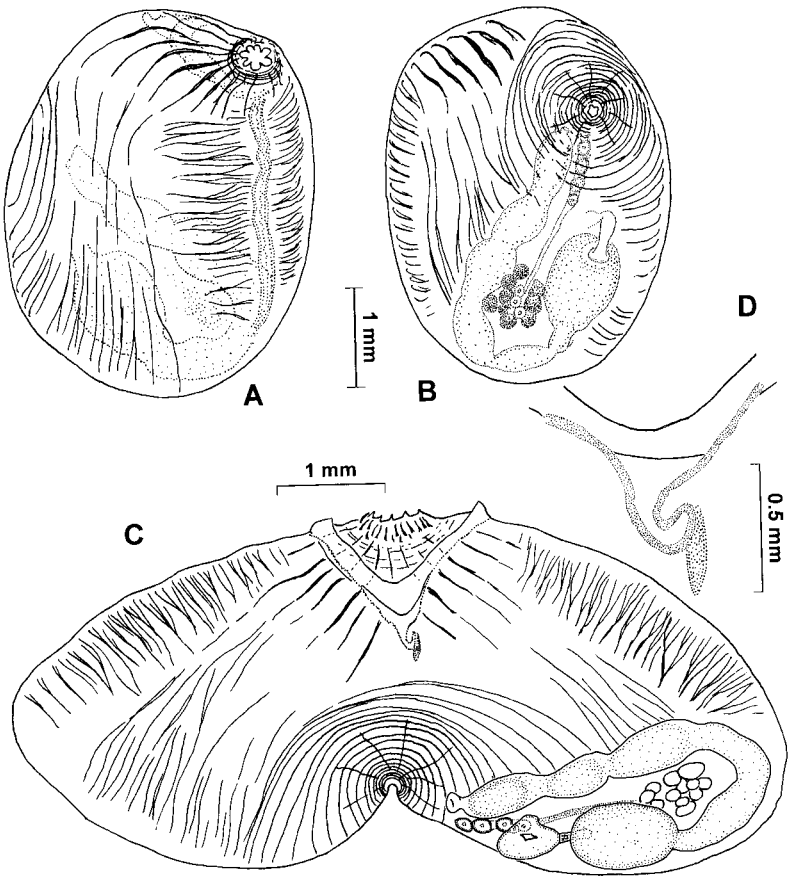

FIG. 14. *Agnezia abyssa* sp. n.: (A, B) specimen with the test removed; (C) opened specimen; (D) dorsal area.

many of them are attached to small sponges and form large clusters, resembling somewhat a colony of *Perophora* (figure 13B). The shape is irregular, but usually the body narrows posteriorly to a distinct peduncle, which terminates in one or more thin test processes. The test is thin and translucent, the surface is smooth or has a small amount of sand and mud adherent to it. In most specimens apertures are sessile, well removed from each other and situated on the opposite ends of the upper surface, but in some strongly contracted specimens there are pronounced diverging siphons. The siphons, however, appear only on the body itself, and not on the test, which is no longer attached to the body in many specimens. Probably both apertures have six lobes, but these were difficult to count.

The body is contracted into a compact mass much smaller than the less contractile test. The muscles around the apertures are differently developed: the atrial siphon has strongly developed circular muscles, and few thin and short radial muscles, while circular muscles of the branchial siphon are weak and do not extend below the branchial velum. A number of thick muscles radiate from the branchial aperture, some are short, but others continue to the end of the body. Short parallel transverse muscles form a band on each side of the endostyle. The longitudinal muscles are

confined mostly to the posterior end of the body and between the circular muscles of the atrial siphon and the band of ventral transverse muscles (figure 14).

Short, thick and numerous tentacles of various sizes are in several circles. A high velum well separated from the tentacles makes a distinct dorsal V. An unusually thick prepharyngeal band runs close to the velum, or even on the velum laterally and ventrally, and makes a pronounced V dorsally, with the tip curving to the left side. The dorsal tubercle was not detected, the neural ganglion is on the left of the dorsal V. Each side of the branchial sac has three double rows of about six wide stigmata with no more than 1.5 coils. The stigmata are enlarged and the tissue between them is greatly reduced. Radial parastigmatic vessels are present on some stigmata. The double rows are separated by two transverse vessels, each with a high triangular dorsal languet. One or two low flattened papillae are present on each transverse vessel on the left side, and two papillae on the right. The ventral margin of the branchial sac is attached to the body wall far from the endostyle, along the line between the lateral longitudinal and ventral transverse muscles.

The shape of the intestine is variable and depends on the degree of contraction of the muscular body. In relaxed specimens, including the holotype, the gut loop is straight and parallel to the last row of stigmata, but in some specimens the rectum bends dorsally and makes an angle with the axis of the primary loop. The long narrow oesophagus curves through a right angle to enter into the stomach. The shape of the stomach resembles that of the genus *Synoicum*, it is small, oval, asymmetrical, smooth-walled and distinctly demarcated from the oesophagus and intestine. The intestine is filled with fine sediments. The anus in all specimens examined is small and apparently has a smooth margin. The gonad, consisting of a central ovary surrounded by large oval male follicles, is present in the gut loop. The male and female ducts are thick and contain large eggs and spermatozoa. The gonoducts follow the rectum and open near the anus.

Remarks. In the unequal development of circular muscles around the branchial and atrial apertures and the presence of two rows of stigmata between the transverse vessels, the present species resembles *A. celtica* (Monniot and Monniot, 1974), an abyssal species described from the north Atlantic and later reported from the south Atlantic and east Indian Ocean. This species has, however, ten rows of stigmata, and each stigma makes several coils. Another abyssal Atlantic species, *A. atlantica* (Monniot and Monniot, 1973), differs greatly in many features, especially in the structure of the branchial sac.

In the limited number of papillae *A. abyssa* resembles *A. tenue* (Monniot and Monniot, 1983), from the south-western Atlantic, from 18 m. This similarity is convergent and is related to the small size of *A. tenue*; in the other features (body muscles, branchial sac, gut loop) the species are different.

Monniot and Monniot (1982) recorded three specimens of *Agnezia* sp. from exactly the same locality as the present material (55°07′S, 26°01′W, 7600 m). They are similar to the present material externally, but have four rows of spirals, separated by transverse vessels with four papillae. According to Monniot and Monniot (1982: 111), their specimens cannot belong to any known species because of the 'peculiar muscle arrangement'. They have strong circular muscles around the apertures and 'two lateral symmetrical areas, which come together on the dorsal axis'. It is difficult to understand without a figure what these 'symmetrical lateral areas' are, but they may correspond to the longitudinal muscles on the body sides in the present species. In any case it seems unlikely that at such a great depth and in the same place two

different species of the same genus may exist. The Monniots' specimens were not in a good condition and this may explain the mentioned differences.

This is one of the most deep-water species and it is probably abundant in the South Sandwich Trench.

Adagnesia charcoti Monniot and Monniot, 1973
(figures 15B, 16A)

Adagnesia charcoti Monniot and Monniot, 1973: 424; 1976: 634; 1985a: 284; Monniot, 1994; Sanamyan and Sanamyan, 1999: 1844 (synonymy).

Material examined. St. 4104, 5110–5120 m, two specimens.

Description. The dorso-ventrally flattened, disk-shaped body is 13 mm in greatest diameter. The test is naked and transparent, it is thick on the upper (dorsal) half

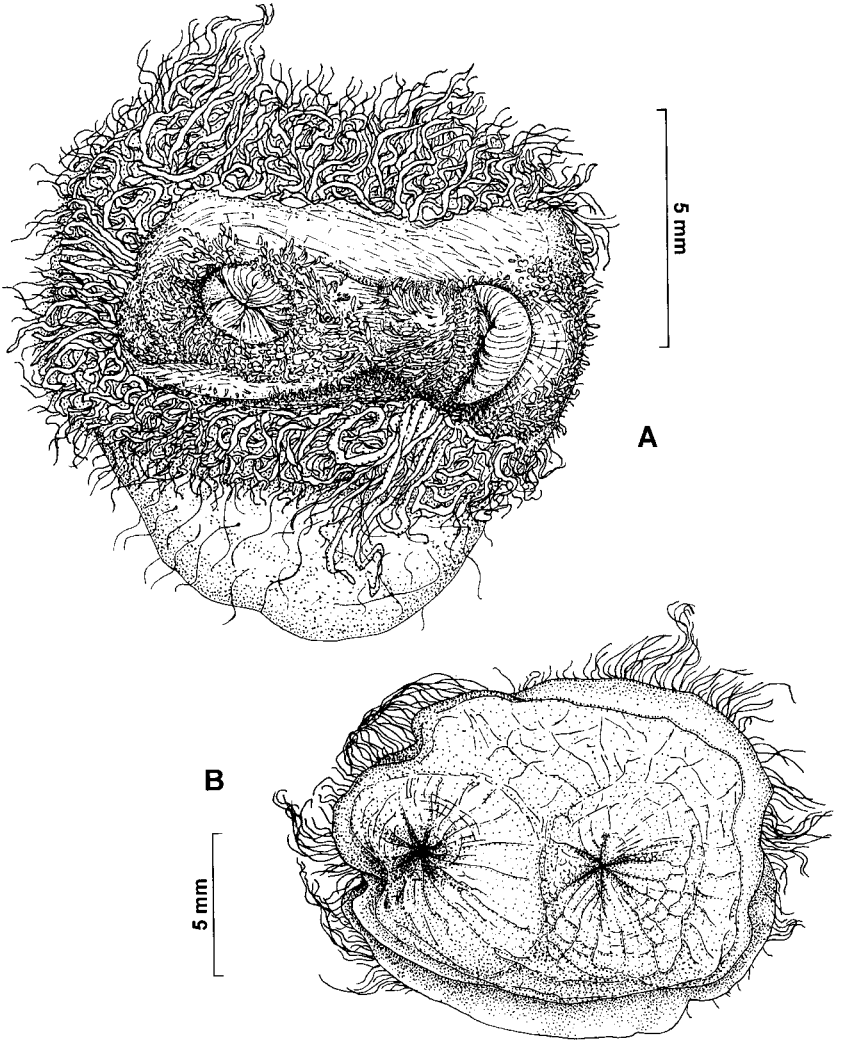

FIG. 15. (A) *Proagnesia depressa* (Millar, 1955); (B) *Adagnesia charcoti* Monniot and Monniot, 1973. Intact specimens.

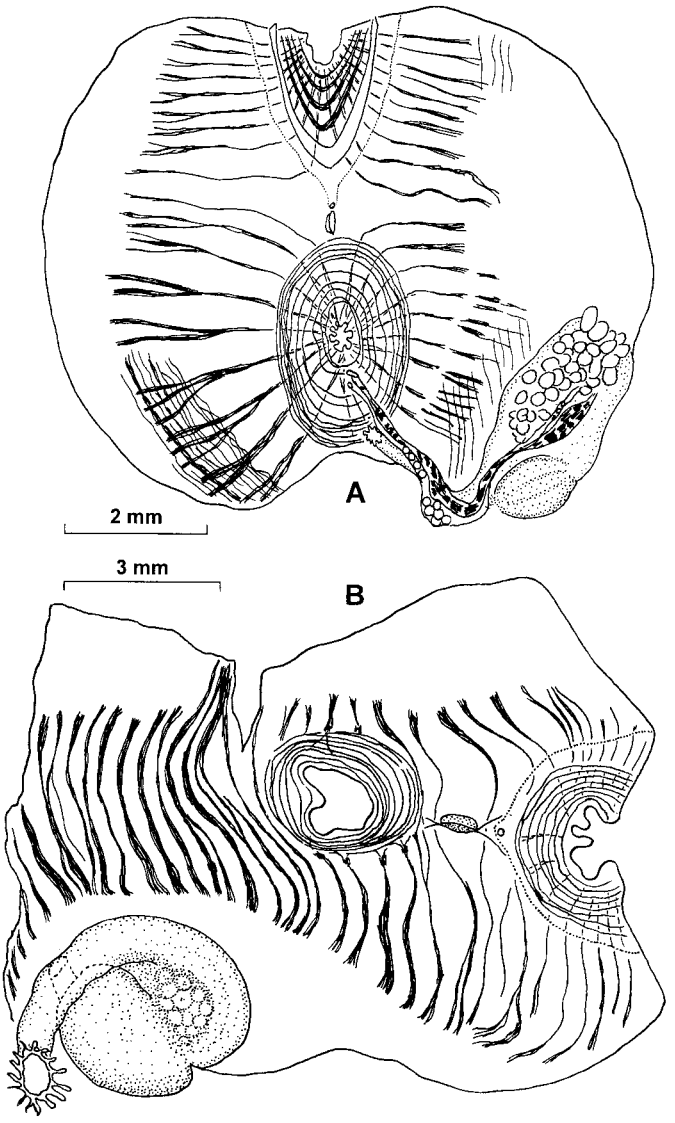

FIG. 16. *Adagnesia charcoti* Monniot and Monniot, 1973; (B) *Proagnesia depressa* (Millar, 1955). Opened specimens.

of the disk and thin on the ventral half. Few hair-like processes are present only around the margin of the body. The branchial aperture has six triangular lobes, the atrial has seven.

