Redescription of *Sertularia notabilis* Fraser, 1947 (Sertulariidae, Hydrozoa)

A.E. Migotto & W. Vervoort

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A.E. Migotto, Centro di Biologia Marinha, Universidade de São Paulo, Caixa Postal 83, 11600-970, São Sebastião, SP, Brazil (e-mail: aemigott@usp.br).
W. Vervoort, National Museum of Natural History, Leiden, The Netherlands (e-mail: vervoort@naturalis.nnm.nl).

Key words: Cnidaria Hydrozoa; Sertulariidae; *Sertularia notabilis*; systematics; distribution.
An obscure species of the large leptolid genus *Sertularia*, *S. notabilis* Fraser, 1947, originally described from Tortuga Island, Venezuela, and not recorded since, is re-described and recorded from Brazilian coastal waters. This material is compared with Fraser's type series; its relationship with *Sertularia hattori* Leloup, 1940, from Japanese and Korean waters, is discussed and possible conspecificity evaluated.

Introduction

The present paper deals with the re-description of a species of the large leptolid genus *Sertularia* Linnaeus, 1758, that at first proved difficult to identify. It turned out to be identical with *Sertularia notabilis* Fraser, 1947, originally described from Tortuga Island, off Venezuela, in the Caribbean.

Most of the material studied was collected during a survey of the biota of the inner continental shelf of southern Espírito Santo State, SE Brazil. The bottom of this shelf is composed mainly of calcareous nodules, originating from coralline algae (Rhodophyta), that serve as substrata for other algae and animals (Berchez et al., 1995). Calcareous nodules and foliaceous algae were collected by SCUBA diving at c. 15-20 m depth, c. 20 km from the coast (21°10.7'S 40°37.2'W). The material was fixed in formalin (4%), transferred to 80% ethanol and examined under a stereomicroscope.

Additional material was collected on the island of São Sebastião (23°51.18'S 45°25.07'W), São Paulo State, growing epibiotically on *Sertularia marginata* Kirchenpauer, 1864, one of the most common hydroids of the intertidal and shallow infralittoral of the region (Migotto, 1996). The type series of *Sertularia notabilis* Fraser, 1947, and one microslide (no. 55) of the Vannucci collection (see Migotto, 1996), with 3 stems of *S. notabilis*, were also examined.

Stems for scanning electron microscopy (SEM) were dehydrated in a graded series of ethanol, dried in a critical-point drier, and sputter-coated with gold.

Figures 1-11 were drawn by A.E. Migotto; figures 12 and 13 were drawn by W. Vervoort.

Taxonomic part

Sertularia notabilis Fraser, 1947
(figs 1-14)

Sertularia notabilis Fraser, 1947: 11, pl. 2 fig. 5a-c; Schmitt, 1948: xii, xv; Vervoort, 1968: 106.

Sertularella moluccana; Vannucci Mendes, 1946: 569-530, fig. 39. (Lapsus pro *molukkana*).
Not *Caminothujaria molukkana* Von Campenhausen, 1896: 104, 106 (for synonymy see Vervoort, 1993: 102-103).

Material.— Off Espírito Santo State, 21°10.7'S 40°37.2'W, 15-20 m, on *Sargassum* spec., Stn 5, 23.ii.1987, a few stems, mostly with 2-3 pairs of hydrothecae, one with 8 pairs; no gonothecae, leg. F.L. da Silveira (AM 917).— Idem, Stn 7, 13.xii.1986, a few stems, mostly with 1-2 pairs of hydrothecae, no gonothecae, leg. F.L. da Silveira (RMNH-Coel. 28851).— Idem, Stn 7, 23.ii.1987, fairly abundant stems, mostly with 2-3 pairs of hydrothecae, but some with 4 or 5. Some hydrothecae with renovated margin; no gonothecae, leg. F.L. da Silveira (AM 18).— Idem, Stn 8, 23.ii.1987, fairly abundant stems, mostly with 3-4 pairs of hydrothecae, some with up to 7. Several stems with developing gonothecae, and a few with fully formed gonothecae, leg. F.L. da Silveira (RMNH-Coel. 28852).— Idem, Stn 9, 13.xii.1986, a few stems with 1-2 pairs of hydrothecae; no gonothecae, leg. F.L. da Silveira (AM 919).— Idem, Stn 11, 13.xii.1986, a few stems with 2-4 pairs of hydrothecae, some not opposite; no gonothecae, leg. F.L. da Silveira (RMNH-Coel. 28853, slide 4276).— Idem, Stn 12, 24.ii.1987, a few stems with 2-4 pairs of hydrothecae, some with 6; no gonothecae, leg. F.L. da Silveira (AM 920).— Parcel da Praia Grande, island of São Sebastião, São Paulo State, 23°51.18'S 45°25.07'W, intertidal, on *Sertularia marginata* and tubes of *Phragmatopoma lapidosa* (Polychaeta), 18.vi.1996, a few stems with 1-4 pairs of hydrothecae, one with 5. Some with one hydrotheca only on the first internode. No gonothecae, leg. A.E. Migotto (RMNH-Coel. 28854).— Idem, on *Sertularia marginata*, 11.x.1996, a few stems with 1-4 pairs of hydrothecae, some with 5 or 6; no gonothecae, leg. A.E. Migotto (AM 921).— Idem, on *Sertularia marginata*, 28.x.1996, a few stems with 1-3 pairs of hydrothecae, some with 5; no gonothecae, leg. A.E. Migotto (AM 922).— Guarujá, São Paulo State, 10.xi.1944, microslide no. 55 of Vannucci collection (three stems with 2 pairs of hydrothecae each; without gonothecae).— Tortuga Island (Isla la Tortuga), Venezuela, Allan Hancock Caribbean Sea Expedition, Stn A22-39, 10°58'00"N 65°24'45"W, 2-5 fms (= 2.5-9 m), 13.iv.1939, up to 5 mm high colonies arising from stolon on *Sargassum* spec., type series; 2 slides 2593 (RMNH-Coel. 28855) are part of the type series. Slide made 17/21.iv.1995, Janus Green/Permount.— Tobago Island, Allan Hancock Caribbean Sea Expedition, 13.iv.1939 (no further details on label; station not mentioned by Fraser (1947), date does not correspond with station list; locality reference may be corrupted!). C. 4 mm high stems with gonothecae on algae. Slide 2592 (RMNH-Coel. 28856). Slide made 17/21.iv.1995, Haematoxylin/Permount.

