

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER
CARIBBEAN ISLANDS, No. 117.

SERPULINAE (POLYCHAETA) FROM THE CARIBBEAN:
I - THE GENUS SPIROBRANCHUS

by

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After studying more than thousand *Spirobranchus* worms from Curaçao and other Caribbean Islands, and after comparison with the material from other tropical and subtropical regions, it appeared that in the West Indies 3 species and 1 variety of *Spirobranchus* could be recognized; viz:

Sp. giganteus giganteus: large (45–66 mm), more or less solitary; operculum with 2 or 3 antler-like horns; branchiae in a spiral.

Sp. tetraceros: smaller (30–40 mm), more or less gregarious; operculum as a rule with 3 groups of much branched horns, appearing as 6 or 8 distinct horns; branchiae not in a spiral.

Sp. polycerus: small (about 15 mm), usually forming colonies; operculum in general with 7 small horns, sometimes small secondary spines; branchiae in a spiral.

Sp. polycerus var. *augeneri* n. var.: small (about 14 mm), usually colonial; operculum with 2 ox-horn shaped horns, also a medio dorsal knob may be present; branchiae in a spiral.

The material studied was mainly collected by Dr. P. WAGENAAR HUMMELINCK (1930, 1948–49, 1955, 1963–64, 1967), when sampling a number of habitats in the tidal zone and below, to a depth of about 2 m. The material, as a rule, has been preserved with formaldehyde, and was, after a short period, transferred to alcohol. The specimens studied are mainly in the author's collection or in the Rijksmuseum van Natuurlijke Historie, Leiden (nrs. 04400–04429, 04431); small, but representative series are in the Zoological Musea of Amsterdam, Utrecht, Copenhagen, Hamburg and Jerusalem.

The author is deeply indebted to Dr. P. WAGENAAR HUMMELINCK (Rijksuniversiteit, Utrecht) on whose collections this work is based, and whose valuable suggestions and criticisms have contributed to its completion.

He wishes to express his thanks to Dr. GESA HARTMANN-SCHRÖDER (Zoologisches Museum, Hamburg: ZMH), Dr. G. HARTWICH (Zool. Museum, Berlin, D.D.R.: ZMB), Dr. J. B. KIRKEGAARD (Zoologiske Museum, København: ZMK), Dr. E. KIRSTEULER (American Museum Natural History: AMNH), Dr. H. STEINITZ (The Hebrew University of Jerusalem: HUJ), Dr. S. VAN DER SPOEL (Zoölogisch Museum, Amsterdam: ZMA) and Drs. J. VAN DER LAND (Rijksmuseum van Natuurlijke Historie, Leiden: RMNH) for the loan of specimens. Miss E. TAAT (Rijksuniversiteit, Utrecht) kindly read the greater part of the manuscript, pointing out various inaccuracies regarding English orthography and grammar; the author is to blame for remaining faults.

Drawings of opercula and tubes were made by using a screen in one ocular of the stereo-microscope and screened paper.

In order to make drawings of setae and uncini it was necessary to separate them. This was achieved by putting a tuft of setae or a row of uncini in a few drops of KOH 10% for 12–24 h. Afterwards the setae or uncini could easily be squashed apart in glycerine-gelatin. Drawings were made by using a drawing-prism. Measurements in mm. Opercula in apical view with dorsal side upwards.

KEY TO CARIBBEAN SPIROBRANCHUS

1. Branchial filaments not in a spiral; wings of peduncle small, generally fringed; operculum with 3 groups of very branched horns; gregarious *Sp. tetraceros*
- 1a. Branchial filaments in a spiral; wings of peduncle large, not fringed 2
2. Operculum having 2 or 3 large usually branched horns; solitary *Sp. giganteus giganteus*
- 2a. Operculum having 2 or 3 small conical horns; colonial *Sp. polycerus* var. *augeneri*

2b. Operculum usually having 7 small horns, the 4 latero-ventral ones often with secondary spines; colonial . . . *Sp. polycerus*

Spirobranchus tetraceros (Schmarda, 1861)

- "Deckel... mit 6 stachelichten Hörnern bewafnet... in einer Ostindischen Schnecken-Röhre" ABILDGAARD, 1789, p. 143, fig. 6. [Fig. of operculum.]
Pomatoceros tetraceros SCHMARDA, 1861, p. 30, pl. 21 fig. 179. ["Neu-Süd-Wales". – Very short description. – Fide AUGENER 1914, p. 148–150.]
Pomatoceros tetraceros: GRUBE, 1862, p. 66. [Name only.]
Serpula (Pomatoceros) multicornis GRUBE, 1862, p. 67, fig. 3. ["Rothen Meer". – Very short descr.; fig. of operculum with fringed wing.]
Galeolaria ? tetracerus (Schmarda) MÖRCH, 1863, p. 371. [No new data.]
Spirobranchus semperi MÖRCH, 1863, p. 405–406, fig. 24–25. ["Hab. ad ins. philippin., legit cl. Carolus Semper; exstat in collectione fratris Altonae". – Diagnosis; fig. of operculum.]
Spirobranchus dendropoma MÖRCH, 1863, p. 406–407. ["Hab. in oceano americano ad ins. St. Thomae. (A. Dietz) A. H. Riise". – Diagnosis.]
Vermilia tetraceros (Schmarda) QUATREFAGES, 1865, p. 520. [Diagn. of Schmarda.]
Cymospira Semperi (Mörcb.) QUATREFAGES, 1865, p. 545. ["Hab. les îles Philippines". – Diagn. of Mörcb.]
Cymospira litigera QUATREFAGES, 1865, p. 545. [Diagn. of Mörcb's *Sp. dendropoma*, new name only.]
Serpula (Pomatoceros) multicornis: GRUBE, 1868, p. 639–640. [Red Sea. – Descr.]
Serpula (Pomatoceros) multicornis: GRUBE, 1870, p. 519. [Red Sea. – Descr.]
Serpula tricornigera GRUBE, 1878, p. 273–275, pl. 15 fig. 7. ["Von den Philippinen (Pandanom)". – Extensive description; fig. of operculum.]
Serpula quadricornis GRUBE, 1878, p. 275–276, pl. 15 fig. 6. ["Von den Philippinen (Ubay)". – Ext. descr.; fig. of operc.]
Serpula (Pomatoceros) tricornis GRUBE, 1881, p. 115–116. [Manila. – Descr.; see Discussion.]
Pomatoceros elaphus HASWELL, 1885, p. 663–665, pl. 31 fig. 7, pl. 32 fig. 9–10. [Port Jackson, Sydney. – Descr.; fig. of operc., wings and branchiae.]
Spirobranchus dendropoma: BENEDICT, 1886 (1887?), p. 553, pl. 24 fig. 57–58, pl. 25 fig. 50–56. [St. Thomas, Jamaica, Curaçao. – Fig. of e.g. operc.]
Spirobranchus semperi: EHRLERS, 1897, p. 176. [Zanzibar. – Name only.]
Pomatoceropsis Coutierei GRAVIER, 1905, p. 445–448. [Djibouti and Gulf of Aden localities. – Ext. descr.]
??*Spirobranchus cervicornis* WILLEY, 1905, p. 317–318, pl. 7 fig. 188–192. [Ceylon. – See discussion of *Sp. giganteus*.]
Spirobranchus semperi: WILLEY, 1905, p. 318. [Ceylon. – Few characteristics.]
Spirobranchus semperi var. *acroceros* WILLEY, 1905, p. 318, pl. 7 fig. 193. [Ceylon. – Few charact., fig. of operc.]
Spirobranchus tricornigerus (Grube) WILLEY, 1905, p. 318. [Ceylon. – Short descr.]
Pomatoceropsis Coutierei: GRAVIER, 1906, pl. 8 fig. 294–299; 1908, p. 125–130, fig. 482–487. [Gulf of Aden. – Descr. same as GRAVIER 1905; in 1908 *Contierei* in errore; fig. of e.g. operc.]

- ?*Pomatoceropsis Jousseaumei* GRAVIER, 1906, pl. 8 fig. 292–293; 1908, p. 130–132, fig. 488–491. [Djibouti and Perim. – Ext. descr., fig. of e.g. operc.]
- ?*Pomatoceros tricornigera* (Grube) MALAQUIN & DEHORNE, 1907, p. 371. [Bay of Amboina. – Name only.]
- Spirobranchus multicornis* (Grube) FAUVEL, 1911, p. 430–433. [Bahrein and other Iranian Gulf localities. – Descr.]
- Spirobranchus Semperi*: AUGENER, 1913, p. 300–302. [Sharks Bay, Australia. – Ext. descr., synonymy.]
- Spirobranchus semperi*: PIXELL, 1913, p. 82. [Zanzibar, Red Sea. – Very short diagn., material partly studied.]
- Spirobranchus semperi* var. *aceros*: PIXELL, 1913, p. 82–83. [Red Sea, Zanzibar, Maldives Islands. – Descr., material partly studied.]
- Spirobranchus semperi* var. *aceros*: PIXELL, 1913, p. 83. [Amirante Islands. – Diagn.]
- Spirobranchus contieri* [= *coutierei*] (Gravier) PIXELL, 1913, p. 83–84, pl. 9 fig. 8. [Zanzibar, Red Sea, Suez. – Fig. of uncini, material partly studied.]
- Spirobranchus Semperi*: AUGENER, 1914, p. 148–152. [Same as above, more synonyms.]
- Spirobranchus tetraceros* (Schmarda) JOHANSSON, 1918, p. 7–10, fig. 2. [Cap Jaubert Australia. – Fig. of e.g. operc. Ext. descr. and synonymy.]
- ?*Spirabranicus* [sic] *spinosus* MOORE, 1923, p. 248–250, pl. 18 fig. 47. [Santa Barbara Island, Calif. – Fig. of uncinus. Very doubtful, referring to *Pom. quadricornis*, perhaps some type as *Sp. incrassatus*?]
- Spirobranchus dendropoma*: AUGENER, 1927b, p. 77–78. [Curaçao. – Material studied.]
- Spirobranchus jousseaumi* [sic] (Gravier) POTTS, 1928, p. 701. [Suez. – Name only.]
- Spirobranchus giganteus*: FAUVEL, 1930b, p. 66. [Gulf of Manaar, India. – Few charact.]
- p.p.*Spirobranchus giganteus*: FAUVEL, 1932, p. 244. [Iranian Gulf and Indian Ocean localities. – According to the characteristics given only part of the material belongs to *Sp. giganteus*, the other part belongs to *Sp. tetraceros*.]
- ?*Spirobranchus jousseaumei*: FAUVEL, 1932, p. 244–245. [Palan Biddang. – Short descr.]
- Spirobranchus giganteus*: FAUVEL, 1933a, p. 78–79. [Gulf of Suez, Gulf of Eilath. – Giving synonyms of *Sp. tetraceros*, and charact. which obviously refer to the same species and not to *Sp. giganteus*.]
- Spirobranchus giganteus*: FAUVEL, 1933b, p. 143. [Same as above.]
- Spirobranchus giganteus*: FAUVEL, 1933c, p. 62. [Chan-Hai-Koan. – Few charact.]
- Spirobranchus contieri* [= *coutierei*]: MONRO, 1933b (1934?), p. 1080–1081, fig. 24. [Colón. – Some charact., fig. of branchiae, material studied.]
- Spirobranchus giganteus*: MONRO, 1937, p. 317. [S. Arabia. – Few charact., material studied.]
- Spirobranchus giganteus* var. *arabica* MONRO, 1937, p. 317, fig. 28. [S. Arabia. – Fig. of operculum, material studied.]
- ?*Spirobranchus giganteus*: TAKAHASI, 1938, p. 213–215, fig. 15. [Izu Peninsula near Tokyo. – Fig. of e.g. operculum. Doubtful, not *Sp. giganteus*.]
- p.p.*Spirobranchus giganteus*: MESNIL & FAUVEL, 1939, p. 33–34. [Several islands from E. Indonesia. – Characteristics of *Sp. giganteus* and *Sp. tetraceros*.]
- Spirobranchus Jousseaumei*: MESNIL & FAUVEL, 1939, p. 34. [Banda Sea, 4892 m deep. – Material studied, peduncle with wings in contrary to charact. given.]

- Spirobranchus semperi*: WESENBERG-LUND, 1949, p. 359, fig. 47b. [Iranian Gulf. – Material studied.]
- Spirobranchus semperi* var. *acroceros*: WESENBERG-LUND, 1949, p. 359–360, fig. 47c. [Iranian Gulf. – Material studied.]
- Spirobranchus semperi* var. *papillosum* WESENBERG-LUND, 1949, p. 361, fig. 47a. [Iranian Gulf. – Material studied.]
- ?*Spirobranchus giganteus*: DAY, 1951, p. 65. [South Africa. – Name only.]
- ?*Spirobranchus giganteus*: FAUVEL, 1951, p. 638. [Djibouti. – Name only.]
- ?p.p.*Spirobranchus giganteus*: FAUVEL, 1953a, p. 19. [Martinique, Fort-de-France. – Name only.]
- Spirobranchus jousseaumei*: FAUVEL, 1953b, p. 464. [Palan Biddang. – Charact.]
- p.p.*Spirobranchus giganteus*: DEW, 1959, p. 45–46, fig. 17. [Several localities in Australia. – Of the 4 specimens studied, 2 belonged to *Sp. giganteus corniculatus*.]
- p.p.*Spirobranchus giganteus*: RIOJA, 1959, p. 296–297. [Veracruz, México. – In part.]
- Spirobranchus semperi*: PILLAI, 1960, p. 17–18, fig. 6 E–I. [Pearl Banks, Ceylon. – Descr., material partly studied.]
- Spirobranchus semperi* var. *acroceros*: PILLAI, 1960, p. 18–20, fig. 7 A–C. [Pearl Banks, Ceylon. – Charact., material studied.]
- Spirobranchus tricornigerus*: PILLAI, 1960, p. 20, fig. 7 D–G. [Pearl Banks, Ceylon. – Descr., material partly studied.]
- Spirobranchus ceylonensis* PILLAI, 1960, p. 20–21, fig. 7 H–K. [Pearl Banks, Ceylon. – Descr. Since in my material of *Sp. polycerus* var. *augeneri* a similar operculum also is present, I believe that this is only an individual diminishing of horns, cumulating in a hornless specimen. Holotype (BMNH) in very poor condition.]
- Conopomatus acuiconus* PILLAI, 1960, p. 21–23, fig. 8 A–E. [Pearl Banks, Ceylon. – Descr. See Discussion and Remarks, material studied.]
- Conopomatus sectoconus* PILLAI, 1960, p. 23, fig. 8 F–I. [Pearl Banks, Ceylon. – Descr. See Discussion and Remarks, material studied.]
- ?*Spirobranchus giganteus*: IMAJIMA & HARTMAN, 1964, p. 373. [Japan. – Short descr.]
- Spirobranchus tetracerus*: DAY, 1967, p. 803–804, fig. 38.3.1–n. [Mocambique, Madagascar. – Short descr.]

CURAÇAO. – SPAANSE WATER, from *Porites porites*, 4.IV., 13.IV., 14.IV., 19.IV. & 5.V.1920, C. J. van der Horst coll. (28 specimens); from sponges on mangrove roots, 8.IV.1920, v. d. Horst (2 spec.); 6.IV. & 25.V.1920, v. d. Horst (20 spec.); 1920, on mangroves, v. d. Horst (2 spec.). – SCHOTTEGAT, 22.IX.1905, J. Boeke coll. (1 spec.). All specimens described by AUGENER 1927b, sub *Spirobranchus dendropoma* (ZMA, V. Pol. 1341, 1342; ZMH, V. 10339). – SPAANSE BAAI, sandy beach, on *Rhizophora*, abt. 1 m deep, 21.IV.1949, Sta. 1037A (10 spec.). – SPAANSE WATER, New Haven, on *Rhizophora*, abt. 1 m deep, 10.IV.1949, Sta. 1036A (1 spec.); shore of N. peninsula (Jan Zoutvlat), 1–2 m, 5.X.1968, s.n. (many specimens). – CURAÇAO, Hentschell coll. (1 spec., ZMH, V. 9716, sub *Sp. dendropoma*, AUGENER det.).

grenada. – S. coast, 8. VII. 1967, Sta. 1551A (2 spec.).

HISPANIOLA. – PORT-AU-PRINCE (4 spec., ZMH, V. 2883, sub *Sp. dendropoma*, AUGENER det.)

IRANIAN GULF. – 4 mi. ENE from BAHREIN Light-ship, on dead mussel shell, 20.III.1938, B. Løppenthin coll., Sta. 87 (14 spec.); 21 mi. NE from BAHREIN, 33 m

deep, on dead shells, 30.III.1937, G. Thorson coll., Sta. 42C (6 spec.). All specimens ZMK, described by E. WESENBERG - LUND 1949 sub *Sp. semperi*; a single specimen from first sample as var. *papillosum*, another specimen as var. *acroceros*.

BANDA SEA. - 3°32'5" S. Lat., 124°15'5" E. Long., from uncertain depth, 19.IX. 1899, Siboga Exp. Sta. 203 (1 spec.). Described by MESNIL & FAUVEL 1939 sub *Sp. Jousseaumei* (ZMA, V. Pol. 1794).

PHILIPPINES. - MANILA, Dr. F. Jagor coll., A. E. GRUBE det. (1 spec., sub *Serpula (Pomatoceros) tricornis* type, ZMB nr. 871).

Tube: The tubes from the Bahrein specimens have a rather prominent serrated ridge, which terminates in a median tooth-like projection over the entrance of the tube (Fig. 1-2). The tubes are reddish, attached to a mussel-shell, more or less triangular in cross-section, or (Sta. 42C) forming a cluster winding round each other.

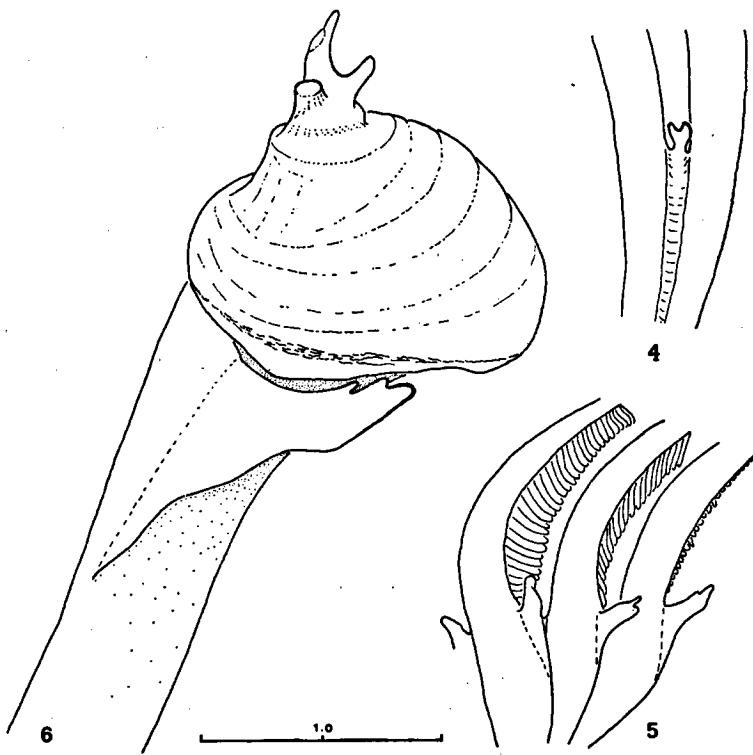
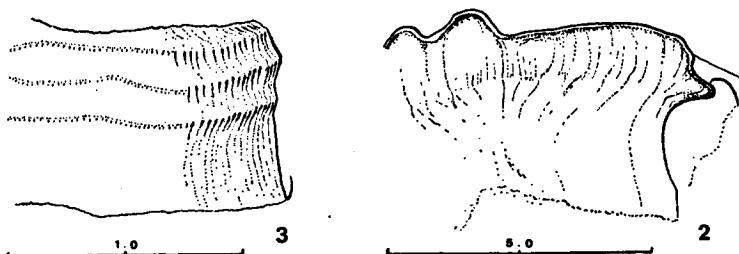
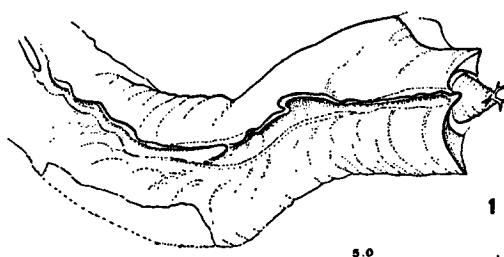
In the Curaçao specimens no colour had been preserved (acc. to AUGENER 1927b, p. 77-78 the inner side of the tube is blue, a feature also known from other *Spirobranchus* species). The ridge is far less prominent and on either side there is a very faint secondary ridge; also growth-lines are present (Fig. 3). The tubes are less attached to the substrate and more rounded on cross-section; sometimes the terminal end of the tube is free and circular.

Branchiae: Having but one turn, rather more in a ring than in a spiral. Branchial membrane $\frac{1}{2}$ - $\frac{2}{3}$ filamental length; usually bearing processes between the filaments (Fig. 4-5).

Peduncle: Broad and winged, inserted on the left half of the branchial crown. The wings in general showing a fringed or lobed edge (Fig. 23-25); wings usually triangular, distally sharply pointed and smaller than in other species of the genus.

Operculum: White, variable, usually with a circular, calcareous basal plate, which may be flat, concave, convex or even conical; this plate bears on its surface 3 groups dichotomously branched spines, sometimes only 3 spines are present, especially in the forms with a conical operculum. The position of the spines is always the same: 1 or 1 group medio-ventrally and 2 or 2 groups

Fig. 1-6. *Spirobranchus tetraceros*. — 1-2. Tube of specimen from BAHREIN (Sta. 87). — 1, with a conical operculum; 2, with an operculum resembling Fig. 7. — 3. Tube from CURAÇAO (Spaanse Water). — 4-6. Specimen from CURAÇAO (Spaanse Water): 4-5, branchial membrane with bilobed processes between the filaments; 6, more or less conical operculum.



latero-dorsally (see Figs.) The most common form (given in Fig. 7-8, 25-26) appears to have 6 or 8 spines.