A few thick circular muscles are present around the branchial aperture, and numerous thinner muscles around the atrial opening. About 20 thick longitudinal muscles radiate from each siphon. On the left side, muscles radiating from the atrial siphon are interrupted. A wide band of fine parallel transverse muscles crosses the mid-dorsal line posterior to the atrial siphon across the rectum.

Numerous long branchial tentacles arise from the outside of a high velum. The prepharyngeal band makes a dorsal V; and papillae were not detected in the

prepharyngeal area. Long dorsal languets arise from the wide imperforate mid-dorsal portion of the branchial sac. The branchial sac has ten rows of about the same number of square spiral stigmata, each with up to 2.5 coils. The rows are separated by transverse vessels with T-shaped papillae, about two papillae per spiral.

The gut forms a small closed loop, the stomach is small and its limits are not clear. Gonads are well developed, the ovary and testis follicles being in the gut loop and spread over it. Thick gonoducts run along the rectum and open anterior to the lobed anus.

Remarks. Most characters of the present specimens are in good agreement with previous descriptions and we have no doubt in the present identification. As in the specimen from Macquarie Island (see Sanamyan and Sanamyan, 1999), we failed to find any papillae in the prebranchial area of the present specimens. Such papillae were mentioned and figured in the original description of *A. charcoti*, as well as in other descriptions provided with figures (Monniot and Monniot, 1985a; Monniot, 1994), excepting a specimen from the Argentine Basin (Monniot and Monniot, 1976). The latter specimen was listed (Monniot and Monniot, 1976, table 1) as *Adagnesia* sp., but was then described as *A. charcoti*. It closely resembles our specimens, although it has thinner and less regular muscles.

This is the first record of the species below the Antarctic Convergence. The species previously was known from numerous records from the Atlantic and also was recorded from the Indian Ocean (Amsterdam Island) and Macquarie Island.

Proagnesia depressa (Millar, 1955)
(figures 15A, 16B)

Agnesia depressa Millar, 1955: 223.
Proagnesia depressa: Monniot and Monniot, 1973: 418; 1974: 739.

Material examined. St. 4077, 3285–3160 m, one specimen; st. 4104, 5110–5120 m, one specimen.

Description. The specimens are strongly contracted and are about 1 cm in diameter. The basal half is hemispherical with thin test. The upper surface is flattened, oval and covered by thicker and more rigid test. The apertures are on short siphons on the upper disk. The area around and between the siphons is covered by short thick crowded papillae, but the remainder of the upper disk is covered by long outgrowths which are sparse on the lower part of the body (which apparently was immersed in soft mud).

Thin crowded circular muscles are present around the apertures, and a conspicuous band of long thick parallel transverse muscles crosses the dorsal surface between the apertures and posterior to the atrial siphon. They closely resemble those figured by Monniot and Monniot (1974). We have not found any tentacles. The prepharyngeal band is composed of a single lamella and the dorsal V is absent. The neural ganglion and oval neural gland are halfway between the siphons. There are four long dorsal languets. The branchial sac has four high transverse vessels without papillae. Some stigmata spiral, but mostly they are irregular and it is not possible to count either the number per row, or the number of rows between two transverse vessels.

The gut loop makes a complete circle and the rectum is directed away from the atrial siphon. The stomach is relatively large, oval and smooth-walled. The anal

border has long finger-like lobes. The gonad is in the gut loop, but gonoducts were not detected.

Remarks. The orientation of the rectum is probably an artefact. In previously described specimens the proximal part of the gut forms the usual loop and the rectum is, as usual, directed to the atrial aperture. The other features, especially the structure of the branchial sac and body muscles, are in agreement with existing accounts.

This is the first record of the species from Antarctic waters. It was previously known from numerous records from the northern and central Atlantic, around South Africa and from central and northern parts of the Indian Ocean.

Corynascidia lambertae sp.n.
(figure 17)

Material examined. St. 4100, 1265–1376 m, one specimen. HOLOTYPE KIE 1/1033.

Description. The body is 4 cm long and 1.5 cm wide in the anterior part, gradually tapering to the peduncle, which is 2 cm long and 5 mm wide. The specimen probably was attached to a stone, the base of the peduncle is flattened, spread out into a thin membrane without any root-like outgrowths. The test on the body is thin, naked, transparent and soft, but a little more rigid on the peduncle. Large apertures are on short diverging and obscurely lobed terminal siphons on the top of the body, one on each side of the upper surface (figure 17B, C).

Thin circular muscles are present only around the margins of the siphons. A set of thin longitudinal muscles is on the upper third of the body and a series of short, parallel transverse muscle bands is below the branchial siphon. Muscles are thicker and more numerous on the right side of the body. Longitudinal muscles anterior and posterior to the atrial siphon form two thick bundles crossing the mid-dorsal line. None of the other muscles cross the mid-line of the body.

About 80 tentacles of at least three size orders arise from a low muscular velum. The tentacular circle is near the edge of the siphon ventrally, but far from it dorsally. In full expansion the branchial siphon apparently is directed downward, as in *C. herdmani* (see Sanamyan, 1998, figure 4). The prominent dorsal tubercle has an oval longitudinal opening. The prepharyngeal band is composed of two lamellae which are equal along most of their length. The anterior lamella curves only slightly around the dorsal tubercle, but the posterior lamella makes a short narrow, thick-walled V behind the dorsal tubercle. An elongated neural ganglion is hidden under the dorsal V. The dorsal lamina has a line of short languets. The endostyle is long, extending from the branchial siphon forming an angle in the top of the peduncle and continuing a little upwards. The body wall and the branchial sac project slightly into the top of the peduncle. Transverse vessels are directed obliquely to the longitudinal axis of the body and are of two regularly alternating orders. The stigmata are in about 45 transverse rows of 37–40 square meshes with no more than 1.5 irregular spirals. The membrane of the pharyngeal wall between the perforations is very much reduced and thread-like (figure 17D). The spirals are crossed by two thin radial vessels. About 50 longitudinal vessels are present on each side of the branchial sac, they are seldom interrupted and are on long papillae arising from the transverse vessels.

The gut loop is U-shaped, straight, narrow and vertical. The stomach is clearly demarcated from the oesophagus and intestine and has well-developed but slightly irregular external longitudinal folds. The long straight rectum lies directly under the

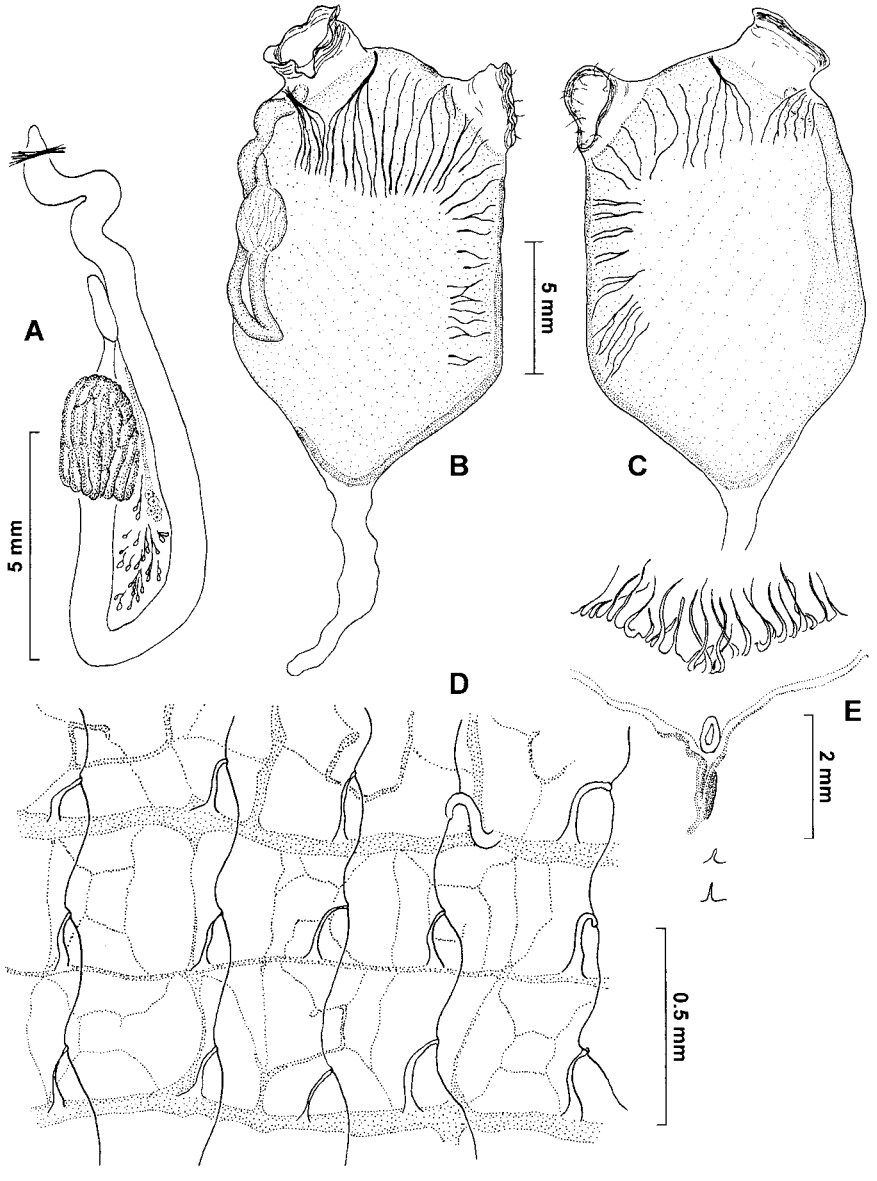

FIG. 17. *Corynascidia lambertae* sp. n.: (A) gut loop; (B, C) holotype without test from right and left sides; (D) part of the branchial sac; (E) dorsal area.

dorsal lamina. The stomach and ascending limb of the intestine, which is relatively long, are slightly displaced to the right of the mid-line. The form of the anal border was not determined.

The gonads are immature. The small ovary with few oocytes, and small separated testicular follicles are in the gut loop.

Remarks. This is the fourth pedunculate *Corynascidia*, the other three being *C. suhmi* Herdman, 1882, *C. herdmani* Ritter, 1913 and *C. hartmeyeri* Monniot and Monniot, 1994. *Corynascidia suhmi* and *C. hartmeyeri* differ from the present species in many characters, including the position of the siphons, shape and orientation of

the gut loop, and shape of the stigmata with their more numerous coils and especially numerous radial vessels. *Corynascidia hartmeyeri* has two lines of dorsal languets. The present species seems to be more closely related to *C. herdmani* from the Bering Sea, recently rediscovered by Sanamyan (1998). It has a similar body form, similar position and shape of the siphons and similar shape of the gut loop with folded stomach. It has a different branchial sac which Sanamyan (1998) did not figure as it is similar to that figured by Ritter (1913) in the original description. In *C. herdmani* the stigmata are better developed than in *C. lambertae* and coiled up to four times, and transverse muscles are not present posterior to the branchial siphon.

Etymology. The species is named after Dr Gretchen Lambert.

Corynascidia mironovi sp. n.
(figure 18)

Material examined. St. 4104, 5110–5120 m, 14 specimens. HOLOTYPE KIE 1/1031.

