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Scientific Results of the Hassler Expedition.
Bryozoa. No. 2. Brazil

JUDITH E. WINSTON, LEANDRO M. VIEIRA, AND
ROBERT M. WOOLLACOTT



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SCIENTIFIC RESULTS OF THE *HASSLER* EXPEDITION. BRYOZOA. NO. 2. BRAZIL

JUDITH E. WINSTON,¹ LEANDRO M. VIEIRA,² AND ROBERT M. WOOLLACOTT³

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ABSTRACT. Fifty species of bryozoans from three Brazilian stations dredged by L. Agassiz and L. F. Pourtalès during the *Hassler* Expedition (1871–1872) are described and illustrated here.

The U.S.S. *Hassler* was built in New Jersey for use by the U.S. Coast Survey off the west coast of North America. Benjamin Peirce, then superintendent of the Survey, invited L. Agassiz to form a scientific party to collect specimens and make scientific observations during the course of repositioning the *Hassler* from Boston to San Francisco. The bryozoan samples were discovered in the Invertebrate Paleontology collection at the Museum of Comparative Zoology and are now incorporated into the collections of the Department of Marine Invertebrates of the Museum of Comparative Zoology, Harvard University. The first paper on the collection, consisting of the bryozoan material from Barbados, was published in 2009 (Winston and Woollacott 2009).

Taxonomic results from the Brazilian segment of the expedition include 24 new cheilostome species, *Antropora hastata*, *Retevirgula multipunctata*, *Parellisina lunatirostris*, *Discoporella salvadorensis*, *Canda alsia*, *Micropora angustiscapulis*, *Floridina proterva*, *Labioporella tuberculata*, *Cellaria brasiliensis*, *Puellina octospinosa*, *Trypostega tropicalis*, *Poricella frigerosa*, *Exochella frigidula*, *Metrarabdotos jani*, *Parasmittina simpulata*, *Parasmittina loxoides*, *Stylopoma rotundum*, *Stylopoma carioca*, *Fenestulina constellata*, *Buffonellaria variavicularis*, *Turbicellepora brasiliensis*, *Fodinella atlantica*, *Plesioleidochasma foliosum*, and *Cigclisula tuberculata*; one new combination; and three new cyclostome species, *Plagioecia bugiei*, *Nevianipora arcuata*, and *Disporella brasiliiana*. Two new families, Marcusadoreidae and Vitrimurellidae, and one new genus, *Vitrimurella*, are also described.

The bryozoan material comes from three of the Brazilian locations where the *Hassler* Expedition dredged. Eleven species were collected from a station north of Salvador, Bahia state, in 15–17 fathoms (fms) (27.4–31 m). The other two stations were both off Cabo Frio, Rio de Janeiro state. Eleven species were found in the dredge haul from 35 fms (56.7 m), while 32 species occurred in the second haul from 35–45 fms (56.7–82 m). Species from the Bahia station have more tropical affinities; those collected from off Cabo Frio are subtropical–temperate. There was no overlap between the stations from the two regions. Most striking is the fact that 142 years after the collections were made, and on the basis of this very limited material, more than half the species found were new to science, or were species that had previously been misidentified, so needed new names and descriptions: *Canda alsia*, *Labioporella tuberculata*, *Metrarabdotos jani*, *Nevianipora arcuata*, *Parasmittina loxoides*, *Parasmittina simpulata*, and *Plagioecia bugiei*.

Key words: Bryozoa, *Hassler*, Brazil, New Species



Figure 1. U.S.S. *Hassler*. From the Archives of the Ernst Mayr Library of the Museum of Comparative Zoology, Harvard University.

INTRODUCTION

This is the second in a series of paper on the bryozoans collected by L. F. Pourtalès and L. Agassiz during the *Hassler* Expedition (1871–1872) and based on material discovered in the teaching collection of the Invertebrate Paleontology Department at the Museum of Comparative Zoology, Harvard University. Bryozoan samples were found at stations from Barbados to Brazil and around the coast of South America to La Jolla, California. In the first paper in this series (Winston and Woollacott 2009) we described the bryozoans collected off Barbados. In this paper we report on the bryozoans from the three Brazilian stations, one made off Salvador, Bahia state, and the other two stations from off Cabo Frio, Rio de Janeiro state.

The *Hassler* Expedition (1871–1872) was the final large-scale field operation headed by Louis Agassiz. There are numerous

accounts of the expedition. Among these, Elizabeth Carey Agassiz's two-volume work on the letters of Louis Agassiz with her annotations and biographical account (1885), James Henry Blake's scrapbook (1871–1940), and Edward Lurie's biography of Louis Agassiz (1960) are the most comprehensive. Readers will also find of interest accounts of the expedition by Thomas Hill (Land, 1933) and J. William White (Repplier, 1919), both of whom accompanied the expedition.

The steamship U.S.S. *Hassler* (Fig. 1) was constructed for use by the U.S. Coast Survey. The ship was named after Ferdinand R. Hassler, the first superintendent of the U.S. Coast Survey. It was built in Camden, New Jersey, but was to be based in San Francisco and intended for use on the west coast. It was necessary, therefore, to sail the ship from Boston to San Francisco. At the time, Benjamin Peirce, a

Harvard faculty colleague of Agassiz, was superintendent of the U.S. Coast Survey and he invited Agassiz to form a scientific party of his choosing to join the repositioning cruise in order to perform scientific observations and make collections along the route. Peirce stipulated that the scientific inquiries should not unduly delay the ship's progress and that all expenses associated with the scientific party were to be funded by Agassiz. In raising funds for the trip, Agassiz solicited potential donors, including the Reverend R. C. Waterston of Boston. In one letter to Waterston, Agassiz wrote the following:

“And, if I am not greatly mistaken, the results of this voyage will be as important for the increase of our knowledge of the characteristics of the Sea, as the voyage of Capt. Cook were, a century ago, for the improvement of navigation & geography.”
(L. Agassiz, undated)

Clearly, Agassiz had a grand vision for his final expedition. In a letter to Benjamin Peirce (Agassiz, 1871), Agassiz lays out further goals in striking detail about what he expects to find on the expedition. He contended that by sampling at great depths, new life forms would be discovered that resembled those thought long extinct in the fossil record. Such findings, Agassiz postulated, would be at variance with Darwin's theory of descent by natural selection in that they would document Agassiz's concept of the permanency of species. Unfortunately, dredge sampling at great depth proved difficult owing to equipment and material failure. Consequently, most samples were collected at depths less than 100 fathoms.

Agassiz's scientific party included: James Blake, assistant in the Museum of Comparative Zoology, as assistant and artist; Count L. F. Pourtalès, collaborator in the Museum, to manage dredging operations; Thomas Hill, former president of Harvard College; Franz Steindachner; ichthyologist from the Royal Vienna Museum, as collector; J. William White, M.D. of Philadelphia, as assistant;

and Mrs. Elizabeth Cary Agassiz. The wife of the ship's captain, P. C. Johnson, also accompanied the expedition.

The *Hassler* departed Boston Harbor on December 4, 1871, and arrived in San Francisco Bay on August 31, 1872. En route, a number of stops were made, some intentional and some as a consequence of equipment failure and the need for repairs. Agassiz (1873) and Pourtales (1875) provide official accounts of the voyage.

After an unscheduled stop to make repairs in Barbados [In a previous publication Winston and Woollacott (2009) described the species of bryozoans collected in Barbados], the next scheduled landfall was to be Rio de Janeiro, Brazil. Owing to a short supply of coal, however, the *Hassler* was forced to stop at a port in the state of Pernambuco, Brazil. The ship remained in the harbor for 24 hours under voluntary quarantine because of the prevalence of yellow fever in the town. On January 23, the *Hassler* entered the harbor at Rio de Janeiro. While intending only a short stay, logistical difficulties in provisioning the ship forced delays in departure. During this interval several trips were made into the countryside, and collections of brains from freshwater and marine fish were prepared for analysis back in Cambridge. The next port of call after Rio de Janeiro was Montevideo, Uruguay.

STUDY AREA AND METHODS

The Brazilian specimens studied here were among the specimens of bryozoans collected during the *Hassler* Expedition (1871–1872). Bryozoan material from the *Hassler* was discovered in the paleontology teaching collection in the Museum of Comparative Zoology (MCZ) in the early 2000s and transferred to the Department of Marine Invertebrates. As was the case for the material from Barbados (Winston and Woollacott, 2009) all of the Brazilian material was uncatalogued and unidentified when found.

While in the territorial waters of Brazil, several dredging samples were taken. Peirce and Patterson (1879–1880) provide a list of dredging stations of the *Hassler* and other Coast Survey steamers. They report seven stations (north of Salvador) off the state of Bahia, four stations off the Abrolhos Archipelago, two off Cabo Frio, and two near the border with Uruguay. *Hassler* material from Brazil found in the collections of the Museum of Comparative Zoology has only fragmentary information associated with the specimens. To the best of our ability to determine, the MCZ material comes from three stations: one relatively shallow station (15–17 fms) (27.4–31 m) from “north of Salvador” off the state of Bahia, January 17–18, 1872, (11°49’S; between 37°10’ and 37°27’W), the shallowest of seven dredges taken in a transect from shallow to deep water over a 24-hour period, and two hauls off Cabo Frio, Rio de Janeiro state (around 23°S), at 35 and 35–45 fathoms on January 22, 1872.

We are unaware of the existence of any other bryozoans from Brazil collected on the *Hassler* Expedition. We could find no comments from Expedition participants on the bryozoan collection from the N Salvador station, but Pourtalès noted the bryozoans found at Cabo Frio, “On the 22d, in the neighborhood of Cape Frio, in 35–45 fathoms, a quantity of concretions formed by Bryozoa, about the size and shape of potatoes, were obtained by the dredge; also a few corals and shells.” (Pourtalès 1875: 215).

The concretions are made up of layers of calcareous algae and encrusting bryozoans, chiefly *Celleporaria atlantica*; most of the other species from Cabo Frio were attached to the surface of the concretions. As is often the case with limited material, such as a historical collection like the *Hassler*, most of the specimens of new species were represented by only one specimen, the holotype. Fortunately most colonies or colony fragments identified were in adequate condition for identification and study.

Specimens from each station were rinsed in fresh water and dried. They were then examined under a dissecting microscope,

sorted and, when necessary, detached from larger substrata for study. The processed specimens were given preliminary taxonomic identifications and placed in plastic boxes approved for dry biological collection storage. From each sorted lot one or more colonies or colony fragments were selected for study and digital imaging using scanning electron microscopy (SEM).

Standard measurements were made on at least one colony of each taxon found. Measurements were made using a Wild stereomicroscope with 20× oculars (magnification = 100×). The measurements included dimensions of the following characters if present: zooid length and width (Lz, Wz), length and width of primary layer zooids (Lze, Wze), length and width of frontally budded zooids (Lzf, Wzf), opesia length and width (Lop, Wop), primary orifice length and width (Lo, Wo), orifice diameter (Diam.o) for round orifices, secondary orifice length and width (Lo2, Wo2), length from proximal rim of orifice to ascopore (Loa), oecium length and width (Lov, Wov), length and width of oecium orifice (Lovo, Wovo), gonozooid orifice length and width (Lgzo, Wgzo), avicularian length and width (Lav, Wav), avicularian mandible length and width (Lavm, Wavm), avicularian zooid length and width (Lavz, Wavz), zooeciule length and width (Lzcl, Wzcl), and branch diameter (BrD).

Museum bryozoan material from Brazil is found in few institutions outside Brazil itself. Comparison of the *Hassler* Expedition bryozoan material from Brazil was made with museum specimens collected by University of São Paulo Professor Ernst Marcus and others, housed at the Museu de Zoologia da Universidade de São Paulo (MZUSP); the Natural History Museum, London (NHMUK) (to which Marcus donated some specimens from his Brazilian bryozoan work); and the National Museum of Natural History, Smithsonian Institution (NMNH) (for Canu and Bassler types and specimens from Brazil). The classification adopted here is based on Bock and Gordon (2013) and Ostrovsky (2013).

RESULTS

Species Found

Off Salvador, 15–17 fms (27.4–31 m).

Antropora minor
Discoporella salvadorensis
Exechonella sp.
Fodinella atlantica
Labioporella tuberculata
Micropora angustiscapulis
Puellina sp.
Retevirgula mesitis
Steginoporella evelinae
Trypostega tropicalis
Turbicellepora brasiliensis

Off Cabo Frio 1, 35 fms (56.7 m).

Arachnopusia haywardi
Canda alsia
Cellaria brasiliensis
Cellaria subtropicalis
Cigclisula tuberculata
Celleporaria atlantica
Exochella frigidula
Floridina proterva
Hippaliosina imperfecta
Plesiochleidochasma foliosum
Trematooecia ridleyi

Off Cabo Frio 2, 35–45 fms (56.7–82 m).

Antropora hastata
Buffonellaria variavicularis
Cellaria brasiliensis
Cellaria subtropicalis
Celleporaria atlantica
Celleporaria mordax
Crisia sp.
Disporella brasiliana
Fenestrulina constellata
Hippothoa flagellum
Klugerella petasus
Marcusadorea corderoi
Metrarabdotos jani
Mollia elongata
Nellia oculata
Nevianopora arcuata

Parasmittina loxoides
Parasmittina simpulata
Parellisina lunatirostris
Plagioecia bugei
Poricella frigerosa
Puellina octopinosa
Retevirgula multipunctata
Rogicka joannae
Steginoporella connexa
Steginoporella magnilabris
Stephanollona angusta
Stylopoma auranticum
Stylopoma carioca
Stylopoma rotundum
Vitrimurella fulgens

SYSTEMATICS

Class Gymnolaemata

Order Cheilostomata

Suborder Thalamoporellina Ostrovsky, 2013

Superfamily Thalamoporelloidea Levinsen, 1902

Family Steginoporellidae Hincks, 1884

Genus *Labioporella* Harmer, 1926

Labioporella tuberculata **New Species**

Figures 2, 3

Siphonoporella granulosa: Canu and Bassler, 1928a: 69, pl. 4, fig. 5. NOT *Siphonoporella granulosa* Canu and Bassler, 1928b: 68, pl. 8, fig. 1.

Holotype. *Labioporella tuberculata*. Hassler Box 19, MCZ 137420. North of Salvador, Bahia state, Brazil.

Etymology. The species name *tuberculata* (f.) is from the Latin adjective *tuberculatus*, having tubercles, itself based on the Latin noun *tuberculum*, a small swelling.