The basal plate measures along the dorso-ventral line 0.5-3 mm, usually abt. 2 mm.

Collar: Usually well developed, appears to be trilobed, with two smaller lateral, and one single larger ventral lobe which is sometimes medially pointed. There are two tonguelets between the lateral and ventral collar flap. Collar setae of two types as is normal in the genus: (1) simple, more or less limbate, striate setae (Fig. 9); (2) bayonet-like setae, with numerous hair-like processes on its basic portion, about 3/2 as thick as (1) (Fig. 10: "Spirobranchus setae").

Thorax: Seven setigerous segments; the six remaining have simple limbate setae, striate, giving the limba a very finely serrated appearance (Fig. 11). The thoracic uncini are 60-80 μ , subtriangular, with 9-13 curved teeth of which the most anterior is stouter and hollowed out at end: "gouged" tooth (Fig. 13).

The uncinigerous tori of the thorax are widely separated in front, gradually approaching one another towards the end, thus leaving a triangular depression.

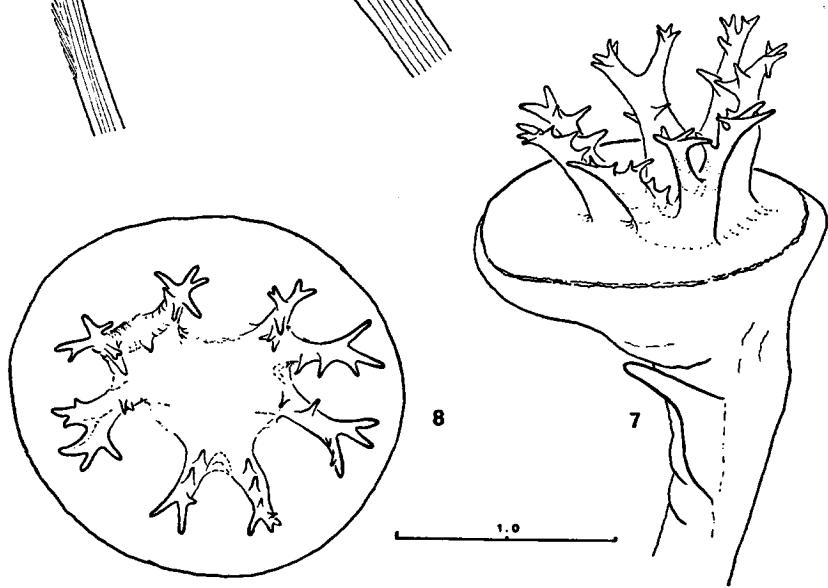
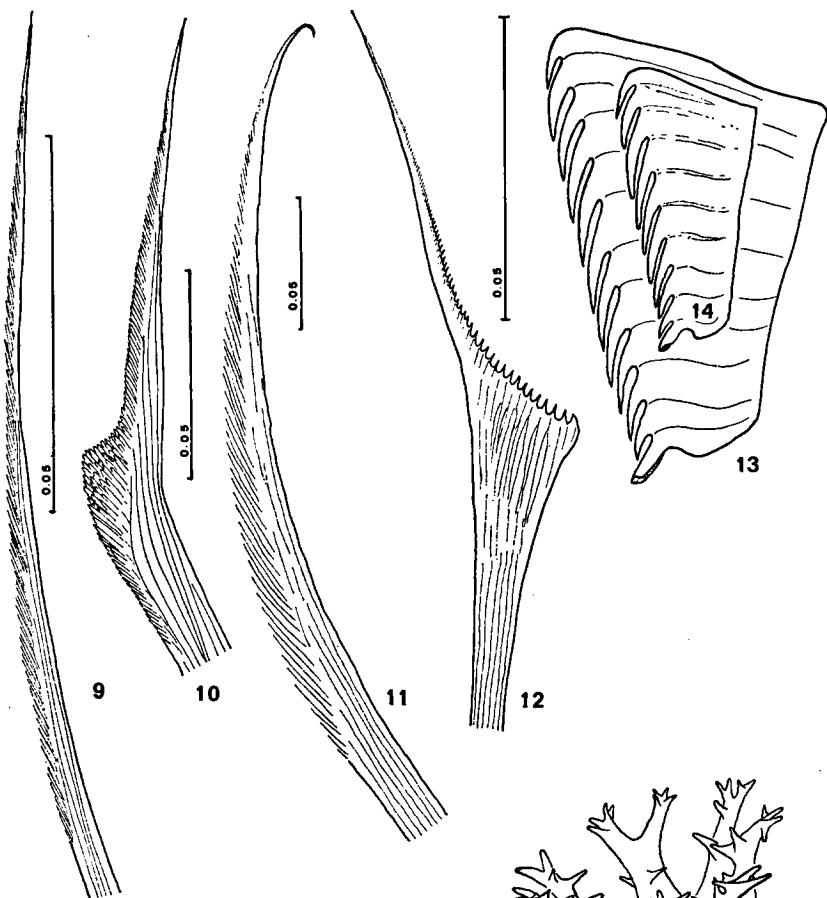
Thoracic membrane forming an "apron" across the mid-ventral line.

Abdomen: Segments variable in number, a specimen of ca 11 mm in total length has about 50 abdominal segments, a specimen of ca 19 mm has about 100, while a specimen of ca 50 mm has about 120.

Setae compressed trumpet-shaped, prolonged towards one side. Free border denticulate (Fig. 12). Uncini similar to those of thorax, but smaller and with less teeth (7-10, Fig. 14).

Total length of animal incl. operculum from 6-55 mm, in general 30-40 mm; breadth of thorax 0.5-3 mm, in general 1.5-2.5 mm.

Fig. 7-14. *Spirobranchus tetraceros*. — From CURAÇAO (Spaanse Baai, Sta. 1037A); all figures from one specimen with a common form of operculum. 7-8, Operculum in side view and in apical view; 9-10, setae from first thoracic setiger; 11-12, thoracic and abdominal seta; 13-14, thoracic and abdominal uncinius.



Comparable figures of setae and uncini and operculum of a specimen with a conical operculum are given in Fig. 15–22.

DISCUSSION

FAUVEL (1923, 1932 and 1933), RIOJA, and others, treat this species merely as a synonym of *Sp. giganteus*. In my opinion this species is clearly different because:

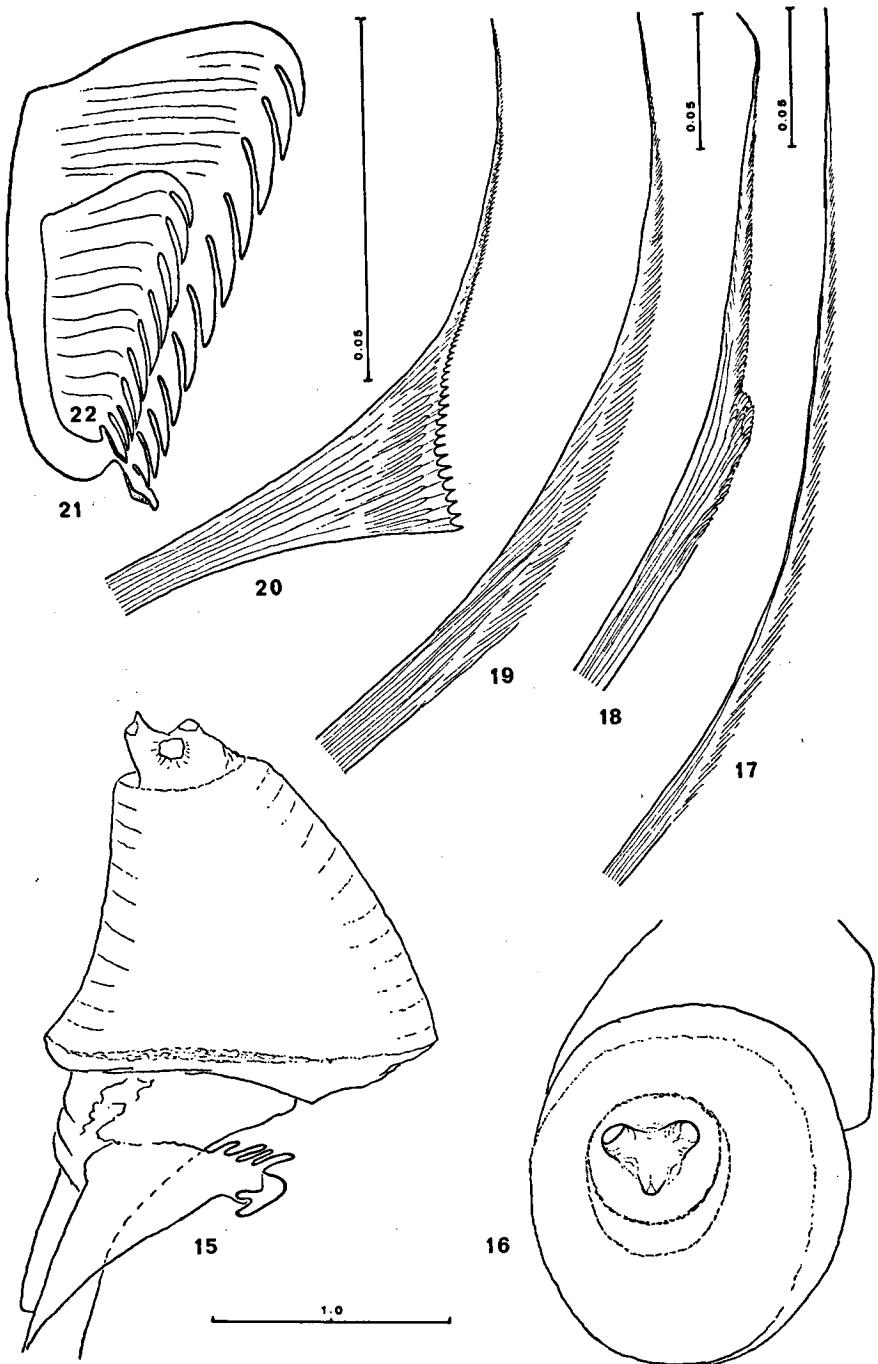
- a) the branchiae are not spirally engaged;
- b) the opercular wings are generally smaller, and fringed;
- c) the branchial membrane usually bears processes between the filaments;
- d) the composition of the opercular spines, which are generally also of a much more delicate structure;
- e) this is a smaller form.

Furthermore sexual products were present in the tubes and between thoracic membrane and body of the specimens from Curaçao (Sp. Water, 25.V.1920), which means that this species cannot be a young form of *Sp. giganteus* as is supposed by some authors.

As regards the processes of the branchial membrane – also described by MONRO 1933b (p. 1080–1081, fig. 24), GRAVIER 1906 (pl. 8 fig. 294) and FAUVEL 1911 (p. 430) – I agree with PIXELL 1913 (p. 83–84, sub *Sp. contieri*) that these are between the filaments and not – as is stated by BENEDICT 1886 (1887?; p. 553, fig. 50, sub *Sp. dendropoma*) – on the base of the filaments.

In my opinion *Sp. semperi* var. *acroceros* WILLEY 1905 (p. 318, pl. 7 fig. 193) – also mentioned by PIXELL 1913, WESENBERG-LUND 1949, PILLAI 1960 – is not a separate variety since too many specimens in the Curaçao material have opercula which are intermediate between this form and the typical form (see Fig. 6 and 30). Specimens with conical opercula are also mentioned by GRAVIER 1906–08 (sub *Pomatoceropsis Coutierei*), FAUVEL 1911 (sub *Sp. multicornis*), AUGENER 1913, 1914 (sub *Sp. Semperi*), AUGENER 1927b (sub *Sp.*

Fig. 15–22. *Spirobranchus tetraceros*. — From BAHREIN (Sta. 87); all figures from one specimen with a conical operculum. 15–16, Operculum with three broken horns in side view and in apical view; 17–18, setae from first thoracic setiger; 19–20, thoracic and abdominal seta; 21–22, thoracic and abdominal uncinius.



dendropoma), FAUVEL 1933a, 1933b and RIOJA 1958 (both sub *Sp. giganteus*).

Also it is stated by WESENBERG-LUND 1949 (p. 360) that there is no difference in the tubes of the typical and *acroceros*-forms from Sta. 87. I could find neither any differences in tubes of typical and *acroceros*-forms from Sta. 42C and from Curaçao, Sp. Water, nor in the setae and uncini (Fig. 17-22).

Since the only difference between *Spirobranchus* Blainville and *Conopomatus* Pillai can be found in the form of the operculum, and – as stated above – conical opercula are not unusual in *Sp. tetraceros*, I believe that *Conopomatus* is only a synonym of *Spirobranchus*; the more since among the ca 300 specimens of typical *Sp. polycerus* studied one specimen with a conical operculum, superimposed on a normal one, has been found (Fig. 123, see also p. 48-49).

As regards the *Sp. semperi* var. *papillosus* WESENBERG-LUND 1949 (p. 361, fig. 47a), in my opinion the claviform papillae do not belong to the operculum but are of vegetable origin.

The specimen from the Banda Sea described by MESNIL & FAUVEL 1939 (p. 34) does have small wings on its peduncle, therefore it is only a *Sp. tetraceros*.

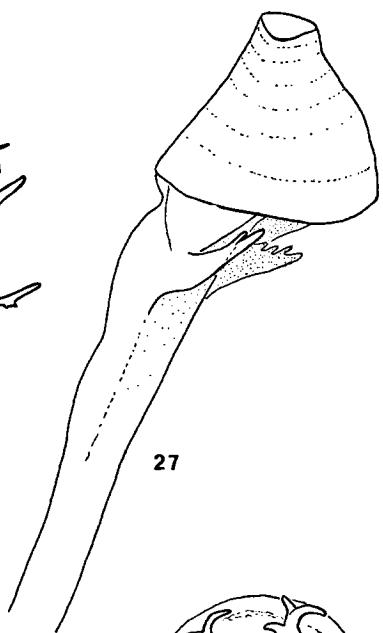
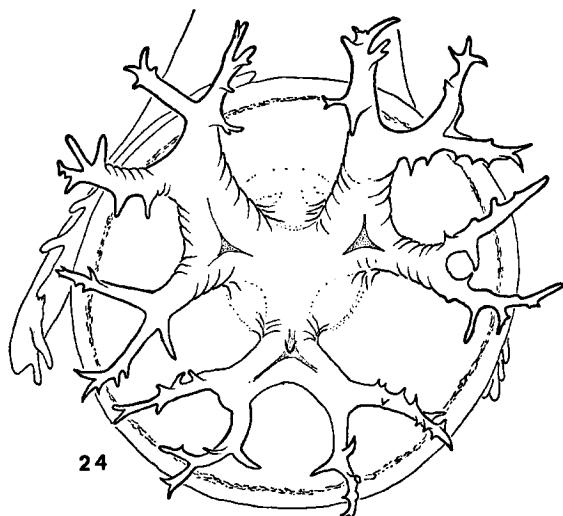
Reexamination of the type of *Serpula (Pomatoceros) tricornis* Grube, 1881, showed that this specimen had all the characters of *Spirobranchus tetraceros* as given above (sub a)-e)), including "Spirobranchus-setae". Its operculum is like Fig. 23-24, with a medioventral horn, which has a longer shaft.

A few more opercula are given in Fig. 27-29, 31-34; Figs. 31-32 and 33-34 of specimens with only 40 and 18 abdominal segments respectively.

DISTRIBUTION

Caribbean Sea, Tropical Pacific Coast of America, Malaysian Archipel, Indian Ocean (Red Sea and Iranian Gulf): all these locali-

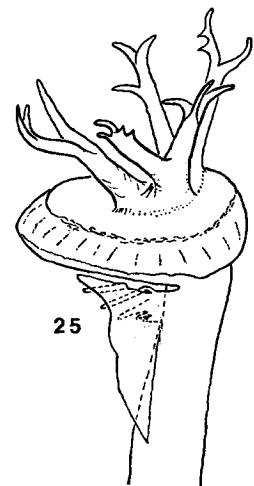
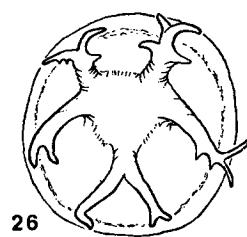
Fig. 23-27. *Spirobranchus tetraceros*. — From BAHREIN (Sta. 87; 23-26) and from CURAÇAO (Spaanse Water; 27). 23, 25, Opercula in side view; 24, 26, same in apical view. 27, Conical operculum without horns in side view. — Although the basic pattern is the same, the horns of Fig. 25-26 (the commoner form) are much simpler as those of Fig. 23-24.



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ties between the Tropics of Cancer and of Capricorn. — This species is also found in: Natal, Sydney, Japan and probably the Gulf of Catalina (Calif.). Except the last one, these localities are all influenced by warm ocean currents. Remarkable is the absence — as far as yet known — on the West Coast of Africa and the Mid-Pacific Islands.

Spirobranchus giganteus (Pallas, 1766) Blainville, 1818

This magnificent worm has caused much confusion, because of the variability of the operculum. However, a thorough survey of literature shows that the opercula of *Sp. giganteus* from Red Sea to central Pacific are much simpler than the opercula of specimens from tropical and subtropical coasts of America. Therefore it is suggested to distinguish between:

Spirobranchus giganteus giganteus (Pallas, 1766), and
Spirobranchus giganteus corniculatus (Grube, 1862) nov. comb.

Spirobranchus giganteus giganteus (Pallas, 1766)

"Penicillum marinum, ex Indiis Orientalibus". SEBA, 1758, p. 39, tab. 16 fig. 7a–b.
 [Already MÖRCH, p. 403, doubted the correctness of locality; according to the figs. this is indeed a Caribbean specimen.]

Serpula gigantea PALLAS, 1766, p. 139–145, pl. 10 fig. 2–10. [Mentions material from the West Indies, Antigua, St. Thomas and Curaçao. — Descr.]

"species of Actinia called in Barbadoes the Animal Flower...." HOME, 1785, p. 333–339, HUNTER, 1785, p. 340–345, pl. 11. [Barbados (HOME), St. Vincent (HUNTER). — Descr. and figs.]

Terebella bicornis ABILDGAARD, 1789, p. 142 (138–144), pl. 3 fig. 4. ["Westindien, St. Kreuz". — Descr.]

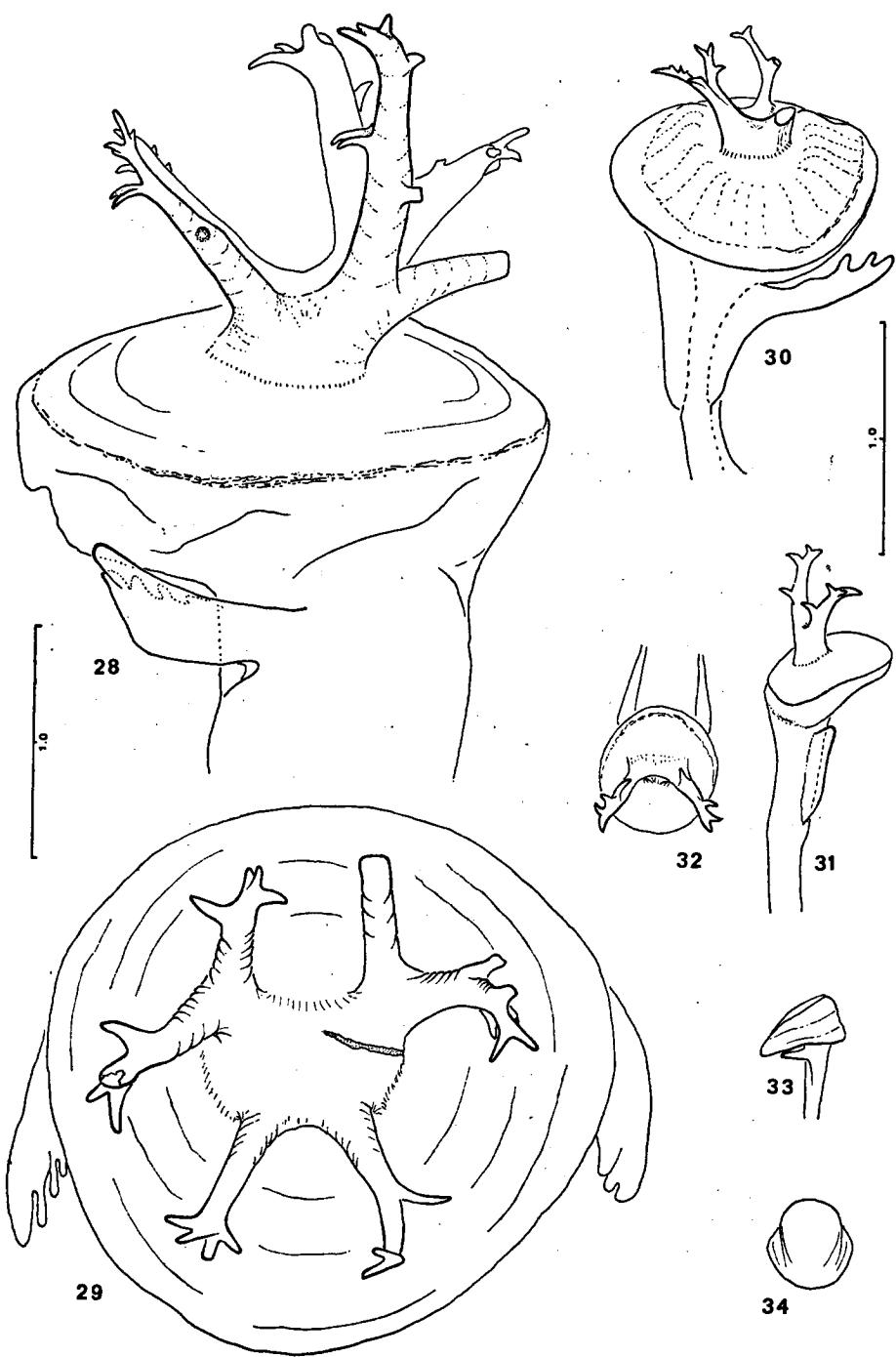
Terebella bicornis: GMELIN, 1791, p. 3114. [Name only.]