AM = private collection of A. E. Migotto; RMNH-Coel. = Coelenterate collection of the Rijksmuseum van Natuurlijke Historie, now National Museum of Natural History, Leiden, The Netherlands.

Description.— Colonies developing by stolonal growth of hydrorhiza on solid substrate, giving rise to erect, unbranched and monosiphonic hydrocauli at regular intervals. Colonies inconspicuous, composed of few and small stems growing on basal part of hydrocaulus and on hydrorhiza of *Sertularia marginata* Kirchenpauer, 1864, at São Sebastião island, and on leaflets and stems of the alga *Sargassum* spec., at the continental shelf off Espírito Santo State.

Stems usually short (2-3 mm high), bearing 2 to 5 pairs of hydrothecae; larger stems c. 5 mm high with a maximum of 8 pairs. Hydrocaulus divided into regular internodes by transverse nodes, represented by simple constrictions of perisarc and demarcated by swelling of distal part of internode (figs 1-4). Usually each internode with one pair of hydrothecae at its proximal end; some stems with one hydrotheca at most proximal internode (figs 4-5). Each pair of hydrothecae placed on front of internode touching frontally for a variable distance, with exception of some pairs - usually most proximal - that may not touch. Hydrothecae face outward and obliquely upwards.

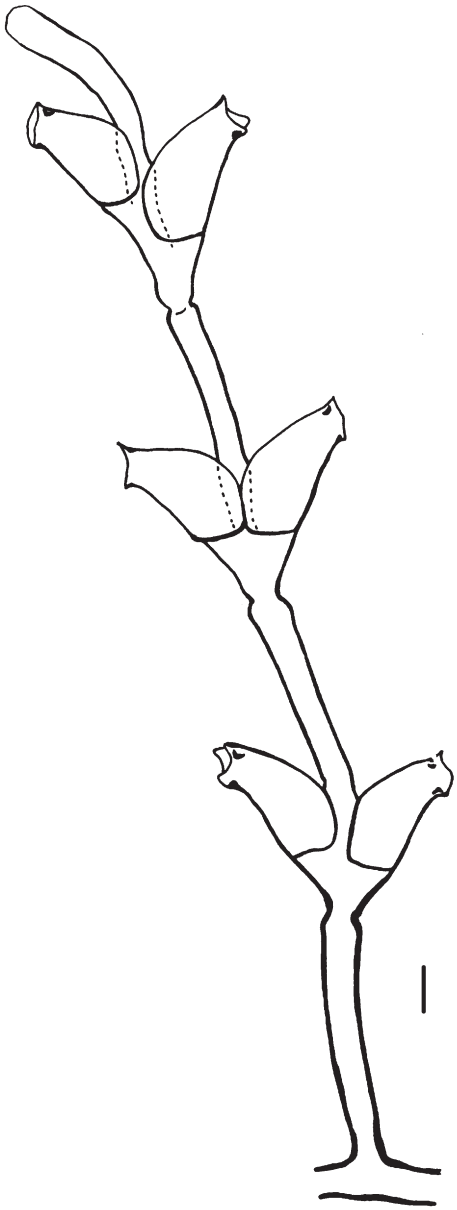


Fig. 1. *Sertularia notabilis* Fraser, 1947. Front view of a stem with 3 pairs of hydrothecae. Note the sub-opposed hydrothecae of the first and third pairs. Stn 11, RMNH-Coel. 28853. Scale 100 µm.

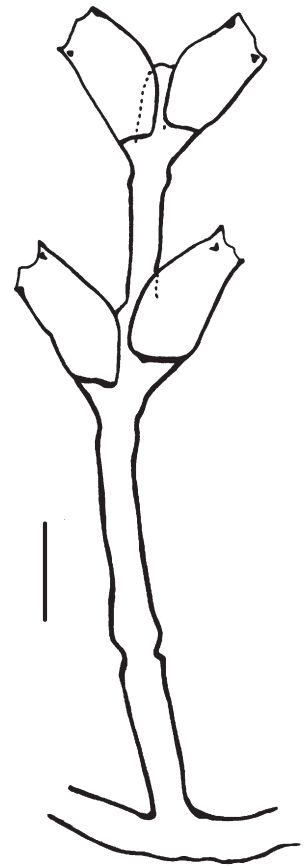


Fig. 2. *Sertularia notabilis* Fraser, 1947. Part of a stem with two sub-opposed pairs of hydrothecae. AM921. Scale 200 µm.