Description. Colony encrusting on hard substrata, capable of forming several layers by self-overgrowth. Zooids are variable in size and shape, subrectangular to suboval, edges rounded distally and sharper proximally. A row of raised, tubereulate cryptocystal calcification defines the lateral rims of zooids. The more granular inner shelf

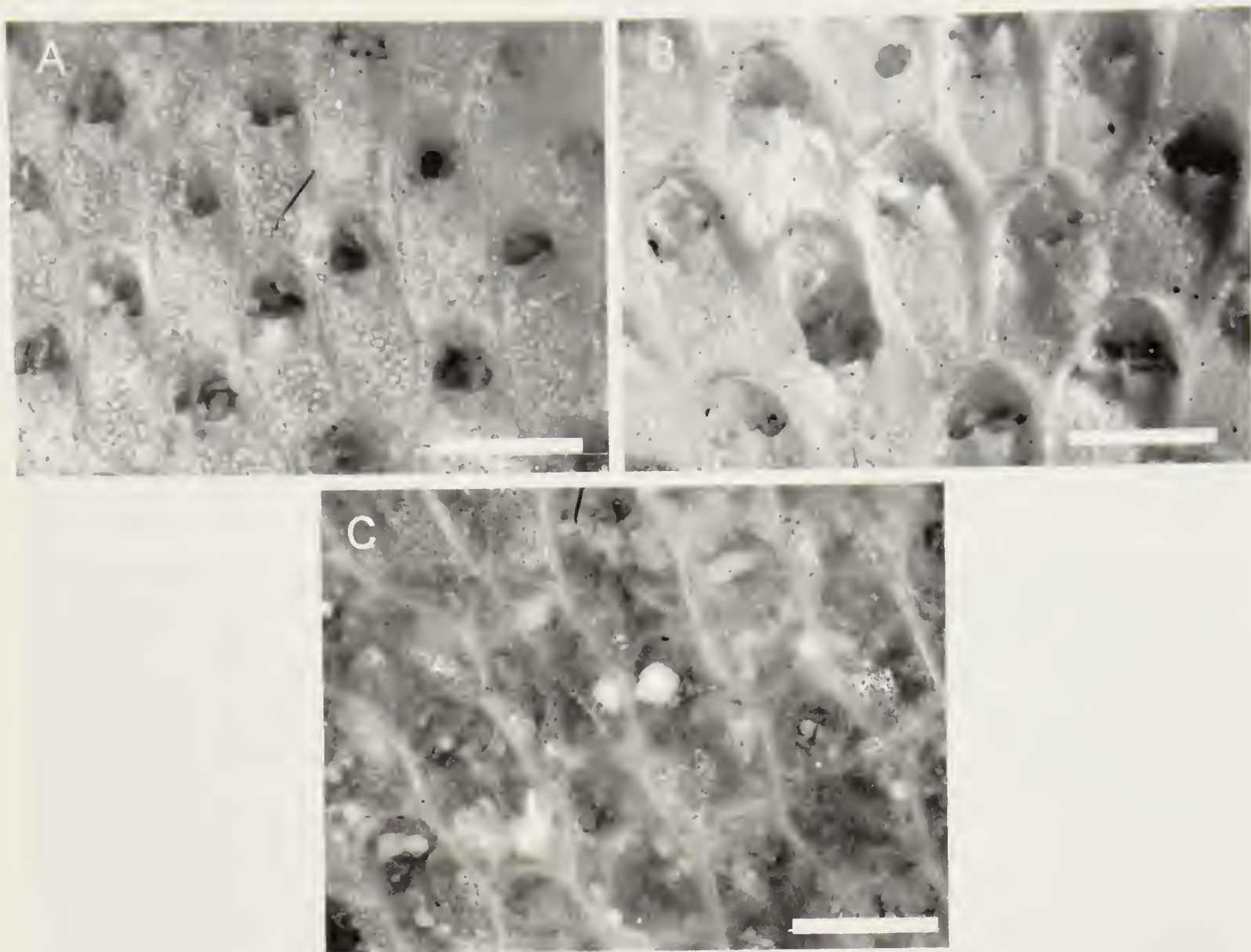


Figure 2. Light micrograph of *Labioporella* specimens deposited at the NMNH. A. NMNH 8551, *Labioporella tuberculata*, from Bahia (= *Siphonoporella granulosa sensu* Canu and Bassler, 1928). Scale bar = 500 μ m. B. NMNH 7593, *Labioporella granulosa*, type material of Canu and Bassler. Scale bar = 500 μ m. C. NMNH 11832, *Labioporella sinuosa*, type material of Osburn. Scale bar = 500 μ m.

cryptocyst is sunken proximally with a number of small, irregularly shaped pores present, becoming more shallow and imperforate distally where it covers the central calcified polypide tube. The opesia is large, the uncalcified area covering the distal quarter to a third of the distal end of the zooid. The inner vestibular arch also has distinctive granular calcification extending into the zooid interior. Large smoothly calcified tubercles occur at one or both proximal corners of zooids. No avicularia present in this material.

Diagnosis. *Labioporella* with large and prominent tubercles on the proximal corners of the zooids, distinct from *Labioporella sinuosa* in its smaller zooids and less

porous cryptocyst and from *Labioporella dipla* in lacking large interzoocial avicularia and possessing proximal corner tubercles.

Measurements. All values are millimeters. Min = minimum; Max = maximum.

	Min	Max	Range	Mean	SD	N
Lz	0.540	0.720	0.540–0.720	0.624	0.070	6
Wz	0.270	0.324	0.270–0.324	0.291	0.021	6
Lop	0.180	0.252	0.180–0.252	0.213	0.026	6
Wop	0.144	0.198	0.144–0.198	0.174	0.022	6

Notes. This species is very similar to *Labioporella dipla* (Marcus, 1949), in being characterized by a prominent tubercle on the distal wall beneath the operculum but

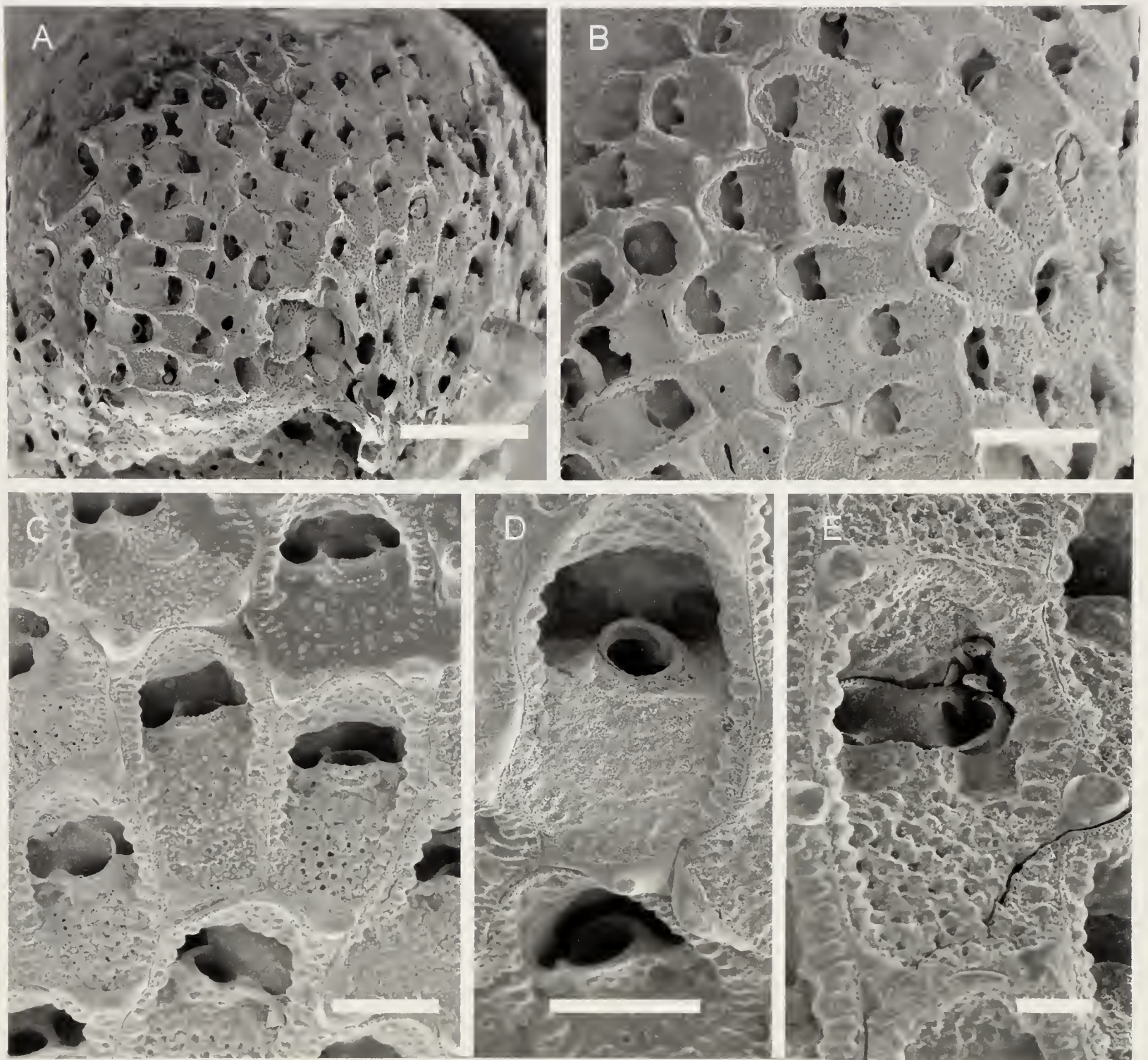


Figure 3. *Labioporella tuberculata*. LAB. Hassler Box 19, MCZ 137420. A. Portion of encrusting colony. Scale bar = 1,000 μm . B. Group of zooids near growing edge. Scale bar = 500 μm . C. Close-up of zooids and large tubercles. Scale bar = 200 μm . D. Oblique view of zooid showing polypide tube. Scale bar = 100 μm . E. Zooid with double polypide tube. Scale bar = 100 μm .

lacks the large interzoocelial avicularia and possesses large proximal tubercles. It is also similar to *Labioporella granulosa* (Fig. 2B), but that species has larger, more elongate reetangular zooids and a more porous eryptoeyst and does not have corner tubercles. *Labioporella sinuosa* (Osburn, 1940) (Fig. 2C) has smaller zooids than those of *L. tuberculata*.

Distribution. This species is very common in shallow waters NE of Brazil (L. M. Vieira, unpublished data).

Specimens Examined. *Labioporella tuberculata*. Hassler Box 19, MCZ 137420. North of Salvador, Bahia state, Brazil. NMNH 8551, *Siphonoporella granulosa*, F. Canu and R. Bassler det., Salvador, Bahia state, Brazil. *Labioporella dipla*, Syntypes: MZUSP (four balsam slides n. 615–616; one dry specimen), Espírito Santo, Brazil. *Siphonoporella granulosa*, Holotype: NMNH 7593, 40 f. Fowey Light, 15 m, Miami, Florida. *Labioporella sinuosa*, Holotype: NMNH 11832, balsam slide, Tortugas, Florida, 12 fms.

Genus *Steginoporella* Smitt, 1873

Steginoporella connexa Harmer, 1900

Figure 4

Steginoporella connexa Harmer, 1900: 254, pl. 12, fig. 6, pl. 13, fig. 18.

Steganoporella connexa: Marcus, 1949: 11, pl. 2, figs. 7–8; Braga, 1968: 9.

Steginoporella connexa: Pouyet and David, 1979: 773, text-fig. 2; Vieira et al., 2008: 20; Winston and Woollacott, 2009: 254, fig. 11.

Description. Colony form varies from encrusting sheets to foliaceous plates. Zooids variable in size but not clearly dimorphic. They are subhexagonal in shape, the distal third taken up by the smooth rimmed, semicircular orifice with two low proximal condyles. In life this is closed by a thickly chitinized, strongly reinforced operculum with about 11 pointed chitinous teeth. A thick, rounded rim of granular cryptocyst outlines each zooid, descending proximally to a flat granular cryptocystal shelf with a few small, scattered pores. This shelf is raised distally to the proximal base of the orifice, over the polypide tube, and is pierced on each side by two narrow opesiules and has an almost square central depression in the calcification between them. No avicularia. No ooecia. Embryos brooded in zooids.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.720	0.828	0.720–0.828	0.783	0.044	6
Wz	0.432	0.558	0.432–0.558	0.474	0.044	6
Lop	0.216	0.234	0.216–0.234	0.222	0.009	6
Wop	0.306	0.360	0.306–0.360	0.342	0.020	6

Notes. Marcus considered all the zooids in this species to be B-zooids. However B-zooids in *Steginoporella magnilabris* have a different behavior pattern than A-zooids, lie open when A-zooids are closed and may function as “ears” of the colony, detecting

movement of organisms on or near the colony surface (Winston, 2004). It seems more likely that the variably sized zooids of *S. connexa* should be considered A-zooids or autozooids. There is also size variation in length and width of zooids in colonies from different geographic locations (e.g., Brazil [above] mean Lz, 0.783 mm; mean Wz, 0.474 mm vs. Barbados mean Lz, 1.139 mm; mean Wz, 0.748 mm) suggesting that “*connexa*” represents a species group rather than a single species.

Distribution. Western Atlantic: Brazil (Espírito Santo, Rio de Janeiro), Barbados, Caribbean.

Specimens Examined. *Steginoporella connexa*. Hassler Box 40, MCZ 137421. Off Cabo Frio, Rio de Janeiro state, Brazil. MZUSP (balsam slide n. 609; specimen IO/USP 121), *Steganoporella connexa*, E. Marcus det., Espírito Santo, Brazil.

Steginoporella evelinae Marcus, 1949

Figure 5

Steganoporella evelinae Marcus, 1949: 12, pl. 3, figs. 11–13.

Steginoporella evelinae: Vieira et al., 2008: 20 (in part).