Serpula gigantea: GMELIN, 1791, p. 3747. [Name only.]

Serpula gigantea: BLUMENBACH, 1810, pl. 17 and text. [Copy of HOME 1785.]

"new species of actinia, or animal flower, from Barbadoes". HOME, 1814, II, pl. 1. [Figures with explanation.]

Fig. 28–34. *Spirobranchus tetraceros*. — From CURAÇAO (Spaanse Water; 30, and Spaanse Baai, Sta. 1037A; 31–32) and from BAHREIN (Sta. 87; 28–29 and 33–34). 28–29, Operculum in side view and apical view; 30, slightly conical operculum in apico-dorsal view (right dorsal horn broken); 31–34, opercula of juvenile specimens in side view (31, 33), apical view (32) and apico-ventral view (34).



- Serpula gigantea*: OKEN, 1815, p. 382, pl. 2. [No new data.]
- Spirobranche* BLAINVILLE, 1818, p. 79. [“SPIROBRANCHE (Bv.) . . . Ce genre est établi avec le *S. gigantea* de Linné.”]
- Serpula gigantea*: SAVIGNY, 1820, p. 74–75. [“Espèce des Antilles, qui vit sur les madrépores . . .”] Also in *Isis* (OKEN) 1832, p. 951.
- Serpula bicornis* (Abildgaard) SAVIGNY, 1820, p. 75. [“Espèce des mers de l’Amérique, décrite et figurée par Abildgaard . . .”] Also in *Isis* (OKEN) 1832, p. 951.
- Cymospira gigantea* (Pallas) BLAINVILLE, 1828, p. 431. [Name only.]
- Cymospira bicornis* (Abildgaard) BLAINVILLE, 1828, p. 431. [Name only.]
- Serpula gigantea*: CUVIER, 1830, p. 191. [Name only, sub *Galeolaires*.]
- Serpula (Galeolaria) gigantea*: VOIGT, 1836, p. 13. [New subgenus *Galeolaria* = *Galeolaires* Lam., CUVIER, 1830, p. 191.]
- Serpula gigantea*: MILNE EDWARDS, 1836?, p. 21. [No new data.]
- Serpula bicornis*: GUÉRIN-MÉNEVILLE, 1829–43, 1, p. 6; 2, pl. 1 fig. 4. [“opercule de *Serpula bicornis* Cuv. abildg.” and fig. of it.]
- Serpula gigantea*: PHILIPPI, 1844, p. 189. [Name only.]
- Serpula bicornis*: Savigny, VAN DER HOEVEN, 1849, p. xxi, pl. 6 fig. 4. [Only figs.]
- Serpula gigantea*: GRUBE, 1850, p. 338. [Name only.]
- Serpula gigantea*: GRUBE, 1858, p. 120. [Puntarenas, St. Croix. – Name only.]
- Cymospira gigantea*: SCHMARDHA, 1861, p. 31, pl. 21 fig. 180. [S. Jamaica. – Descr.]
- Serpula (Pomatoceros) gigantea*: GRUBE, 1862, p. 66. [“aus dem Antillenmeer”. – Few characteristics.]
- Spirobranchus giganteus* (Pallas) Blainville, MÖRCH, 1863, p. 402–404, fig. 18–20. [Mentions following localities: Antigua, La Guayra, St. Thomas, Barbados, Jamaica, St. Crucis. – Var. A, Puerto Cabello. – Var. B. *tricornis*, W. I., Puerto Cabello. – Var. C. *microceras*, Antilles? (“Vestindiske Hav?”); see Fig. 56.]
- Spirobranchus incrassatus* (Kreyer M. S.) MÖRCH, 1863, p. 405, fig. 21–23. [“Hab. in oceano pacifico ad Columbiam occidentalem in Margaritifera sp. affixus, Mus. Cuming. Puntarenas (Ørsted) H. Krøyer.”; see descr. of the latter material in discussion, Fig. 46–47.]
- ?*Cymospira megasoma* QUATREFAGES, 1865, p. 541–542. [“le Brésil”. – Descr.]
- ?*Cymospira rubus* QUATREFAGES, 1865, p. 542–543. [“Bahia” Bras. – Descr.]
- Cymospira gigantea*: QUATREFAGES, 1865, p. 543–544. [“Les Antilles”. – No new data.]
- Cymospira cervina* QUATREFAGES, 1865, p. 544. [Nom. nov. for *C. gigantea* (Pallas) Blainville, SCHMARDHA, 1861.]
- Cymospira bicornis*: QUATREFAGES, 1865, p. 544–545. [“Les Antilles”. – Nomencl. remarks.]
- Cymospira incrassata* (Krøyer, Mörch) QUATREFAGES, 1865, p. 545–546. [“l’Océan Pacifique”. – Diagn. of MÖRCH.]
- Spirobranchus giganteus*: BENEDICT, 1886 (1887?), p. 551–552, pl. 13–14 fig. 38–47. [St. Thomas, Curaçao. – Descr.; figs. of operculum, tube, setae and uncini.]
- Spirobranchus incrassatus*: BENEDICT, 1886 (1887?), p. 552–553, pl. 13–14 fig. 48–49. [Vera Cruz, Méx. – Descr., figs. of operculum.]
- Spirobranchus giganteus*: EHLLERS, 1887, p. 286–292, pl. 57 fig. 1–7. [Florida. – Ext. descr.]
- Spirobranchus tricornis* EHLLERS, 1887, p. 292–294, pl. 57 fig. 8–15. [East Key, Tortugas. – Ext. descr. Same as *Sp. giganteus* var. *tricornis* MÖRCH.]

- Spirobranchus incrassatus*: EHLLERS, 1887, p. 294–295, pl. 57 fig. 16, pl. 58 fig. 1–5.
[Acapulco, Méx. – Ext. descr.]
- Spirobranchus incrassatus*: BUSH, 1904, p. 236, pl. 34 fig. 24, pl. 37 fig. 25, 34. [Gulf of California. – Short descr.]
- Spirobranchus pseudoincrassatus* BUSH, 1904, p. 236. [Nov. nom. *Sp. incrassatus* BENEDICT 1886 (1887?).]
- Spirobranchus tricornis*: CHAMBERLIN, 1919, p. 481. [Panamá. – Descr.]
- ?*Spirabbranchus* [sic] *spinosis* MOORE, 1923, p. 248–250, pl. 18 fig. 47. [Santa Barbara Island, California. – Described in having spiralled branchiae, referring to *Pom. quadricornis*. Doubtful, see discussion.]
- Spirobranchus giganteus*: MULLIN, 1923, p. 47–48, pl. 6 fig. 6–8. [Jamaica, Antigua, Florida. – Descr.]
- Spirobranchus tricornis*: TREADWELL, 1924, p. 22. [West Indies. – Name only.]
- Spirobranchus giganteus*: TREADWELL, 1924, p. 22. [Antigua. – Name only.]
- Spirobranchus giganteus*: AUGENER, 1925, p. 15. [St. Croix. – Name only.]
- "*Spirobranchus Krøyeri* Mörch" AUGENER, 1925, p. 18. ["Puntarenas, Pazifisch Costarica". – Descr. of operculum of *Cymospira gigantea* from the Mörch collection; see Fig. 46–47. Incorrect name for *Sp. incrassatus*?]
- p.p.*Spirobranchus giganteus*: AUGENER, 1927b, p. 76–77. [Curaçao. – Part of the material belongs to *Sp. polycerus* var. *augeneri* n. var.]
- Spirobranchus tricornis*: BENHAM, 1927, p. 154–155, pl. 5 fig. 185–188. [South Trinidad. – Descr., material studied.]
- Spirobranchus giganteus*: MONRO, 1933a, p. 268. [Dry Tortugas. – Material studied.]
- Spirobranchus giganteus*: MONRO, 1933b, p. 1080. [Gulf of Panamá, Galápagos Islands. – Few charact., material studied.]
- Spirobranchus incrassatus*: RIOJA, 1941, p. 738. [Acapulco, Méx. – Name only.]
- Spirobranchus incrassatus*: STEINBECK & RICKETTS, 1941, p. 367–369. [Cape San Lucas, S. Californian Gulf. – Name only.]
- Spirobranchus tricornis*: TREADWELL, 1941, p. 29. [Haiti. – Name only.]
- Spirobranchus incrassatus*: RIOJA, 1942, p. 132–133. [Acapulco, Méx. – Descr. of juv. specimens.]
- Spirobranchus tricornis*: HARTMAN, 1944, p. 25. [Trinidad. – Name only.]
- Spirobranchus incrassatus*: RIOJA, 1947, p. 216. [Bahía de Topolobampo, W. Méx. – Name only.]
- ?p.p.*Spirobranchus giganteus*: FAUVEL, 1953a, p. 19. [Martinique, Fort-de-France. – Name only.]
- Spirobranchus tricornis*: CARPENTER, 1956, p. 108. [Franklin County, Fla. – Name only.]
- Spirobranchus tricornis*: ALLEN, 1957, p. 56. [Puerto Rico. – Name only.]
- p.p.*Spirobranchus giganteus*: RIOJA, 1959, p. 296–297. [Veracruz, Méx. – Part of the material belongs to *Sp. tetraceros*.]
- p.p.*Spirobranchus giganteus*: MARDEN, 1960, p. 1015–1017, fig. 30–33. [Barbados, Jamaica. – Part of the material probably *Sp. polycerus* or var. Ext. descr. of larvae, etc.]
- Olga elegantissima* JONES, 1962, p. 202–204, pl. 52, fig. 125–128. [Jamaica. – Described in having no collar setae, only difference with *Sp. giganteus*. See discussion.]
- ?*Spirobranchus giganteus*: RIOJA, 1963, p. 220. [Several localities on West Mexican coast. – Name only.]

CURAÇAO. — CARACASBAAI, from *Maeandrina* [= *Diploria strigosa*], 7.IV.1920 (2 spec.); from coral, 5.V.1920 (3 spec.); 13.V.1920 (4 spec.). All specimens coll. C. J. van der Horst, mentioned by AUGENER 1927b (ZMA, V. Pol. 1349/1, 1349/2 & 1349/7 ZMH, V. 10331); on chain (10 m deep?), 22.IV.1955, Sta. 1334A (2 spec.). — FUİK BAAI, rocky shore of muddy lagoon, about 1 m, 17.IV.1949, Sta. 1038a (1 spec.). — PISCADERA BAAI, swimming pool in outer bay, rocky shore, abt. 1 m, 29.I.1949, Sta. 1029 (1 spec.); on fence and piles, abt. 1 m, 19.I.1949, Sta. 1029A (8 spec.); outer bay, piling, 14.X.1967 (iron and wooden poles; 0–1 m), Sta. 1620 (90 spec.); Piscadera Bay, 1–2 m, 10.X.1958, J. Stock coll. (2 spec., E. WESENBERG-LUND det., ZMK). — ST. MICHELSBAAI, between branches of *Oculina*, abt. 6 m, 3.IV.1966, Van Rijd coll. (1 dried spec.). — KNIP BAAI, S. side, perpendicular limestone cliff, ½–1 m, 8.I.1949, Sta. 1017 (2 spec. in tube and 2 empty tubes).

BONAIRE. — KRALENDIJK roadsted, from buoys, ½–1 m, 21.IX.1948, Sta. 1053 and 1054 (5 spec.); Kralendijk, pier, abt. ½ m, 20.VIII.1955, s.n. (2 spec.); Kralendijk pier, 0–1 m, 28.XII.1958, J. Stock coll. (4 spec., E. WESENBERG-LUND det.: 3 spec. ZMA, V. Pol. 1345; 1 spec. ZMK).

ILES-DES-SAINTES. — TERRE-DE-HAUT, harbour, washed ashore, 6.II.1963, s.n. (empty tubes).

ST. CROIX. — “*Cymospira gigantea* Pall. St. Croix. Krøyer”. (1 spec., ZMK, see Fig. 35–36).

ST. THOMAS. — “*Serpula (Cymospira) gigantea* auct. S. Thomas.” (1 spec., ZMK); “*Serpula Cymospira gigantea* Pall. St. Thomas. Krebs. 1860” (2 spec., ZMK, see Fig. 57); “*Serpula (Cymospira) gigantea* St. Thomas” (1 spec., ZMK); “*Serpula Cymospira gigantea* St. Thomas Riise 1860” (1 spec., ZMK, see Fig. 43–44, also mentioned by MÖRCH, p. 402).

TORTUGAS. — Bird Key Riff, H 07 [Hartmeyer coll.] (1 spec., AUGENER det., ZMH, V. 9065).

WEST INDIES. — “*Cymospira gigantea* Pall. Vestindiske Hav? Krøyer” (2 spec., ZMK, see Fig. 37–38, 56); “*Cymospira gigantea* Pall. Vestindien (Prosch.)” (1 spec., ZMK); West-Indië, J. Boeke coll. (1 spec., ZMA, V. Pol. 1348).

? CALIFORNIA. — On Abalone (*Haliotis fulgens* Philippi), thus presumably from California, no date. (ca 10 tubes and 3 dried specimens, see Fig. 58–59).

COSTA RICA (Pacific). — “*Cymospira incrassata* Kr. Puntarenas Krøyer” corrected in “*gigantea* Pall.” (1 spec., ZMK. Described by MÖRCH, 1863, p. 405, fig. 21–22, and AUGENER, 1925; see Fig. 46–47).

Tube: A very prominent median tooth projects over the entrance of the tube. The teeth, formed in succession, give the keel a more or less serrated appearance. The inner side of the tube — sometimes also the outer side — is often purplish-blue as in other species of the genus. Tube triangular in cross-section, very well attached to the substrate, in one case (Sta. 1029A) forming clusters with tubes of *Sp. polycerus* and *Sp. polycerus* var. *augeneri*. Tubes often overgrown by coral.

Branchiae: The branchial filaments are arranged in a spiral

of 3–8, usually 6–7 whorls. Branchial membrane $\frac{1}{2}$ – $\frac{1}{3}$ filamental length, not showing processes as in *Sp. tetraceros*.

Peduncle: Broad and winged, inserted nearly medially, somewhat to the left. Wings along $\frac{1}{2}$ – $\frac{2}{3}$ of length of peduncle, with entire edge. Wings more or less elongated oval.

Operculum: Reddish; very variable. The calcareous basal plate is usually hollowed out at the posterior margin, circular or somewhat pear-shaped. On its surface it bears 2 or 3 spines, the 2 latero-dorsal spines are always present, have in general a smaller secondary dorsal spine, and many small secondary spines. The single medio-ventral spine may be absent (Fig. 35–36), only indicated by a knob (Fig. 37–39), very small and simple (Fig. 40–41), “morgenstern-shaped” (Fig. 42), bifurcate (Fig. 43–45), or even nearly split in two (*incrassatus*-type, Fig. 46–47).

The basal plate measures along the dorso-ventralline 2.3–10.5 mm, in general 6–7 mm.

Collar: Well developed, with two smaller lateral lobes and one larger ventral lobe that appeared to be triangular, sometimes with a long rostral point. There are a larger and a smaller tonguelet between the lateral and the ventral collar flap, the larger is folded and split, bearing the smaller.

Collar setae as usual in the genus (Fig. 50–51). Sometimes the bundle of collar setae is very small and submerged in the collar tissue (see also Discussion).

Thorax: Seven setigerous segments, the six remaining have setae as *Sp. tetraceros* (Fig. 52). Thoracic uncini 110–225 μ , having 16–23 curved teeth, the last one gouged (Fig. 54). The number of teeth depends on the position of the uncinus in its row and on the proportions of the specimen concerned. The uncini are subrectangular-elongated. Thoracic membrane forming a medio-ventral “apron” across the abdomen.

Abdomen: Segments variable in number, a small specimen had about 125, large specimens about 210 abdominal segments, usually about 190. Setae and uncini as usual (Fig. 53, 55), uncini subtriangular, with 9–15, in general 11–13 curved teeth.

Total length of the animals incl. operculum 16–90 mm, usually 45–66 mm; breadth of thorax usually about the same as the length

of operculum. The colours of the animal, especially branchiae, collar and thoracic membrane, are very vivid but also very variable – even within one specimen – and easily extracted by alcohol and formol, and thus of no diagnostic value. Often occurring colours are blue and white (branchiae), purple (collar) and red scarlet (thoracic membrane), but other combinations are also possible.

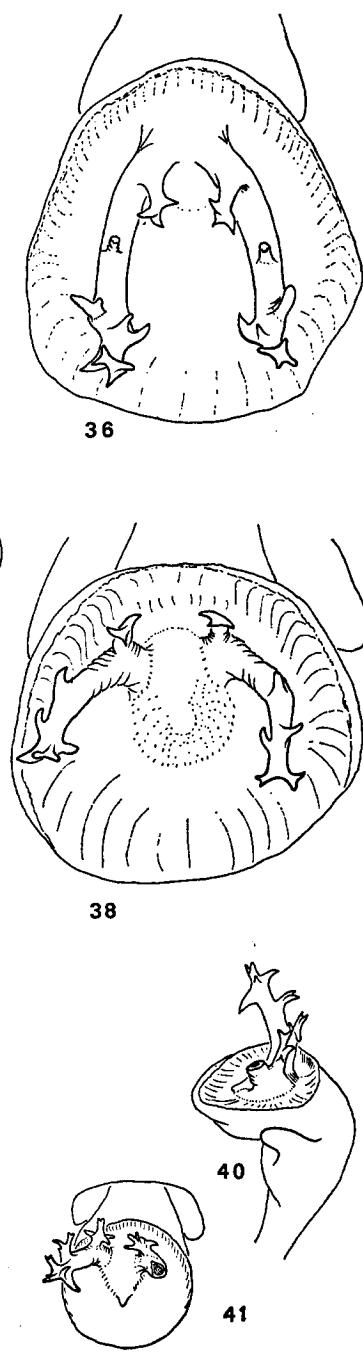
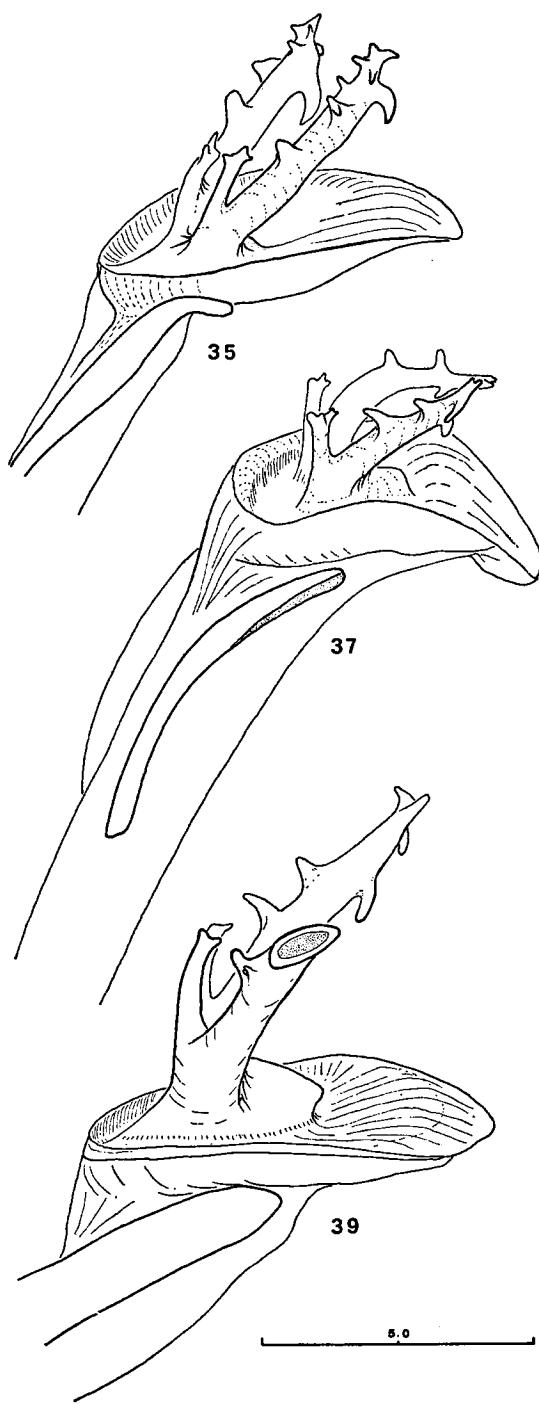
DISCUSSION

Differentiating, as done, in *Sp. giganteus*, *tricornis* and *incrassatus* is in my opinion of no use. In Bonaire, Curaçao and St. Thomas – even in the same locality – the first two types have been found together, and also intermediate forms (Fig. 37–41). In the ca. 150 specimens studied ca. $\frac{1}{2}$ did belong more or less to the *giganteus*-type (Fig. 35–36), $\frac{1}{4}$ were intermediates, as given in Fig. 39, and $\frac{1}{4}$ belonged to the *tricornis*-type (Fig. 42–45, 48–49). As regards other characteristics I could find no differences at all.

One specimen possessed an operculum of the *incrassatus*-type (Fig. 46–47; ZMK, sub *Cymospira gigantea*, but having an older label *Cymospira incrassata* Krøyer, Puntarenas) and I suppose that this is one of the specimens seen by MÖRCH, 1863 (p. 405, fig. 21–22), since it fits his figures very well. I could not find clear differences between the setae and uncini of this specimen – thoracic uncini having 18 teeth, abdominal 9–10 – and of foregoing types. MÖRCH already states that the operculum of his *incrassatus*-form resembles the operculum of *Sp. giganteus* var. B. *tricornis* Mörch very much: “Laaget af denne Art ligner meget Laaget af Sp. *giganteus* var. B”. According to him the only difference is the short grip of the medio-ventral horn (it is much longer in *Sp. giganteus* var. B). In my opinion this difference is of no specific importance.