Majority of paired hydrothecae perfectly opposed, but internodes with sub-opposite (fig 2-3) or alternate (figs 4-5) hydrothecae occur, resembling species of *Sertularella*. In such cases the subsequent pairs usually are distinctly opposite.

Hydrothecae (figs 5, 8-10) urn-shaped, wider at the base, maximum diameter at c. 1/3 from base, conspicuously narrowing towards apex and usually flaring abruptly just under aperture. Rim circular to oval, with two big lateral cusps, and a smaller, adcauline cusp, closed by an operculum composed of two valves; adcauline flap smaller and frequently divided in middle (figs 7, 12c, 14a-c). Three intrathecal cusps present just under rim, one abcauline, occasionally small or missing, and two adcauline laterals, stronger and better developed than abcauline cusp (figs 7-11). Some hydrothecae show marginal renovations (figs 10-11); in such cases duplication of marginal, intrathecal cusps may occur (fig. 11). Perisarc of hydrothecal bottom thickened and frequently with small projections into hydrothecal cavity. No intrathecal septum crosses hydrothecal cavity.

Hydranths milky-white, 370-540 µm high (from base of hydrotheca to base of tentacles), with conical hypostome and 18 to 22 filiform tentacles, 180-288 µm long. Abcauline caecum clearly visible when hydranth is retracted into hydrotheca.

Gonothecae (figs 6-7, 13) inserting just below proximal hydrothecae, with short but distinct pedicel, large in comparison to stem and hydrothecae, elongate, cylindrical, with distinct transversal annulation, petering out towards the base (fig. 14d), and with circular orifice. Sexual dimorphism of gonothecae not evident.

Small microbasic mastigophores (6.0-7.0 × 2.0 µm) scattered on hydranth body and in coenosarc, concentrated along tentacles.

Table 1 - Measurements of Sertularia notabilis Fraser, 1937, in µm.

	São Sebastião	Espirito Santo collection	Vannucci****	Tortuga Id *****
Diameter of hydrorhiza	86.0±15.6 (64 -120)	86.0±22.5 (64 - 160)	80 - 96	133 - 170
Distance between 2 consecutive pairs*	375.6±128.4 (80 - 632)	350.8±85.8 (224 - 576)	168 - 432	259 - 518
Internode, diameter **	77.3±8.1 (64 - 92)	74.3±10.8 (60 - 108)	72	89 - 111
Node, diameter	107.9±10.5 (88 - 128)	99.2±18.0 (80 - 160)	88 - 96	112 - 126
Hydrotheca				
length abcauline wall	244.3±19.5 (216 - 312)	252.1±30.3 (184 - 316)	240 - 248	318 - 350
length free part adcauline wall	197.6±24.2 (136 - 240)	224.1±27.6 (152 - 288)	202 - 208	281 - 296
length adnate part adcauline wall	72.1±22.5 (120 - 208)	165.6±21.9 (108 - 224)	156 - 168	200 - 292
length contiguous part adcauline wall***	105.0±30.3 (56 - 168)	111.9±24.3 (56 - 168)	68 - 112	118 - 133
diameter at margin	111.2±12.2 (88 - 148)	97.1±12.4 (60 - 126)	96 - 106	133 - 148
maximum diameter	153.2±16.3 (104 - 184)	158.7±14.8 (100 - 188)	140 - 168	215 - 236
diameter at base of pair	203.2±33.8 (116 - 264)	219.0±33.0 (152 - 304)	148 - 216	163 - 192
Gonotheca				
length	1050 - 1200 (female?)	1.600 -1.800 (male?)		
maximum diameter	420 - 472	766 - 814		
diameter at aperture	288 - 295	355 - 400		
number of annulations	19 - 24	17 - 20		

* from the top of a pair to the node above
** in the middle of the internode
*** not considered 0 (zero) value when the hydrothecae of a pair do not touch each other
**** from slide no. 55 of the Vannucci collection - only the range of variation is provided due to the scarcity of material
***** gonothecae from type series

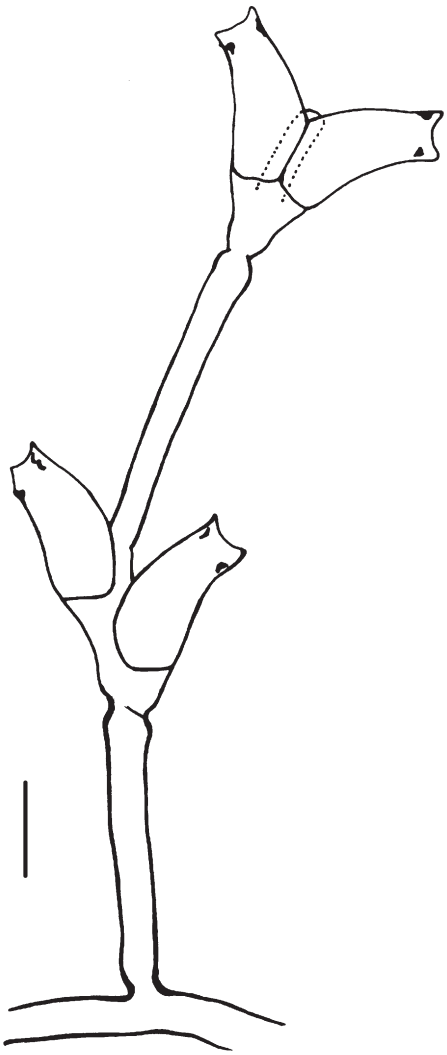


Fig. 3. *Sertularia notabilis* Fraser, 1947. Frontal view of a stem with 2 pairs of hydrothecae, the first pair sub-opposite. Stn 11, RMNH-Coel. 28853. Scale 100 µm.