Description. Colony encrusting, forming more than one layer by self-overgrowth. Zooids of two types: A-zooids (most of the zooids of the colony) and larger, less common B-zooids. A-zooids are oval in shape, with smooth lateral walls and proximal gymnocystal calcification. The cryptocystal shelf is heavily granular laterally and proximally but becomes less granular distally near the rounded tongue-like projection that reaches the base of the zooid orifice, covering the polypide tube and providing opesiular indentations on either side for retraction muscle insertion. The distal end of the tongue is reinforced with additional calcification, and its edges and the edges of the opesiules bear small sharp pointed denticles. The orifice is semicircular with a smooth rim and pro-

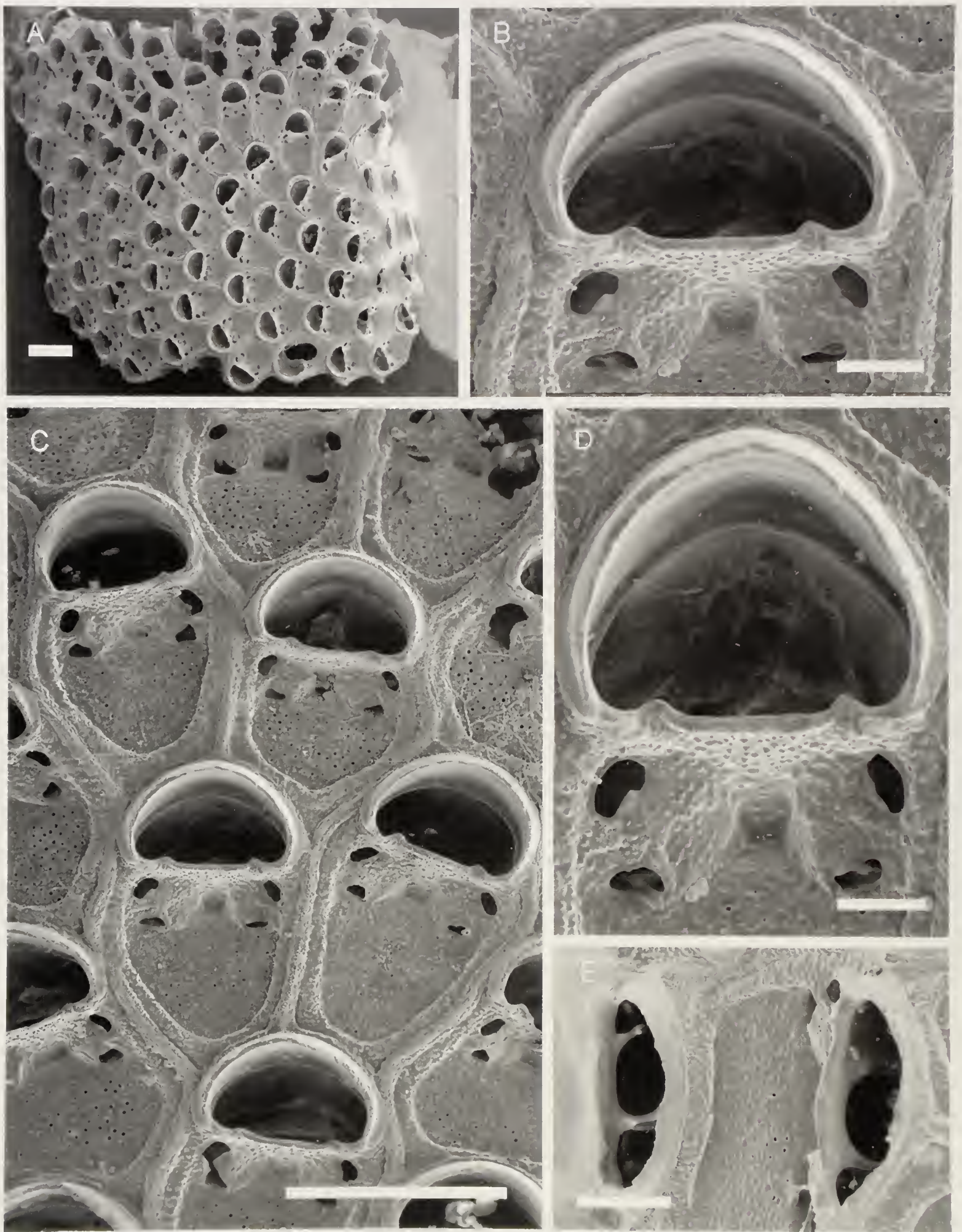


Figure 4. *Steginoporella connexa*. STEG40. Hassler Box 40, MCZ 137421. A. Portion of colony encrusting nodular substratum. Scale bar = 1,000 μm . B. Zoid orifice and opesiules. Scale bar = 200 μm . C. Group of A-zoids. Scale bar = 1,000 μm . D. Distal end of more elongate zoid. Scale bar = 100 μm . E. Oblique view of polypide tubes from above. Scale bar = 300 μm .

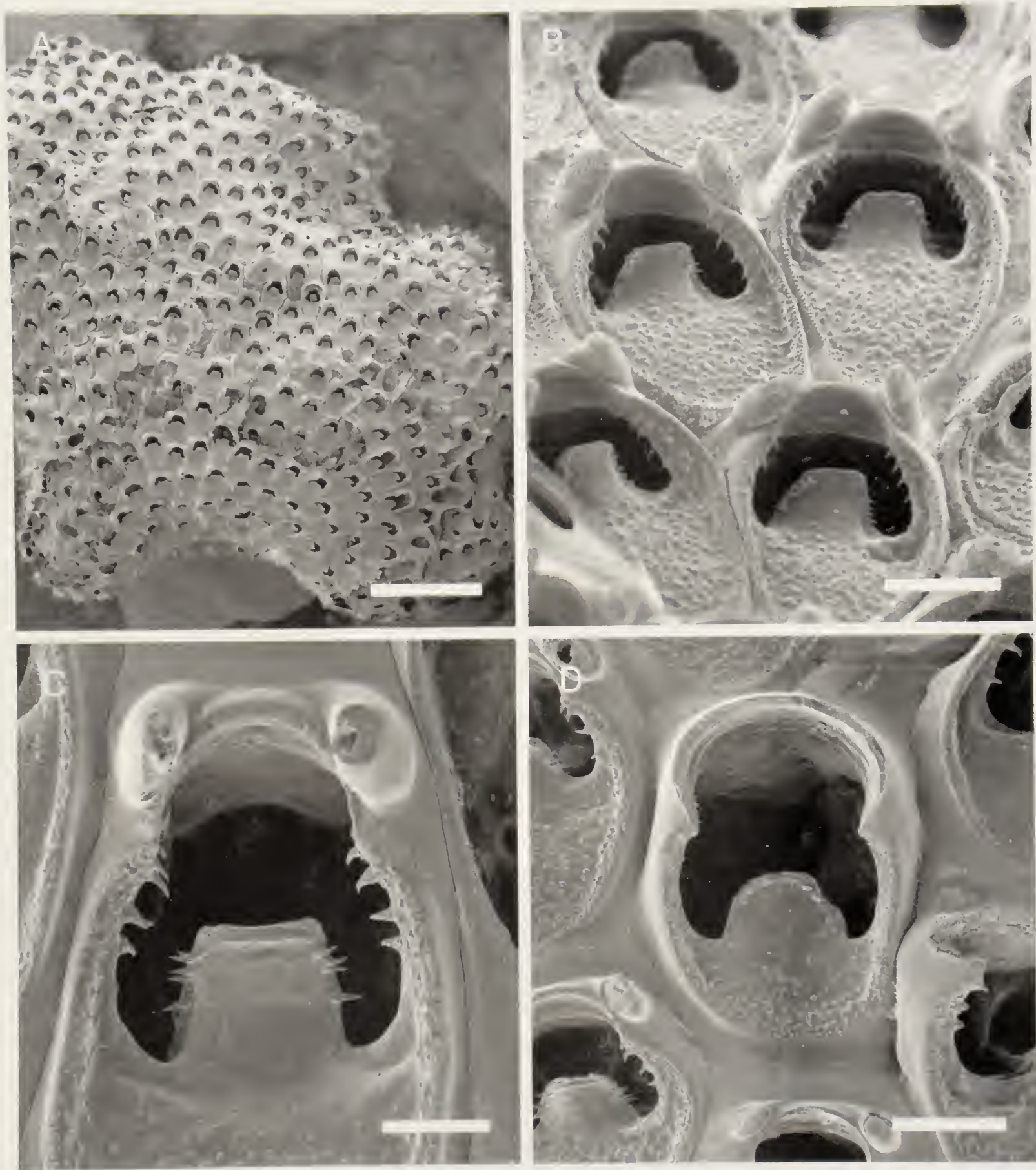


Figure 5. *Steginoporella evelinae*. SBREVIS. Hassler Box 19, MCZ 137422. A. Encrusting colony on nodular substratum. Scale bar = 2,000 μm . B. Group of zooids angled to show length of distal tubercles. Scale bar = 200 μm . C. Close-up of autozooid to show opesia spines. Scale bar = 100 μm . D. B-zooid. Scale bar = 200 μm .

tected on either side by two large projecting tubercles. B-zooids are similar in shape and size but have a longer tongue with longer opesia indentations, and with few or none of the denticles found on A-zooids.

The distal end of the zooid has a much larger rim and opercular shelf for the larger and heavier mandible and does not have the tubercles found in A-zooids. No avicularia. Brooding internal.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
<i>Steginoporella evelinae</i> A-zooids						
Lz	0.630	0.864	0.630–0.864	0.729	0.081	6
Wz	0.378	0.432	0.378–0.432	0.411	0.024	6
Lop	0.198	0.270	0.198–0.270	0.234	0.025	6
Wop	0.234	0.342	0.234–0.342	0.270	0.044	6
Lo	0.081	0.108	0.081–0.108	0.095	0.011	6
Wo	0.126	0.180	0.126–0.180	0.150	0.019	6
<i>Steginoporella evelinae</i> B-zooids						
Lz	0.684	0.810	0.684–0.810	0.747	0.063	4
Wz	0.414	0.486	0.414–0.486	0.437	0.034	4
Lop	0.342	0.450	0.342–0.450	0.405	0.045	4
Wop	0.288	0.378	0.288–0.378	0.324	0.039	4
Lo	0.216	0.324	0.216–0.324	0.284	0.047	4
Wo	0.180	0.198	0.180–0.198	0.194	0.009	4

Notes. The colonies in the *Hassler* collection were skeletal, so the mandibles of A- and B-zooids were not present. According to Marcus's original description, that of A-zooids is small, with a broad main sclerite. B-zooid opercula are larger with a basal sclerite, a very broad submarginal sclerite with basal reinforcement, and 5–9 stout chitinous teeth.

Vieira et al. (2008) suggested that Busk's (1854) *Membranipora rozieri* from Rio de Janeiro and Kirkpatrick's (1888) *Steganoporella smittii* from Fernando de Noronha Archipelago may belong to *Steginoporella*

evelinae. These specimens, however, are a *Thalamoporella* species, probably *Thalamoporella evelinae* Marcus, 1939.

Distribution. Brazil: Espírito Santo, Bahia.

Specimens Examined. SBREVIS. Hassler Box 19, MCZ 137422. Off Salvador, Bahia state, Brazil. *Holotype:* MZUSP (slide n. 623; two balsam slides n. 608), *Steganoporella evelinae*, E. Marcus det., Espírito Santo, Brazil.

Steginoporella magnilabris (Busk, 1854)

Figure 6

Membranipora magnilabris Busk, 1852a: vi (explanation of pl. LXV), pl. LXV, fig. 4; 1854: 62 (part), 113.

Steginoporella elegans: Smitt, 1873: 15, pl. IV, figs. 96–101; Verrill, 1900: 594. NOT *Eschara elegans* Milne-Edwards, 1836: 337, pl. 12, fig. 13.

Steganoporella magnilabris: Harmer 1900: 279, figs. 10, 31, 4446; Osburn, 1914: 196; 1940: 375, 1947: 18; Canu and Bassler, 1923: 63, pl. 14, figs. 12, 13; 1928b: 64, pl. 7, figs. 8–10, pl. 32, fig. 6; Marcus, 1955: 284, pl. 2, fig. 25; Cook, 1964: 53, pl. 1, fig. 4, fig. 2; 1968: 153; 1985: 108, pl. 12D; Long and Rucker, 1970: 19, figs. 2, 6; Powell, 1971: 769.

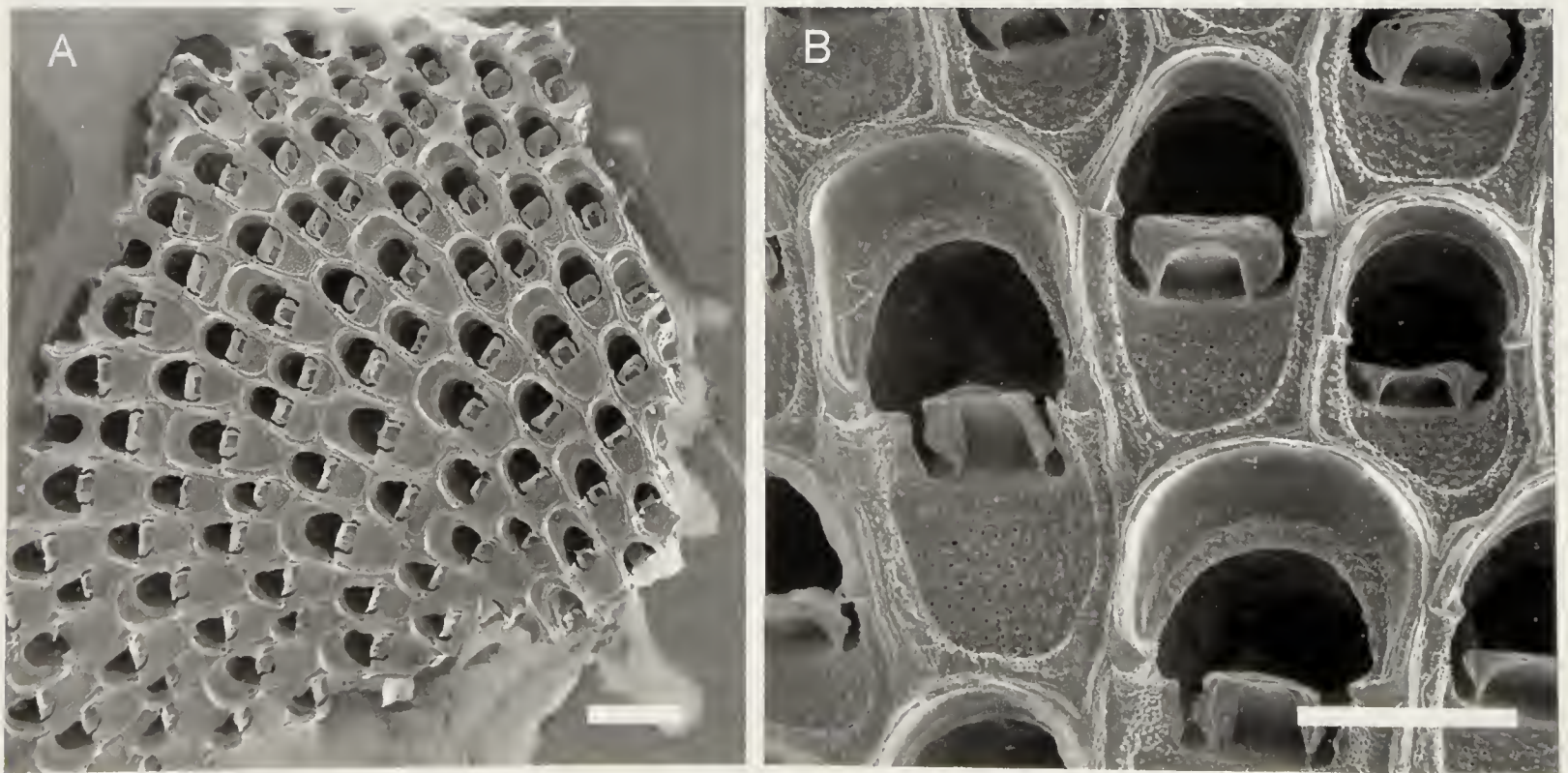


Figure 6. *Steginoporella magnilabris*. ST42. Hassler Box 42, MCZ 137423. A. Colony fragment with A- and B-zooids. Group of zooids. Large B-zooid on the left. Scale bar = 1,000 μ m. B. Scale bar = 500 μ m.