Description. The body is soft, test is thin and transparent, and preserved specimens are shapeless, about 2 cm in maximum dimension (figure 18A). Few thick and short, root-like test outgrowths with thin terminal branches are present on the ventral part of the body. The opaque body is no longer attached to the test. The apertures are on short wide siphons and well removed from each other at opposite ends of the upper surface. The branchial siphon may have seven lobes, although these are shallow and irregular. Its dorsal side is higher than the ventral, thus directing the opening ventrally. The atrial siphon is plain-edged.

It is difficult to see the body muscles, even on stained specimens. The circular siphonal muscles are poorly developed and present only on a narrow area around the margin of each siphon. Those on the branchial siphon do not extend beyond the line of tentacles. Thick, short and more or less equally spaced transverse muscles cross the mid-dorsal line between the siphons. Similar thick muscles gather together on the dorsal side of the branchial aperture, their free edges orientated longitudinally and extending a little beyond the anterior margin of the branchial sac (figure 18B, E). Two bunches of transverse muscles are present on dorsal and ventral sides of the atrial siphon, the ventral bunch crosses the rectum. Muscles were not detected on the ventral half of the body.

About 70 long, thin tentacles of several sizes arise from a low velum and project from the branchial aperture. The prepharyngeal band is some distance from the tentacles and is close to the branchial sac. It makes a distinct dorsal V around the small, simple dorsal tubercle. The elongate ganglion is just posterior to the tip of the dorsal V. The dorsal lamina has long languets with wide bases. The large cylindrical branchial sac has more than 30 transverse rows of spiral stigmata, separated by transverse vessels. The rows may be subdivided in two by transverse vessels. The branchial tissue is greatly reduced, the stigmata form rectangular meshes and resemble a spider's web (figure 18D). Each mesh is crossed by two radial vessels. The limits of the meshes are difficult to determine and it is not possible to count exactly the number of the meshes per row, but apparently it is about 20–30. The branchial papillae arising from the transverse vessels are long and narrow, their length is approximately equal to the width of one row of stigmata. Most papillae are T-shaped, but rarely, terminal branches of two papillae from adjacent rows are connected to each other indicating their origin as longitudinal vessels. There are about two papillae per mesh.

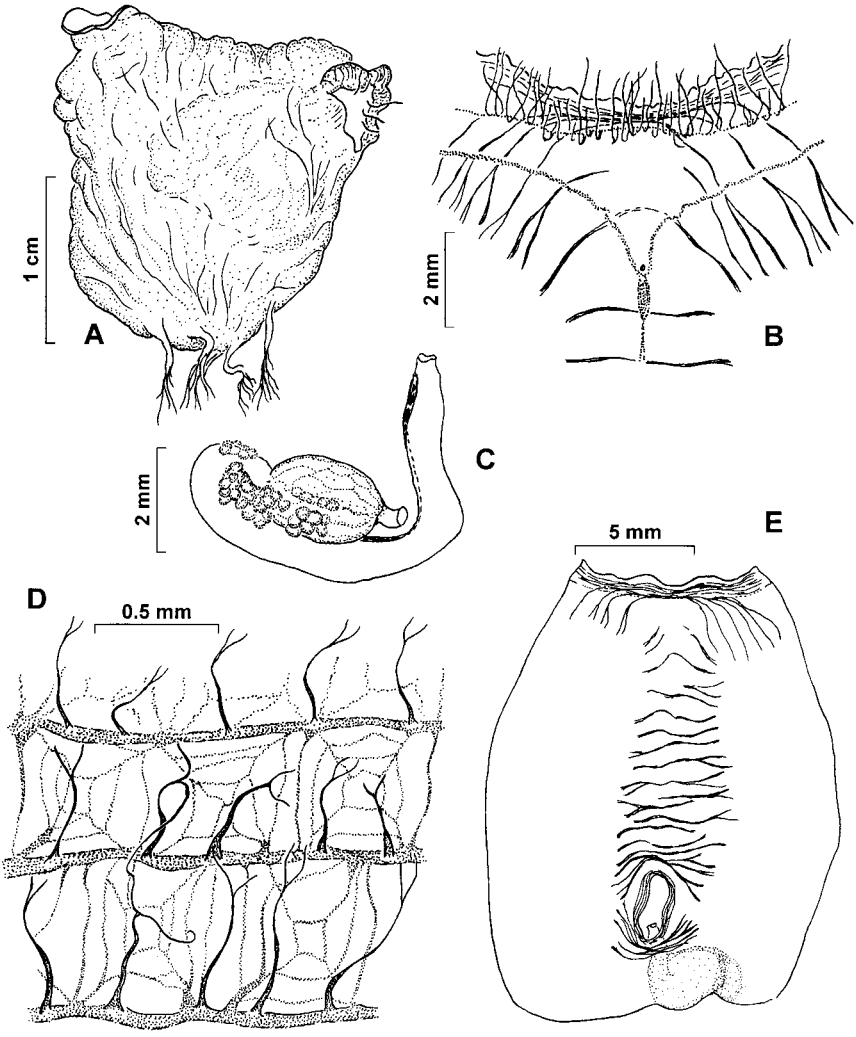

FIG. 18. *Corynascidia mironovi* sp. n.: (A) intact specimen; (B) dorsal area; (C) gut loop; (D) part of the branchial sac; (E) body muscles (from external side).

The gut forms a short, narrow, straight loop on the right side of the posterior end of the body. The stomach, clearly demarcated from the intestine and oesophagus, is smooth externally, but has obscure and irregular internal folds. The rectum bends vertically and opens close to the atrial orifice. The anal border is smooth. Numerous small and oval male follicles are in the gut loop, and between the gut loop and the body wall. The thick sperm duct follows the rectum and opens near the anus. An ovary was not seen.

Remarks. The present species resembles *C. translucida* (Monniot, 1969) in general body form, shape, position and size of the gut loop, and some other features (see Monniot, 1969, 1970). *Corynascidia mironovi* has different body muscles: in *C. translucida* they are present on the whole right side of the body and are absent on the left side. The two species have different stigmata and the branchial papillae are much longer in the present species. Another related species, *C. alata* Monniot

and Monniot, 1991, has poorly developed muscles, short papilla-like tentacles and a large lobed structure near the anus.

Corynascidia translucida was initially described under the generic name *Agnesiopsis*. The genus *Agnesiopsis* was characterized by position of the gut loop, clearly on the right side of the body, presence of spiral stigmata and T-shaped papillae, which are more numerous than the branchial meshes. The single difference between these genera is the degree of development of the longitudinal vessels, which may be incomplete in some species of *Corynascidia*, and represented by few fragments in *Agnesiopsis*. Monniot and Monniot (1991) synonymized *Agnesiopsis* with *Corynascidia* and we agree with this opinion.

Etymology. The species is named after Dr A. N. Mironov from the Institute of Oceanology.

Corynascidia suhmi Herdman, 1882
(figure 19)

Corynascidia suhmi Herdman, 1882: 186; Kott, 1969: 87; Millar, 1988: 1429; Monniot and Monniot, 1994: 22.

Material examined. St. 4090, 6145–5680 m, two specimens.

Description. The specimens are about 10 cm long. The test is thin, transparent and so soft, that it is difficult to recognize its real shape and dimensions. The anterior end of these long specimens is about 2 cm wide and the body gradually tapers to the peduncle. The test on the peduncle is a little thicker and more rigid. The peduncle is about half the body length and contains an extension of the body wall. Its posterior end is flattened and does not have any root-like outgrowths, suggesting that the specimens were attached to hard substratum. Large, obscurely lobed apertures are on the side of the body. The branchial aperture is in the middle of the lower half of the body, the atrial is halfway between the branchial aperture and the top.

The circular siphonal muscles are thin. About eight short, thick parallel longitudinal muscles extending from each side of the dorsal mid-line between the siphons are in a continuous series with the radial muscles from each side of the base of the siphons. They all terminate abruptly in a vertical line not more than halfway down each side of the body. Bundles of muscle bands above the anal siphon and below the branchial siphon cross the mid-dorsal line. Other longitudinal muscles do not cross the mid-dorsal line (figure 19A).

At least 150 long tentacles of several orders arise from a low muscular velum. The prepharyngeal groove lacks a dorsal V and has two well-separated rims. A large elongate neural gland is on one line, anterior to the ganglion, and has a large anterior opening. The dorsal lamina has one line of long languets. The branchial sac projects into the anterior part of the peduncle. The thick long endostyle extends from the branchial opening, curves on the top of the peduncle, and turns up along the ventral side of the body. It was not possible to distinguish between the endostyle and the retropharyngeal groove. The branchial tissue is delicate. Transverse rows of spiral stigmata extend along the long axis of the body. Each side of the branchial sac has about 60 rows of about 50 spirals with 1.5–2.5 coils. Spirals are not very regular, between large spirals small additional (interstitial) ones are occasionally present. Rows are separated by flat transverse vessels. Long branchial papillae arise from the transverse vessels, and, occasionally, from spirals or even from radial

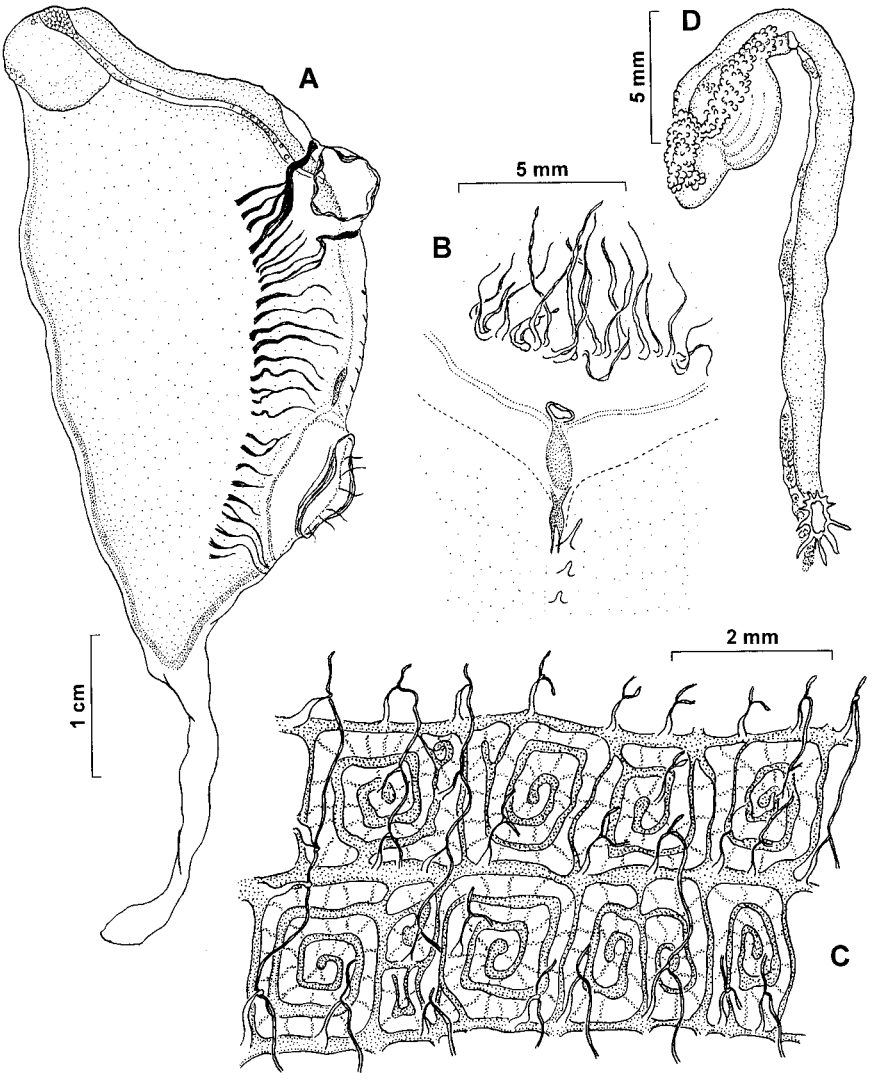

FIG. 19. *Corynascidia suhmi*: (A) specimen with test removed; (B) dorsal area; (C) part of the branchial sac; (D) gut loop of another specimen.

vessels. Many papillae are T-shaped, but in some places longitudinal vessels persist. There are about two longitudinal vessels per spiral (figure 19C).