MÖRCH's var. C *microceras* is given in Fig. 56. I think that the small dorsal tines of the latero-dorsal opercular horns are broken,

Fig. 35–41. *Spirobranchus giganteus giganteus*. — From Sr. CROIX (35–36), from “Vestindiske Hav?” (37–38), from “Vestindien” (39) and from CURAÇAO (Piscadera Baai, Sta. 1029A; 40–41). — The series shows the gradual change from “*bicornis*” to “*tricornis*”-form of operculum in side view (35, 37, 39–40) and in apical view (36, 38, 41). In Fig. 39 and 40–41 the right and the left dorsal horns are broken respectively.



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and not – as is stated by MÖRCH – totally absent, since there are non-calcareous spots on the places where they could be expected.

The ? California specimens have opercula with secondary dorsal tines (of the latero-dorsal spines), which are free spines of their own (see Fig. 58–59). In one of these specimens the medio-ventral spine is indicated by 2 separate small knobs, thus suggesting that these opercula are more like an *incrassatus*-form. These features might also refer *Spirobranchus spinosus* to *Sp. giganteus giganteus*.

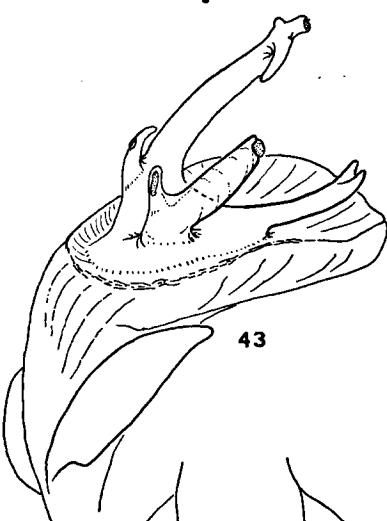
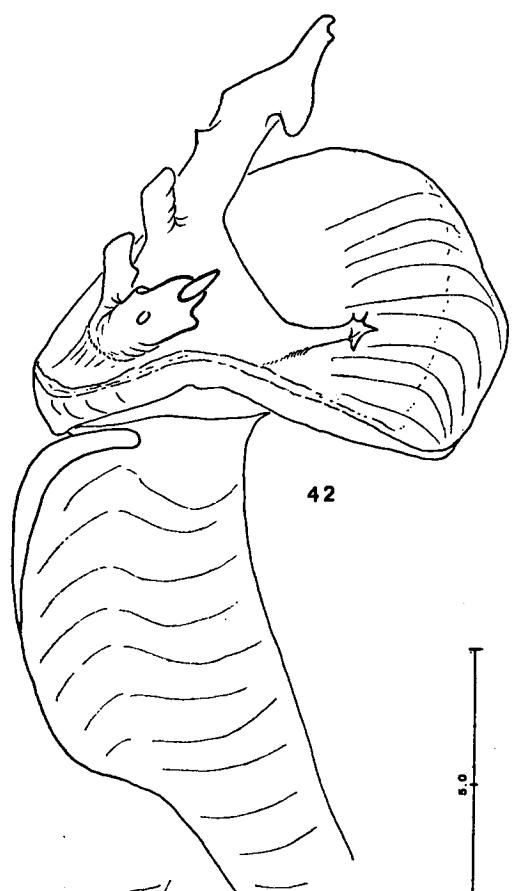
The collar setae have been observed in the ca 100 specimens of Sta. 1620. They varied from very inconspicuous to large and many. In 3 specimens the collar setae were absent at one side, conspicuous at the other side. In one specimen even section could not reveal any collar setae, there was even no split or other indication of them. Therefore *Olga elegantissima* JONES, 1962 (p. 202, pl. 52 fig. 125–128) – only differing from *Sp. giganteus* in absence of collar setae – may be considered a synonym of *Sp. giganteus*. Lack of collar setae has also been described in *Pomatoceros helicoides* MARENZELLER, 1885, p. 217–218, partly in *Sp. giganteus* (FAUVEL, 1936, p. 87–88) and in *Pomatoceros triqueter* (VON DRASCHE, 1884, fide MARENZELLER; MCINTOSH, 1923, p. 367).

No differences could be found between the “*tricornis*” and “*bicornis*” – forms as regards their geographical distributions.

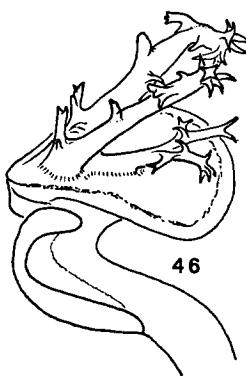
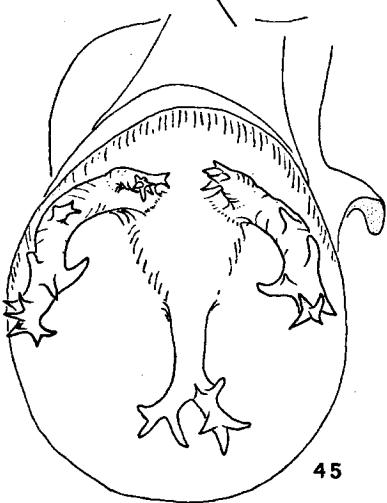
DISTRIBUTION

Caribbean Sea, Gulf of México (from Florida to and including Trinidad), Bahia (Brasil), Tropical Pacific Coast of America (from Gulf of California to and including the Galápagos) and probably the Gulf of Catalina (Calif.): all these localities in the tropical and sub-tropical coasts.

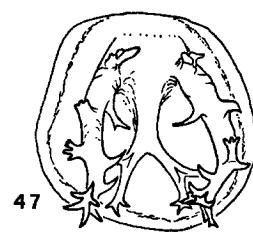
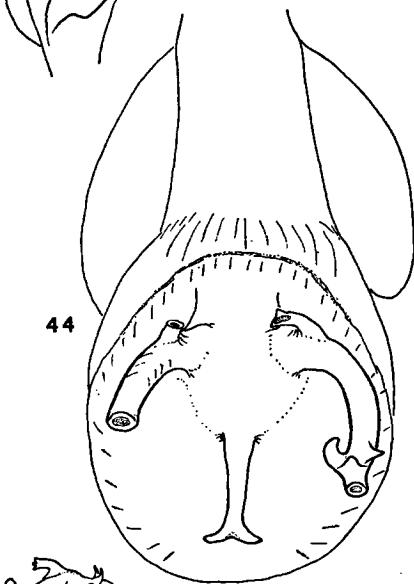
Fig. 42–47. *Spirobranchus giganteus giganteus*. — From “West-Indië” (42), from ST. THOMAS (43–44), from CURAÇAO (Knip Baai, Sta. 1017; 45) and from COSTA RICA (Puntarenas, Pac.; 46–47). — The series shows the gradual change from one ventral spine in two nearly separate ones with only a short common base left, in side view (42–43, 46) and apical view (44–45, 47). In Fig. 42–44 some horns are damaged.



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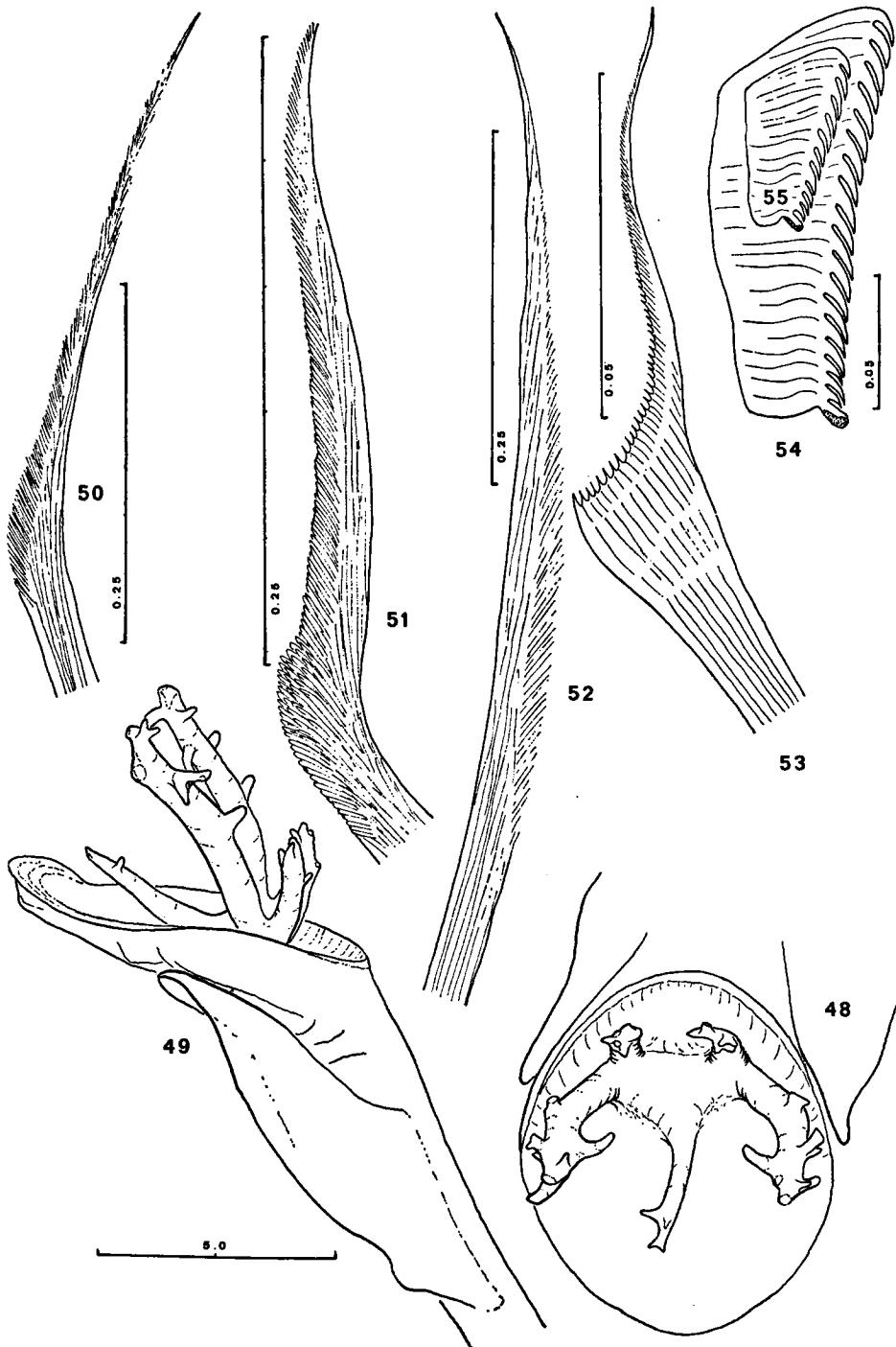
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Spirobranchus giganteus corniculatus (Grube, 1862) nov. comb.

- Serpula (Pomatoceros) corniculata* GRUBE, 1862, p. 66, fig. 5. ["aus Java, im Leidener Museum". — Probably the material collected by Kuhl and Van Hasselt; see Discussion, and Fig. 63.]
- Serpula (Pomatoceros) crucigera* GRUBE, 1862, p. 67, fig. 6. ["Rothen Meer". — Few characteristics.]
- Pomatocerus* [sic] *bucephalus* MÖRCH, 1863, p. 411, fig. 26. ["Samboanga insular. Philippin., C. Semper..."; same fig. of operculum as *Serpula (Pomatoceros) crucigera* GRUBE, 1862; see also AUGENER 1925, p. 18.]
- Cymospira tricornis* BAIRD, 1865, p. 17, pl. II fig. 1. [Djedda. — Few charact., material studied, not *Sp. gig.* Var. B. *tricornis* MÖRCH.]
- Cymospira brachycera* BAIRD, 1865, p. 17–19, pl. II fig. 2. [Swain's Reefs; E. coast of Australia. — Ext. descr., fig. of operculum same as Java spec., material studied.]
- Vermilia bucephala* (Mörcb) QUATREFAGES, 1865, p. 520–521. [Diagnosis of MÖRCH.]
- Cymospira crescentigera* QUATREFAGES, 1865, p. 538–539. ["Nlle-Irlande". — Descr.]
- Cymospira Quoyi* QUATREFAGES, 1865, p. 539. ["Vanikoro". — Descr.]
- Cymospira Gaymardi* QUATREFAGES, 1865, p. 539–540, pl. 20 fig. 13. ["Hab.?". — Descr.]
- Cymospira Mörchii* QUATREFAGES, 1865, p. 540–541, pl. 20 fig. 14–17. ["Nlle-Hollande". — Descr.]
- Serpula (Pomatoceros) crucigera*: GRUBE, 1870, p. 518. [No new data.]
- Serpula (Pomatoceros) luzonica* GRUBE, 1881, p. 116–117. [Manila. — Descr.; see Discussion.]
- Cymospira brachycera*: HASWELL, 1885, p. 662. [Descr. of BAIRD 1865.]
- Cymospira Mörchii*: HASWELL, 1885, p. 662–663. [Descr. of QUATREFAGES.]
- ?*Pomatoceros helicoides* MARENZELLER, 1885, p. 217–218, pl. IV fig. 4. [S. Japan. — Descr. in having no collar setae.]
- Spirobranchus giganteus*: GRAVIER, 1908, p. 132–133, fig. 492; 1906, pl. VIII fig. 300. [Red Sea, Suez to Djibouti. — Descr.]
- Spirobranchus giganteus*: PIXELL, 1913, p. 80–81, pl. 8 fig. 6. [Zanzibar, Red Sea, Maldives Islands. — Descr., most of the material studied.]
- Spirobranchus giganteus* var. *turbinatus* PIXELL, 1913, p. 81. [Maldives Islands. — Few charact., material studied.]
- Spirobranchus gardineri* PIXELL, 1913, p. 81–82, pl. 8 fig. 7. [N. of Madagascar. — Descr., fig. of e.g. operculum.]
- Spirobranchus giganteus*: FAUVEL, 1919, p. 343. ["Isles Gambier", Pac. — Name only.]
- Spirobranchus giganteus*: FAUVEL, 1923, p. 52–53. ["Isles Gambier". — Name only.]
- Pomatoceros bucephalus*: AUGENER, 1925, p. 18. [Discussion of possible synonymy.]
- Spirobranchus giganteus* Pall. var. AUGENER, 1927a, p. 149–150. [Matupi (New Guinea). — Descr.]

Fig. 48–55. *Spirobranchus giganteus giganteus*. — From BONAIRE (Kralendijk); all figures from one specimen. 48–49, Operculum in apical view and in side view; 50–51, setae from first setiger; 52–53, thoracic and abdominal seta; 54–55, thoracic and abdominal uncinius.



- Spirobranchus giganteus* Pall. var. AUGENER, 1927c, p. 363. [Samoa. — Name only.]
Spirobranchus giganteus: PRUVOT & FAUVEL, 1930, p. 88–89. [“Nouvelle Calédonie”. — Short descr.]
- Pomatoceros Gaymardi* PRUVOT [& FAUVEL], 1930, p. 88–89. [Quoted as synonym of *Sp. giganteus*: “*P. Gaymardi* Pruvot, M. S.”]
Spirobranchus giganteus var. *Tricornis*: FAUVEL, 1930a, p. 557. [Ile des Pins (“Nouvelle Calédonie”). — Descr.]
- Spirobranchus giganteus*: MONRO, 1931, p. 31. [Great Barrier Reef. — Material studied.]
- p.p. *Spirobranchus giganteus*: FAUVEL, 1932, p. 244. [Nicobars. — Few charact., also part of the material *Sp. tetraceros*.]
not *Spirobranchus giganteus*: FAUVEL, 1933a, p. 78–79. [= *Sp. tetraceros*.]
not *Spirobranchus giganteus*: FAUVEL, 1933b, p. 143. [The synonyms point to *Sp. tetraceros*.]
- Spirobranchus Gardineri*: FAUVEL, 1933a, p. 79. [Gulf of Suez. — Few charact.]
Spirobranchus Gardineri: FAUVEL, 1933b, p. 143. [Same as above.]
- Spirobranchus giganteus* Pall., var. AUGENER, 1934, p. 118–119. [Partly type material see Discussion and Fig. 63–64.]
- Pomatoceropsis roxasi* HOLLY, 1935, p. 97–100, fig. 1–6. [Mindoro, Philippines. — Ext. descr., same as *Sp. gig. corniculatus* except for collar setae.]
- Spirobranchus giganteus*: FAUVEL, 1936, p. 87–89. [Japan.—Descr.]
Pseudopomatoceros roxasi HOLLY, 1936, p. 223. [Nom. nov. *Pomatoceropsis roxasi*.]
not *Spirobranchus giganteus*: MONRO, 1937, p. 317. [S. Arabian Coast. — See *Sp. tetraceros*.]
?not *Spirobranchus giganteus*: TAKAHASI, 1938, p. 213–215, fig. 15. [Izu Peninsula, Japan. — Descr. more like *Sp. tetraceros*.]
p.p. *Spirobranchus giganteus*: MESNIL & FAUVEL, 1939, p. 33–34. [Several Islands from E. Indonesia. — Part of the material *Sp. tetraceros*.]
- Pomatoceras* [sic] *davaoensis* TREADWELL, 1942, p. 4–5, fig. 12–15. [Philippines. — See Discussion.]
- ?*Spirobranchus giganteus*: DAY, 1951, p. 65. [S. Africa. — Name only.]
?not *Spirobranchus giganteus*: FAUVEL, 1951, p. 638. [Djibouti. — Synonyms point to *Sp. tetraceros*.]
Spirobranchus giganteus: FAUVEL, 1953, p. 462–463. [Nicobar Islands, Great Coco Island, Ceylon. — Few charact.]
- Spirobranchus giganteus*: HARTMAN, 1954, p. 623, 626, 627, 629. [Marshall Islands. — Name only.]
- ?*Spirobranchus giganteus*: DAY, 1955, p. 449. [South Africa. — Name only.]
Spirobranchus giganteus: FAUVEL, 1957, p. 10. [Gulf of Eilath. — Material studied.]
Spirobranchus gardineri: FAUVEL, 1957, p. 10. [Gulf of Eilath. — Material studied.]
p.p. *Spirobranchus giganteus*: DEW, 1959, p. 45, fig. 17. [Queensland, N.S. Wales. — Also partly *Sp. tetraceros*, material studied.]
?not *Spirobranchus giganteus*: IMAJIMA & HARTMAN, 1964, p. 373. [Japan. — Descr. more like *Sp. tetraceros*.]
?*Pomatoceros helicoides*: IMAJIMA & HARTMAN, 1964, p. 371–372. [Japan. — Descr.]
Spirobranchus giganteus: DAY, 1965, p. 26. [Entebir Is., S. Red Sea. — Name only.]
Spirobranchus giganteus: DAY, 1967, p. 803, fig. 38.3.h–k. [Natal, Nocambique. — Short descr.]
- Spirobranchus giganteus*: REISH, 1968, p. 229. [Marshall Islands. — Name only.]

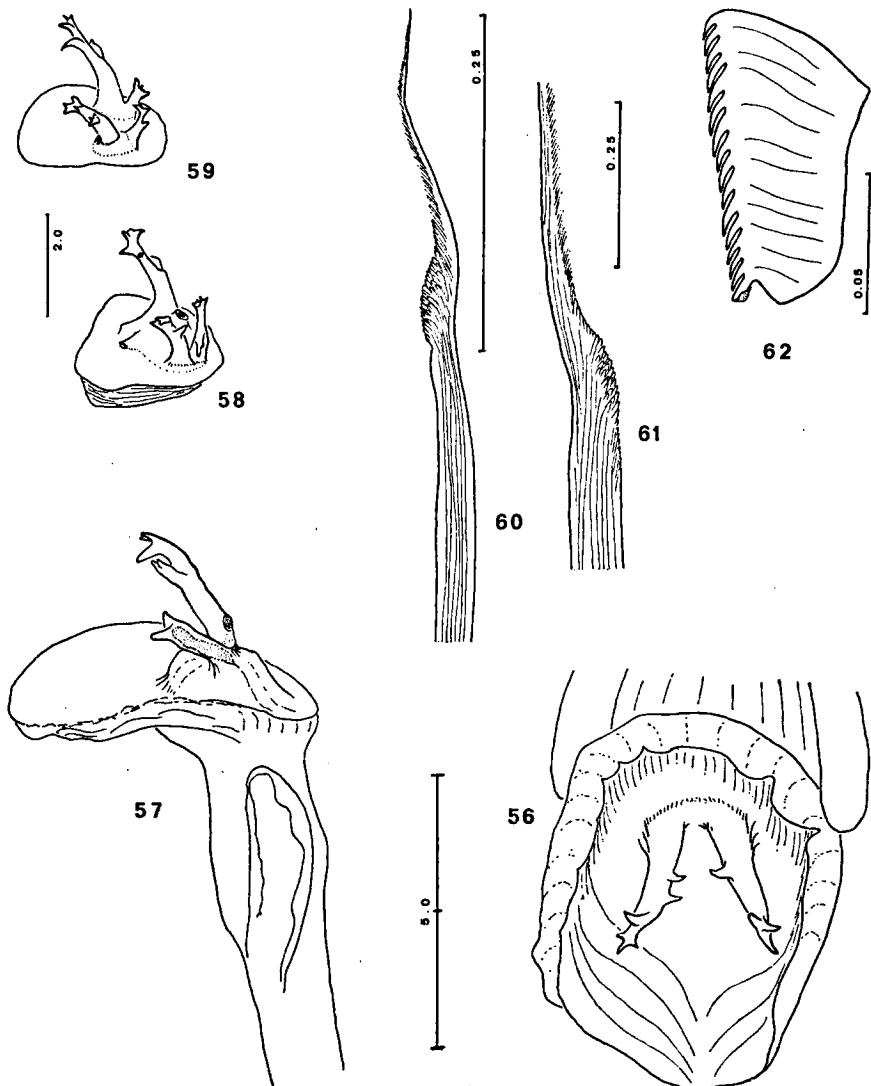


Fig. 56–62. *Spirobranchus giganteus giganteus*. — From "Vestindiske Hav?" (56), from St. THOMAS (57), from "?California" (58–59, 62) and from COSTA RICA (Puntarenas, Pac.; 61). 56, Operculum in apical view; 57–59, opercula in side view; 60–61, "Spirobranchus-setae"; 62, thoracic uncinus.