Steginoporella magnilabris: Shier, 1964: 618; Pouyet and David, 1979: 784, text-fig. 2, pl. 1, figs. 6, 7; Winston, 1984: 10, fig. 18; 2005: 29, figs. 73, 75; Souza, 1989, 497; Vieira et al., 2008: 20; Winston and Woollacott, 2009: 252, fig. 11.

Description. Colonies vary from encrusting to erect and foliaceous. Zooids shoe-shaped, elongate, subrectangular proximally, rounded distally. Zooids dimorphic, smaller A-zooids most frequent, with larger B-zooids with bigger, more reinforced orifices and opercula scattered between them. The A-zooid orifice is semicircular, with a smoothly calcified distal rim and shelf, and two condyles that project into the zooids about halfway down the length of the zooids. The proximal half of the zooid is marked by a thick rim of granular cryptocyst and a sunken cryptocystal shelf, less granular and with a few small pores. The tongue of the “shoe” is a deeply indented, then raised and laterally reinforced projection with elongate opesiular grooves on either side. It covers the polypide tube and allows for insertion of retractor muscles.

The morphology of the B-zooids is similar, but the opercular region is enlarged and has a deeper lunate shelf with granular calcification at its base. When living, both A- and B-zooids have strongly reinforced opercula edged with sharp-pointed chitinous teeth. No avicularia. Brooding internal.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
<i>Steginoporella magnilabris</i> A-zooids						
Lz	0.774	0.954	0.774–0.954	0.885	0.069	6
Wz	0.450	0.522	0.450–0.522	0.498	0.027	6
Lop	0.450	0.558	0.450–0.558	0.519	0.038	6
Wop	0.324	0.432	0.324–0.432	0.384	0.039	6
Lo	0.162	0.216	0.162–0.216	0.189	0.019	6
Wo	0.198	0.252	0.198–0.252	0.222	0.022	6
<i>Steginoporella magnilabris</i> B-zooids						
Lz	1.152	1.332	1.152–1.332	1.239	0.068	6
Wz	0.540	0.684	0.540–0.684	0.600	0.055	6
Lop	0.756	1.152	0.756–1.152	0.900	0.139	6
Wop	0.306	0.450	0.306–0.450	0.384	0.053	6
Lo	0.306	0.324	0.306–0.324	0.315	0.010	6
Wo	0.252	0.288	0.252–0.288	0.273	0.018	6

Notes. Both A- and B-zooids are capable of trapping and killing trespassers on the colony. The B-zooids seem to have a sensory function; their opercula often lie open when A-zooids of the colony are shut. However, unlike avicularia they possess polypides that expand along with the A-zooids to feed (Winston, 2004). The taxonomy of this species is discussed more fully in Winston (2005).

Distribution. Western Atlantic: Florida, Gulf of Mexico, and Caribbean. Brazil: Abrolhos Island, Bahia, Espírito Santo, and Rio de Janeiro. Reported to have a much broader tropical–subtropical distribution around the world.

Specimens Examined. *Steginoporella magnilabris*. Hassler Box 42, MCZ 137423. Off Cabo Frio, Rio de Janeiro state, Brazil. MZUSP, *Steganoporella magnilabris*, Marcus det., 1949, Pierre Drach leg., 1948, Espírito Santo, 35 m.

Suborder Neocheilostomatina d’Hondt, 1985

Superfamily Calloporoidea Norman, 1903

Family Antroporidae Vigneaux, 1949

Genus *Antropora* Norman, 1903

Antropora minor (Hincks, 1880)

Figure 7

Membranipora trifolium var. *minor* Hincks, 1880: 87, pl. 9, fig. 6.

Membrendoecium parvus Canu and Bassler, 1928a: 61, pl. 1, figs. 1, 2.

Membrendoecium minus: Marcus, 1937a: 50, pl. 9, figs. 22A, B.

Antropora minor: Tilbrook, 1998: 34, figs. 2A–F (cum syn); Vieira et al., 2008: 14.

Description. Colonies encrusting. zooids oval to subtriangular. Proximal portions broader than distal portions. Frontal membrane rimmed by area of gymnocystal wall, more elongated proximally. A beaded rim of cryptocyst underlies the frontal membrane, creating an oval to bell-shaped opesia. The cryptocystal shelf is also broader proximally,

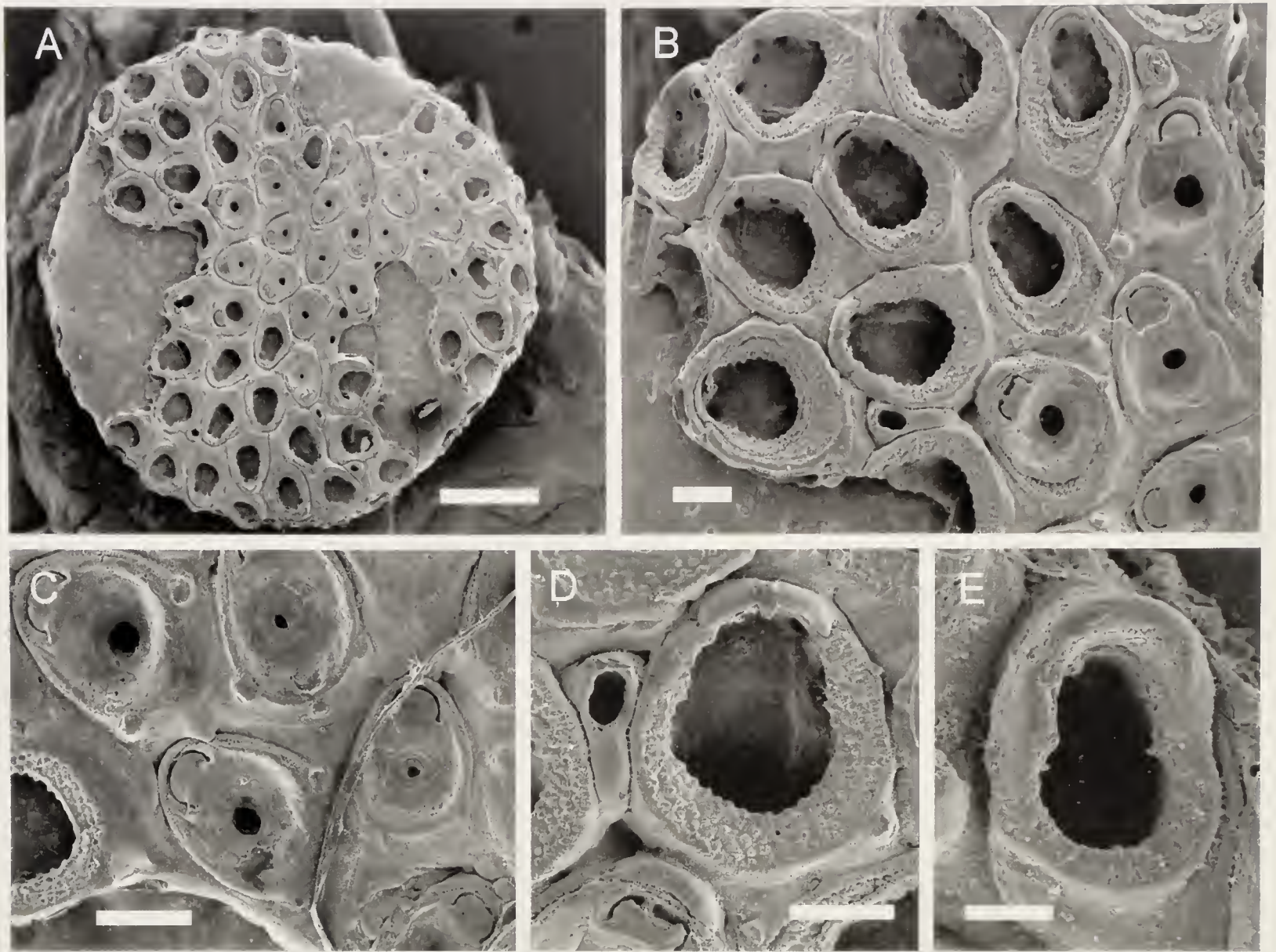


Figure 7. *Antropora minor*. AN1. Hassler Box 18, MCZ 137424. A. *Antropora* colony encrusting basal side of *Discoporella* colony. Scale bar = 500 μ m. B. Group of zooids, some with oecia and small avicularia. Scale bar = 100 μ m. C. Close-up of zooids with frontal surfaces almost completely closed by calcification. Scale bar = 100 μ m. D. Zooid with oecium and adjacent avicularium. Scale bar = 100 μ m. E. Close-up of an avicularium. Scale bar = 20 μ m.

gradually narrowing to the distal wall around the half-moon-shaped operculum. Small interzoocial avicularia with figure 8-shaped openings are interspersed between some autozooids; the proximal gymnocysts of others have developed calcified tubercles. Avicularia also have elongated proximal gymnocystal walls, a rim of beaded cryptocyst underlying the palate, and a U-shaped mandible, with a rounded, heavily calcified rostrum. Brooding zooids show a thickened lunate rim of calcification, fortifying their distal rims.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.324	0.396	0.324–0.396	0.357	0.031	6
Wz	0.198	0.252	0.198–0.252	0.228	0.019	6
Lop	0.162	0.198	0.162–0.198	0.180	0.011	6
Wop	0.117	0.162	0.117–0.162	0.137	0.017	6
Lo	0.054	0.081	0.054–0.081	0.068	0.011	6
Wo	0.072	0.099	0.072–0.099	0.086	0.011	6
Lov	0.036	0.054	0.036–0.054	0.041	0.008	5
Wov	0.090	0.108	0.090–0.108	0.103	0.008	5
Lav	0.090	0.144	0.090–0.144	0.113	0.025	6
Wav	0.054	0.072	0.054–0.072	0.068	0.008	6

Notes. The single colony found in the *Hassler* material was encrusting the base of a *Discoporella* colony. It was mostly skeletal and parts of the colony had been abraded away, while other zooids showed evidence of repair (more than one ring of cryptocyst) or had frontal walls completely calcified, except for a central opening. The large vicarious avicularia described by Tilbrook (1998) are absent in the *Hassler* specimen. The type specimen of *Membrendoecium parvum* (Canu and Bassler, 1928a), deposited at USNM is here considered a junior synonym of *A. minor*.

Distribution. *Antropora minor* has been recorded from Bahia and São Paulo states in Brazil. The species also has been reported from many tropical and subtropical localities around the world. Some of those records may refer to related species.

Specimens Examined. *Antropora minor*. Hassler Box 18, MCZ 137424. North of Salvador, Bahia state, Brazil. *Membranipora trifolium* var. *minor*, Holotype, NHMUK 1899.5.1.645, T. Hincks coll., Bahia, Brazil. *Membrendoecium parvum*, Holotype, USNM 8536, F. Canu and R. Bassler coll., Bahia, Brazil.

Antropora hastata New Species

Figure 8

Holotype. *Antropora hastata*. Hassler Box 45, MCZ 137425. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. Species name based on the Latin adjective *hastatus* (f. *hastata*), spear-shaped, armed with a spear.

Description. Colony encrusting. Zooids with an irregular outline; gymnocyst extending more broadly proximal to the opesia. Opesia oval to subtriangular, the underlying coarsely beaded cryptocyst broad proximally, then narrowing to a thread around the distal rim of the zooid, outlining a bell-shaped frontal membrane. Interzoecial avicularia, with a rounded palate and elongate, slightly curving hastate mandible, are interspersed on the gymnocyst between the autozooids. Ooecia are broadly lunate imperforate mounds of calcification.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.414	0.486	0.414–0.486	0.450	0.030	6
Wz	0.216	0.324	0.216–0.324	0.282	0.037	6
Lop	0.216	0.252	0.216–0.252	0.240	0.015	6
Wop	0.144	0.234	0.144–0.234	0.198	0.030	6
Wo	0.081	0.099	0.081–0.099	0.089	0.007	6
Lov	0.135	0.135		0.135		1
Wov	0.180	0.180		0.180		1
Lav	0.234	0.306	0.234–0.306	0.261	0.027	6
Wav	0.072	0.090	0.072–0.090	0.081	0.010	6

Diagnosis. *Antropora* with elongate, slightly curving, spear-shaped interzoecial avicularia, longer than those of *Antropora typica*.

Notes. The colony found was skeletal and showed evidence of repair during its lifetime. The overall shape of zooids was very like those of the preceding species as well as those of the common Caribbean species, *Antropora typica* (Canu and Bassler, 1928b). *Antropora minor* has very small ovoid avicularia and a much narrower ooecium. *Antropora typica*, also recorded in Brazilian waters (Canu and Bassler, 1928a) has smaller avicularia with pointed, but much less elongate tips and the body of the avicularium is somewhat tubular, its base raised from the surrounding gymnocyst, whereas in *Antropora hastata* it is the rostrum of the avicularium that appears raised.

Distribution. Brazil: Rio Janeiro.

Specimens Examined. *Antropora hastata*. Hassler Box 45, MCZ 137425. Off Cabo Frio, Rio Janeiro state, Brazil. *Antropora typica*, syntypes, USNM 7484, F. Canu and R. Bassler coll., North of Cuba.

Family Calloporidae Norman, 1903

Genus *Retevirgula* Brown, 1948

Retevirgula mesitis (Marcus, 1949) **New Combination**

Figure 9

Pyrulella mesitis Marcus, 1949: 6, fig. 4.

Crassimarginatella mesitis: Vieira et al., 2008: 14 (in part).