The gut lies along the mid-line of the body and is not displaced to either side. A short straight oesophagus opens close to the upper extremity of the body. In both specimens the globular stomach is distinctly demarcated from the oesophagus and from the intestine. In one specimen it has rather distinct internal longitudinal folds, which have disintegrated in the other specimen. The intestine curves immediately behind the stomach, runs beside the stomach and oesophagus, and then curves across the oesophagus and runs up to the atrial opening as a long, straight rectum which terminates in an anus fringed with long finger-shaped lobes below the atrial orifice.

Gonads are well developed. The elongate ovary is between the intestine and the stomach and testis follicles are spread around the ovary and between the stomach and the body wall. Gonoducts run along the rectum and end above it, their openings were not seen.

Remarks. This is the type species of the genus. It has been seldom recorded and only few specimens are known. We cannot agree with the existing opinion (Millar, 1988), that *C. herdmani* may be conspecific with this species. They differ in many characters, including position of the siphons and especially in the shape and orientation of the gut loop.

Although the gut loop is median in this species, its course is characteristic of the Corellidae with the intestine (or distal limb of the loop) posterior to the oesophagus and stomach (constituting the proximal limb) and the rectum crossing over the oesophagus before running anteriorly to the atrial aperture.

Corella eumyota Traustedt, 1882

Corella eumyota Traustedt, 1882: 271; Kott, 1985: 83 (synonymy); Sanamyan and Sanamyan, 1999: 1842.

Material examined. St. 4100, 1265–1376 m, about 20 specimens (up to 12 cm long) and fragments.

Remarks. This is the deepest record for this widely distributed species, the greatest depth previously recorded is 842 m. Usually it lives on hard substrata, but the present specimens have crowded and branched root-like outgrowths on the posterior end of the body, suggesting that they were anchored in the mud.

Ascidia sp.

Material examined. St. 4100, 1265–1376 m, one specimen.

Description. The specimen was attached to the test of *Corella eumyota* by the whole ventral side. It is small, the body removed from the tunic is 6 mm long. The branchial siphon is terminal, the atrial is in the posterior third of the body length and directed downward. The muscles are only on the right side where they form an irregular mesh. About 20 tentacles of three size orders arise from the margin of the low velum. A small, oval, dorsal tubercle has a simple round opening. The neural ganglion is close to the dorsal tubercle. The branchial sac has about 30 internal longitudinal vessels and lacks intermediate papillae. The visceral mass is in the posterior half of the body. The small globular stomach has several shallow longitudinal furrows, the intestine makes a vertical closed loop and the rectum is directed nearly horizontally. Gonads and excretory vesicles were not found.

Remarks. Only few species of the genus *Ascidia* are known from deep waters and only three species are distributed in Antarctic and Subantarctic waters: *A. challengeri* Herdman, 1882, *A. meridionalis* Herdman, 1880 and *A. translucida* Herdman, 1880. The present specimen differs from these species in several characters (shape of the gut loop, tentacles, dorsal tubercle), and although the differences may be related to the size, we do not think the specimen belongs to any one of them. It seems to be closer to *A. meridionalis*, which has a small, simple, dorsal tubercle and lacks rib-like extensions from the base of the tentacles (as in *A. challengeri*). The short, transversely directed rectum of the present specimen distinguishes it from *A. meridionalis*. In the shape of the gut loop, structure of the branchial sac and position of the ganglion close to the dorsal tubercle it resembles the north Atlantic *A. tritonis*

Herdman, 1883, but because of the unknown structure of the gonads, it is not possible to confidently assign this juvenile specimen to a known species.

Dimeatus attenuatus Sanamyan, 2000
(figure 20)

Dimeatus attenuatus Sanamyan, 2000.

Material examined. St. 4090, 6145–5680 m, about 150 specimens.

Remarks. The genus *Dimeatus* comprises two closely related species, the type *D. mirus* Monniot and Monniot, 1982 and *D. attenuatus*. The genus is probably most unusual among Ascidiacea and was originally assigned to the Cionidae. It has two large atrial openings and very peculiar gonads, which do not resemble the gonads of *Ciona* in any way. In *D. mirus*, gonads were poorly developed and their structure was not determined, although it was reported that they were in the gut loop (Monniot and Monniot, 1982). The specimens from the present collection all have well-developed gonads and the male and female ducts always penetrate the test and open directly to the exterior by multiple openings. In all other ascidians the gonoducts open into the atrial cavity.

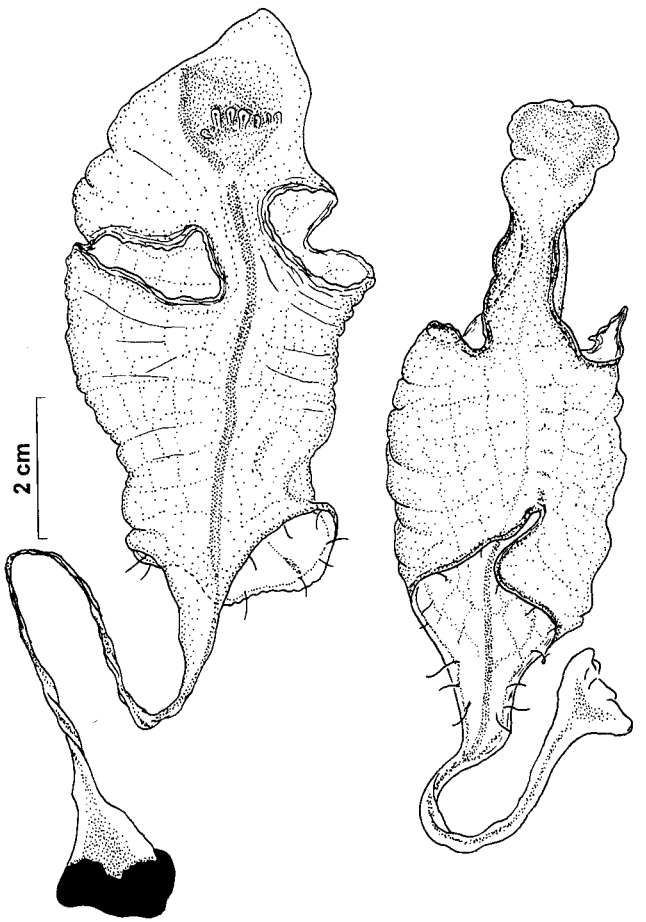

FIG. 20. *Dimeatus attenuatus* Sanamyan, 2000. Intact specimens (from Sanamyan, 2000).

Dimeatus is the sole genus of the family Dimeatidae Sanamyan, 2000. For further discussion and full description see Sanamyan (2000).

Dimeatus attenuatus was found only at one station, but as many specimens. The same is true for *D. mirus*. Apparently, they form rare compact settlements of many individuals.

Cnemidocarpa bathyphila Millar, 1955
(figure 21)

Cnemidocarpa bathyphila Millar, 1955: 228 (part); Monniot and Monniot, 1973: 430; 1985b: 28; Monniot *et al.*, 1976: 1190. Monniot, 1997: 21.
Cnemidocarpa sp. Monniot and Monniot, 1977a: 702.
Styela bathyphila: Kott, 1971: 52.
Styela sericata Millar, 1959: 196 (part).

Material examined. St. 4104, 5110–5120 m, two specimens.

Description. The globular specimens are 5 and 7 mm in diameter. The body is covered by relatively thick hairs, with a naked area only around and between the apertures. About 24 tentacles of two or three size ranges arise from a high velum. There is an atrial velum with a few thin and short tentacles on its edge. Unlike in *Cnemidocarpa bythia*, described below, we did not find any tentacles or papillae on the test lining the siphons. The prepharyngeal band has two lamellae and forms a shallow wide V around the small dorsal tubercle, which has a transverse slit. The neural ganglion is just posterior, and close to the dorsal tubercle. A high, plain-edged, dorsal lamina is displaced to the left and somewhat removed from the closest longitudinal vessel on the right side of the branchial sac. Transverse branchial vessels connecting this vessel and the dorsal lamina are raised into laminar expansions, but

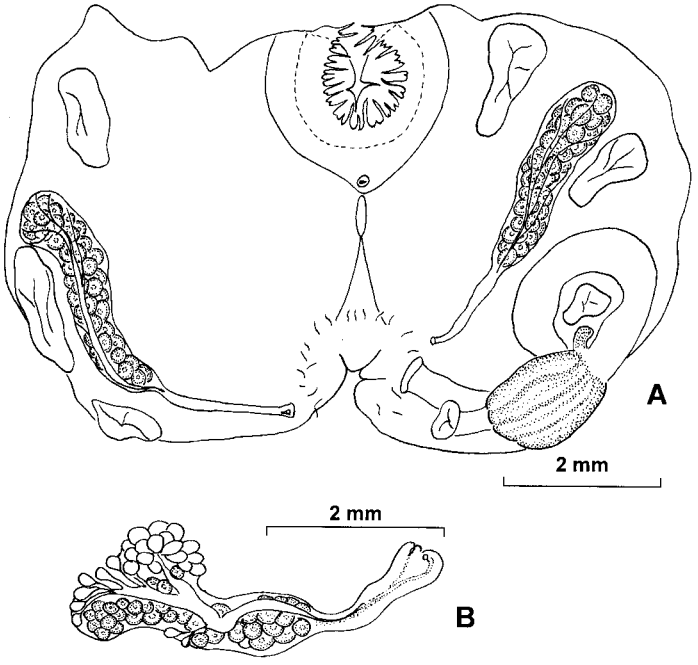

FIG. 21. *Cnemidocarpa bathyphila* Millar, 1955: (A) opened specimen; (B) right gonad of another specimen.

there is no inverted fold, which is present in some deep-water Styelidae. The branchial sac has three high folds on each side, of which the most dorsal are highest, and the fourth, most ventral, fold is indicated by a cluster of about four longitudinal vessels. It is difficult to count the number of vessels on and between the folds, the approximate formula is: E3(3)1(10)2(10)3(17)6DL3(10)4(9)5(8)2(4)2E.

The stomach has eight to ten wide longitudinal folds and a large caecum. The anal margin is smooth. One gonad is on each side of the body. Their shape is different in the two specimens. One has a long cylindrical gonad of *Cnemidocarpa*-type, but in the other specimen the testis follicles are greatly developed and are not only between the ovary and the body wall, but also form clusters on the sides of the ovary (figure 21B). In both cases the oviduct is long, and male and female openings are close to each other. Three large endocarps are present on each side of the body, one anterior and two posterior to the gonad. On the left the most posterior endocarp is in the gut loop.

Remarks. The presence of an endocarp in the gut loop, first recognized by Kott (1971), is a stable feature of this species, although it was overlooked in several previous descriptions (see Monniot and Monniot, 1985b). Other distinguishing characters are long oviducts, one or two endocarps on the sides of the gonads and well-developed branchial folds.

The species is widely distributed in the Atlantic and Indian Oceans, and has also been recorded from the south-west Pacific.

Cnemidocarpa bythia (Herdman, 1881)
(figure 22)

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

Material examined. St. 4104, 5110–5120 m, four specimens, two of which are badly damaged.

Description. The specimens are attached to small stones. They are small, sessile, hemispherical or upright and cylindrical, the larger is 4 mm high and 3.5 mm wide.

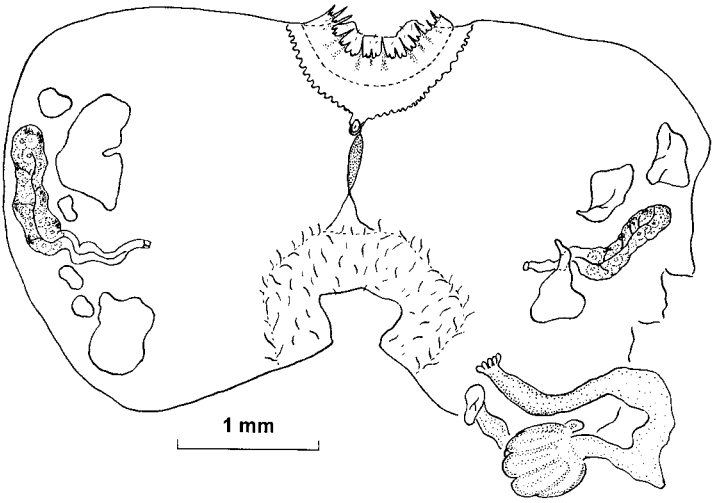

FIG. 22. *Cnemidocarpa bythia* (Herdman, 1881). Opened specimen.