GULF OF EILATH (Red Sea). — 55/384, 432, 473, 438, 439, sub *Spirobranchus giganteus* (Pallas). E55/285 sub *Spirobranchus gardineri* Pixell. [All specimens collected by H. STEINITZ and mentioned by FAUVEL 1957.]

JAVA. — Kuhl and Van Hasselt coll. [1821?] (2 spec., RMNH nr. 1524). [It is likely that one of these specimens belongs to *Serpula (Pomatoceros) corniculata* GRUBE, 1862, p. 66, fig. 5; AUGENER 1934 mentions this material too. One of these, with the operculum as given in Fig. 63, is indicated as *lectotype*; the other is shown in Fig. 64.]

CELEBES. — Pankaja near MAKASSAR, from *Porites*, 3.III.1930, Snellius Expeditie (ca. 45 spec., RMNH nr. 04430).

PHILIPPINES. — Padada Beach, GULF OF DAVAO, IV.1936, sub *Pomatoceros davaoensis* Treadwell. [Holotype, A.M.N.H. no. 3220. See also Discussion]. — MANILLA, coll. Dr. F. Jagor, det. A. E. GRUBE, sub *Serpula (Cymospira)* [sic!] *Luzonica* Grube. [Types, 4 spec., Z.M.B. nr. 865.]

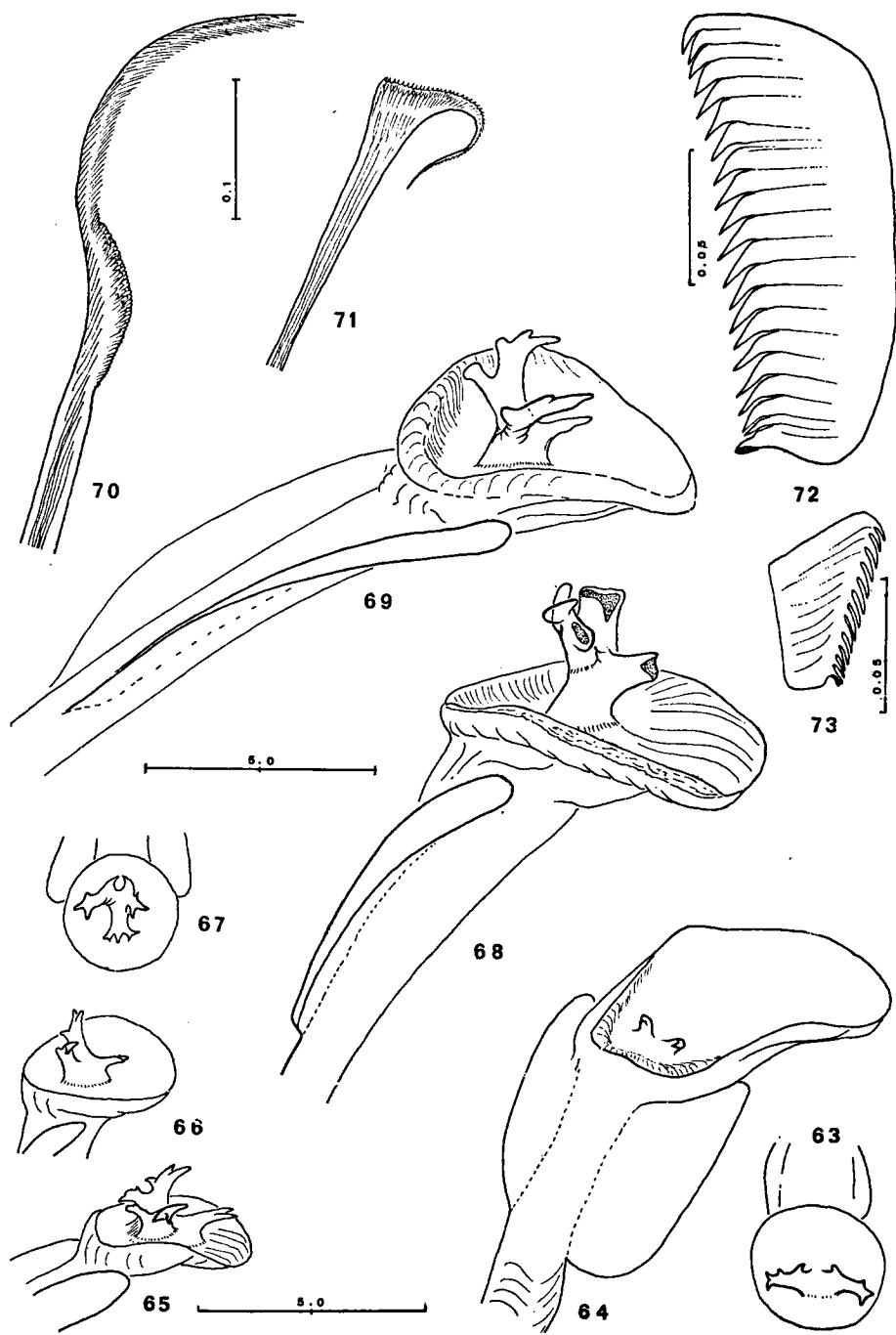
Tube: No tube present.

Branchiae: The branchial filaments are arranged in a spire of 1.5–7, usually 4–6 whorls. Branchial membrane $\frac{1}{3}$ filamental length, not showing interfilamental processes.

Peduncle: Broad and winged, inserted nearly medially. Wings along $\frac{2}{3}$ of peduncle, with entire edge. Wings more or less elongated oval.

Operculum: Variable. The calcareous basal plate is usually hollowed out at the posterior margin, circular or somewhat pear-shaped. On its surface it bears (2 or) 3 spines, more or less originating from one common base, this may be a column (*gardineri*-form). The latero-dorsal spines have in general a smaller secondary dorsal tine and a few small side-spines (see Fig. 68–69). The medio-ventral spine may be absent. In the specimens from Java the latero-dorsal spines of the operculum are very small, without the dorsal tines, one specimen having three small side-spines (Fig. 63–64), the Celebes spec. usually have the medio-ventral horn (furcated) and secondary dorsal (tines) knobs on the latero-dorsal spines (see Fig. 65–67).

Fig. 63–73. *Spirobranchus giganteus corniculatus*. — From JAVA (63–64), from CELEBES (65–67) and the RED SEA, Gulf of Eilath (68–73). 63–69, Opercula in apical view (63, lectotype; 67), apico-dorsal view (64; 69), side view (65; 66; 68, specimen named *Sp. gardineri* by FAUVEL, 1957); 70, "Spirobranchus-seta"; 71, abdominal seta; 72–73, thoracic and abdominal uncini. — Fig. 69–73 of the same specimen.



The basal plate measures 4–7 mm along the dorso-ventral line (in the Makassar spec. 1–3, usually 2–2.5 mm).

Collar: Same as in *Sp. giganteus giganteus*, but in the Makassar spec. small. Collar setae as usual in the genus (Fig. 70). Sometimes the bundle is very small and submerged in the collar-tissue (especially in the specimen named *Sp. gardineri* by FAUVEL).

Thorax: Same as in *Sp. giganteus giganteus*. Thoracic uncini ca 160 μ , having 15–23 curved teeth, incl. the "gouged" tooth (Fig. 72).

Abdomen: 160–170 segments (in Makassar spec. 65–115, usually ca. 100). Setae and uncini as usual (Fig. 71, 73), uncini with 11–15 teeth and ca. 65 μ in length.

Total length of the animals incl. operculum 45–65 mm (Makassar spec. 7–40, usually ca. 22 mm):

DISCUSSION

The constant feature of relatively simple opercula of all *Sp. giganteus* in the Indian and Pacific Ocean (excl. Pacific coast of America) made me conclude that for this region a separate subspecies – *corniculatus* – could be discerned. The more, since, throughout literature, nor in my material no specimens with such a simple operculum could be found on the tropical Atlantic and Pacific coasts of America.

In the State Museum of Natural History (RMNH, Leiden) only 4 specimens of *Spirobranchus* were present (all from about 1820) and named *Sp. giganteus*. Two of them are of unknown locality (operculum as in Fig. 45 and thus probably from the West Indies), 2 of them are from Java (with aberrant opercula, described by AUGENER 1934, p. 118–119). Therefore I believe that the latter ones were seen by GRUBE, 1862, who described from the Leidener Museum *Serpula (Pomatoceros) corniculata*. In fact one of them has an operculum (Fig. 63) as described and figured by GRUBE. However, GRUBE was mistaken in describing this one as a separate species on its aberrant operculum, since the operculum is regenerating (see also AUGENER 1934). In general the length of the operculum is about the same as the thoracal breadth (or larger), in this specimen it is only 2 mm, thoracal breadth 4 mm (compare the other specimen of the same size [operc. Fig. 64]: operc. 7 mm long, thorax 4 mm wide). Usually

the length of the peduncle is about the length of the branchial crown, in this specimen only $\frac{2}{3}$ of it; the wings of the peduncle are very small too. Finally the basal plate in this specimen is not calcareous (perhaps the lime has been resorbed by the preserving fluid, but in the second specimen this was not the case), which is also an indication of regeneration. Nevertheless I think that this specimen should be the LECTOTYPE of this subspecies. The description has been based mainly on the specimens from the Gulf of Eilath.

Opercula as given in Fig. 69, are also described by the following authors:

Sp. giganteus, FAUVEL, 1936, p. 87–89 (Japan), PRUVOT, 1930, p. 88–89 (Nouv. Caledonie);

S. Pomatoceros crucigera GRUBE, 1862, p. 67, fig. 6 (Red Sea);

Cymospira tricornis BAIRD, 1865, p. 17, pl. II fig. 1;

Cymospira Morchii QUATREFAGES, 1865, p. 540–541, pl. 20 fig. 14–17 (Nlle. Holland) and

Pomatoceros helicoides MARENZELLER, 1885, p. 217–218, pl. VI fig. 4.

Opercula more or less as in Fig. 63–64 are given by: *Sp. giganteus*, GRAVIER, 1906–08, p. 132–133, pl. VIII fig. 300 (Red Sea), PIXELL, 1913, p. 80–81 (Zanzibar, Red Sea, Maldives Islands), FAUVEL, 1923, p. 52–53 (Gambier Islands) and AUGENER, 1927a, p. 149–150 (Matupi; New Guinea), *Cymospira brachycera* BAIRD, 1865, p. 17–19 fig. 2 (E. coast of Australia), *Cymospira crescentigera* QUATREFAGES, 1865, p. 538–539 (Nlle Irlande) and *Cymospira Quoyi* QUATREFAGES, 1865, p. 539 (Vanikoro = St. Cruz, Pacific). However I could find no differences in geographical range of these two types of opercula, and because of the high variability of the operculum in this genus, it is my opinion that these two forms belong to one and the same subspecies.

As for *Sp. cervicornis* WILLEY, 1905, I believe this to be a *Sp. tetraceros* because of measurements, form of peduncular wings, form and elaborateness of opercular spines, and the branchial filaments occurring in a spiral of only one turn and a half (possibly in one circle only).

Reexamination of the typematerial of *Serpula (Pomatoceros) lzonica* Grube, showed it to be identical with *Sp. giganteus corniculatus*. In one specimen the right bundle of collar setae was missing (even

section could not reveal it) and indicated only by a nearly invisible split, another specimen showed no collar setae at all. The measurements of these 4 specimens agree with the Eilath specimens. The opercula are more or less like Fig. 65, however, without the medio-ventral horn. Branchiae are in a spiral of 4–6 whorls.

Studying the description of *Pomatoceras* [sic] *davaoensis* TREADWELL 1942, abusively referred to *P. caeruleus* by HARTMAN (1956, p. 301), it occurred to me that it might be a *Spirobranchus giganteus corniculatus* too. Reexamination of the holotype proved this beyond doubt. *P. davaoensis* has its branchiae in a spiral of 3 whorls and has "Spirobranchus-setae". Its operculum has 3 broken horns, one of them still shows the small secondary tine as figured in Fig. 69.

DISTRIBUTION

Indian Ocean (Red Sea), Malaysian Archipel, Philippines, N. Eastern Australia and Pacific Islands: all localities approximately between the Tropics of Cancer and Capricorn. – This species is also found in Natal and Japan.

Spirobranchus polycerus (Schmarda, 1861) Mörch, 1863

- Cymospira polycera* SCHMARDA, 1861, p. 31, pl. 21 fig. 181. [Jamaica. – Few charact.]
Cymospira (Pomatoceros) polyceros: GRUBE, 1862, p. 67. [No new data.]
Spirobranchus? polycerus MÖRCH, 1863, p. 407–408. [No new data, discussion of possible synonymy.]
Cymospira polycera: QUATREFAGES, 1865, p. 546. [No new data.]
Spirobranchus insignifer AUGENER, 1922, p. 50. [Barbados. – Short descr., material studied.]
Spirobranchus polycerus: AUGENER, 1925, p. 43–45, fig. 3. [Ext. descr. of original material of Schmarda.]
Spirobranchus polycerus: AUGENER, 1927b, p. 78–79. [Curaçao: "Spaansch Water, Caracas-Bai, West Punt". – Few charact., material studied.]
p.p. *Spirobranchus giganteus*: MARSDEN, 1960, p. 1015–1017, fig. 30–33. [Barbados. – Descr. of small colonial form, possibly *Sp. polycerus* or var. *augeneri*.]

<i>Sta.</i>	<i>Locality, date, substrate.</i>	<i>Spirobranchus</i>	<i>poly-</i>	<i>inter-</i>	<i>var.</i>
		<i>cerus</i>	<i>cerus</i>	<i>medi-</i>	<i>auge-</i>
				<i>ate</i>	<i>neri</i>
ST. MARTIN					
1399	Point Blanche Bay, 5.VI.1955, beach rock.	—	3	17	
SABA					
1120	Fort Bay, 21.VIII.1949, andesitic rock.	—	1	8	
ST. EUSTATIUS					
1119	Tumble Down Dick Bay, 10.VII.1949, andesitic rock.	—	—	15	
1433	Concordia Bay, 10.X.1963, andesitic rock.	—	30	185	
BARBADOS					
1553	Conset Bay, 7.VII.1967, limestone.	—	—	100	
—	Barbados, 10.I.1907 (sub <i>Sp. insignifer</i> ZMH, V. 9752).	1	—	—	
BONAIRE					
1054	Kralendijk roadstead, 21.IX.1948, wooden buoy.	5	—	—	
1056Ba	Paloe Lechi, 4.IX.1948, beach rock.	2	—	—	
1057	Kralendijk, 3 & 5.IX.1930, beach rock.	66	11	29	
1057a	Kralendijk, 15.IX. 1930, beach rock.	33	3	24	
1058	De Hoop, N, 12.V.1930, beach rock.	4	—	—	
1058C	De Hoop, 10.IX.1948, dead coral.	1	—	—	
1059A	Punt Vierkant, 9.IX.1948, limestone.	—	—	1	
1068	Lac, Boca, 9.X.1930, dead coral.	3	1	—	
1068a	Lac, Boca, 1.X.1948, dead coral.	6	—	—	
1565	Lac, Secu di Sorobon, 21.VIII.1967 (2 eroded opercula).	2	—	—	
1568	Lac, Binnenklip, 24.VIII.1967, dead & living coral.	1	—	—	
s.n.	Kralendijk, pier, IV.1955.	1	—	—	
KLEIN BONAIRE					
1049A	East coast, landing, 13.IX.1948, limestone.	2	—	100	
1049Aa	East coast, landing, 30.III.1955, limestone.	5	1	100	
1049B	East coast, landing, 13.IX.1948, dead coral.	1	—	1	
1369	North coast, 30.III.1955, beach rock.	2	—	—	
1372	NE shore, 13.IV.1955 (Zaneveld coll.).	—	—	2	
KLEIN CURAÇAO					
1046	Western shore, 1.X.1948, beach rock.	10	—	1?	
CURAÇAO					
1017	Knip Baai, 8.I.1949, limestone.	25	—	1	
1019	Plaja Djerimi, 11.XII.1948, rock.	4	—	—	
1020D	Boca Lagoen, 27.XI.1948, dead coral.	7	—	—	
1024	Plaja Hoeloe, 2.IV.1949, limestone.	1	—	1	

Sta.	Locality, date, substrate.	<i>Spirobranchus</i>			
		<i>poly-</i> <i>cerus</i>	<i>inter-</i> <i>medi-</i>	<i>var.</i> <i>auge-</i> <i>ate</i>	<i>neri</i>
1028	Piscadera Baai, Enoch, 2.II.1949, muddy debris. [juv.]	—	—	—	—
1028A	Piscadera Baai, Enoch, 2.II.1949, Rhizophora. [juv.]	2	—	—	—
1029	Piscadera Baai, Boca, 29.I.1949, limestone. [juv.]	5	1	5	—
1029A	Piscadera Baai, Boca, 29.I.1949, fence.	80	1	27	—
1458	Piscadera Baai, Boca, 5.I.1964, limestone.	2	—	—	—
1459	Piscadera Baai, Boca, 1.I.1964, limestone. [juv.]	—	—	—	—
1620	Piscadera Baai, Boca, 14.X.1967, piling.	20	—	—	—
1037A	Spaanse Baai, 21.IV.1949, Rhizophora.	10	—	—	—
1324	Cape Santa Marta, 24.II.1955, limestone.	—	—	1	—
1334A	Caracas Baai, buoy, 22.IV.1955, chain (10 m deep?).	3	—	—	—
1504A	St. Marie Baai, seepage, 22.XII.1963, dead coral.	—	—	—	1
—	Spaanse Haven, 1920 (v. d. Horst).*	—	—	—	26
—	Caracas Baai, 1920 (v. d. Horst).*	8	4	—	30
—	Boca Labadera, 1920 (v. d. Horst).*	—	—	—	5
—	Westpunt, 1920 (v. d. Horst).*	1	—	—	—
—	Boca Santa Marta, XII.1954 (Zaneveld).	1	—	—	—
ARUBA					
1011	Boca Prins, 28.VI.1930, beach rock.	—	—	—	4
1310	Rincón, 7.V.1955, beach rock.	—	—	—	16
1311	Boca Andicuri, 11.V.1955, non-calcareous rock.	—	1	—	5

* ZMA, V. Pol. 1346 1/2/4/5; 1349 3/4/5/6/8/9/10: and ZMH, V. 10331, 10381, 10388.

T u b e: The tubes are very strongly attached to the substratum (often other tubes) and thus triangular in cross-section. A prominent median tooth – sometimes more flap-like – projects over the entrance. Often the entrance, tooth and inner-side of the tube, sometimes the surface too, are bluish. The tubes sometimes form large clusters.

Branchiae: In a spiral, number of whorls up to 5 (depending on the measurements of the specimen), in general 2–3. Branchial membrane $\frac{1}{6}$ – $\frac{1}{3}$ filamental length; no processes as in *Sp. tetraceros* are present.

Peduncle: Broad and winged, inserted on the left half of the branchial crown. The wings are large (about $\frac{2}{3}$ of the length of the peduncle) and rounded, edge entire.

O perculum: Very variable (see Figs. and Discussion). The most common form (240 of the 300 specimens studied: Fig. 76–77, 85–86)

has 7 horns, the latero-ventrals with side-spines; other forms are given in Fig. 33–38. All 7 horns have a common base. Their position is:

- 1 medio-dorsally, usually a blunt knob without side-spines;
- 2 latero-dorsally, ox-horn-shaped, in general also without side-spines;
- 4 latero-ventrally, mostly with 2 side-spines; these 4 horns usually are more parallel to the basal plate.

The basal plate, along its middorsal line, measures 0.5–3 mm, in general about 1.5 mm. These measurements, however, are different in the various colonies, e.g. in Sta. 1029A in general 1.5–2 mm, in Sta. 1057 1–1.5 mm (see Fig. 124).

The operculum is usually white, sometimes the basal plate showed a faint reddish edge. The opercula that are intermediate between the typical form and the var. *augeneri* are often reddish, as is usual in the var. *augeneri* too. Sometimes there are a few small secondary knobs or spines along the dorsal edge of the operculum (Fig. 87).

Collar: Usually well developed, trilobed, with one single larger ventral lobe (medially pointed), and two smaller lateral lobes. Tonguelets between lateral and ventral collar-flap as in *S. giganteus*.

Collar setae of two types, as is normal in the genus (Fig. 78–80).

Thorax: Seven setigerous segments; the six remaining have simple limbate setae with faintly striated blades (Fig. 81). Thoracic uncini 35–62 μ , subtriangular, with 10–12 curved teeth of which the most anterior is stouter and hollowed out at end: “gouged tooth” (Fig. 83).

The uncinigerous tori of the thorax are widely separated in front, gradually approaching one another towards the end, thus leaving a triangular depression. The setae project beyond the thoracic membrane; the latter forming medio-ventrally a rounded lobe across the abdomen.

Abdomen: Segments variable in number (20–110), usually 70–85 abdominal segments.

Setae: about 6 per bundle, compressed trumpet-shaped, prolonged towards one side. Free border denticulate (Fig. 82). Uncini similar to those of thorax, but smaller (ca. 35 μ) and with less teeth (10–11, Fig. 84).

Total length incl. operculum 4–40 mm, in general about 15 mm (differences are possible in various colonies); breadth of thorax 0.5–3 mm, usually about 1.5 mm.

DISCUSSION

The elevation of the opercular horns is variable; the horns may stand nearly vertical to the basal plate (Fig. 86), sometimes they may be nearly adnate (Fig. 75).