Description. Colony encrusting. Autozooids oval, with an oval frontal membrane

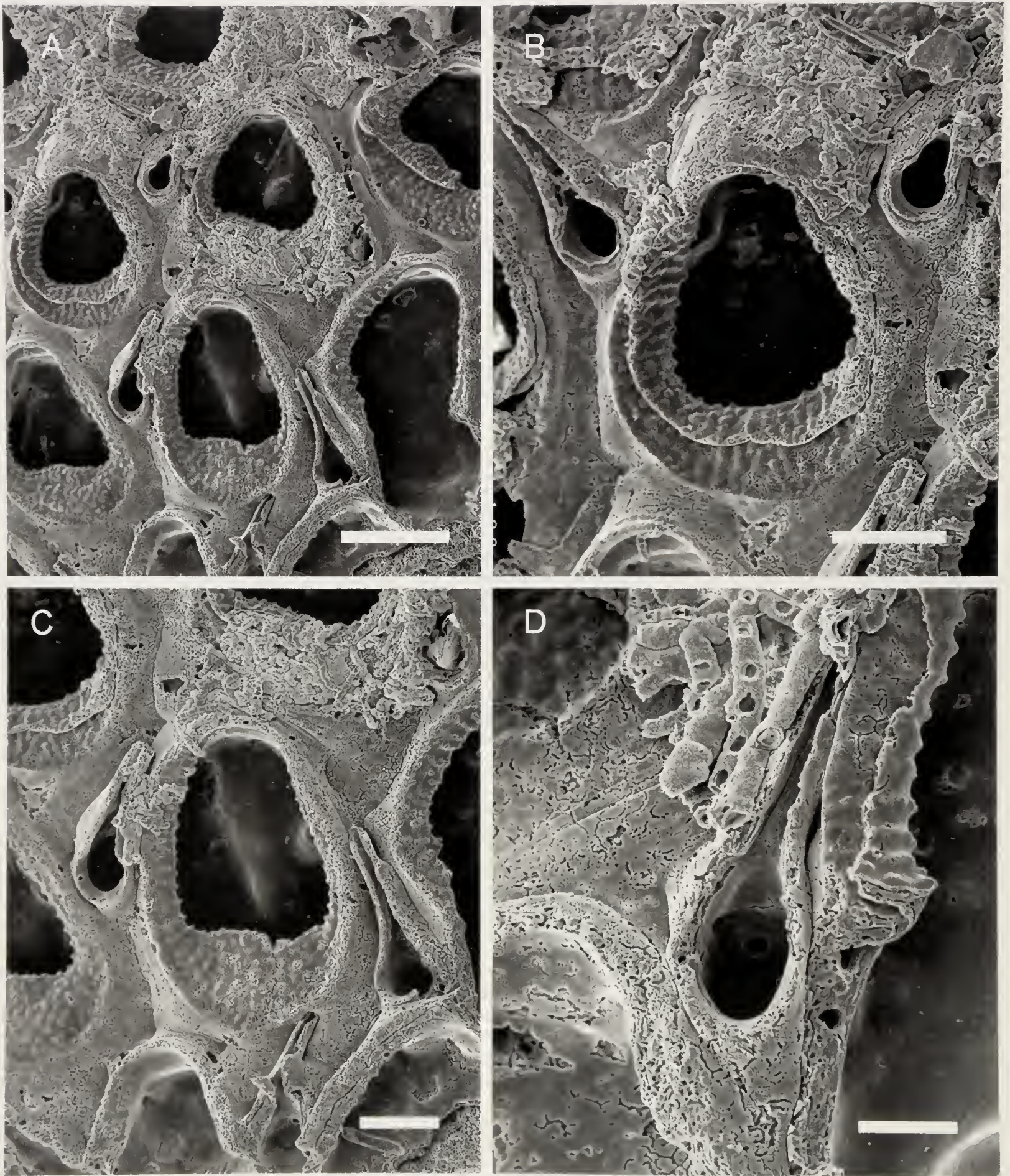


Figure 8. *Antropora hastata*. AN2. Hassler Box 45, MCZ 137425 A. Group of zooids. Scale bar = 200 μm . B. Close-up of zooid with oecium, regenerated cryptocyst, and two avicularia. Scale bar = 100 μm . C. Autozoid and avicularia. Scale bar = 100 μm . D. Close-up of one of the interzoecial avicularia, showing elongate and slightly curved rostrum. Scale bar = 50 μm .

bordered laterally and proximally by a narrow rim of cryptocyst and surrounded by a row of about 12–14 thick, evenly spaced spines, which are inclined at an

angle over the frontal membrane. At the distal end of the autozoid, four spines flare outward around the rim, while another very long pair is directed upward. A network of

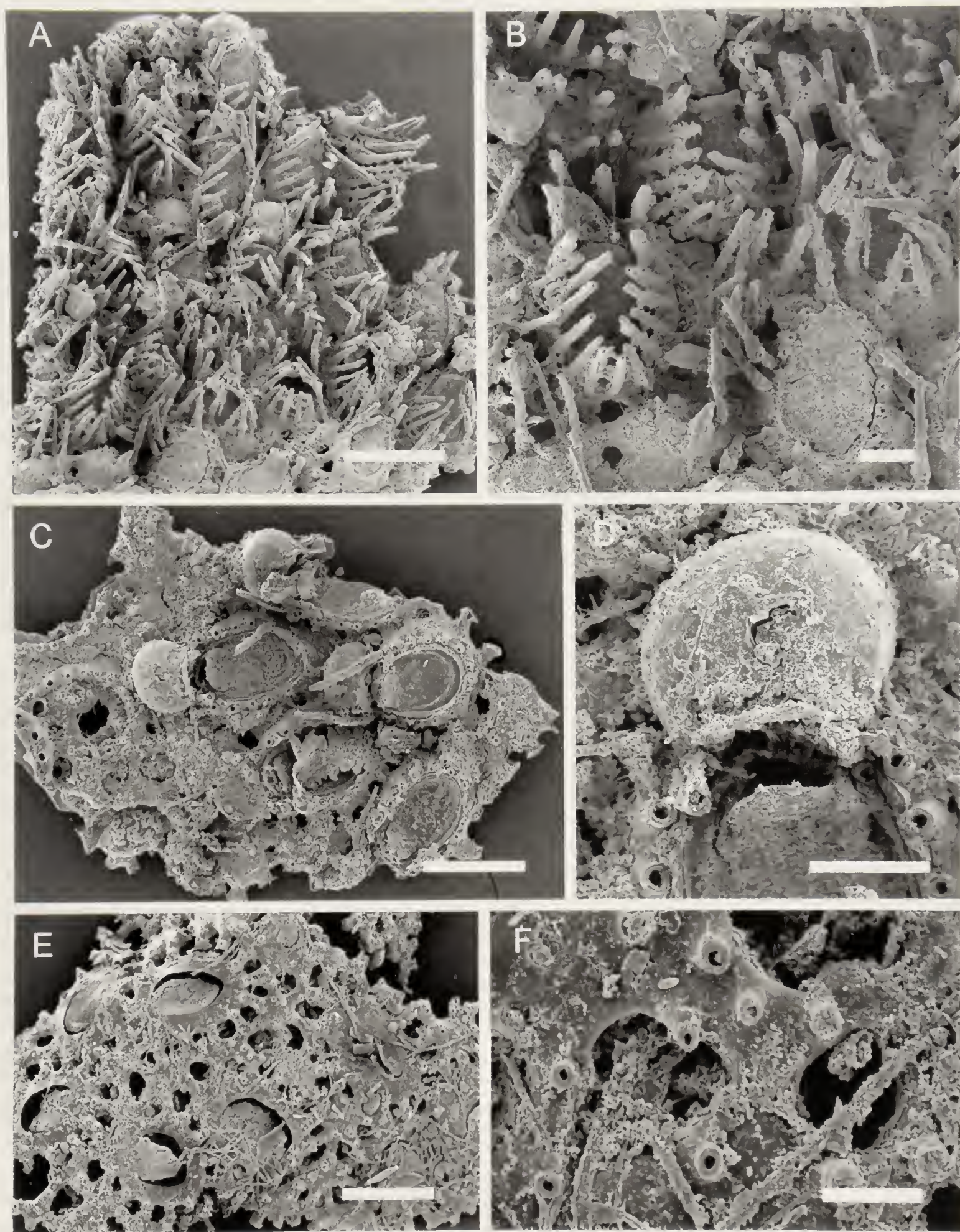


Figure 9. *Retevirgula mesitis*. AVIR, RVIR. Hassler Box 18, MCZ 137426. A. Group of zooids near growing edge of colony. AVIR. Scale bar = 400 μm . B. Group of zooids showing spines. AVIR. Scale bar = 100 μm . C. RVIR fragment showing zooids with oocysts. Scale bar = 300 μm . D. Close-up of oocyst. RVIR. Scale bar = 100 μm . E. Basal surface of colony fragment. RVIR. Scale bar = 300 μm . F. Close-up of basal surface showing attachment tubules. RVIR. Scale bar = 50 μm .

tubules, with open spaces between them in places, connects autozooids to each other. Where connecting tubules meet, rounded kenozooids develop in place of autozooids. They have a membranous frontal wall and no mandibles. Ooecia are prominent, rounded, and smoothly calcified with a central lacuna and are not closed by the zooid operculum. The basal walls of the colony show the ovoid autozooids, the radiating network of tubules, and the series of rimmed pores on the undersides of the tubules, perhaps for better attachment to the substratum.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.468	0.504	0.468–0.504	0.483	0.014	6
Wz	0.234	0.288	0.234–0.288	0.252	0.023	6
Lop	0.288	0.360	0.288–0.360	0.309	0.026	6
Wop	0.144	0.216	0.144–0.216	0.171	0.025	6
Lo	0.144	0.216	0.144–0.216	0.171	0.025	6
Wo	0.090	0.126	0.090–0.126	0.113	0.014	6
Lov	0.162	0.180	0.162–0.180	0.171	0.010	4
Wov	0.180	0.198	0.180–0.198	0.189	0.010	4

Notes. The colonies found in the *Hassler* collection, although fragmentary, had been alive when collected and still had spines, dried frontal membranes, and opercula. Marcus did not find an ooecium in his material. A large ooecium with a central lacuna was found in a specimen from St. Peter and St. Paul Archipelago (Vieira et al., 2008), and the *Hassler* fragments had several complete ooecia. The St. Peter and St. Paul Archipelago specimens, however, have been referred to an undescribed species by Vieira et al. (2012); one that requires reinvestigation.

Distribution. Brazil: Espírito Santo, Bahia.

Specimens Examined. *Retevirgula mesitis*. Hassler Box 18, MCZ 137426. North of Salvador, Bahia state, Brazil. Syntypes: MZUSP (two balsam slides, n. 607), *Pyridella mesitis*, E. Marcus det., Espírito Santo, Brazil.

Retevirgula multipunctata New Species

Figure 10

Holotype. *Retevirgula multipunctata*. Hassler Box 38, MCZ 137427. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. Species name compounded from the Latin comparative, *multus*, more, many, and *punctatus*, (f. *punctata*), provided with pores, derived from the Latin noun *punctum*, small hole. The name is descriptive of the many pores in the basal walls of zooids.

Description. Colony encrusting. Autozooids oval, large, with an elongated proximal gymnocyst. Frontal membrane oval, edged by a fairly smooth rim and surrounded by about five to nine lateral and two distal spines. Zooids with 14–17 very short connecting tubules; zooid margins perforated by single rows of holes between the tubules that give the colony frontal surface a lacy appearance. Between some zooids are oval avicularia on small zoeciules. They have a slightly raised, strongly calcified rostrum and, like the zooids, are connected by short tubules with only a single row of pores. No ooecia were present in the *Hassler* specimen. The basal surface of the colony has evenly spaced tuberculate attachment pores on both zooids and connecting tubules.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.576	0.612	0.576–0.612	0.600	0.019	6
Wz	0.306	0.360	0.306–0.360	0.330	0.022	6
Lop	0.378	0.396	0.378–0.396	0.387	0.010	6
Wop	0.234	0.270	0.234–0.270	0.243	0.015	6
Wo	0.090	0.108	0.090–0.108	0.101	0.009	6
Lov	0.072	0.072		0.072		1
Wov	0.198	0.198		0.198		1
Lav	0.180	0.270	0.180–0.270	0.231	0.031	6
Wav	0.180	0.216	0.180–0.216	0.198	0.016	6

Diagnosis. The present species differs from Brazilian *Retevirgula mesitis* (Marens, 1955) in having fewer spines and shorter connective tubes between the zooids.