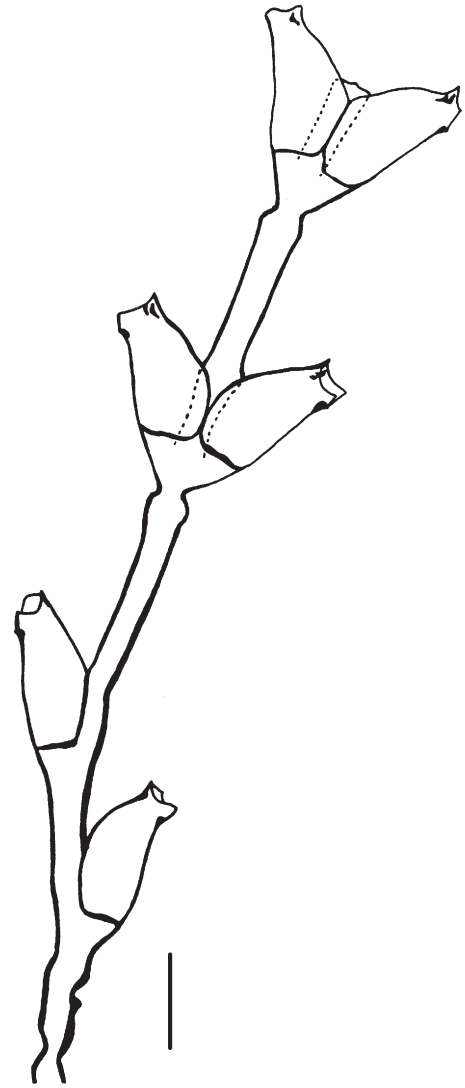


Fig. 4. *Sertularia notabilis* Fraser, 1947. Frontal view of a stem with 3 pairs of hydrothecae, the first pair alternate. Parcel da Praia Grande, 18.vi.1996, RMNH-Coel. 28854. Scale 200 µm.

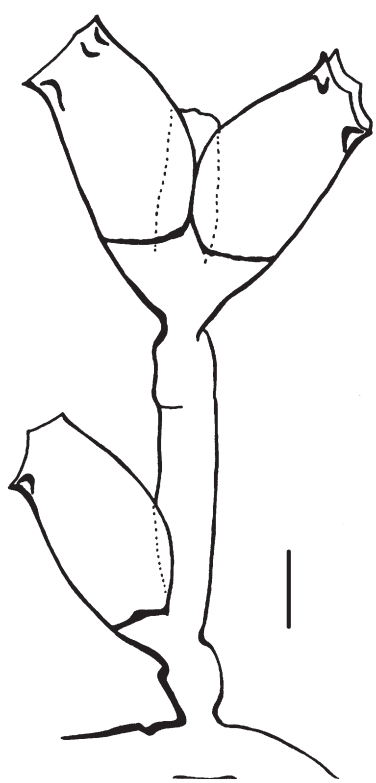


Fig. 5. *Sertularia notabilis* Fraser, 1947. Stem with only one hydrotheca on the first internode. Parcel da Praia Grande, 18.vi.1996, RMNH-Coel. 28854. Scale 100 µm.

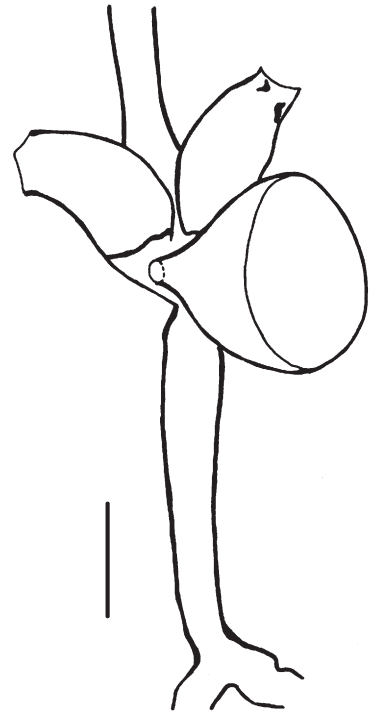


Fig. 6. *Sertularia notabilis* Fraser, 1947. Part of a stem with developing gonotheca on the most proximal internode. Stn 8, RMNH-Coel. 28852. Scale 200 µm.