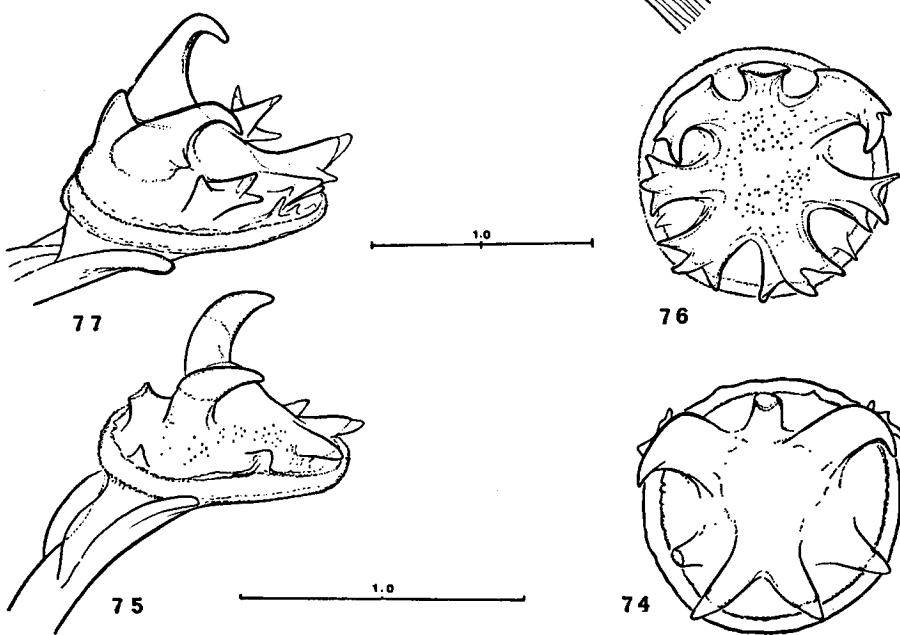
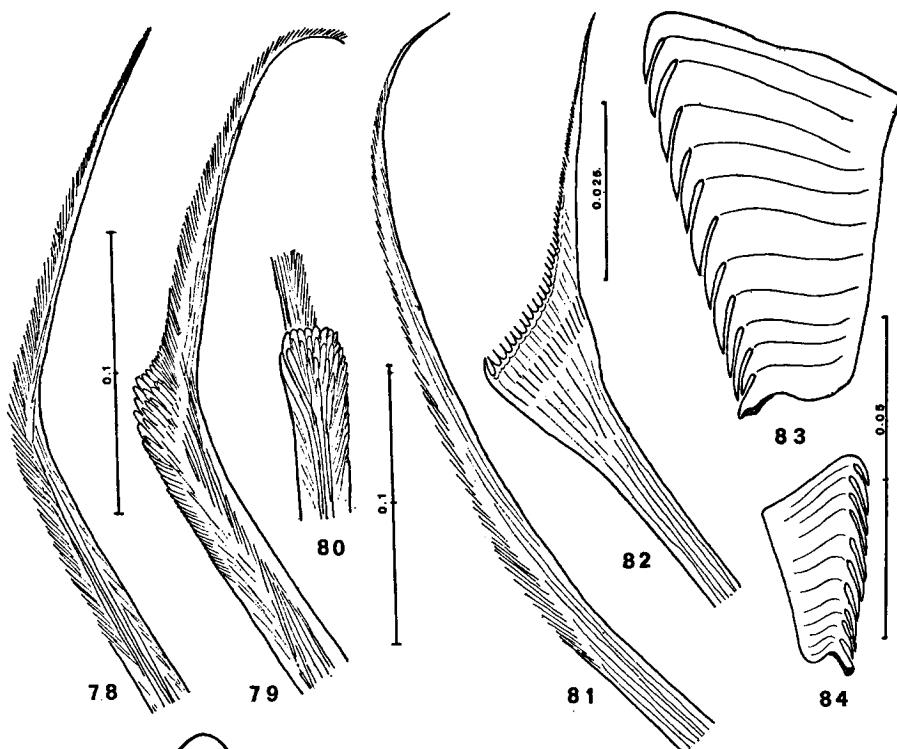
Exceptionally the medio- and latero-dorsal horns have side-spines like the latero-ventrals.

It is easily to be imagined, that if the elevation of the latero-ventral horns becomes less and less, firstly the operculum looks as in Fig. 87 and 88; then only the median pair of ventral horns remains (Fig. 89–91) – (this being the larger pair, see Fig. 74–75) – until even no ventral horns can be seen at all, forming an operculum by which *Sp. polycerus* var. *augeneri* is characterized. About 55 of these intermediate forms of opercula have been found (see table of material p. 33–34).

In Sta. 1037A no differences in the tubes of *Sp. polycerus* and *Sp. tetraceros* could be found; however, the worms of the same size, could easily be distinguished. In *Sp. polycerus* the branchiae are in a spiral, in *Sp. tetraceros* they are not; in the first type there are no inter-filamentous cirri, and the opercula are different. Usually, however, *Sp. polycerus* is somewhat smaller than *Sp. tetraceros*.

In several localities juvenile specimens have been found (e.g. Sta. 1017, Sta. 1049Aa). Already very small worms – less than 5 mm – could be identified as *Sp. polycerus*, their operculum being as in Fig. 92–93; some of them (2.6 mm long, and having only 17 abdominal segments) possess only 6 branchial filaments per side in one circle, their operculum measuring 0.34 mm. The material from Sta. 1029

Fig. 74–84. *Spirobranchus polycerus*. — From BONAIRE (Kralendijk, Sta. 1057); 76–84 from the same specimen. 74–75, Operculum in apical view and in side view, all horns without side-spines; 76–77, most common form of operculum, in apical view and in side view, the four latero-ventral horns with side-spines; 78–80, setae from first setiger; 79–80, "Spirobranchus-seta" in side view and front view; 81–82, thoracic and abdominal seta; 83–84, thoracic and abdominal uncinus.



and Sta. 1049Aa gave the impression that the juveniles of typical *Sp. polycerus* and var. *augeneri* both start with an operculum as in Fig. 96–97, a geniculate chalk plate. This stage, however, lasts longer in *Sp. polycerus* var. *augeneri*, the operculum becoming 2–3 times as large as in the typical *polycerus* before getting horns. The further development might be as illustrated in Fig. 98–102, 94–95 and 92–93. Fig. 92–93 shows how the horns (here the latero-ventrals) are formed by a fold in the chalk plate.

DISTRIBUTION

Caribbean Sea: Barbados, Bonaire, Klein Bonaire, Klein Curaçao, and Curaçao (see table on p. 33–34).

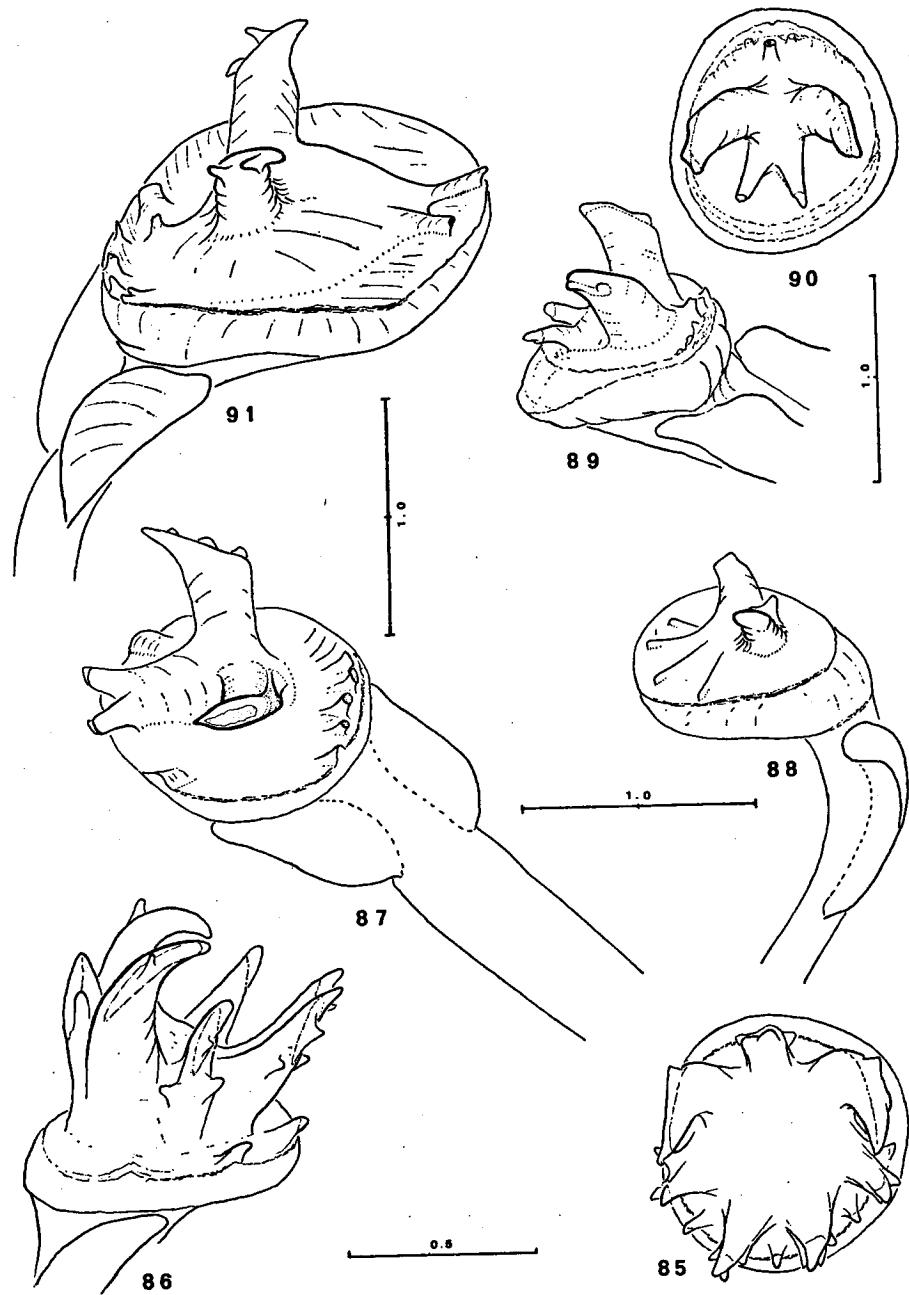
Spirobranchus polycerus (Schmarda, 1861) var. ***augeneri***, nov.

Spirobranchus giganteus (Pallas) juv.?, AUGENER, 1927b, p. 76 fig. 6. [Curaçao. — Material studied.]

MATERIAL: see table on p. 33–34.

This variety differs from the typical form chiefly in its operculum, which has only 2 latero-dorsal ox-horn shaped horns (Fig. 109–110). In about 50% of the material (in total ca. 700 spec.) a third, mediodorsal small knob is present (Fig. 111–112). The position of these 2 or 3 horns is as the dorsal ones of the typical form, however, the middorsal one is situated generally somewhat nearer to the dorsal margin. The operculum is usually reddish (as in *Sp. giganteus*), while typical *Sp. polycerus* generally has a white operculum.

Fig. 85–91. *Spirobranchus polycerus*, and intermediates to var. *augeneri*. — From BONAIRE (Kralendijk; 85–86), from St. EUSTATIUS (Sta. 1433; 87), and from BONAIRE (Lac, sta. 1068; Kralendijk, Sta. 1057; 88–91). 85–86, Common and typical form of operculum in apical view and side view; 87–91, intermediate forms of opercula, showing the relative constancy in latero-dorsal horns and the variability in the latero-ventral horns and the dorsal ones. The lateral pair of ventral horns, still indicated in Fig. 87, disappears altogether in Fig. 89–91; the dorsal horn, well-developed in Fig. 86, is small in Fig. 88–89 and 91 but not present in Fig. 87 (the small spines here are additional only).



Setae and uncini are not essentially different, as is shown in Fig. 114–118. However, it appeared that the number of teeth in the thoracic uncini is slightly higher as in typical *Sp. polycerus*; in 5 specimens it was 13–14 against 10–12. This last difference may be coherent with the fact that in 3 colonies the worms appeared to be larger than typical *Sp. polycerus*. Measurements, however, gave no significant differences (see Fig. 124).

A further difference might prove to be the number of abdominal segments: in 38 specimens of *Sp. polycerus* this varied from 40–100, of these 20 had 70–85 segments; in 43 *Sp. polycerus* var. *augeneri* from 50–80, 26 specimens had 60–70.

DISCUSSION

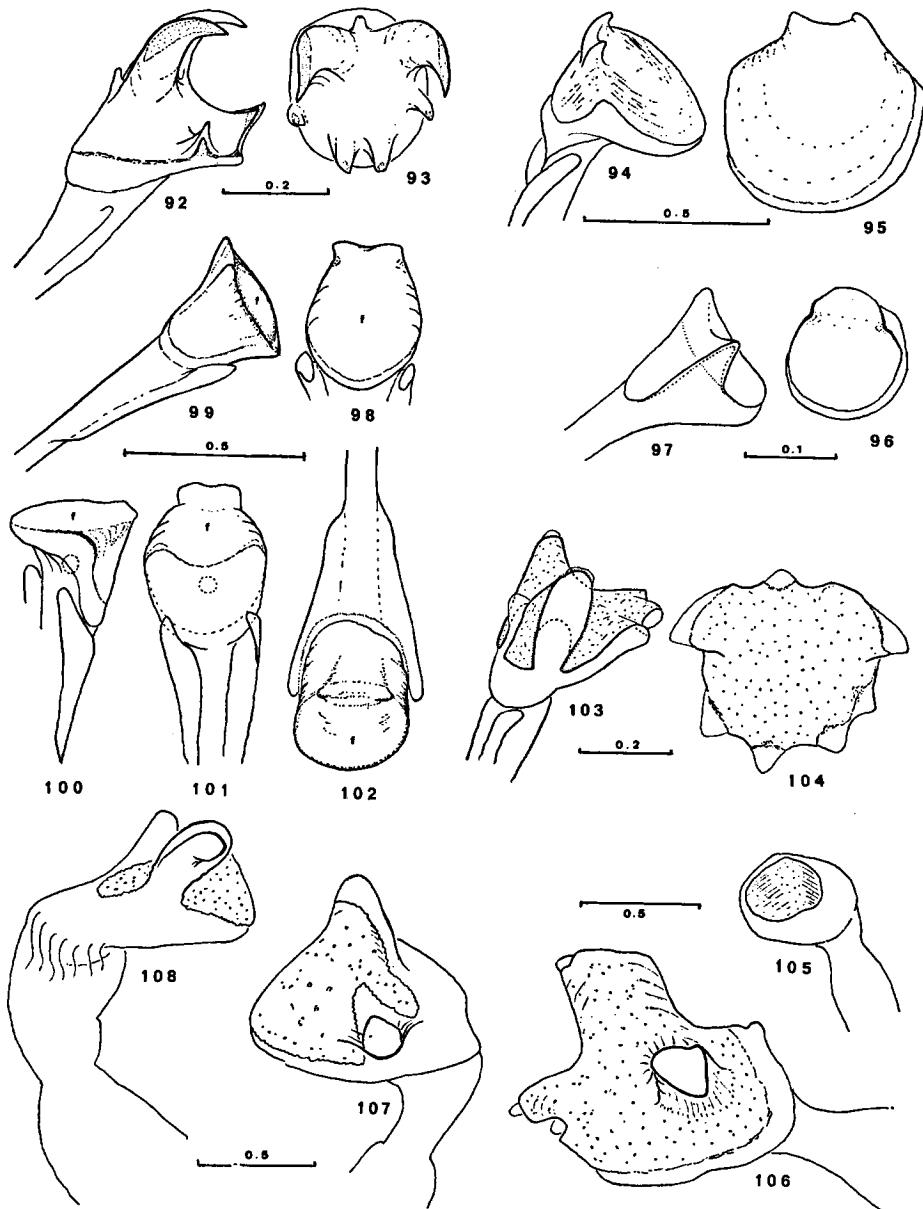
I do not agree with AUGENER 1927b (p. 76–77) that this worm is a juvenile *Sp. giganteus*, since in several cases (especially Sta. 1433 and Sta. 1620) I found sexual products in the body wall and in the tubes.

The worm might be mistaken for *Sp. giganteus corniculatus* (in the form as illustrated by Fig. 64); but the measurements of the latter generally are at least twice as large, and the distribution of both worms is different.

In about 55 specimens (see list of material on p. 33–34) the opercula were intermediate between the typical *polycerus* and var. *augeneri*; usually these opercula were reddish as in the var. *augeneri*.

This variety shows considerable variation in its operculum too. The horns, although usually ox-horn shaped, may be conical (Fig. 119) or indicated by rounded lobes only (Fig. 120), they may even disappear altogether (two specimens from St. Eustatius where no typical *polycerus* has been found yet; Fig. 121).

Fig. 92–108. *Spirobranchus polycerus*. — From CURAÇAO (Knip Baai, Sta. 1017; 92–93, 96–97, 98–102, 3 specimens. Piscadera Baai, Sta. 1495; 94–95. Caracasbaai; 105, 107–108, 2 spec.) and BONAIRE (Kralendijk s.n. and Sta. 1057a; 103–104, 106, 2 spec.). 92–102, Opercula of juvenile specimens with about 20 abdominal segments, explanation on p. 38; 103–108, regenerating opercula. — Although 98–102 are similar to the figures given by RIOJA (1942, fig. 16–20) for *Pomatoceros minutus*, the tube and the collar setae of my specimens were different, and the growth-series of the tubes was to clear to be misunderstood. The f indicates the same frontal spot in all figures.



A single case of duplicity of the operculum was observed, in the ca. 700 specimens of this worm studied; in the other *Spirobranchus* forms this was never seen. This duplicity is remarkable since in *Spirobranchus* no rudimentary operculum is present as it is in e.g. *Hydroides*. In the closely related *Pomatoceros* duplicity is also quite exceptional (SEGROVE 1941, p. 534); in *Hydroides* and *Eupomatus* it is a more common abnormality.

In 5 specimens a new operculum was being formed halfway down the peduncle. In Sta. 1310 both opercula (old and new) were of the *augeneri*-type. In Sta. 1046 one specimen showed an upper (old) and a lower (new) operculum of the typical *polycerus*-type (the lower more or less like the regenerating operculum in Fig. 103–104); one specimen had an upper *augeneri*-type and a lower typical *polycerus*-type operculum (Fig. 122). In Sta. 1024 one specimen showed an upper conical and a lower typical *polycerus*-type operculum (Fig. 123). The specimen named *Spirobranchus insignifer* (holotype, AUGENER 1922, p. 50) has – although AUGENER does not mention this – one typical *polycerus*-type operculum and halfway down the peduncle a more or less regenerating *polycerus*-type; the upper one, however, was broken off, as could be seen from the identical lines of fracture.

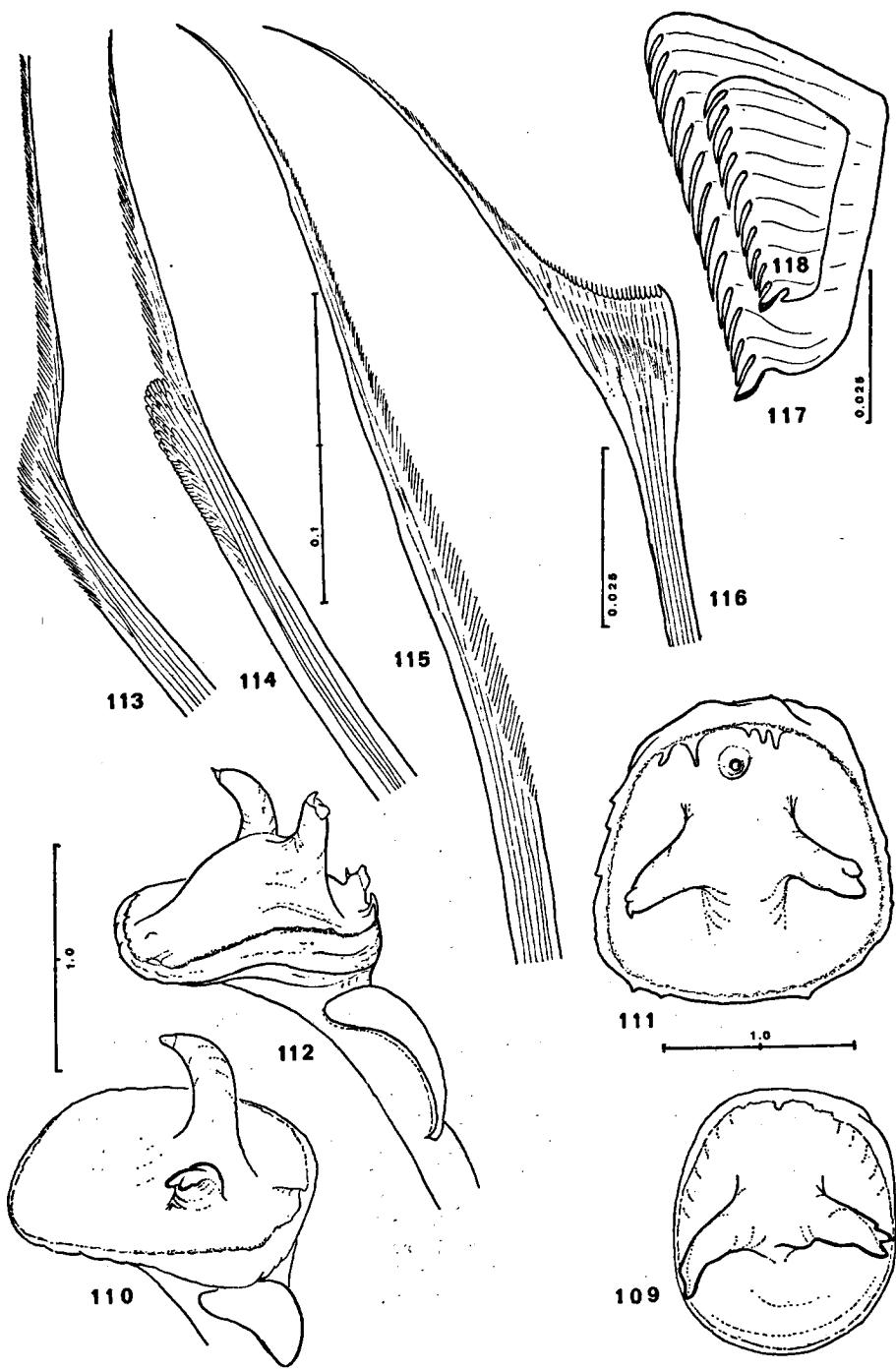
Some more regenerating opercula are given in Fig. 105–108, where again is clearly demonstrated that the forming of opercular horns is initiated by a fold of the fleshy parts of the operculum, resulting firstly in a folded chalk-plate, later in a horn.