Notes. This specimen is quite similar in zooid morphology, spine number, connecting tubules, and avicularia to *Retevirgula tubulata* as described by Hastings (1930) from the Galapagos Islands and Gorgona, Colombia, by Osburn (1947) from Aruba, and by Osburn (1950) from additional eastern Pacific localities. Osburn (1950) mentions that the species is variable in size, with Lz between 0.45 and

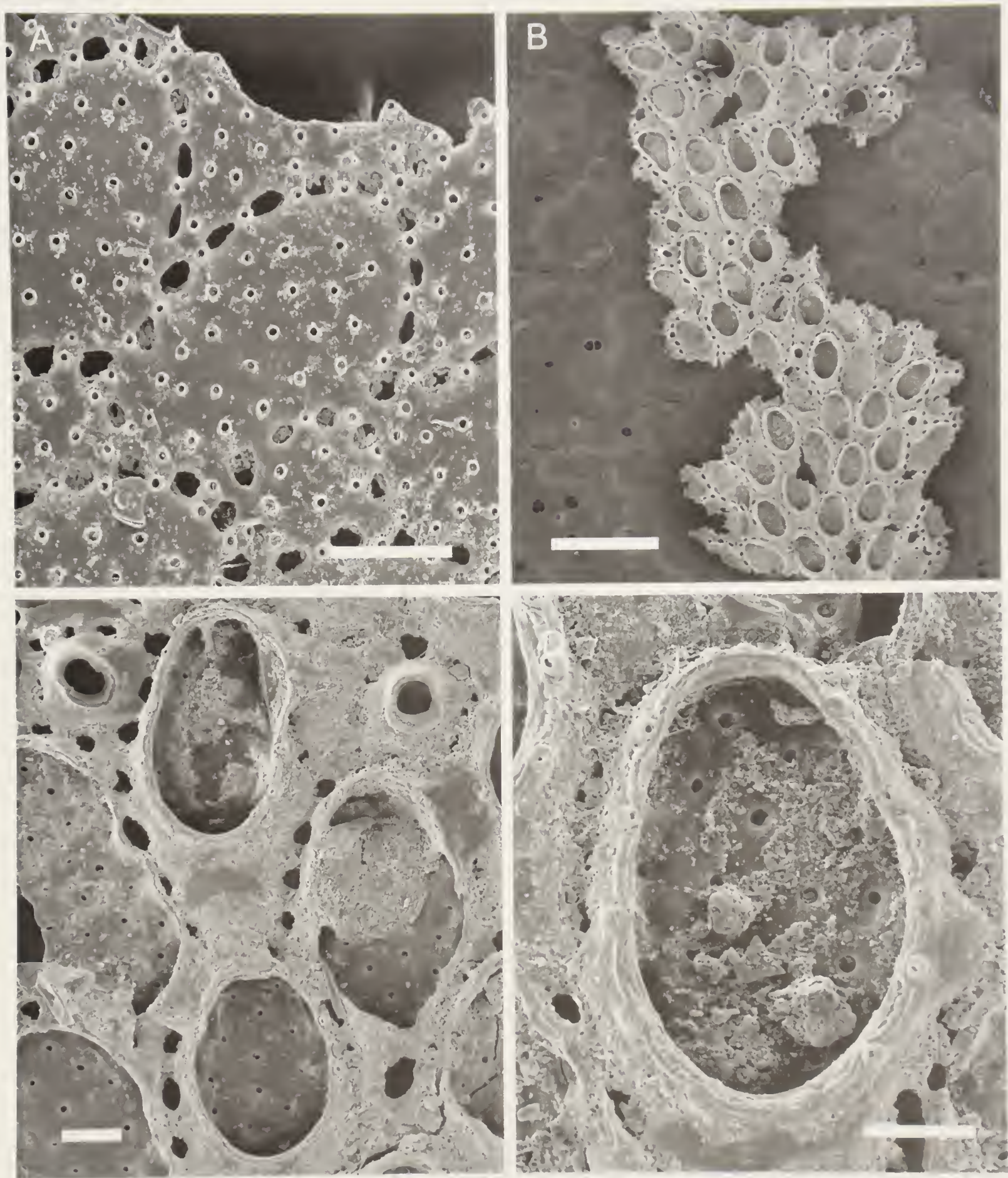


Figure 10. *Retevirgula multipunctata*. RET38. Hassler Box 38, MCZ 137427. A. Basal surface of zooids showing large number of tubules. Scale bar = 200 μ m. B. Frontal surface of colony fragment. Scale bar = 1,000 μ m. C. Frontal surface of zooids and avicularia. Scale bar = 100 μ m. D. Single zooid showing spine bases. Scale bar = 100 μ m.

0.60 mm, which agrees with the mean Lz of the Brazil specimen. Osburn (1947) did not illustrate the specimen from Aruba. Winston (1986) illustrated a specimen from Jamaican

reef habitats as *Retevirgula tubulata*. The Jamaican material is quite similar to the Brazilian specimen, except in having fewer pores in the basal walls of zooids.

The Pacific specimens of *Retevirgula tubulata* (*sensu* Hastings, 1930) differ from *Retevirgula multipunctata* in having less numerous connecting tubules and a shorter proximal gymnocyst than those of *R. multipunctata*. *Retevirgula multipunctata* and *Retevirgula mesitis* are distinguished by the number of spines and shape of connective tubules between the zooids. *Retevirgula caribbea* (Osburn, 1947) has smaller zooids than *R. multipunctata*, and their zooids are often connected by 6 tubules.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Retevirgula multipunctata*. Hassler Box 38, MCZ 137427. Off Cabo Frio, Rio de Janeiro state, Brazil.

Genus *Parellisina* Osburn, 1940

Parellisina lunatirostris **New Species**

Figure 11

Holotype. *Parellisina lunatirostris*. Hassler Box 45, MCZ 137428. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name is compounded from the Latin adjective *lunatus*, shaped like a crescent moon, and *rostris*, the stem of the Latin noun *rostrum*, beak, bill, snout with the possessive Latin suffix *-is*. The name describes the curved crescent shape of the rostrum of the avicularium.

Description. Colony encrusting. Zooids oval to irregular in shape, with a smooth gymnocyst that is more extensive proximally, and an oval opesia rimmed by two rows of bead-like cryptocyst. The margin narrows, but doesn't disappear around the distal rim surrounding the operculum. A small triangular knob often present in proximal gymnocyst, near to the cryptocyst. Interzoecial avicularia have kenozooids taking up almost as much space as autozooids, with a keyhole-shaped uncalcified area that extends beneath the curved semicircular rostrum. Ooecia imperforate, covered by a coarse textured calcification, round in shape with a curved proximal margin and an opening separate from the operculum.

Diagnosis. The present species differs from Brazilian *Parellisina centetica* Marcus,

1955, in having zooids without lateral spines and in the shape of avicularia.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.414	0.612	0.414–0.612	0.462	0.077	6
Wz	0.270	0.342	0.270–0.342	0.303	0.029	6
Lop	0.288	0.342	0.288–0.342	0.318	0.019	6
Wop	0.198	0.252	0.198–0.252	0.225	0.019	6
Wo	0.108	0.126	0.108–0.126	0.120	0.007	6
Lov	0.180	0.198	0.180–0.198	0.186	0.009	6
Wov	0.198	0.216	0.198–0.216	0.207	0.010	6
Lav	0.360	0.360		0.360		1
Wav	0.180	0.180		0.180		1

Notes. This skeletal and abraded colony was found on the same substratum as *Antropora hastata*. It is broken and partly overgrown by encrusting foraminiferans and calcareous algae, but remaining zooids show the characters of ooecia and autozooids necessary for identification. A short pointed gymnocystal spine is visible at the proximal end of the opesia on one autozoid (Fig. 11C). The single avicularium appears to have been damaged and perhaps repaired.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined: *Parellisina lunatirostris*. Hassler Box 45, MCZ 137428 Off Cabo Frio, Rio de Janeiro state, Brazil.

Genus *Klugerella* Moyano, 1991

Klugerella petasus (Canu and Bassler, 1928) **New Combination**

Figure 12

Membraniporella petasus Canu and Bassler, 1928b: 36, pl. 4, figs. 1, 2.

Description. Colony encrusting, unilamellar. Zooids oval with a smooth gymnocyst surrounding an oval frontal membrane. The frontal membrane is protected by an outer shield composed of 8–11 (most often 10) flat calcareous spines, bifurcated at their tips where they meet, overlapped, and fused along the zooid midline. The distal rim of the zooid has three spines, a

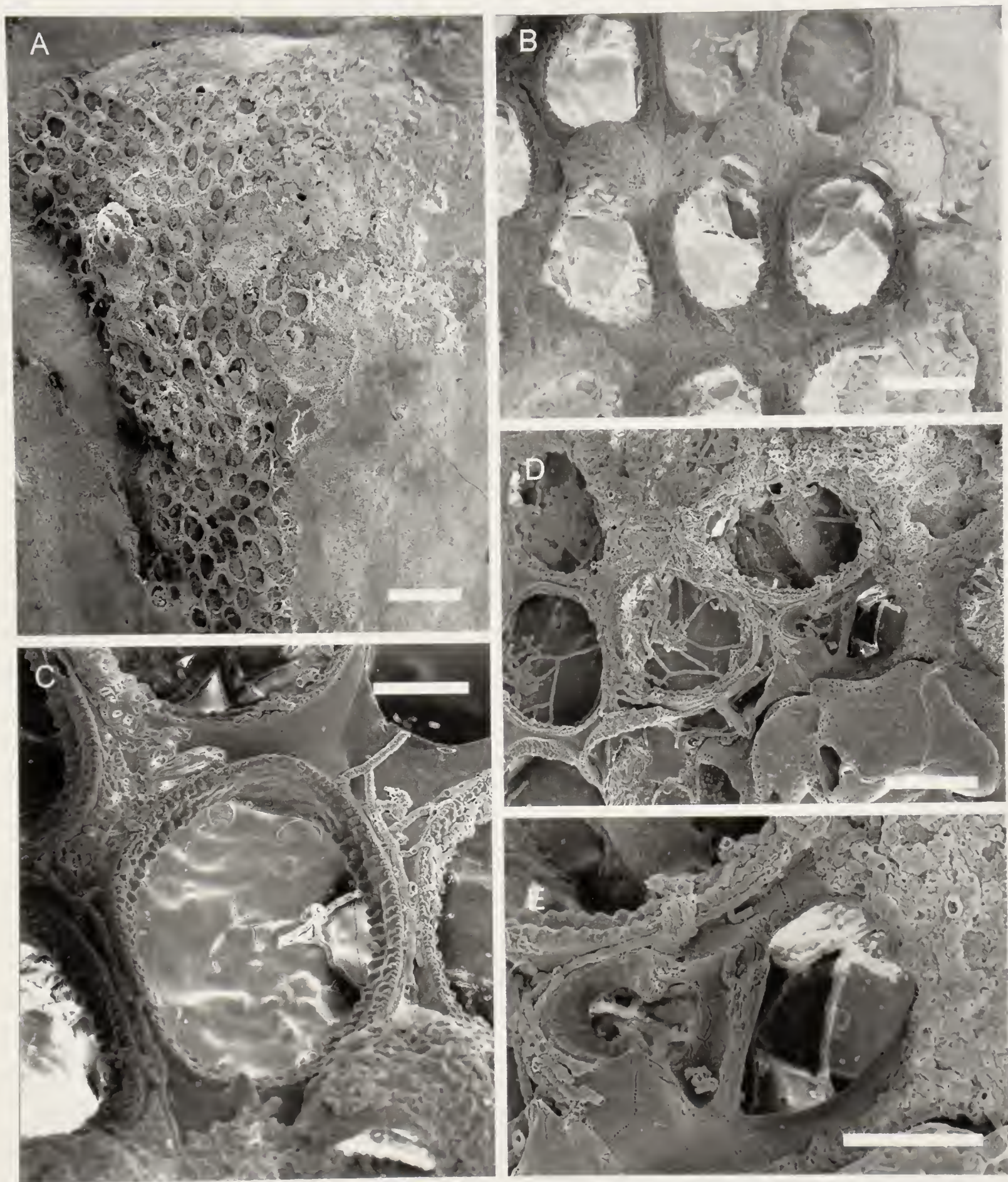


Figure 11. *Parellisina lunatirostris*. AN. Hassler Box 45, MCZ 137428. A. Entire encrusting colony fragment. Scale bar = 1,000 μm . B. Three zooids with oecia. Scale bar = 200 μm . C. Autozoid, note proximal conical spine. Scale bar = 100 μm . D. Zooids and an avicularium (on right side). Scale bar = 200 μm . E. Close-up of the broad avicularium. Scale bar = 100 μm .

center straight or bifurcating spine, and two forked (bifurcating or trifurcating) lateral spines surrounding the orifice. No avicularia. Oecia are helmet shaped with

a slightly keeled center and a thick rim surrounding a semicircular lacuna and a raised lunate to triangular proximal edge.

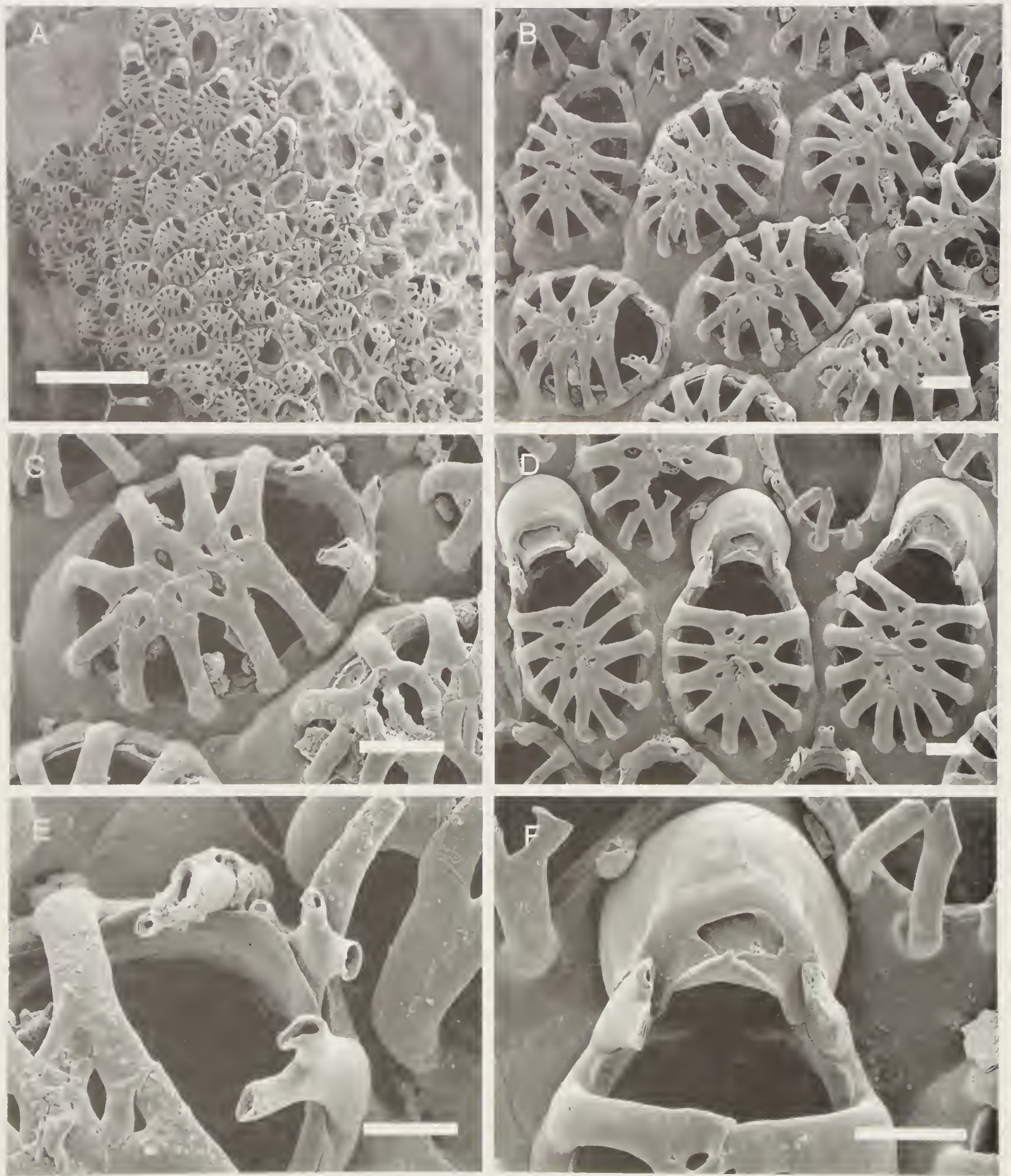


Figure 12. *Klugerella petasus*. MEM36. Hassler Box 36, MCZ137429. A. Overview of colony. Scale bar = 1,000 μm . B. Group of zooids. Scale bar = 100 μm . C. Close-up of zooids showing branching frontal and distal spines. Scale bar = 100 μm . D. Group of three zooids with oocysts. Scale bar = 100 μm . E. Close-up of distal spines. Scale bar = 500 μm . F. Close-up of oocyst. Scale bar = 100 μm .