Remarks

The rare records of *Sertularia notabilis* are probably due to its small size, making it more inconspicuous than other species of *Sertularia*. Yet it is a quite distinctive species, particularly because of its characteristic hydrothecae and gonothecae, transverse nodes, and absence of hinge-joints. However, it resembles small species of *Sertularella* because of the occasional alternate disposition of the hydrothecae; in lateral view the hydrotheca may easily give the impression of having four marginal cusps as occur in *Sertularella*. This probably induced Vannucci Mendes (1946: 569-570, fig. 39), to identify it as *Sertularella molukkana* (von Campenhausen, 1896). Her material originated from the coast of the State of São Paulo (Guarujá) and is described as having hydrothecae with an operculum of 4 valves and a hydrothecal rim with 4 cusps. Examination of a slide of the Vannucci collection, however, with material labelled *S. moluccana*, reveales that her observation was incorrect and that her figure 39 is inaccurate.

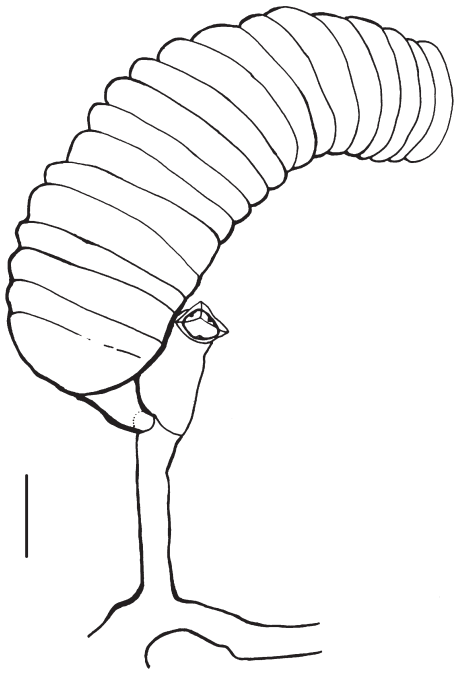


Fig. 7. *Sertularia notabilis* Fraser, 1947. Stem with fully developed, empty gonotheca. Stn 8, RMNH-Coel. 28852. Scale 200 µm.

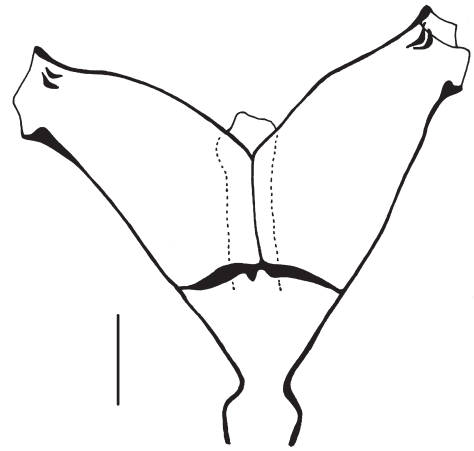


Fig. 8. *Sertularia notabilis* Fraser, 1947. Detail of a distal pair of opposed hydrothecae. AM917. Scale 100 µm.

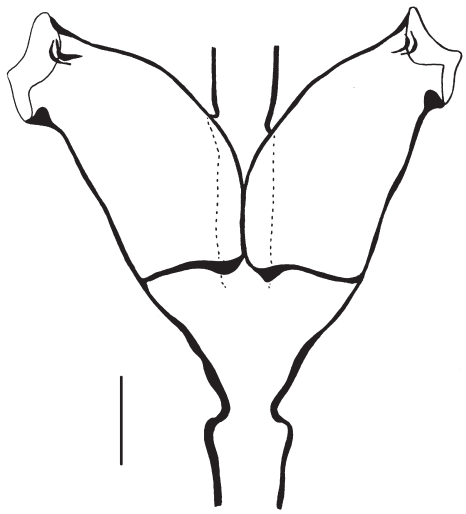


Fig. 9. *Sertularia notabilis* Fraser, 1947. Detail of a proximal pair of opposed hydrothecae. AM919. Scale 100 µm.

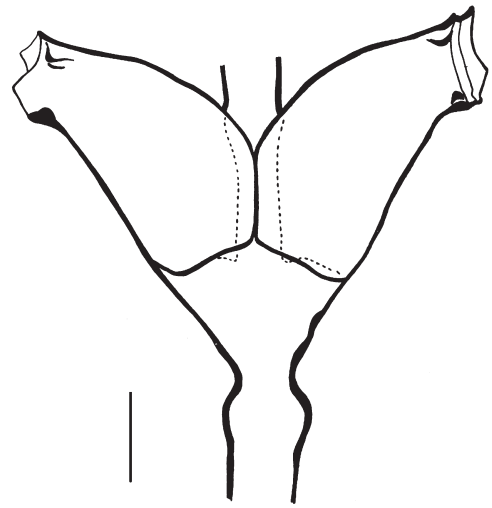


Fig. 10. *Sertularia notabilis* Fraser, 1947. Detail of a proximal pair of hydrothecae. Note the margin reduplication in one of the hydrothecae. AM917. Scale 100 µm.