The sessile apertures are on the upper surface. The tunic is thick but not hard. Its superficial layer is covered by numerous, minute, crowded spherules, resembling those of *Styela coriacea* (Alder and Hancock), and it has a velvet-like appearance. The tunic has neither root-like outgrowths nor foreign particles attached to it.

The body wall is thick and muscular. About 12 large and a number of smaller branchial tentacles arise from the rim of a high velum. There is an atrial velum covered by thin atrial tentacles. Similar tentacles are present on the test lining the branchial siphon. The prepharyngeal band is composed of a single high undulating lamella, there is an inconspicuous dorsal V around a small dorsal tubercle. The neural ganglion is just posterior to the dorsal tubercle and situated half way between the siphons. A high and folded dorsal lamina has numerous long languets on its rim. The branchial sac is dense and has four prominent folds which have no clear limits, the larger folds have about 14 internal longitudinal vessels, and three or four vessels are between the folds. A few transverse stigmata are present on the bottom of the branchial sac of one specimen, but we did not find them in another dissected specimen.

One elongate gonad of the *Cnemidocarpa*-type is present on each side of the body. Large male follicles are along the whole length of gonad, between the gonad and the body wall. The gonads are loosely attached to the body wall close to the mid-ventral line, and the ducts, directed to the atrial orifice, open far from it.

The small stomach has seven or eight wide longitudinal folds and a conspicuous caecum. The anal border is distinctly lobed. Two or three large and several small endocarps are present on each side of the body. The structure of the inner surface of the body wall of both dissected specimens is identical and peculiar. It is completely covered with crowded, low and nearly rectangular elevations, looking like numerous papillae.

Remarks. The species can be easily distinguished by the presence of minute spherules in the tunic and by the dorsal lamina with languets. Transverse stigmata on the bottom of the branchial sac are known for several Styelidae, but they were not previously reported for this species. The present specimens have a lobed anus, as in the specimens described by Monniot and Monniot (1973) from the north Atlantic, while the specimens from the Tasman Sea and the Kermadec Trench, described by Millar (1959), have a smooth anus. The presence of transverse stigmata (protostigmata) and a lobed anus may constitute valid characters for separation of an Atlantic from a Tasman Sea species. The species has been recorded from the Atlantic, Indian and Pacific oceans and around the Antarctic, but although records are numerous, most of them lack descriptions, and additional material is required to confirm possible differences between Atlantic and Pacific specimens.

Cnemidocarpa drygalskii (Hartmeyer, 1911)

Tethyum drygalskii Hartmeyer, 1911: 452.

Cnemidocarpa drygalskii: Monniot and Monniot, 1983: 69 (synonymy); Sanamyan and Sanamyan, 1999: 1850.

Material examined. St. 4100, 1265–1376 m, two specimens.

Remarks. Two small hemispherical juvenile specimens attached to the test of *Corella eumyota* appear to be of this species. However, the gonads are not developed and therefore the identification is tentative.

Cnemidocarpa platybranchia Millar, 1955

Cnemidocarpa platybranchia Millar, 1955: 226; Monniot *et al.*, 1976: 1192; Monniot and Monniot, 1984: 141; 1985a: 294; 1985b: 28; Sanamyan and Sanamyan, 1999: 1850.
Bathystyeloides enderbyanus: Monniot and Monniot, 1970: 323 (part).

Material examined. St. 4104, 5110–5120 m, one specimen.

Remarks. According to Monniot *et al.* (1976: 1192) the first (most dorsal) longitudinal vessel on the right side of the branchial sac is notably larger than the remainder and 'the transverse bars in this region are raised into laminar expansions'. Actually, there is an inverted fold, like those described by Sanamyan and Sanamyan (1999) for *Styela tenuibranchia* Monniot, Monniot and Millar, 1976.

This is the first record of the species below the Antarctic Convergence. The species was previously recorded from the north and central Atlantic, the central Indian Ocean and from the Tasman Sea.

Bathyoncus mirabilis Herdman, 1882

Bathyoncus mirabilis Herdman, 1882: 165; Sanamyan and Sanamyan, 1999: 1856 (synonymy).

Material examined. St. 916, 4664–5631 m, one 13 mm specimen with broken peduncle.

Remarks. The internal features of this species are stable. The species is widely distributed around the Antarctic, although the records are few.

Pyura bouvetensis (Michaelsen, 1904)
(figure 23)

Boltenia bouvetensis Michaelsen, 1904: 216.
Pyura bouvetensis: Monniot and Monniot, 1983: 88 (full synonymy); 1994: 33.

Material examined. St. 4096, 255–285 m, three specimens; st. 4100, 1265–1376 m, 23 specimens.

Remarks. The specimens (figure 23) agree exactly with the previous description of this well-known periantarctic species.

Culeolus antarcticus Vinogradova, 1962
(figure 24)

Culeolus antarcticus Vinogradova, 1962b: 207; Monniot and Monniot, 1982: 117; 1985b: 31.
Culeolus sluiteri: Diehl, 1977: 147.

Material examined. St. 896, 5651–5530 m, one specimen; st. 925, 2980–2960 m, one specimen; st. 908, 5474–5465 m, one specimen; st. 916, 4664–5631 m, five specimens.

Description. The body length is from 10 to 36 mm and all the specimens have broken peduncles. The general body shape is similar in all specimens, the body being elongate and slightly tapering anteriorly. The thin and firm test is completely covered by small spherules. A few of these slightly protrude like small papillae, but in a 30 mm specimen from st. 925, the papillae are longer and more numerous, giving the specimen a shaggy appearance. The postero-ventral crest is T-shaped (figure 24A), it consists of a short mid-ventral branch and two lateral branches running obliquely from the most postero-ventral point of the body and ending some distance from the corners of the slit-like atrial aperture. The lateral branches are straight or their free ends slightly curved dorsally and posteriorly (but not ventrally

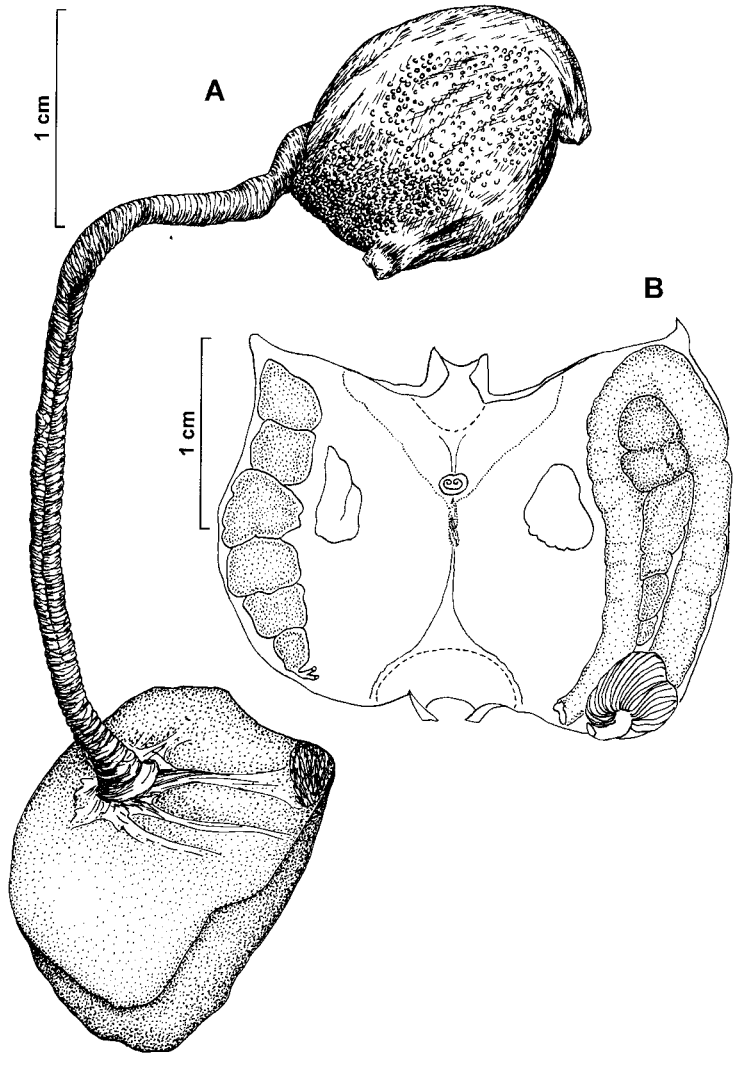

FIG. 23. *Pyura bouvetensis* Michaelsen, 1904: (A) intact specimen; (B) opened specimen.

as figured by Vinogradova, 1962b). The mid-ventral branch is absent only in the smallest (10 mm) specimen. The postero-ventral crest has sometimes free papillae, or they are united along most of their length to form a solid lamella. Papillae are arranged in one line in most specimens, but are crowded and form a wide band in the 'shaggy' specimen referred above.

About 22 large and heavily branched tentacles are present. In opened specimens they hide the whole prebranchial area and project beyond the rim of the branchial siphon. The branchial sac has usually six folds on each side, but only five on the right side in the 30 mm specimen from st. 908. The branchial formula of the figured specimen is: E2(3)2(4)2(6)4(7)3(7)4(4)2DL3(5)5(4)3(6)3(5)2(3)1(4)2E.

One gonad is present on each side of the body, the left is in the gut loop. Each gonad consists of three to seven lobes; the number of lobes does not necessarily depend on body size as the two smallest specimens (10 and 15 mm long) have seven

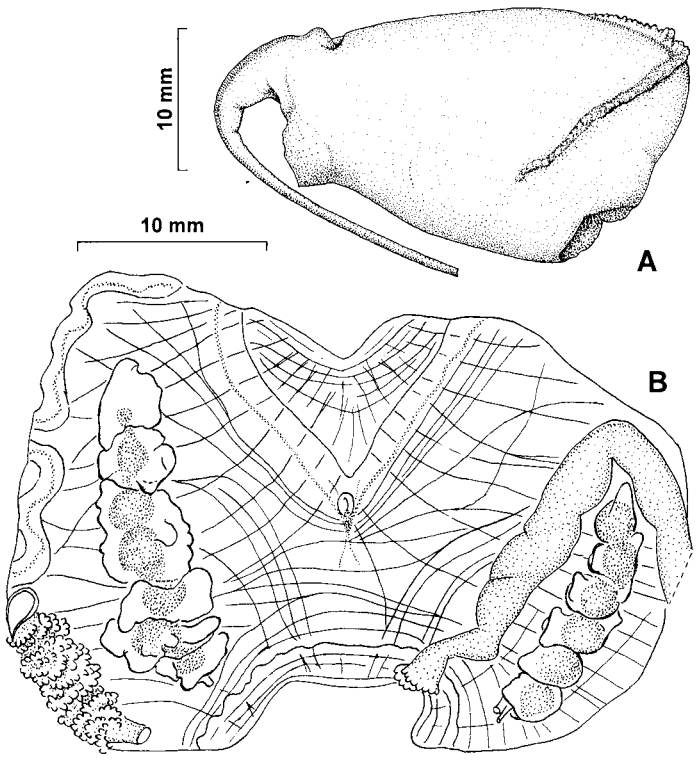

FIG. 24. *Culeolus antarcticus* Vinogradova, 1962: (A) intact specimen; (B) opened specimen.

lobes on the left gonad and three on the right, but the 30 mm specimen has five and four lobes, respectively.

The anal border is characteristic, with two flat lobes, each with a lobed rim.

Remarks. Although the postero-ventral crest may be solid or formed by papillae of various lengths, its general shape is constant and this is a good distinguishing character for the species. On the other hand, the presence or absence of other papillae on the body is variable. The presence of only one, usually long, gonad on each side of the body, and the shape of the anal border are other distinguishing characters.

The species was initially described from the Indian sector of the Antarctic and then recorded from the south-east Pacific and the south-west Atlantic, the Ross Sea; the most northern record is from the Cape Basin (33°N). It probably has a peri-antarctic distribution.

This is the deepest record for this species, the greatest depth previously recorded was 4820 m.

Culeolus anonymus Monniot and Monniot, 1976
(figure 25)

Culeolus anonymus Monniot and Monniot, 1976: 645; 1982: 121 (part, probably not Plate 3D); 1985b: 31; Sanamyan and Sanamyan, 1999: 1862.