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.414	0.540	0.414–0.540	0.486	0.051	6
Wz	0.324	0.396	0.324–0.396	0.363	0.029	6
Wo	0.126	0.144	0.126–0.144	0.129	0.007	6
Lov	0.144	0.180	0.144–0.180	0.162	0.011	6
Wov	0.198	0.234	0.198–0.234	0.213	0.014	6

Notes. The specimens from the *Hassler* collection fit the description of *Membraniporella petasus* in Canu and Bassler's (1928b) work on fossil and Recent Bryozoa of the Gulf of Mexico region in overall morphology, including number of costae and shape of oral spines. They are slightly smaller (mean length and width of zooids, 0.486×0.363 vs. 0.50×0.40) than the Canu and Bassler specimens that were collected from depths of 257–283 m off the north coast of Cuba. Moyano (1991) reassigned some *Membraniporella* species to the genus species *Klugerella*, due to the presence of branching costae and oecia with semicircular membranous ectoecium; these characteristics are also seen in Canu and Bassler's species, thus *Klugerella petasus* new combination.

The specimens reported as *Membraniporella aragoi* (Audouin, 1826) from Santos, Brazil (Marcus, 1937a), are distinct from *Klugerella petasus* in having 5 calcareous spines around the opesia; these specimens may belong to *Klugerella marculsi* (Cook, 1967) (see Cook, 1967; López de la Cnadra and García Gómez, 2000).

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Klugerella petasus*. Hassler Box 36, MCZ 137429. Off Cabo Frio, Rio de Janeiro state, Brazil.

Family Quadricellariidae Gordon, 1984

Genus *Nellia* Busk, 1852a

Nellia oculata (Busk, 1852)

Figure 13

?*Cellaria tenella* Lamarck, 1816: 135.

Nellia tenella: Levinsen, 1909: 120; Cheetham, 1966: 48, fig. 28; Cook, 1968: 156, pl. 9, fig. g; Winston and Cheetham,

1984: 258, figs. 1, 2; Fransen, 1986: 41, fig. 14. Winston, 2005: 10, figs. 15–19; Vieira et al., 2008: 15.

Nellia oculata Busk, 1852a: 18, pl. 64, fig. 6; pl. 65, fig. 4.; Smitt, 1873: 3, pl. 1, figs. 53–54; Osburn, 1914: 191; 1940: 400; 1947: 25; 1950: 119, pl. 13, fig. 4; Canu and Bassler, 1928b: 26; Marcus, 1939: 131, pls. 8, 9A–C; Shier, 1964: 622; Tilbrook, 2006: 36, pl. 4F.

Description. Colony erect, rooted by rhizoids, with bushy white branches in a distinctive evenly bifurcating pattern. Branches narrowly four-sided, made up of internodes with four to seven or more elongate subquadrangular zooids connected by chitinous joints. A pair of very small oval avicularia with semicircular mandibles occurs proximolaterally on each zooid. Two proximal pairs of small multiporous septulae present at internal wall; three distal multiporous septulae: two large and lateral, connecting the adjacent distal zooids, and a smaller and deeper pore chamber medial, connecting the distal zooid. Ovicell in the *Hassler* specimen endozooidal, with oocial vesicle raised slightly distally and more heavily calcified laterally, with a lunate fenestra, and closed by the maternal zooid operculum.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.396	0.504	0.396–0.504	0.429	0.040	6
Wz	0.180	0.234	0.180–0.234	0.213	0.022	6
Lop	0.252	0.360	0.252–0.360	0.300	0.042	6
Wop	0.090	0.126	0.090–0.126	0.116	0.014	6
Wo	0.063	0.090	0.063–0.090	0.077	0.011	6

Notes. Considered to have a circumtropical–subtropical distribution. Found in full and slightly reduced salinities and at a broad range of depths. We prefer to use the name *Nellia oculata* for the Brazilian material until the revision of Lamarck's *Cellaria tenella* is done. Taxonomic opinions diverge as to whether this is a single genetically constrained “living fossil” species or a cryptic species complex. Ecologically it is

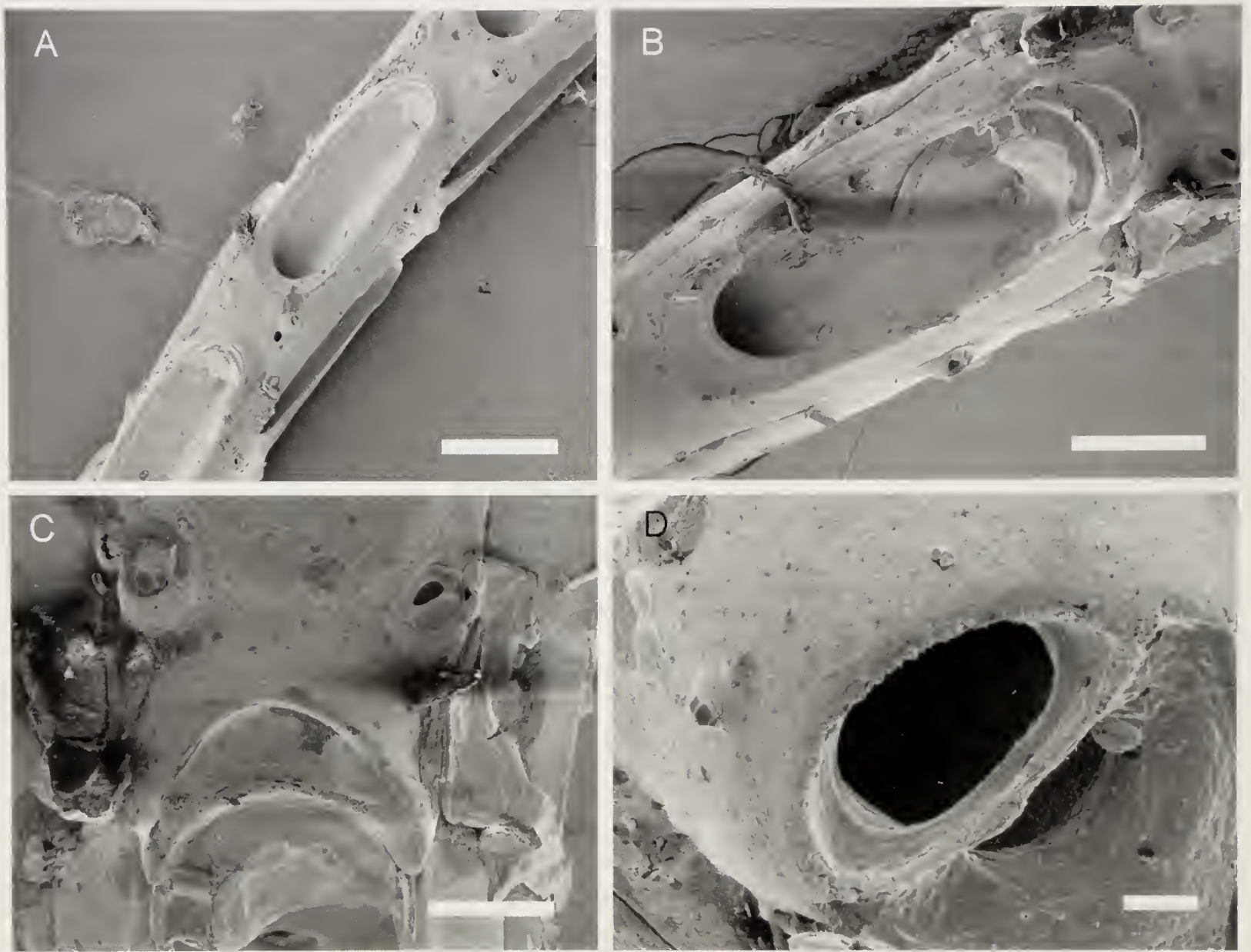


Figure 13. *Nellia oculata*. Hassler Box 34, with *Celleporaria mordax* and *Parasmittina* spp. MCZ 137430. A. Zooids on branch. Scale bar = 200 µm. B. Close-up of zooid with developing ooeonium. Scale bar = 100 µm. C. Close-up of ooeonium area. Scale bar = 50 µm. D. Close-up of avicularium. Scale bar = 4 µm.

hard to explain the great differences in the habitats and regions where it has been recorded, but there are as yet no genetic data from its diverse populations.

Distribution. Widespread in warm waters. Brazil: Rocas Atoll, Pernambuco, Bahia, and Rio de Janeiro.

Specimens Examined. *Nellia oculata*. Hassler Box 34, MCZ 137430. Off Cabo Frio, Rio de Janeiro state, Brazil.

Family Cupuladriidae Lagaaij, 1952

Genus *Discoporella* d'Orbigny, 1852a

Discoporella salvadorensis **New Species**

Figure 14

Holotype. *Discoporella salvadorensis*. Hassler Box 18, MCZ 137431. North of Salvador, Bahia state, Brazil.

Etymology. Species name refers to the type locality, north of Salvador, Bahia state, Salvador, plus the Latin suffix of location *-ensis*, the place where.

Description. Colony dome-shaped with a solid base, free-living on sediment. Colony small, about 3.6 mm in diameter, forming a relatively steep-walled dome. Colony growth is determinate; mature colonies which have ceased growth show the basalmost row of the zooidal surface marked by calcified kenozooids, but with functional vibracula. The colony base (Fig. 14A) is flat and relatively smooth, neither densely granular, nor with basal grooves. Zooids are oval to diamond shaped, with a transversely oval orifice that is large relative to zooid size. The beaded cryptocyst has four to six spiny

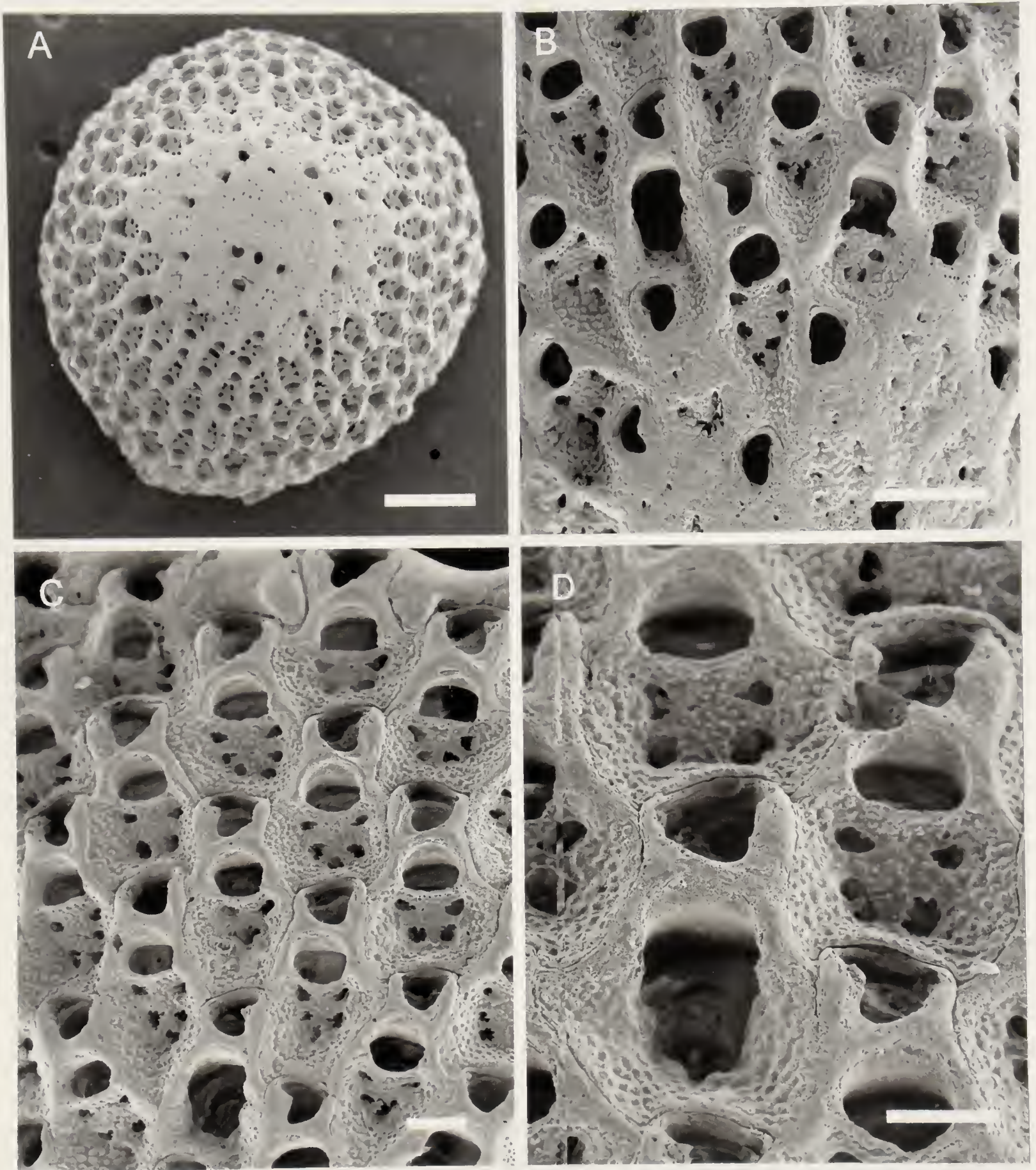


Figure 14. *Discoporella salvadorensis*. Hassler Box 18, MCZ 137431. A. Conical colony. Scale bar = 500 μm . B. Early (near top of colony) zooids and avicularia. Scale bar = 200 μm . C. Growing edge zooids and avicularia. Scale bar = 100 μm . D. Group of zooids and avicularia. Scale bar = 100 μm .

opesiules. Each zooid bears a vibraculum with a triangular to C-shaped opening and a long setiform mandible used to clean and move the colony in the sediment. Brood-

ing is internal. Zooids at the top of the colony become filled in by secondary calcification but retain some open vibracular zooids.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.216	0.324	0.216–0.324	0.282	0.044	6
Wz	0.180	0.234	0.180–0.234	0.210	0.022	6
Lop	0.072	0.099	0.072–0.099	0.084	0.011	6
Wop	0.072	0.090	0.072–0.090	0.086	0.008	6
Lav	0.126	0.162	0.126–0.162	0.141	0.014	6
Wav	0.108	0.126	0.108–0.126	0.119	0.009	6

Diagnosis. *Discoporella* with conical colony form, four to six opesiules in cryptocyst of zooids, and triangular to C-shaped vibracular openings.