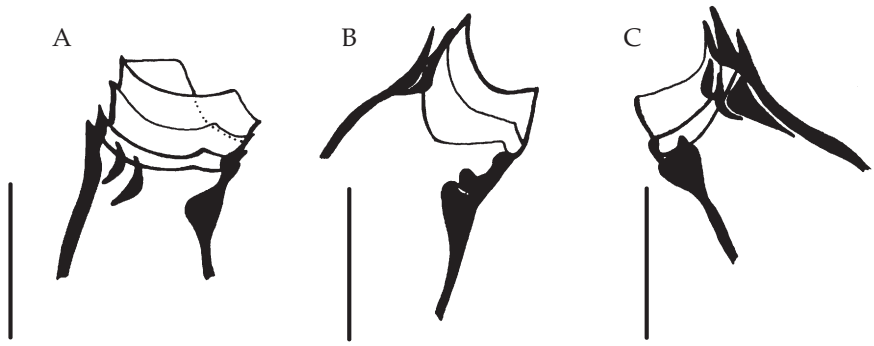


Fig. 11. *Sertularia notabilis* Fraser, 1947. Detail of the margin of three hydrothecae, showing reduplication of margin and intrathecal cusps. A = Stn 8, RMNH-Coel. 28852; B and C = AM918. Scale 100 µm.

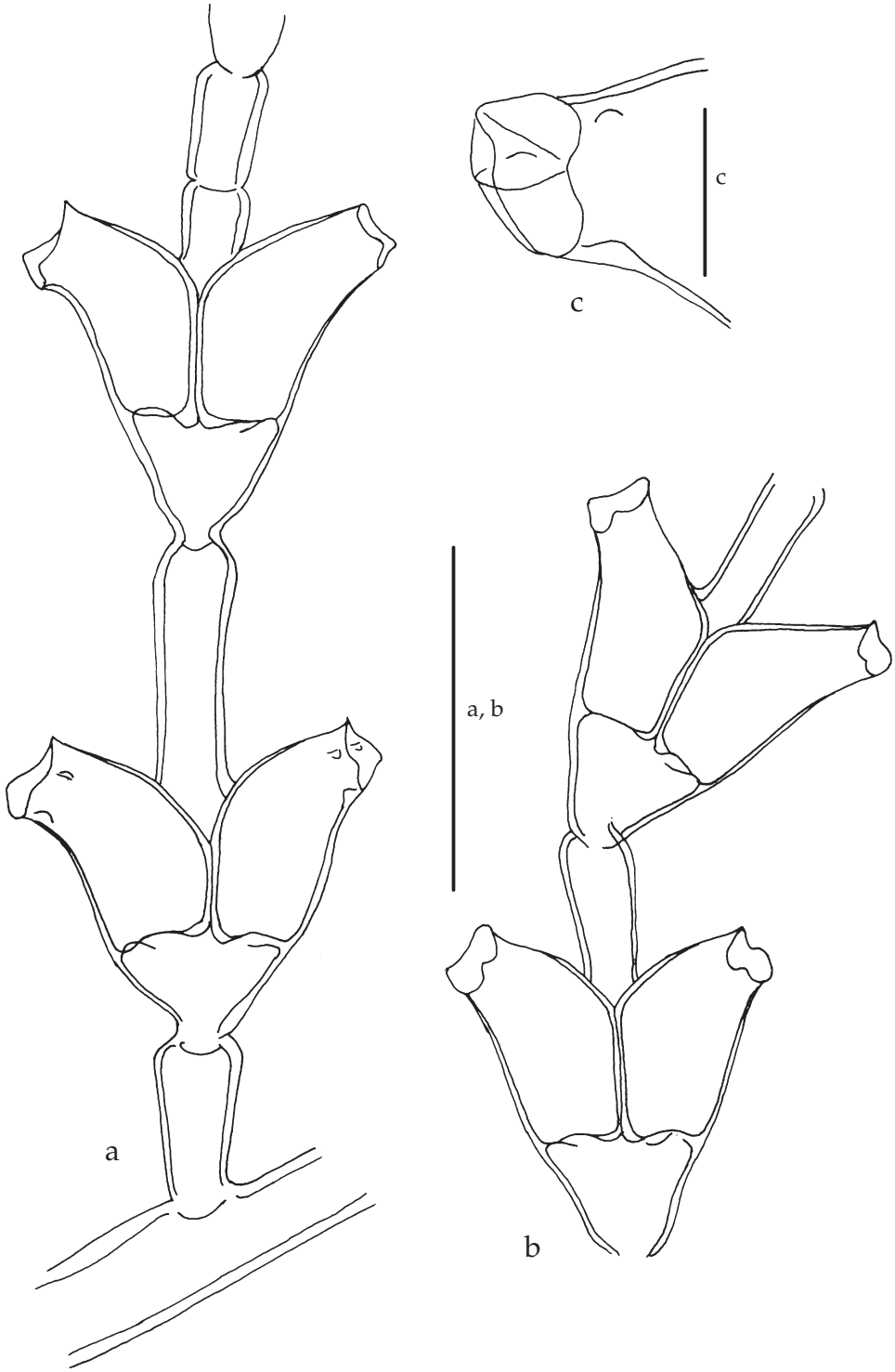
Specimens from São Paulo and Espírito Santo are quite similar, except for the slightly smaller size and greater variability of the hydrothecal arrangements in material from the first locality.

The cnidome of *Sertularia notabilis* apparently includes only one type of nematocyst, a microbasic mastigophore similar to that of other sertulariids (see Migotto, 1996); it lacks a larger kind of nematocyst (micro- or macrobasic mastigophore or holotrichous isorhiza), ranging from 7.5-20 µm in length, present in 12 sertulariids studied by Migotto (1996).