Culeolus suhmi: Millar, 1959: 199 (part, only specimens with incomplete ring of papillae from st. 663 and 668); 1970: 136.

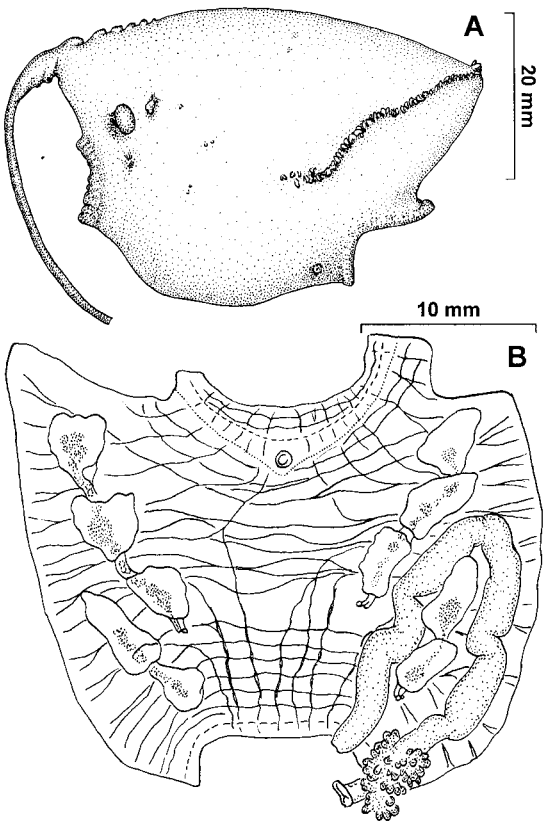

FIG. 25. *Culeolus anonymus* Monniot and Monniot, 1976: (A) intact specimen; (B) opened specimen.

Material examined. St. 896, 5651–5530 m, one damaged specimen; st. 4086, 6130–6420 m, one damaged specimen; st. 4089, 5063–5470 m, one specimen; st. 4090, 6145–5680 m, two specimens; st. 4102, 5145–5150 m, one specimen attached to empty test of *Situla*; st. 4104, 5110–5120 m, three specimens, two of which badly damaged; st. 4109, 5225 m, two specimens.

Description. The body shape and structure of the test surface is similar to *C. antarcticus*, but the postero-ventral crest is different, it lacks a mid-ventral branch and has an arc of papillae only around the posterior end of the body, which is opened dorsally (figure 25A). Internal features conform to previous descriptions, but length and position of the gonads are more variable than was formerly thought. Each gonad consists of two to four, rarely up to seven lobes. The anterior gonad is usually longer than the posterior. In typical specimens (figure 25B) the right gonads are nearly parallel to the endostyle, and at least the distal part of the anterior gonad overlaps the posterior gonad, and gonads terminate not far from each other. On the left, the proximal half of the anterior gonad usually extends posteriorly from the pole of the gut loop to about halfway down the descending limb and ends far from the anus. In the specimen from st. 4109, however, the anterior gonad on the left side is longer, extending along the whole descending limb of the intestine to open near the anus. In other specimens, anterior gonads on both sides are further forward,

the left one at the level of the pole of the gut loop (specimen from st. 4089), or even slightly anterior to it (st. 4086). The anal border has two large lobes, but it was not possible to determine if they are subdivided or smooth.

Remarks. All the present specimens, recorded not far from the type locality, conform well to the original description apart from the above-mentioned variations in position of the gonads in some specimens, and we have no doubt that they are conspecific with material described by Monniot and Monniot (1976). The validity of the species is, however, not so obvious. Monniot and Monniot (1976) give only general remarks on the genus *Culeolus* and provide no direct comparison of their species with other related Atlantic species, in particular with *C. suhmi* Herdman. According to their table 2 (Monniot and Monniot, 1976: 648), *C. anonymus* differs from *C. suhmi* in the structure of the anus and in relative position of gonads to each other and to the gut loop. Indeed, in specimens described as *C. suhmi* by Monniot and Monniot (1973), the gonads look different from those of *C. anonymus*, being well separated from each other on the right side, and on the left the anterior gonad is close to the pole of the gut loop. But in another specimen of *C. suhmi* (Monniot and Monniot, 1985a, figure 10a) and also in specimens from the central Atlantic described below, the gonads appear exactly as in *C. anonymus*. The structure of the anus cannot be used to separate these species, originally it was described as smooth, but later as having 'four or five lobes more or less divided' (Monniot and Monniot, 1982: 122). The two species, however, have different postero-dorsal crests, which completely encircle the posterior end of the body in *C. suhmi*, but are open dorsally in *C. anonymus*.

In all our specimens of *C. anonymus* from the south-west Atlantic and also from the south-west Pacific (see Sanamyan and Sanamyan, 1999), the postero-dorsal crest consists of papillae. Although two populations of this species were described originally, one with the crest consisting of separate papillae, and the other with a continuous crest, many intermediate specimens were found subsequently. A similar range of variation in the structure of the crest was found in *C. antarcticus* and this feature may be considered as intraspecific variation. However, the general shape of the crest, as it is in *C. antarcticus*, seems to be a much more stable character in the present, and probably in other species of *Culeolus*. It is the single character distinguishing *C. anonymus* from *C. suhmi*, but its validity needs to be confirmed in additional material from the north and central Atlantic (where only *C. suhmi* is known).

Millar (1959) doubted that the specimens from the Kermadec Trench Sts 663 and 668 (but not DF661: Monniot and Monniot, 1982, *sic*) belonged to *C. suhmi*, as they had an interrupted dorsal crest. They are synonyms of *C. anonymus* as it is presently defined. Specimens figured on Plate 3D by Monniot and Monniot (1982) probably belong to another species, as they appear to have a complete ring of papillae.

Monniot and Monniot (1982: 121) revised the holotype of *C. wyvillethomsoni* Herdman, 1881 and found it very similar to an abnormal specimen of *C. anonymus*, with only one left gonad, described by Monniot and Monniot (1976). They wrote: 'The lack of one gonad may or may not be an anomaly, but we do not fully believe in two species. Nevertheless, we prefer to maintain Herdman's species with a single individual to avoid having an important anatomical difference between a species and its holotype.' Although the latter statement is not a valid reason to cast aside the prior name, we prefer to use *C. anonymus* as a valid name, because we are not

completely sure it is a junior synonym of *C. wyvillethomsoni*—all the present specimens have two gonads on each side and, although the number of gonads varies in some species of *Culeolus* (e.g. *C. suhmi*: Millar, 1955), it may be stable in others (e.g. *C. antarcticus*).

Culeolus likae sp. n.
(figures 26, 27)

Material examined. St. 916, 4664–5631 m, four specimens, one of which was damaged and was not dissected; st. 4109, 5225 m, one specimen. HOLOTYPE KIE 1/1038 (st. 916).

Description. All specimens have a similar appearance. In large specimens the body is nearly cylindrical and flattened laterally, with a somewhat enlarged posterior end; smaller specimens are oval or egg-shaped. The largest specimen (holotype) has the body 8 cm long and 5.5 cm high and the peduncle 85 cm long. The peduncle, 1.2–1.8 mm diameter, contains horny trabeculae and has a shallow groove running along its whole length. Basally it breaks into small tufts of delicate rhizoids, suggesting that the specimen was attached to a hard substratum.

The test is thin, soft and transparent, whitish or with faint yellow-brownish tint, body muscles and internal organs are rather indistinctly seen through it. The test is nearly smooth, it contains numerous small and uniform vesicles, each with a small dark granule inside, but in most places vesicles are embedded in the test and do not protrude above the surface. The postero-ventral crest consists of three high lamellae arising on the most postero-ventral point of the body and ending at one level halfway along the body. One of these lamellae, the highest, runs along the mid-ventral line and ends abruptly; the others curve along each side from the postero-ventral point of the body to become nearly parallel to the longitudinal axis, or their ends may turn slightly ventrally (figure 26). Lateral lamellae end far from the atrial opening and their height gradually decreases toward the ends. There are no papillae or other ornamentation on the test.

The small atrial aperture, surrounded by a narrow band of slightly more rigid test, is on the postero-dorsal corner of the body. The branchial aperture is larger, on a short siphon and is widely open in the holotype.

The body wall is thin and transparent, with circular and radial muscles forming a rather regular network of large square meshes. The circular muscles are crowded around the siphons. The holotype has 20 large tentacles that protrude beyond the branchial orifice. They have three size orders, with relatively long primary, secondary and tertiary branches. The prepharyngeal band, consisting of two thick lamellae, runs close to the ring of tentacles and close to the branchial sac and makes a prominent dorsal V around the dorsal tubercle and neural ganglion; the latter is wholly anterior to the prepharyngeal band. The dorsal tubercle has an S-shaped opening. The branchial sac has the usual structure for *Culeolus* and has six folds on each side; the branchial formula for the holotype is: E8(6)5(6)7(7)7(9)6(9)6(8)-5DL5(10)7(10)6(10)8(7)6(5)5(5)8E.

All specimens have three gonads on each side, the left and right gonads are placed symmetrically, parallel to the longitudinal axis of the body and directed towards the atrial orifice. On the left one gonad is in the gut loop, the second anterior to the pole of the gut loop and close to the endostyle, and the third is in the middle of the left side at the level of the pole of the gut loop. On the right, two

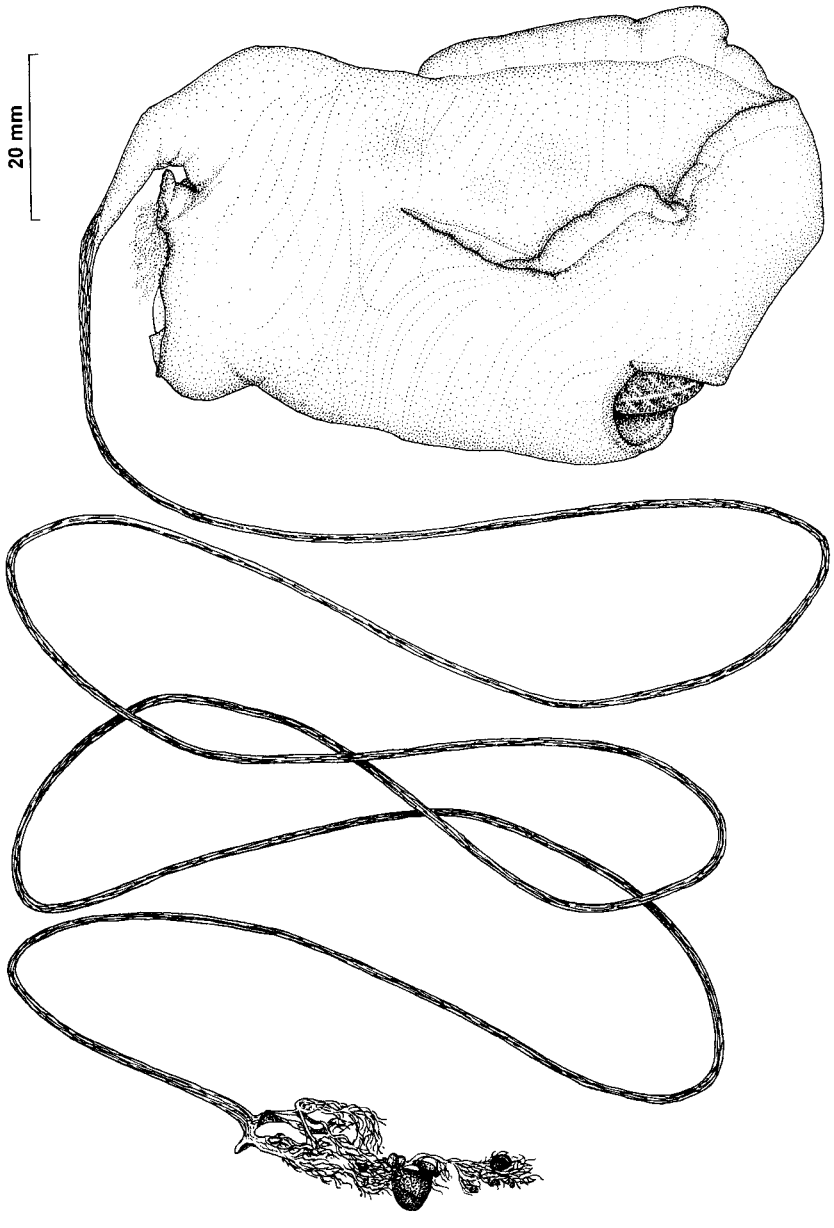

FIG. 26. *Culeolus likae* sp. n. Holotype, external appearance.