It is possible that the difference between typical *Sp. polycerus* and *Sp. polycerus* var. *augeneri* is due to external factors, as the variety mainly abounds on very exposed coasts.

DISTRIBUTION

Caribbean Sea: St. Martin, Saba, St. Eustatius, Barbados, Bonaire, Klein Bonaire, Klein Curaçao?, Curaçao, and Aruba (see table on p. 33–34).

Fig. 109–118. *Spirobranchus polycerus* var. *augeneri* nov. var. — From BONAIRE (Kralendijk, Sta. 1057; 111–118 from the same specimen. 109–110, Operculum in apical view and in side view, without a dorsal knob; 111–112, operculum in apical view and in side view, with a dorsal knob; 113–114, setae from first setiger; 115–116, thoracic and abdominal seta; 117–118, thoracic and abdominal uncinius.



REMARKS ON THE GENUS SPIROBRANCHUS

After completing this manuscript Dr. H. ZIBROWIUS sent me his thesis (1968) and some of his specimens, which leads me to make the following remarks.

In my opinion he is quite right in transferring *Pomatostegus polytrema* to *Spirobranchus*. Thus the total number of *Spirobranchus* species accepted by me would be

7:	<i>eitzeni</i>	<i>lima</i>
	<i>giganteus</i>	<i>polycerus</i>
	<i>latiscapus</i>	<i>polytrema</i>
	(incl. <i>maldivensis</i>)	<i>tetraceros</i>

Spirobranchus giganteus, *polycerus* and *tetraceros* are dealt with in this paper; *lima* and *polytrema* in ZIBROWIUS'.

Sp. eitzeni AUGENER (1918, p. 599) appears to be related to *Sp. lima*, but their possible synonymy should be ascertained from more material.

Typical specimens of *Sp. latiscapus* sensu Marenzeller are described as *Pomatostegus* by: MARENZELLER (1885, p. 218), MOORE & BUSH (1904, p. 173), and TAKAHASI (1938, p. 215); as *Spirobranchus* by: BENHAM (1916, p. 158), AUGENER (1926, p. 272), FAUVEL (1936, p. 89), MESNIL & FAUVEL (1939, p. 32), MONRO (1939, p. 152) and IMAJIMA & HARTMAN (1964, p. 373); as ?*Pomatocerus strigiceps* by MCINTOSH (1885, p. 520). – Localities: Japan, Sulu (Sulu Sea, S.W. of Philippines), New Zealand, and Tasmania.

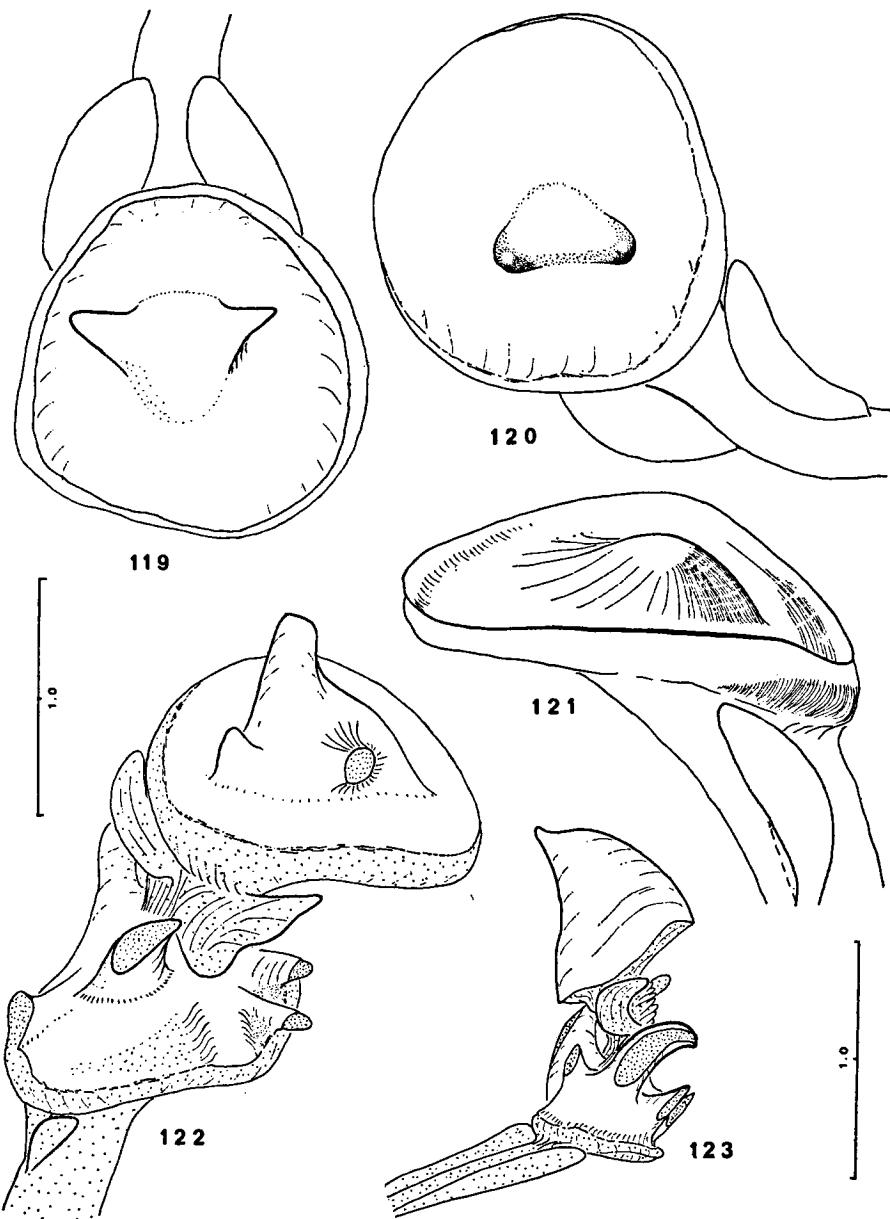
Typical specimens of *Sp. maldivensis* sensu Pixell are mentioned by PIXELL (1913, p. 84), FAUVEL (1932, p. 245; 1953, p. 464), MONRO (1937, p. 318), MESNIL & FAUVEL (1939, p. 33) and WESENBERG-LUND (1949, p. 358). – Localities: S. Arabian Coast, Gulf of Oman, Maldives Islands, off Cape Negrais (Burma) and Kur Island, Taam Island (Banda Sea).

TAKAHASI (1938, p. 217) figures the collar-setae of *Pomatocerus auritubis* Moore (MOORE & BUSH, 1904, p. 174; also mentioned by IMAJIMA & HARTMAN, 1964, p. 371) from Japan as "Spirobranchus-setae". This species strongly resembles *Sp. latiscapus* with 2 calcareous discs on its operculum. Although not mentioned by MESNIL & FAUVEL (1939, p. 32), their Siboga-material (with 6 discs) contained such a specimen with 2 discs (St. 105, ZMA V. Pol. 1721).

Assuming that *Sp. latiscapus* and *Pom. auritubis* [are also synonymous (this point of view is shared by ZIBROWIUS, personal communication), it appears

Fig. 119–121. *Spirobranchus polycerus* var. *augeneri*. — From St. EUSTATIUS (S. of Tumble Down Dick Bay, Sta. 1119; 119. Concordia Bay, Sta. 1433; 120–121). — The series shows the gradual change from two separate opercular horns in one central dome-shaped outgrowth.

Fig. 122–123. *Spirobranchus polycerus*. — From KLEIN CURAÇAO (Sta. 1046; 122) and CURAÇAO (S. of Plaja Hoeloe, Sta. 1024; 123). 122, Anomalous operculum, the upper (oldest) of *augeneri*-form, the lower (youngest) of typical *polycerus*-form; 123, another anomalous operculum, the upper of conical form, the lower of typical *polycerus*-form. – In both opercula the fleshy parts (coarsely dotted) indicate clearly that the horns of the lower ones are not fully grown yet. The small peduncular wing in 122 is an indication of regeneration too; thus the lower opercula must be the younger ones.



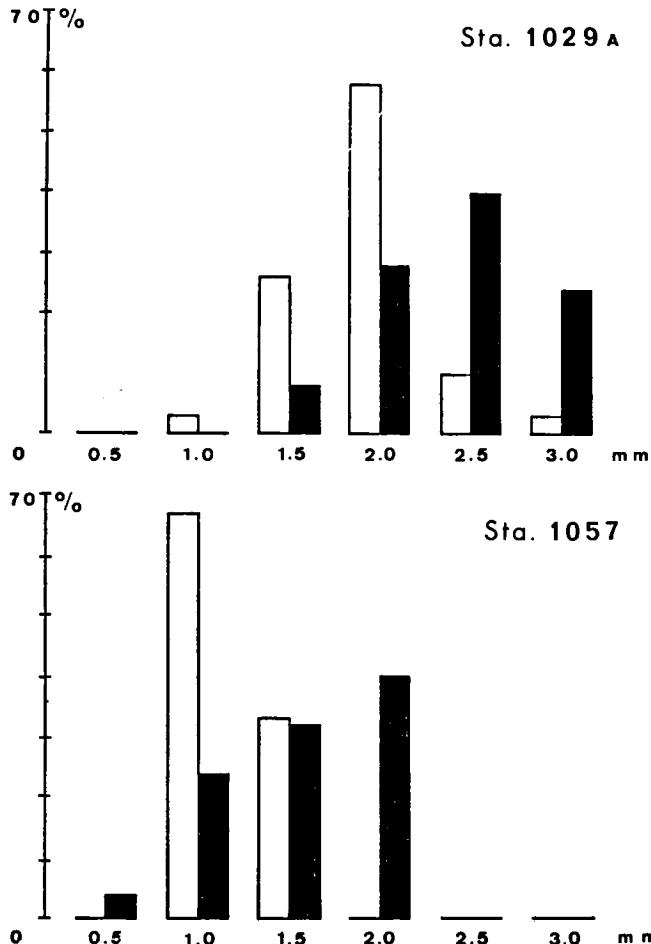


Fig. 124. Differences in opercular measurements of *Spirobranchus polycerus* (white), and *Sp. polycerus* var. *augeneri* (black) from Sta. 1029A (Curaçao, Piscadera) and Sta. 1057 (Bonaire, Kralendijk). – Horizontal axis: length of operculum (basal chalk-plate from dorsal to ventral, in mm). Vertical axis: number of specimens in percentages. – Sta. 1029A: n = 66 for *polycerus*, n = 25 for var. *augeneri*. Sta. 1057: n = 24 for *polycerus*, n = 25 for var. *augeneri*. – 0.5 stands for up to 0.7 mm; 1.0 for 0.8–1.2 mm; 1.5 for 1.3–1.7 mm, etc. – Although statistically no significant differences can be shown, both diagrams indicate the larger measurements of the var. *augeneri*.

that *Sp. latiscapus* (2-7, mostly 4 calcareous discs on its operculum) and *Sp. maldivensis* (1 calcareous disc, except 2 specimens described by MONRO (1937, 1939) with 2 discs) have a somewhat different geographical distribution. Possibly we are dealing with 2 subspecies, which should be named *Spirobranchus latiscapus latiscapus* and *Spirobranchus latiscapus maldivensis*.

In my opinion the material described from S.E. Australia by AUGENER (1927c, p. 271) as *Sp. latiscapus* does not belong to this species, but might be *Pomatoceros terrae-novae* as given by DEW (1959, p. 39). *Pomatostegus latiscapus*: TREADWELL (1926, p. 19) is a real *Pomatostegus* (specimen studied, USNM nr. 19203).

What makes matters somewhat complicated, is that opercula terminated by a flat calcareous disc without spines can be expected exceptionally in other *Spirobranchus* species too, since *Sp. polycerus* var. *augeneri* showed such an operculum. Perhaps *Spirobranchus ceylonensis* PILLAI (1960, p. 20), based on a single specimen only, must be explained in this way too; it could be an aberrant *Sp. tetraceros*, the more so since the operculum is non-calcareous (and thus perhaps regenerating).

The partial (and exceptional complete) absence of collar-setae in *Spirobranchus giganteus* (as described above) might also refer *Pomatoleios kraussii* (Baird) — = *P. crosslandi* Pixell — to *Sp. maldivensis* Pixell. But since all specimens of large colonies of *Pomatoleios* do not have any collar-setae (according to literature, and also in the ca 25 spec. from ZMK seen by the author) I prefer to maintain this genus, unless examples of partial lack of collar-setae in *Sp. latiscapus/maldivensis* come to our knowledge.

A recent visit to the British Museum (Natural History) was the immediate cause of a second series of additions, which may be represented by the following supplement. The author was enabled to visit the BMNH by a grant of the Netherlands Organization for the Advancement of Pure Science (Z.W.O.). He wants to thank Dr. J. D. GEORGE for his kind assistance during his stay. More literature and material came from Dr. L. LAUBIER, Dr. DALE STRAUGHAN and Dr. H. ZIBROWIUS.

Spirobranchus tetraceros

?*Spirobranchus giganteus*: FAUVEL, 1943, p. 30 [Gulf of California, Cape Pulmo; Bay of La Paz. — Might also be *Sp. giganteus giganteus*.]

Spirobranchus giganteus (Pallas) *coutierei* (Gravier), LAUBIER, 1966, p. 18-19. [Beirut. — Descr., material studied.]

Spirobranchus tricornis: STRAUGHAN, 1967a, p. 244, fig. 14 b-d. [Queensland, New South Wales. — Few characters.]

Spirobranchus semperi: STRAUGHAN, 1967a, p. 246. [Queensland. — Few charact.]

?*Spirobranchus coronatus* STRAUGHAN, 1967a, p. 247, fig. 15 a-h. [Queensland. — Few charact.]

Spirobranchus tricornis: STRAUGHAN, 1967b, p. 39. [Queensland. – Diagnosis.]

?*Spirobranchus coronatus*: STRAUGHAN, 1967b, p. 39. [Queensland. – Diagn.]

?*Spirobranchus corrugatus* STRAUGHAN, 1967b, p. 39, fig. 5 a–e. [Queensland. – Diagn. As regenerating opercula of *Sp. polycerus* show similar forms (Fig. 104–105), the author can not see reasons to create a new species for this single specimen.]

Spirobranchus coutierei: STRAUGHAN, 1967c, p. 224, fig. 1 a–d. [Darwin. – Diagn.]

PANAMÁ. – COLÓN, Crossland coll., MONRO 1933b det. (2 spec. sub *Sp. contieri*, BMNH 1933.7.10.352).

LEBANON. – Near BEIRUT, 25–30 m, 1.IX.1965, LAUBIER (1966) coll., det. (7 spec. sub *Sp. giganteus coutierei*).

RED SEA. – SUEZ, AGIG BAY, SUAKIN HARBOUR, KAMARAN ISL., the greater part Crossland coll., PIXELL 1913 det. (in total ca 120 spec., under various names, BMNH 69.7.8.42, 70.12.23.30/31, 1924.6.13.136–146/149/182–192/213, 1937.6.30.1, 1938.7.25.78–90).

SOUTH ARABIAN COAST. – Murray Exp., MONRO 1937 det. (10 spec. sub *Sp. giganteus* & *Sp. giganteus* var. *arabica*, BMNH 1937.9.2.542–4/545–9).

ZANZIBAR. – Crossland coll., PIXELL 1913 det. (4 spec. sub *Sp. semperi* var. *acroceros*, BMNH 1924.6.13.213; 10 spec. sub *Sp. contieri*, with older label *Pomato-ceropsis contieri* = ?*Sp. dendropoma*, BMNH 1924.6.13.115–125; 4 spec. sub *Sp. giganteus*, BMNH 1924.6.13.126–127).

GULF OF MANAAR. – RAMESVARAM, E. Thurston Esq. (6 spec. sub *Sp. giganteus*, BMNH 1888.12.5.14–20).

CEYLAN. – PEARL BANKS, PILLAI 1960 det. (8 spec. under various names, BMNH 1959.12.16.9/10/11–12).

AUSTRALIA. – PORT DARWIN, 45 fms, “C. S. Cable” Eastern & Assoc. Telegraph Co. (1 spec., sub *Sp. semperi* var., BMNH 1924.9.30.4); CRONULLA (NSW). DEW 1959 det. (2 spec., sub *Sp. giganteus*, BMNH 1959.10.19.31–32).

The author tried to distinguish between different opercular forms as for instance “*quadricornis*” and “*tricornigera*”, since PIXELL and PILLAI apparently could recognize more than one species. He numbered ca 60 specimens from Curaçao and Bahrein and classified the numbers with one of the forms. When doing the same with the same numbers a few days later, the outcome was very different. Also PIXELL classified exactly the same opercular forms with *semperi* as well as with *coutierei*. The author could not find reasons to maintain a separation on species- or on subspecies-level, neither in the ca 100 specimens studied closely, nor in the ca. 180 specimens in the BM(NH).

As for PILLAI’s statement on *Conopomatus*, “The operculum is chitinous...” (in STRAUGHAN 1967a, p. 242), the opercula made a leathery-calcareous impression upon the author. Such opercula

occur in *Pomatoceros triqueter* too (material from Marseille, ZIBROWIUS coll., det.), and since there are only 2 specimens known from the same locality as *Sp. tetraceros*, it seems more realistic to consider these species as aberrant *Sp. tetraceros*. The fringed edge of the peduncular wings in *Conopomatus*, not existing in any other serpulid species known to the author, is another argument for synonymy with *Sp. tetraceros*.

Spirobranchus giganteus giganteus

?*Spirobranchus giganteus*: FAUVEL, 1943, p. 30 [Gulf of California, Cape Pulmo; Bay of La Paz. — Might as well be a *Sp. tetraceros*.]

Spirobranchus giganteus: ZIBROWIUS, 1970, ms. [Brazil. — Ext. descr., material studied.]

TRINIDAD. — "Terra Nova" 1910, Sta. 36, BENHAM 1927 det. (1 spec. and 1 tube, sub *Sp. tricornis*, BMNH 1928.2.29.89/107).

D R Y T O R T U G A S. — Sta. 122, G. Tandy & J. S. Coleman, MONRO 1933a det. (4 spec. sub *Sp. giganteus*, BMNH 1932.12.22.105).

B R A Z I L. — FERNANDO DE NORONHA ISLAND, J. Laborel coll., Sta. E, 4–8 m, ZIBROWIUS (1970?) det. (1 spec. sub *Sp. giganteus*).

18°50' S, 38°47' W, 30–34 fms, D. Wilson Barker. (1 spec. sub *Sp. giganteus*, BMNH 1890. 1.24.19).

C A R I B B E A N S E A. — Capt. Cole (1 spec. sub *Sp. tricornis*, BMNH 1884.7.6.1).

G A L Á P A G O S I S L A N D S & G U L F O F P A N A M Á. — Several localities, MONRO 1933b det. (27 spec. sub *Sp. giganteus*, BMNH 1933 .7.10.341–2/343–4/345/346–8/349/350–1).

?C A L I F O R N I A. — On *Haliotis rufescens* (Abalone) sold at SANTA BARBARA, H. Zibrowius coll. 1967 (3 dried specimens).

The material studied from the pacific side of America (in total ca 30 specimens) has opercula like Fig. 46–47, with a well developed medio-ventral horn, except the specimens figured in Fig. 58–59. Generally the medio-ventral horn is split farther than given in Fig. 45, and the 2 branches are bifurcated (as in Fig. 47). When this proves to be a constant feature in more material, it might be possible to discern a third subspecies: *Spirobranchus giganteus* (Pallas) *incrassatus* Mörch, distribution on the Pacific coasts of America (tropical and subtropical).

Spirobranchus giganteus corniculatus

Pomatoceros paumotanus CHAMBERLIN, 1919, p. 479–480, pl. 78 fig. 6–9. [Paumotu Islands. – Descr., fide ZIBROWIUS (pers. commun.)]

Spirobranchus gardineri: STRAUGHAN, 1967a, p. 243–244, fig. 14a. [Queensland. – Diagn.]

Spirobranchus giganteus: STRAUGHAN, 1967a, p. 245–246, fig. 14e. [Queensland. – Diagn.]

Spirobranchus giganteus: STRAUGHAN, 1967b, p. 38. [Queensland, Heron Isl. – Diagn.]

RED SEA. – DJEDDAH, coral reef, Metcalf coll., BAIRD 1865 det. (2 spec. sub *Sp. [Cymospira] tricornis* Types, BMNH 47.9.9.13–14); SUAKIN HARBOUR, Crossland coll. (14 spec. sub *Sp. semperi*, BMNH 1924.6.13.182–192; ?5 spec. sub *Sp. giganteus*, PIXELL 1913 det., BMNH 1938.7.25.4–5 or 7–8).

ZANZIBAR. – 10 fms, Crossland coll., PIXELL 1913 det. (several spec. sub *Sp. giganteus*, BMNH 1924.6.13.126–7).

MALDIVES. – Hulule, MALE ATOLL; Mamaduwari, S. MAHLOS, J. Gardiner coll., PIXELL 1913 det. (1 spec. sub *Sp. giganteus* var. *turbinatus* Type, 3 spec. sub *Sp. giganteus*, BMNH 1938.7.25.2/3/4–5 or 7–8).

CHRISTMAS ISLAND (Ind. Oc.). – Flying Fish Bay and Flying Fish Cove, Dr. F. Harms coll. (8 spec. sub *Sp. giganteus*, BMNH 1933.10.11.15–17/18).