Proximal internodes with only one hydrotheca are rarely described in species of *Sertularia*. This situation, however, is also present in *Sertularia hattorii* Leloup, 1940, and other genera of the family Sertulariidae, for instance, *Amphisbetia* spp. (young colonies raised in the laboratory, reported upon by Teissier, 1929: 649, figs 1-2), and in species of *Diphasia*.

Sertularia notabilis is similar to *Sertularia hattorii* Leloup, 1940, known from various localities along the east coast of Japan (1-25 m) and from Korea. There is general agreement in the shape of the hydrothecae and stem, the absence of hinge-joints, the rare presence of a single hydrotheca in some internodes and of sub-opposite hydrothecae, and in the shape and size of the gonothecae. It differs by the absence of intrathecal cusps and by the presence of occasional side-branches. The deposition of type material of *S. hattori* from Sagami Bay, Japan, is indistinct; though it was described by Leloup no material of this species is mentioned by Bouillon, Massin & Kresevic (1995) in their catalogue of Hydroidomedusae in the collections of the Institut Royal des Sciences naturelles, Brussels, Belgium, where Leloup's collections are kept; the type may have been deposited in the Biological Laboratory, Imperial Palace, Tokyo. Hirohito, who re-described the species after additional Japanese material, is emphatic about the absence of intrathecal cusps in the Japanese material; the presence of ramifications in the Japanese material is quite evident from text and figures. No

Fig. 12. *Sertularia notabilis* Fraser, 1947. a, two basal internodes with hydrothecae; b, pairs of hydrothecae from distal part of stem; c, oblique frontal view of hydrotheca to show position of teeth and closing apparatus. RMNH-Coel. 28856. Scale a-b, 0.5 mm; scale c, 0.1 mm.


c
c
a, b
a
b

renovations of the hydrothecal border have been recorded in *S. hattori*. This, however, may be incidental as the occurrence of renovations in Sertulariidae is quite irregular. The possibility that *Sertularia hattori* Leloup, 1940, and *S. notabilis* Fraser, 1947, turn out to be conspecific cannot altogether be ruled out. The presence of ramifications may be strictly related to age of the colony and the presence of intrathecal cusps in the Japanese and Korean material cannot be entirely neglected as the presence of such cusps in the Brazilan material shows noticeable variation and their small size should be emphasized. It is possible, therefore, that the small cusps escaped Hirohito's attention. The photographs published by Rho & Chang (1972: figs 18-21) and Rho (1977: pl. 81 fig. 76) are inconclusive.

We have compared the Brazilian material with Fraser's type series in the Hancock Building, University of Southern California, Los Angeles, for which we have to express our gratitude to Dr Jerry Bakus, in charge of those collections. There are two bottles with material, one labelled Tortuga Island (Isla la Tortuga), Venezuela, 13.iv.1939, 2-5 fms, Velero Stn A22-39 and a second with the labelling "Tobago Island, Venezuela, 13.iv.1939, 2 fms", no Velero station being specified. The last bottle is either mis-labelled, or the label is incorrect. The Velero expedition did not visit Tobago on the given date, but later. Moreover, Tobago is not in Venezuela.

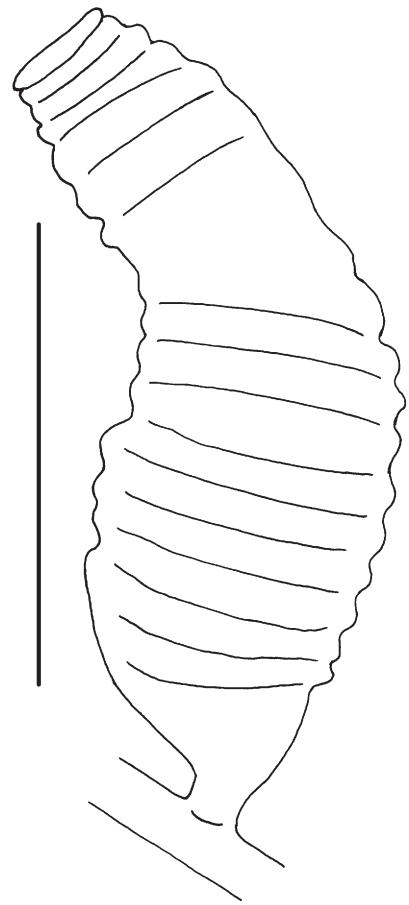


Fig. 13. *Sertularia notabilis* Fraser, 1947. Empty, probably female gonotheca. RMNH-Coel. 28855, part of type series. Scale 1 mm.

Dr Bakus permitted the second author the make a few slides (2 slides from the type material and one from the second sample; details given above under "Material"). There can be no reasonable doubt that the Venezuelan material and the Brazilian material are conspecific: there is complete conformity in shape and development of the hydrothecae, the presence of small intrathecal cusps and overall shape of the gonothecae. The gonothecae in the type material are much bigger than those of the Brazilian material (Espírito Santo), but as some of the gonothecae are still in the process of development the measurements of the Espírito Santo specimen probably relate to young gonothecae. Sexual difference may also be involved as in *Sertularia hattori* Leloup gives the length of male gonothecae as 0.7 mm and that of female gonothecae as 1.7 mm. According to Fraser's description of the gonothecae those in the type series - probably of female sex - measured "over 2 mm".