gonads are on one line along the endostyle, and the third is dorsal to them. Each gonad consists of a compact globular mass of numerous, small male follicles over a short ovary, and a large flattened endocarp in which the gonad is embedded. Short male and female ducts arise under the globular mass of male follicles and open close to each other. The shape of the gonads may be different in different specimens. In the holotype the gonad in the gut loop is much smaller than the others; in the 65 mm specimen from the same station, the most posterior gonad on the right side is not

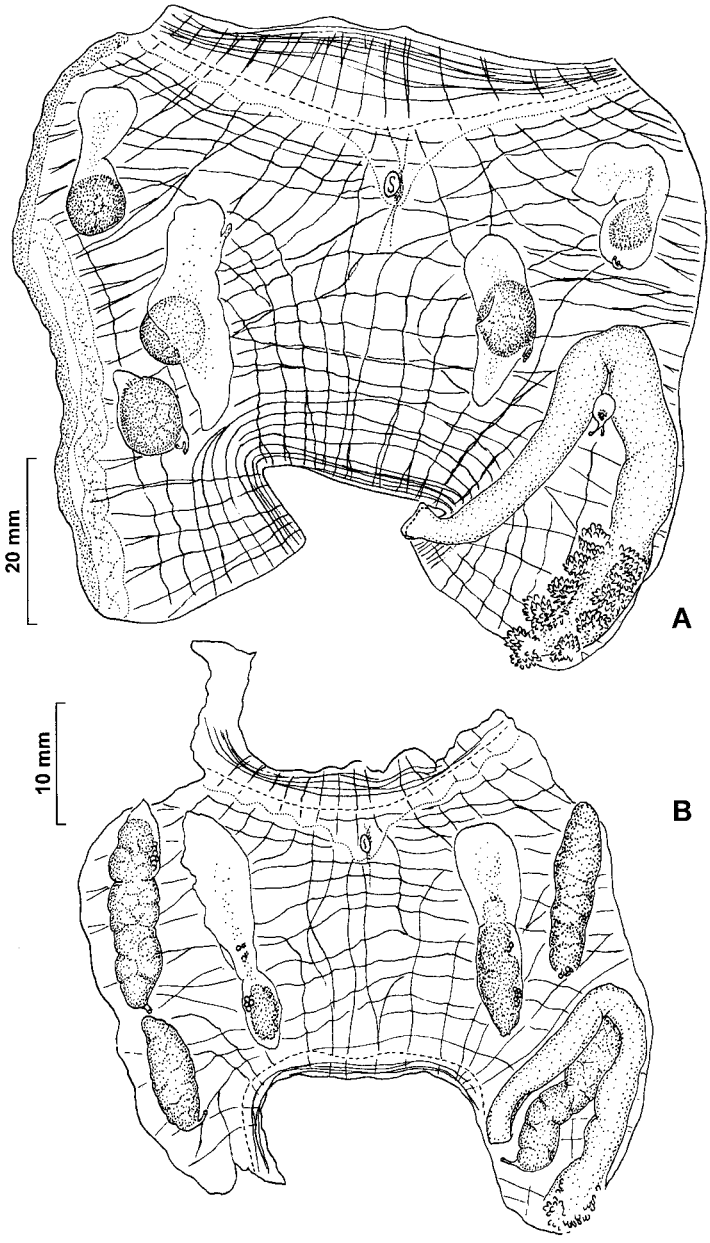

FIG. 27. *Culeolus likae* sp. n.: (A) holotype; (B) paratype from st. 4109.

present, but a corresponding endocarp is present. The specimen from st. 4109 (figure 27B) has large, elongate gonads, but they not divided into lobes.

The gut loop is widely open, bunches of hepatic diverticula are present in two series along the sides of the stomach. The anus has two lobes with clearly smooth margins. A tubular heart is on the right side of the body along the endostyle. Spicules are abundant in the endostyle, heart and hepatic diverticula.

Remarks. This species is closely related and may even be identical with *C. longipedunculatus* Vinogradova, 1970, known from three large specimens from the Kurile-Kamchatka Trench, north-west Pacific. The common features are the shape of the crest, the long peduncle, reaching 132 cm in the 8 cm specimen, compact gonads, smooth anus and number of branchial folds. The main difference is the number of gonads, *C. longipedunculatus* having two on each side. The number of gonads varies in some species of *Culeolus* and this is not a very reliable feature, especially when both species are known from such a small number of specimens. Nevertheless, we think it may be considered as valid, because all our specimens, even small ones with poorly developed gonads, have three gonads on each side, and all Vinogradova's specimens have two. There are a few other differences which, however, are less significant. The peduncle of the north Pacific species is much thinner, 0.5 mm in diameter along the whole length, the tunic is nearly translucent, spicules are not present in the internal organs. Absence of spicules cannot be explained by formalin fixation, as Vinogradova (1970) suggested, because spicules are abundant in *C. tenuis* Vinogradova, 1970, collected from the same station, and the specimens were fixed together. However, presence or absence of spicules probably is not a very reliable feature.

We do not think that the specimen from the Indian Ocean, identified doubtfully as *Culeolus longipedunculatus* by Monniot and Monniot (1985a), is conspecific with the present specimens. It has two gonads on the right, one on the left and the liver is different.

Culeolus recumbens Herdman, 1881, has undivided gonads which, however, are different from those of the present species, and the test is densely covered by sand. *Culeolus pinguis* Monniot and Monniot, 1982, from the Weddell Sea, has two bilobed gonads on each side and a different appearance, with the crest making a complete circle around the posterior end of the body. Other Antarctic species have long lobed gonads, and are not related to the present species. *Culeolus suhmi*: Monniot and Monniot, 1973, has two compact gonads on each side and a different posterior crest. We have specimens of this species, and they clearly differ from *C. likae* (see description below).

Etymology. The species is named after Lika Kimberg, school friend of the first author.

Culeolus suhmi Herdman, 1881
(figure 28)

Culeolus suhmi Herdman, 1881: 86; Monniot and Monniot, 1973: 453 (synonymy); 1974: 765; 1985a: 300; 1985b: 31; Millar, 1955: 232; 1959: 199 (part, not specimens from Kermadec Trench).

Not *Culeolus suhmi*: Millar, 1970: 136 (= *C. anonymus*).

Several specimens of this species were collected in the central Atlantic during cruise 40 of RV *Academic Kurchatov*; we describe them for comparison with *C. anonymus*.

Material examined. St. 4306, 3425 m, 09°28.8′N, 54°41.5′W, 24 November 1984, six specimens.

Description. The body length is 3–6 cm, the peduncles in most specimens are broken, the longest is 28 cm in length. The test is thick, hard and rigid, covered by papillae of various lengths and by hydroids. A complete ring of long crowded papillae encircles the posterior end of the body with the small atrial aperture in the

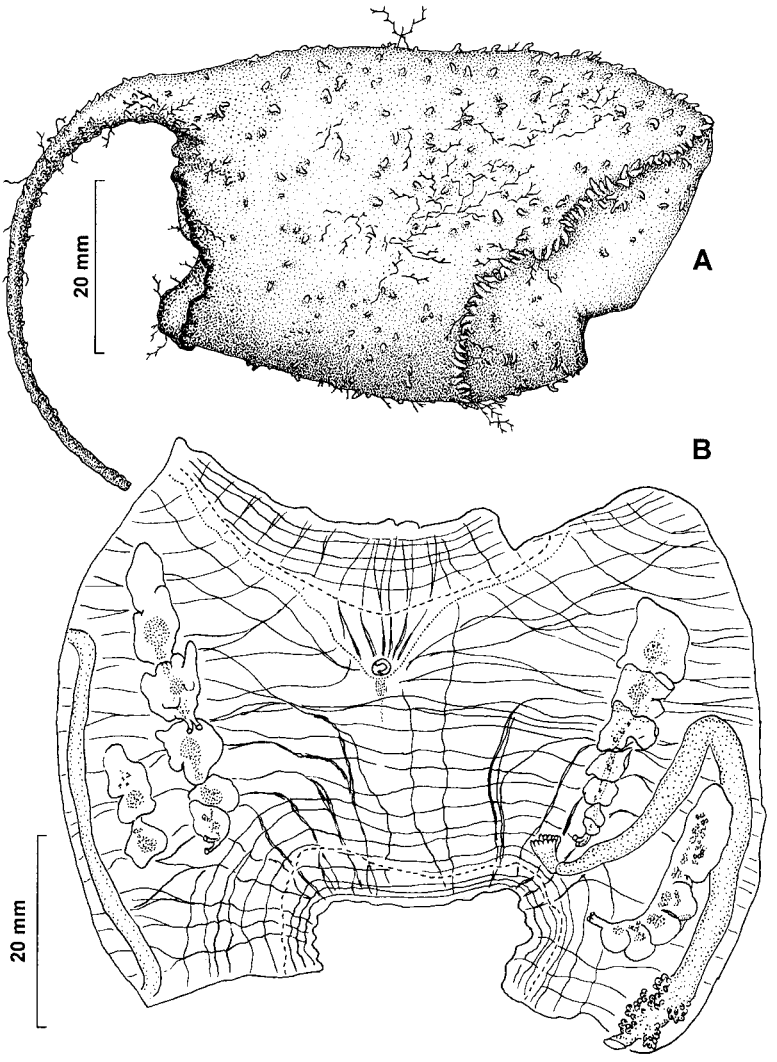

FIG. 28. *Culeolus suhmi* Herdman, 1881: (A) intact specimen; (B) opened specimen.

centre of this ring. There are a few separate and relatively long papillae on the mid-ventral line, but they do not form a distinct mid-ventral crest.

The internal structure was studied in one 6 cm specimen only, the others were too damaged. Body muscles form a regular network as in many other species of the genus, but this species also has a conspicuous bundle of thick longitudinal muscles just anterior to the dorsal tubercle. Twenty-one relatively short and poorly branched branchial tentacles have only primary and occasionally, secondary, branches. The branchial sac has six folds on each side, the branchial formula is: E5(10)6(7)8(6)8(14)7(10)8(16)5DL7(13)13(11)9(12)9(6)9(6)4(3)4E.

Two gonads are present on the left and three on the right side. On the left, one gonad (consisting of five lobes) is inside the gut loop and the other (consisting of seven lobes), is outside. Both are about as long as the descending limb of the gut loop and end more or less at the same level not far from the anus. On the right, the

gonads are shorter, consisting of two or three lobes lying parallel to the endostyle. The presence of three gonads may be an abnormality, especially as they are in one line with the distal end of one being in contact with the proximal end of another, suggesting that one long gonad has divided into two. Two posterior gonads on the right end are close to each other. The anal border has two large, lobed lips, as in *C. antarcticus*.

Molgula millari Kott, 1971
(figure 29)

Molgula millari Kott, 1971: 70. Monniot and Monniot, 1982: 124.

Material examined. St. 4093, 3700–3970 m, one specimen.

Description. The oval specimen is about 13 × 10 mm. The body is entirely covered by short hair-like processes (less crowded ventrally) with attached sand grains. The apertures are beneath two separate transverse folds of the test, well separated from one other and at opposite ends of the upper surface of the body.

The shape of the internal siphons is peculiar: they are short, directed away from each other, and much flattened dorso-ventrally, so that it appears as if they consist of a larger dorsal lip and a smaller ventral one. The margins of the siphons are smooth, but a short distance from the margin, inside the siphon, are six long, pointed, tentacle-like outgrowths, corresponding to siphonal lobes of other Molgulidae. They are thin and thread-like in the atrial siphon, while in the branchial siphon the two dorsal ones are much larger than others. The body is entirely enclosed in a layer of thin, circular anastomosing muscle fibres. About 12–18 thick, internal radial muscles arise from the lateral corners of each aperture and form two isolated muscular areas on each side of the body (figure 29).