ADMIRALTY ISLANDS. – BAUDIN ISL. (2 spec. sub *Sp. giganteus*, BMNH 1926.4.30.143–4).

AUSTRALIA. – SWAIN'S REEF, E. Austr., J. B. Jukes, HMS "Fly", BAIRD 1865 det. (1 spec. sub *Sp. [Cymospira] brachycera* Type, BMNH); JUKES REEF, LOW ISLES, Great Barrier Reef Exp. 1929, MONRO 1931 det. (3 spec. sub *Sp. giganteus*, BMNH 1931.7.1.66–7/68); QUEENSLAND, Heron Isl., Barbara DEW 1959 det. (2 spec. sub *Sp. giganteus*, BMNH 1959.10.19.29–30).

The material mentioned above shows again all possible forms of opercula, ranging from "bicornis" (or better "brachycera", since "bicornis" is a Caribbean form) to "tricornis" (sensu BAIRD 1865): for instance one of the two syntypes of *Cymospira tricornis* Baird has two normally developed latero-dorsal horns and a minute medio-ventral one.

The characteristics given by CHAMBERLIN 1919 for *Pomatoceros paumotanus*, e.g. form of operculum, peduncular wings and thoracic uncini, point to a synonymy with *Sp. giganteus corniculatus*. ZIBROWIUS' statement that the collar-setae of the type (USNM) are typical "Spirobranchus-setae" (personal communication) puts this question beyond doubt.

The "rather fewer branchiae" (PIXELL 1913, p. 81) and the very

large collar on the right side do not justify a special status (var. *turbinatus*) for the single specimen from Hulule.

Doubtful *Spirobranchus* are:

Cymospira MacGillivrayi BAIRD (1865, p. 19, pl. 2 fig. 3). — As only a description of the tube is known, it is impossible to decide with certainty where it has to be placed. From the locality (Fiji Islands), measurements and form of the tube it might be synonymous with *Sp. giganteus corniculatus*.

Cymospira incompleta QUATREFAGES (1865, p. 543). — From the description (branchial filaments in 5 whorls, measurements) it might be a *Sp. giganteus corniculatus*, but since the operculum had been lost, one cannot be certain.

Spirobranchus (?) cariniferus (Gray) EHLERS (1907, p. 29). — This might be a *Pomatoceros* as well, as already suggested by AUGENER (1913, p. 301).

Spirobranchus rostratus (Lam) MÖRCH (1863, p. 404). — Described by LAMARCK (1818, p. 369) as *Vermilia rostrata*, also mentioned by DE SERRES (1855, p. 240) and BUSH (1907, p. 53). The short description of the tube only is not sufficient for identification. It might be better to drop the name altogether.

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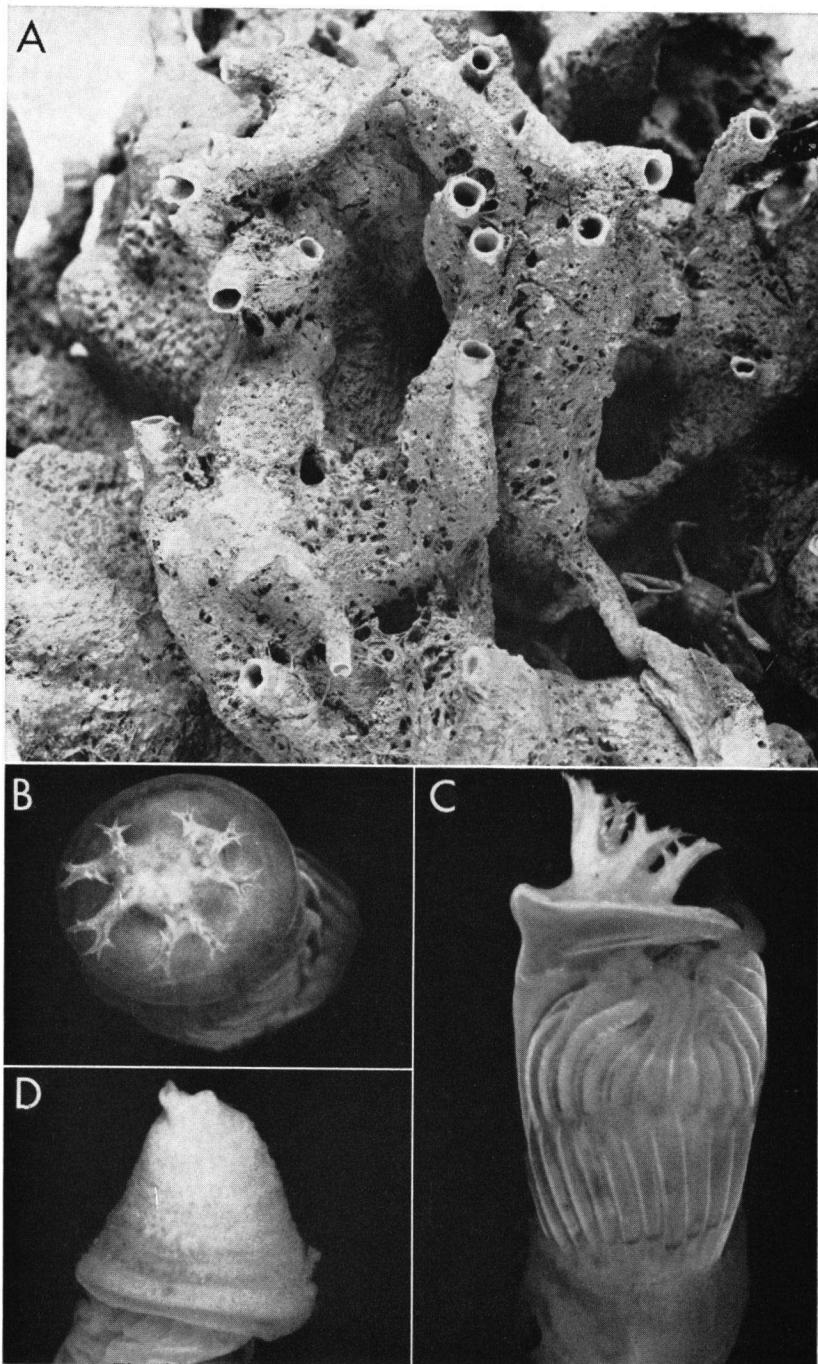
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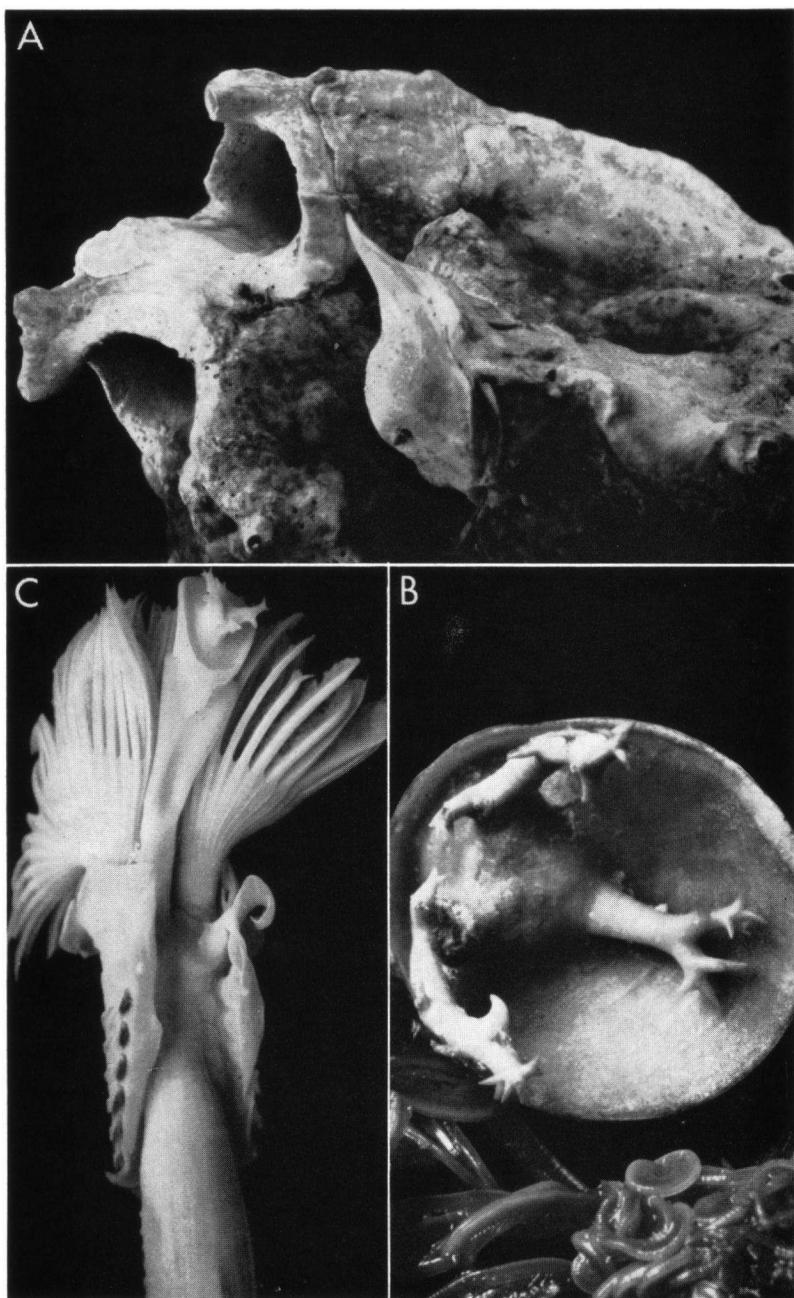
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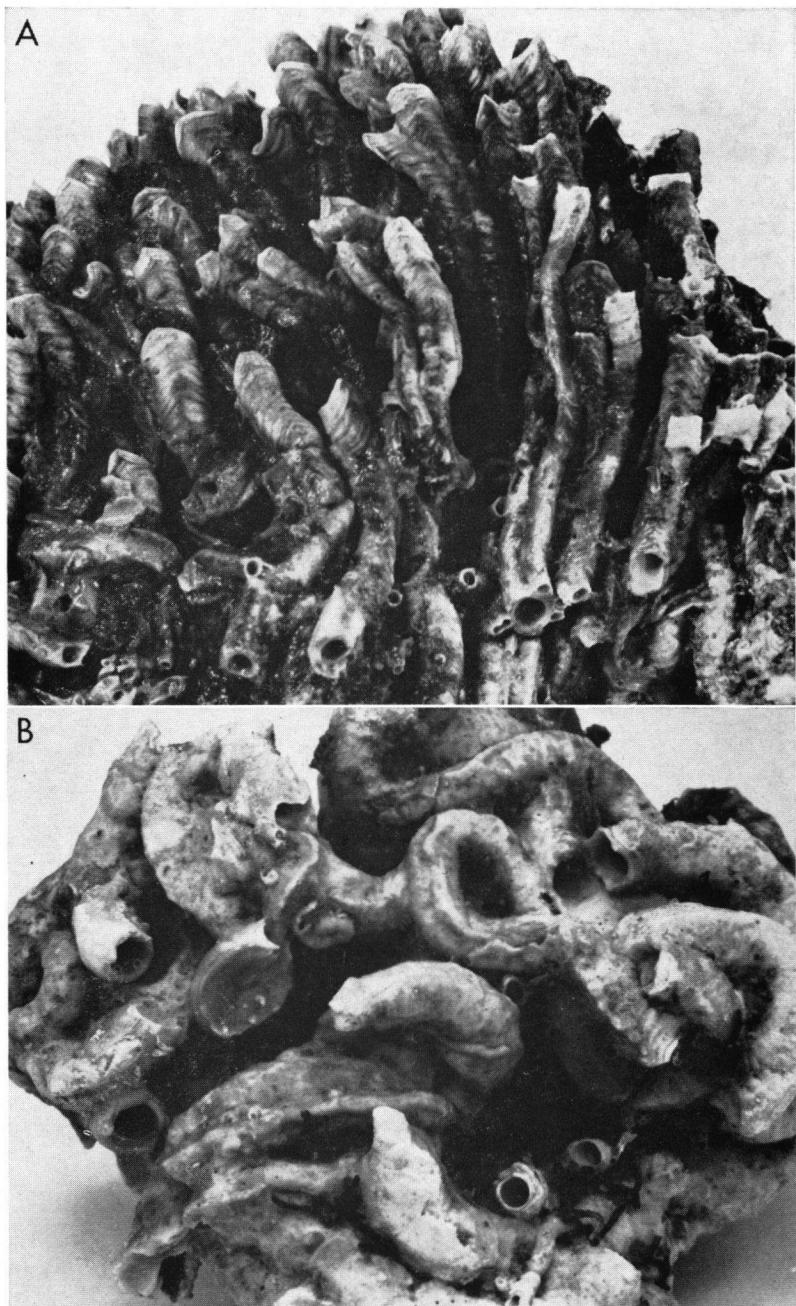
1. *Spirobranchus tetraceros*. — A. Cluster of tubes with *Porites astreoides* on piece of limestone, from CURAÇAO (Spaanse Water, 5.X.1968, 4/3 \times). — B-C. Operculum (apical view) and frontal part of worm (right side view) from CURAÇAO (Sta. 1037A, Spaanse Water, 18 \times). — D. Conical operculum as shown in Fig. 15, from BAHREIN (Sta. 87, 18 \times).

Plate II



II. A-B. *Spirobranchus giganteus giganteus*. — A. Mouths of three tubes from CURAÇAO (Sta. 1029A, Piscadera Baai, 2.3 \times). — B. Operculum as shown in Fig. 45, from CURAÇAO (Sta. 1017, Knip Baai, 8.6 \times).

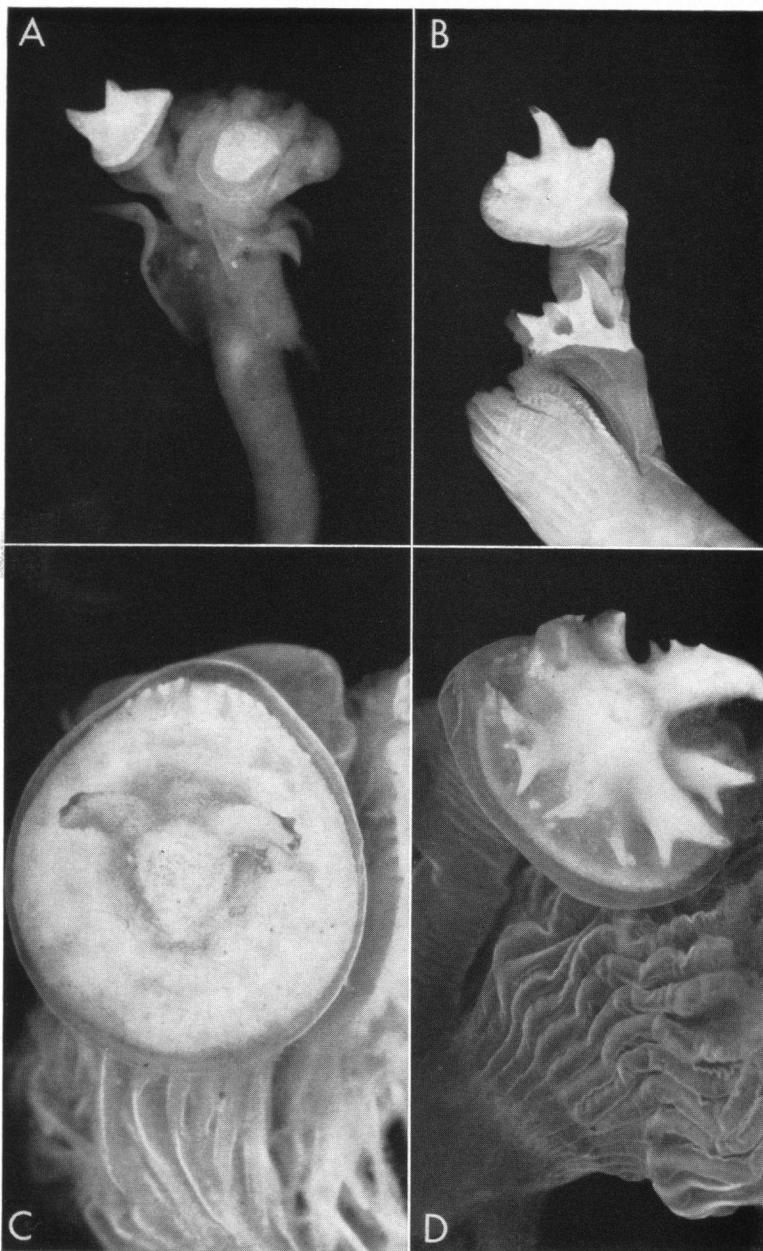
II. C. *Spirobranchus giganteus corniculatus*. — Frontal part of worm, e.g. showing large thoracic membrane, from EILATH (E55/439, 1.8 \times).



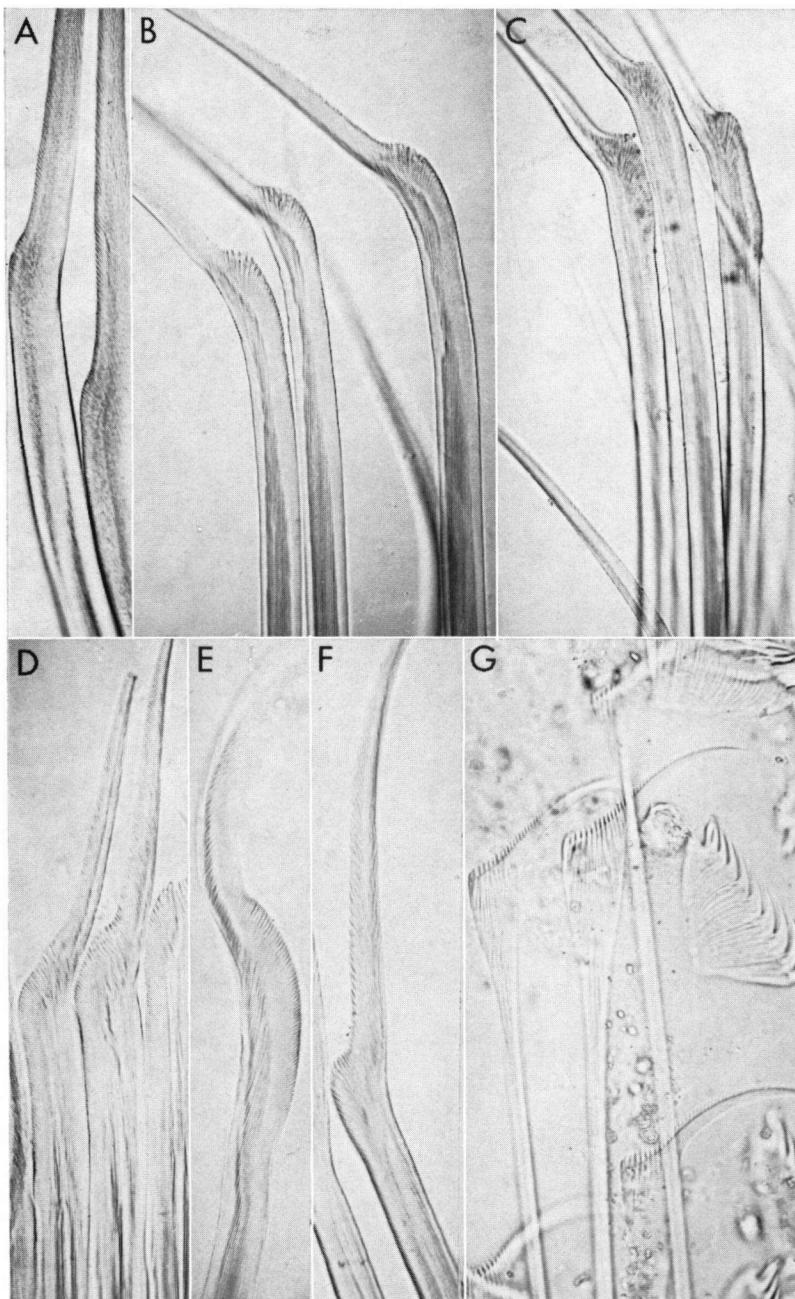
III. A. *Spirobranchus polycerus* var. *augeneri*. — Cluster of tubes, all mouths directed to one side, from BARBADOS (Sta. 1553, Conset Bay, 2.3 \times).

III. B. *Spirobranchus polycerus* and var. *augeneri*. — Cluster of tubes, mouths directed at random, from CURAÇAO (Sta. 1029A, Piscadera Baai, 2.3 \times).

Plate IV



IV. *Spirobranchus polycerus* and var. *augeneri*. — A. Intermediate juvenile form showing duplicity of the operculum, from KLEIN BONAIRE (Sta. 1049A, 31 \times). — B. Frontal end of specimen, showing an upper and lower more or less typical *polycerus* operculum, from CURAÇAO (Sta. 1024, S. of Plaja Hoeloe, 16 \times). — C. Operculum of typical var. *augeneri* in apical view, from CURAÇAO (Sta. 1029A, Piscadera Baai, 17 \times). — D. Operculum of typical *polycerus* in right apico-lateral view, from CURAÇAO (Sta. 1029A, Piscadera Baai, 16 \times).



V. A-F. "Spirobranchus-setae" (ca. 240 \times). — V. G. Abdominal setae and uncini of one of the anterior segments (ca. 390 \times).

- A. *Sp. giganteus giganteus*, from "WEST-INDIË", J. Boeke coll. (Fig. 42).
- B. *Sp. polycerus* (typical form), from BONAIRE (Sta. 1057, Kralendijk).
- C. *Sp. tetraceros*, from CURAÇAO (Sta. 1037A, Spaanse Water).
- D. *Sp. giganteus giganteus*, from BONAIRE (Kralendijk). Very small *tricornis*-form.
- E. *Sp. giganteus corniculatus*, from EILATH, (E55/439, see Fig. 70).
- F-G. *Sp. tetraceros*, from BAHREIN (Sta. 42C). Specimen with a more or less *quadricornis*-form of operculum.