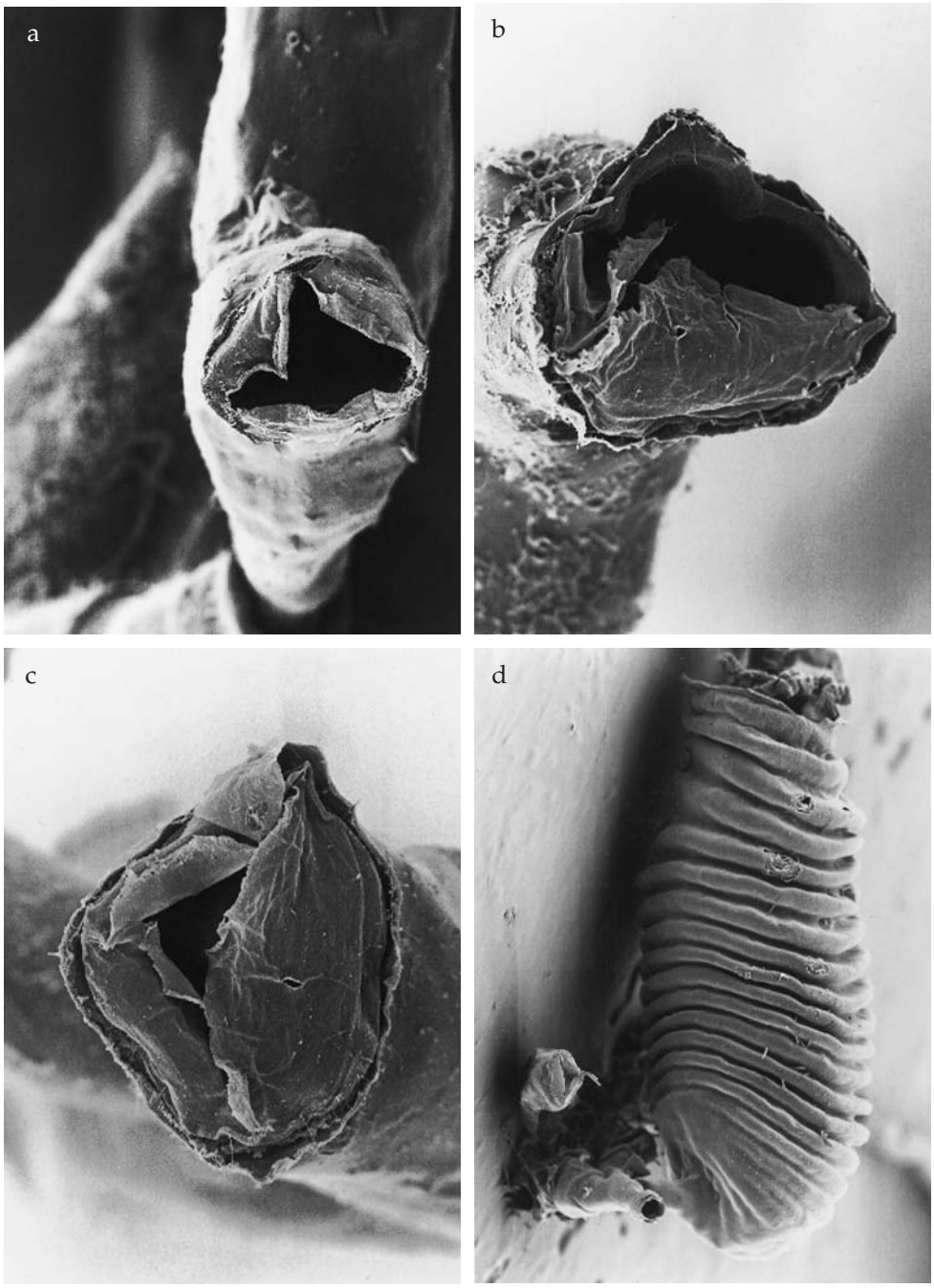


Fig. 14. *Sertularia notabilis* Fraser, 1947. SEM photographs; a-c, frontal view of hydrothecal aperture with operculum. In a and b upper side in adcauline side; in c adcauline side on left. d, gonotheca, basal side downwards.

Distribution

Sertularia notabilis is known to occur at Tortuga Island (Isle la Tortuga), Venezuela (type locality), depth 2-5 fms (3.7-9.1 m), no further details are mentioned by Fraser (1947). The Brazilian specimens are from two localities: off Espírito Santo State, 21°10.7'S 40°37.2'W, 15-20 m depth, on *Sargassum* spec., and at the island of São Sebastião, São Paulo State, 23°51.18'S 45°25.07'W, intertidal on *Sertularia marginata* Kirchenpauer, 1864, and on tubes of the polychaete *Phragmatopoma lapidosa*. Gonothecae were only found on the type, collected in April 1939 and on the specimens from Espírito Santo, at the end of February. The specimens from *Sargassum* occur on the stipes of the 'leaves'. The tiny species is quite easily overlooked. The Pacific material of *Sertularia hattori* Leloup, 1940, originates from Sagami Bay, Japan (Leloup, 1940, type locality; Hirohito, 1995), from Hachijo-Jima and Kagoshima Prefecture, Japan (Hirohito, 1995) and from Jeju-do and Chuja-kundo, Korea (Rho & Chang, 1972; Rho, 1977)

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