About 13 large and medium-sized tentacles, and numerous small crowded tentacles, are on the short muscular velum. The tentacles have branches of the first, second and third orders. The prepharyngeal band is composed of a single, unusually high lamella which makes a deep dorsal V around a minute dorsal tubercle and neural ganglion and continues dorsally into a smooth-edged dorsal lamina. The prepharyngeal band is separated from the ring of tentacles and the perforated part of the pharynx, but longitudinal branchial vessels arise just behind it. The branchial sac has seven high folds consisting only of longitudinal vessels, while the wall of the

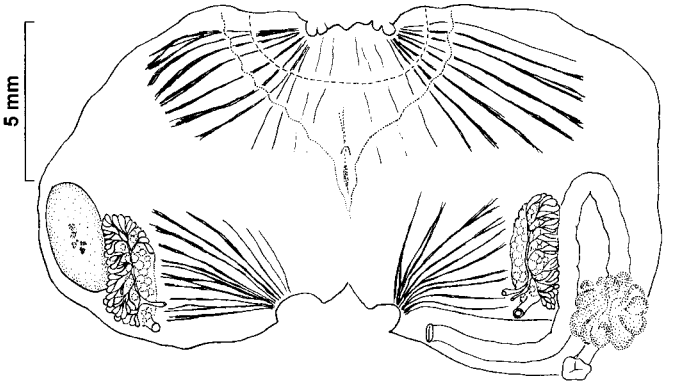

FIG. 29. *Molgula millari* Kott, 1971. Opened specimen.

branchial sac is nearly flat. Such a structured branchial sac is more characteristic for *Molguloides*. There are no longitudinal vessels between the folds. The branchial formula is: E(5)(6)(5)(7)(7)(7)(6)DL(5)(7)(5)(5)(5)(6)(5)E. The stigmata form flat interrupted spirals of five to seven coils. Small interstitial spirals are present.

The gut forms a narrow, straight primary loop parallel to the endostyle, with the straight rectum bending at a right angle to it. The oesophagus is short and straight, the stomach completely hidden under large, scalloped liver pouches, the anal border is bilobed and smooth-edged. The left gonad is along the descending branch of the primary gut loop, the right is in close contact with the postero-dorsal side of the renal sac. Each gonad consists of a thick, tubular ovary and numerous elongate male follicles, scattered along the ventral side and proximal end. One male opening is on the right gonad and two on the left. They are on the ends of short ducts on the dorsal side of the gonad, some distance from the short terminal oviduct.

Remarks. This species was originally described from the south Indian Basin (type locality) and from Tasmania and Macquarie Island. The present specimen was recorded from nearly the same place, and the same depth as Monniot and Monniot's (1982) four specimens assigned to this species, which are similar to the present one, including the presence of two male papillae on the left gonad. All three specimens described by Kott (1971) have a shorter rectum. It is possible that the Atlantic specimens are distinct from Kott's species, but at present we are inclined to follow Monniot and Monniot (1982) and identify them as *M. millari*.

Molgula or ***Molguloides*** sp.

Material examined. St. 4100, 1265–1376 m, two specimens.

Remarks. Two juvenile globular specimens 1.5 and 2.5 mm in diameter were found attached to the tunic of *Corella eumyota*. They are in excellent condition, but without gonads identification is impossible.

Pareugyrioides galatheae (Millar, 1959)
(figure 30)

Molgula galatheae Millar, 1959: 202.

Pareugyrioides galatheae: Kott, 1969: 161; Monniot and Monniot, 1977b: 316; 1982: 124; 1983: 116.

Material examined. St. 914, 5650–6070 m, three specimens; st. 916, 4664–5631 m, one specimen.

Remarks. The anatomy of the present specimens is identical with that of the specimen described by Monniot and Monniot (1977b) from the south Indian Ocean. The specimen figured by Kott (1969: 160) has a different position of the right gonad, its proximal end 'lies against and overlies' the dorsal border of the renal sac. In the present material (figure 30) the right gonad is separated from the antero-dorsal end of the elongate renal sac, as originally described and as figured by Monniot and Monniot (1977b). At present it is difficult to decide if the difference described is intraspecific variation. The most peculiar character of the species is the presence of short papillae on the radial parastigmatic vessels. Similar papillae occur only in the recently described *Molguloides sulcatus* Sanamyan and Sanamyan, 1999.

Originally described from the Guinea Basin, the species was then recorded from the south Atlantic, south-east Pacific Basin, Macquarie Island and the south Indian Ocean.

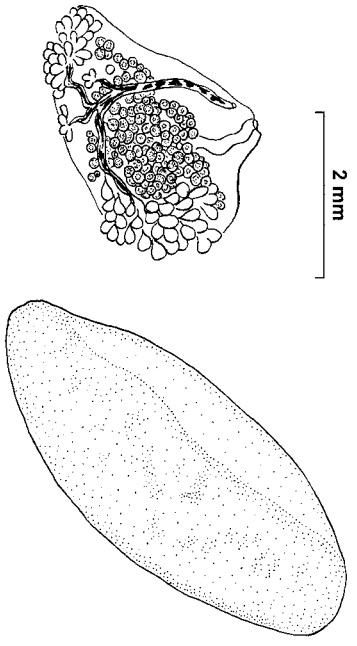

FIG. 30. *Pareugyrioides galatheae* (Millar, 1959). Right gonad and renal sac.

Molguloides cyclocarpa Monniot and Monniot, 1982
(figure 31)

Molguloides cyclocarpa Monniot and Monniot, 1982: 127; 1985b: 33.
Molguloides sp. Monniot and Monniot, 1976: 652.

Material examined. St. 914, 5650–6070 m, one specimen.

Description. The specimen is nearly spherical, 39 mm in diameter. The thin transparent test is covered by short, sparse, unbranched hair-like outgrowths which become crowded around the apertures and a few become slightly longer ventrally. The apertures are widely separated from each other and do not project above the test surface, but the muscular body wall does have a long, tubular atrial siphon inside the test.

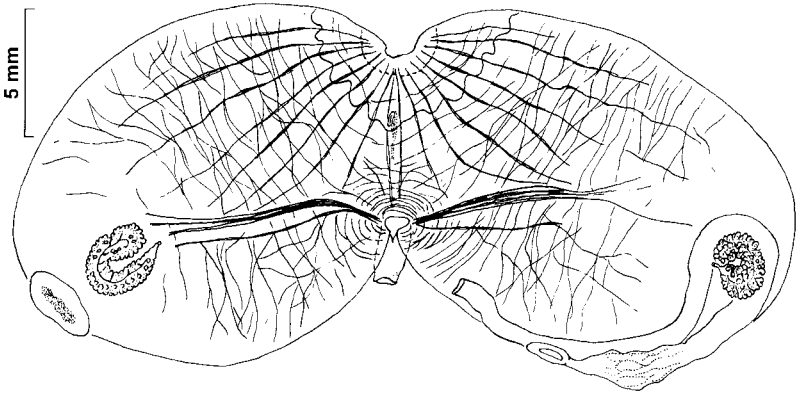

FIG. 31. *Molguloides cyclocarpa* Monniot and Monniot, 1982.

The body wall is thin but muscular. Eight or nine muscles radiate from the branchial siphon and two wide muscle bands extend from the lateral corners of the atrial siphon to the gonads. Relatively strong circular musculature, consisting of thin but numerous muscles, is present around the atrial siphon, but few circular muscles are around the branchial siphon. The whole body is covered by an irregular network of thin anastomosing muscles, most of them transverse and thicker and more numerous on the anterior two-thirds of the body. There are 13 branchial tentacles of three orders, with long and closely set branches of the first order, and numerous short branches of the second and third orders. The prepharyngeal band consists of two low lamellae and makes deep undulations characteristic of the genus. The small dorsal tubercle has a longitudinal slit and is just above the neural ganglion and gland. The high dorsal lamina has a smooth margin. The branchial sac has eight high folds on the left and seven on the right, up to 13 longitudinal vessels on each fold and there are no vessels between the folds. The stigmata form large but interrupted rectangular spirals of up to 13 coils. The spirals are flat, protruding only slightly in the centre. Generally there are six transverse rows of spirals. The anterior transverse row is rather irregular and some spirals here show a tendency to be duplicated and others are reduced to a few short, wide, oval stigmata. The gut forms the loop characteristic for the genus and the rectum is unusually long. The gonads are deeply curved, the right has a U-shaped ovary with the axis orientated longitudinally and some distance from the small renal sac; the left gonad is nearly circular and is in the gut loop. Male follicles are along the outer side of the ovary and overlap its proximal end. The male ducts are joined to one common duct running along the mesial surface of the ovary. Male openings are evenly distributed along the whole length of the ovary, eight on the right gonad and four on the left.

Remarks. Molguloides cyclocarpa is an abyssal south Atlantic species reported from the Argentine Basin, South Georgia and the Cape Basin, from 3138 to 5208 m. The present specimen was recorded from the same region and at greater depth. Externally it resembles the photograph of *M. cyclocarpa* reproduced by Monniot and Monniot (1982, Plate 5B) so closely that they appear to be the same specimen. It differs from the original description in having an irregular network of thin muscles on the body wall. Monniot and Monniot (1982: 127) described and figured only muscles radiating from the branchial siphon and two strong muscle bands from the atrial siphon, which, with the shape of the gonads, constitute the most characteristic features of the species. They clearly stated that 'other atrial muscles are not visible'. Their specimens were only a little smaller than the present one, and the greater development of muscles in the present specimen cannot be explained by its large size. We believe that Monniot and Monniot (1982) overlooked transverse muscles, which may be too thin, especially in comparison with the thick radial muscles.

The differences between *M. cyclocarpa* and *Caesira bathybia* Hartmeyer, 1912 are not as clear as Monniot and Monniot (1982) thought. The characteristic muscle bands on the atrial opening could have been easily overlooked by Hartmeyer (1912), and when circular gonads are in a bad condition they resemble compact round masses. Nevertheless, until the type specimen of *C. bathyphila* is re-examined, *M. cyclocarpa* should be treated as a valid species.

Another closely related species with circular gonads and similar musculature is *M. vitrea* (Sluiter, 1904). Thin, transverse body muscles are present, but they do not form as a dense network as in *M. translucidus* or in the present specimen and its musculature is intermediate between that of *M. cyclocarpa* and *M. translucidus*

Monniot and Monniot, 1991. However, *M. vitrea* differs in having numerous separate male openings, that do not form a common duct (see Monniot and Monniot, 1989b, figure 6).

Monniot and Monniot (1991) used differences in the structure of the anterior rows of stigmata of the branchial sac as a stable character separating different species of *Molguloides*. This feature, however, seems to be more variable than they thought and it is unreliable when used to distinguish the species from one another. For example, Sanamyan and Sanamyan (1999) reported spirals of type **B** (six rows) for *M. glans* Monniot, 1978, while according to Monniot and Monniot (1991) it has type **D** (eight rows). Nevertheless, the difference between types **B** and **D** (both in one species) is greater, than between type **C** (seven rows) reported for *M. translucidus* and type **E** (eight rows) reported for *M. cyclocarpa*.

In arrangement of body muscles the present specimen strongly resembles *Molguloides translucidus*. Other internal features are also similar, although in *M. translucidus* the gut loop and intestine seem to be a little shorter, the renal sac is in contact with the right gonad and male follicles are more numerous. These features do not appear to be significant species differences. The specimens of *M. translucidus* were recorded from relatively shallow waters 650–700 m, far from the locality of the present specimen, from New Caledonia. The differences could result from intraspecific variation in populations of a wide-ranging species.

All these facts suggest that *M. cyclocarpa* and *M. translucidus* are closely related and may be conspecific. The present record supports this opinion, although certain conclusions cannot be made without additional material. At this stage we are inclined to assign our specimen tentatively to *M. cyclocarpa*, rather than to *M. translucidus*, or a new species.

Fungulus perlucidus (Herdman, 1881)

Culeolus perlucidus Herdman, 1881: 86.
Fungulus perlucidus: Sanamyan and Sanamyan, 1999: 1870 (synonymy).

Material examined. St. 870, 4704–4680 m, three specimens; st. 916, 4664–5631 m, two specimens; st. 4109, 5225 m, three specimens.

Remarks. The general appearance and internal features of this species are stable, the present specimens are identical to those described in our previous paper (Sanamyan and Sanamyan, 1999).

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