Notes. This species is very different from the other *Discoporella* species recorded for Brazil and studied by Marcus and Marcus (1962). *Discoporella gemmulifera* Winston and Vieira, 2013, has larger, more saucerlike colonies with indeterminate growth and a large amount of asexual reproduction by fragmentation (Winston and Vieira, 2013). The species most similar in morphology to *Discoporella salvadorensis* is *Discoporella triangula* (Hererra-Cubilla et al., 2008) from the Caribbean coast of Panama. This slightly smaller species also has a conical colony with determinate growth but differs from the *Hassler* specimen in having a larger number of opesiules (5–9) in zooid cryptocyst, a more regular triangular shape to the vibracula, and different proportions of zooid to orifice size.

Distribution. Brazil: Bahia.

Specimens Examined. *Discoporella salvadorensis*. Hassler Box 18, MCZ 137431. North of Salvador, Bahia state, Brazil, with *Antropora minor*.

Superfamily Buguloidea Gray, 1848

Family Candidae d'Orbigny, 1851

Genus *Canda* Lamouroux, 1816

Canda alsia **New Species**

Figures 15, 16

Canda? sp. Ridley, 1881: 45.

Canda simplex: Busk, 1884: 26.

Canda retiformis: Harmer, 1926: 388 (part in text; John Adam's Bank, off Brazil); Marcus, 1955: 290, figs. 38–40.

Holotype. *Canda alsia*. Hassler Box 22, MCZ 137432. Off Cabo Frio, Rio de Janeiro state, Brazil. *Paratypes*: NHMUK 1854.11.15.325–331, Victoria Bank, Brazil; NHMUK 1890.1.30.25–27, 15°19'S, 38°46'W, G. Busk det., 26 fms, on cable. MZUSP (specimen IO/USP035), *Canda retiformis*, E. Marcus det., Espírito Santo, Brazil.

Etymology. The species name is *alsia*, the feminine form of the Latin adjective *alsius*, chill, cold, chilly, in reference to its occurrence off Cabo Frio.

Description. Colony rooted, erect, and fan-shaped, with biserial branches connected by tubular kenozooids. Zooids are small and subrectangular with rounded edges. Each row of zooids opens at an angle of almost 90 degrees from those of the adjacent series. Oval cryptocyst with a coarsely beaded texture underlies most of the frontal wall. The asymmetrically oval, uncalcified opesia extends from the distal end of the zooid to about one half of its length. Zooids have one inner distal spine and a narrow mushroom-shaped scutum, whose stem extends from the inner wall about a third to a half of the way down the length of the zooids out over the frontal membrane. Vibracular chambers on the outside of branches have short curving vibracula. Small subtriangular avicularia with tubular bodies are placed just below the inner distal spine on some zooids. No oocidia occurred on the specimen found in the *Hassler* collection.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.360	0.396	0.360–0.396	0.384	0.015	6
Wz	0.180	0.216	0.180–0.216	0.198	0.016	6
Lop	0.216	0.252	0.216–0.252	0.236	0.012	6
Wop	0.108	0.135	0.108–0.135	0.116	0.012	6
Lo	0.054	0.072	0.054–0.072	0.059	0.008	6
Wo	0.216	0.252	0.216–0.252	0.236	0.012	6

Diagnosis. *Canda* with asymmetrically oval opesia, one inner distal spine and a narrow mushroom-shaped scutum, and small tubular subtriangular avicularia.

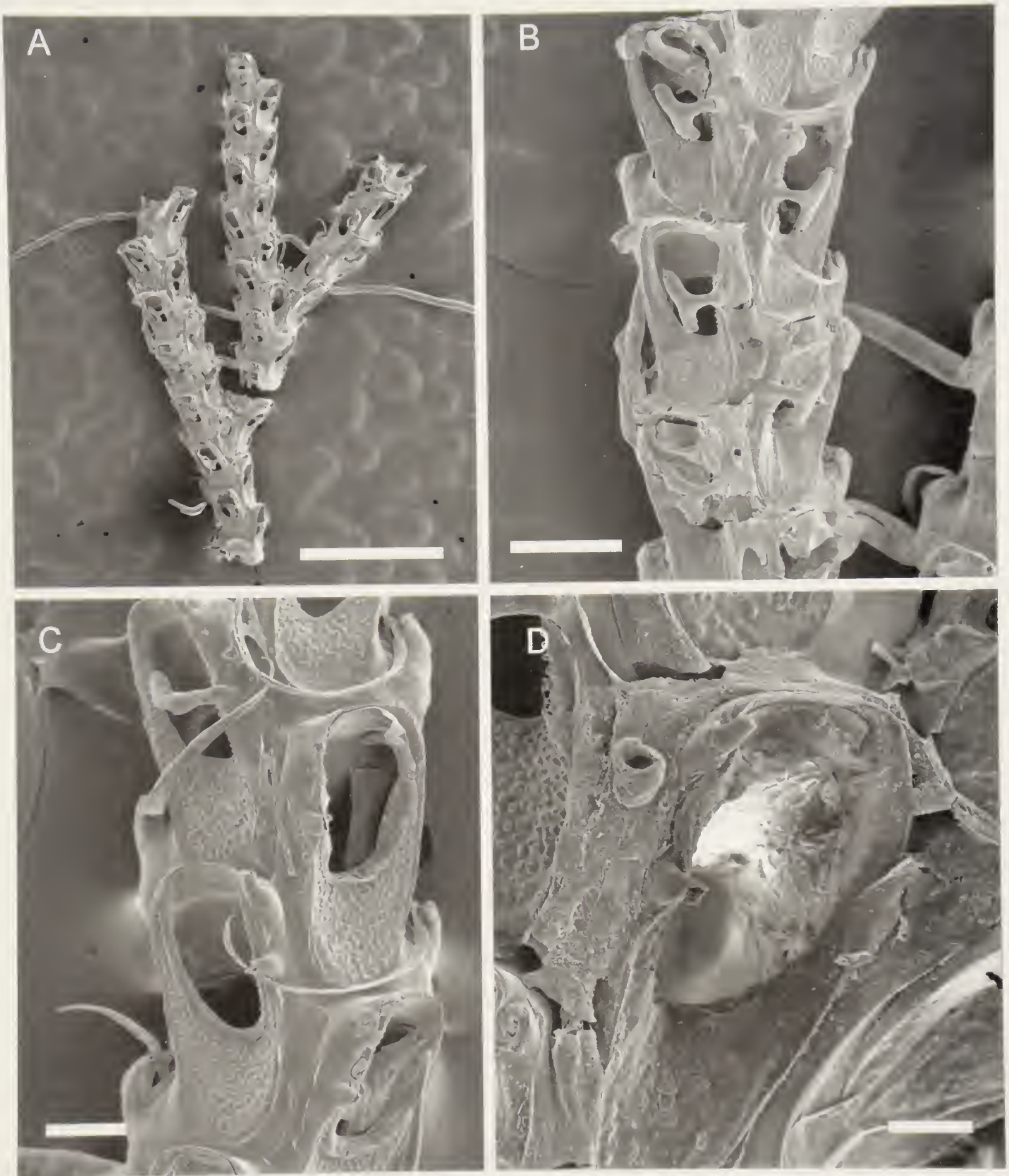


Figure 15. *Canda alsia*. CANR. Hassler Box 22, MCZ 137432. A. Colony branches and radicles. Scale bar = 1,000 μm . B. Group of zooids, showing scutum shape and position. Scale bar = 200 μm . C. Group of zooids showing vibracula. Scale bar = 100 μm . D. Zooid close-up showing position of small avicularium. Scale bar = 50 μm .

Notes. Two species of *Canda* have been reported from Brazil (Vieira et al., 2008). Zooids of *Canda simplex* lack a scutum. The species described above more closely re-

sembles *Canda retiformis* Pourtalès, 1867, that has scuta, but differs in its smaller autozooid size, the presence of only an inner spine, narrower shape of the scutum, and

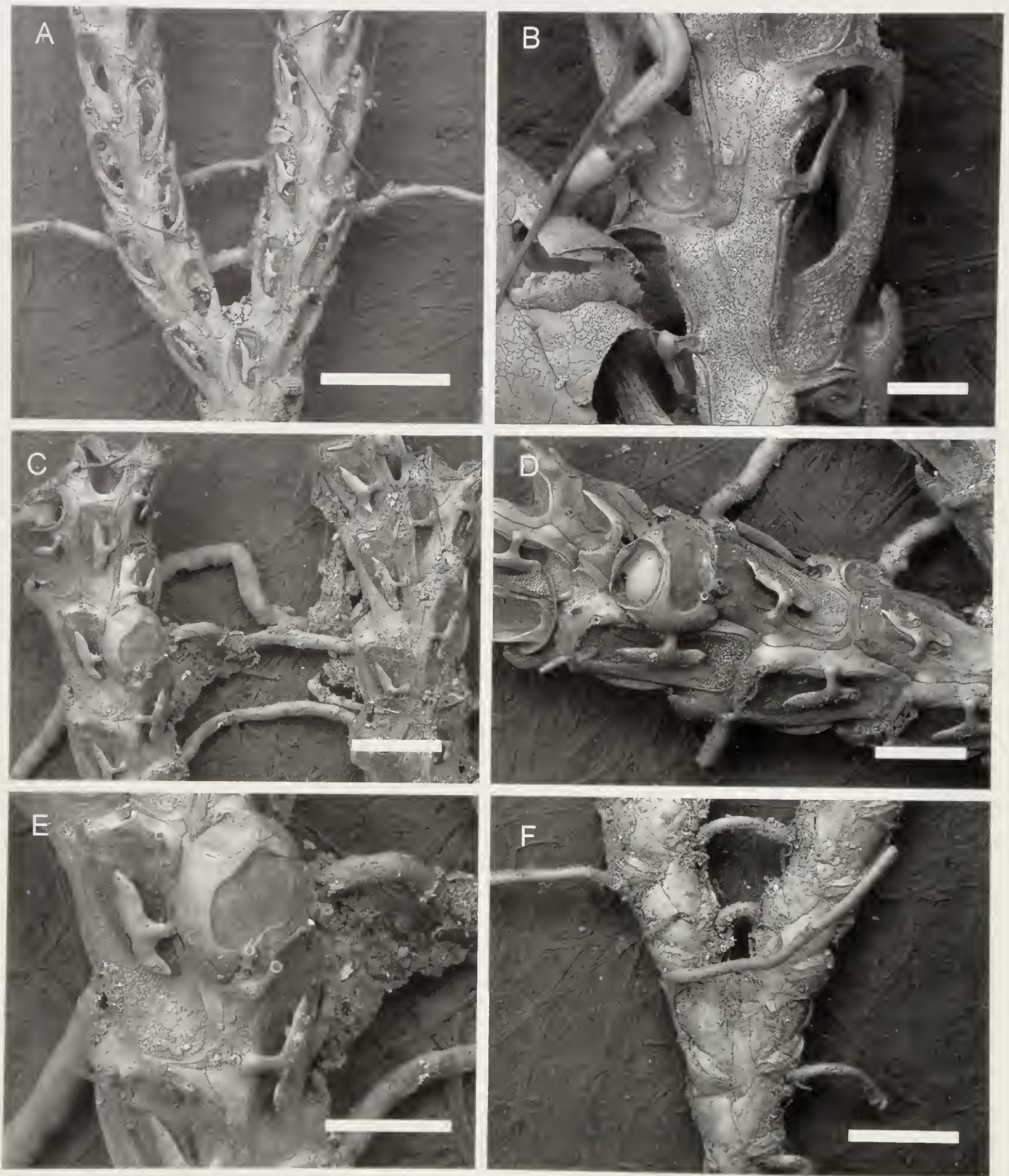


Figure 16. *Canda alsia*. A, B. NHMUK 1854.11.15.325-331. C-F. NHMUK 1890.1.30.25-27. A. Colony branches and radicles. Scale bar = 500 μ m. B. Close up of an autozoid. Scale bar = 100 μ m. C. Two branches joined by radicles. Scale bar = 300 μ m. D. Group of zooids, one with ooecium, on branch. Scale bar = 200 μ m. E. Close-up of a zooid with an ooecium. Note shape of scuta. Scale bar = 200 μ m. F. Abfrontal surface of colony showing radicle and vibracular chambers. Scale bar = 400 μ m.

the presence of small tubular frontal avicularia.

Marcus (1955) noted differences in scutum size between his specimens from Espírito Santo assigned to *Canda retiformis* and Smitt's specimens from the Caribbean. We have examined the specimens studied by Marcus (1955) and conclude they belong to *C. alsia*.

Vieira et al. (2008) listed 2 species of *Canda* from off the Brazilian coast, *Canda retiformis* Pourtalès, 1867, and *Canda simplex* Busk, 1884. However, the listed specimens in Busk's (1884) account referred to a *C. alsia* rather than *C. simplex*. All examined specimens from John Adam's Bank (Victoria, Brazil) assigned to *C. retiformis* deposited at the NHMUK belong to *Canda alsia*. Thus, the species *Canda alsia* is uniquely known from Brazilian waters.

Distribution. Brazil: Espírito Santo, Rio de Janeiro.

Specimens Examined. *Canda alsia*. Hassler Box 22, MCZ 137432. Off Cabo Frio, Rio de Janeiro state, Brazil. NHMUK 1854.11.15.325–331, Victoria Bank, Brazil; NHMUK 1890.1.30.25–27, 15°19'S, 38°46'W, G. Busk det., 26 fms, on cable. MZUSP (specimen IO/USP035), *Canda retiformis*, E. Marcus det., Espírito Santo, Brazil. *Canda retiformis*. Syntypes: Smitt MCZ 167. May 29 [1867] off Chorrera [Cuba], 270 fm. Smitt MCZ 168. *Canda retiformis*. Off Havana, 270 fms [1867].

Family Microporidae Gray, 1848

Genus *Micropora* Gray, 1848

Micropora angustiscapulis **New Species**

Figure 17

Holotype. *Micropora angustiscapulis*. Hassler Box 19, MCZ 137433. North of Salvador, Bahia state, Brazil.

Etymology. The species epithet *angustiscapulis* is a compound name combining the Latin adjective *angustus* narrow, thin, slender with the stem of the Latin noun, *scapula*, (f.) shoulder-blade, *scapul-* and

the possessive suffix, *-is*. The name describes the “narrow-shouldered” appearance of zooids.

Description. Colony encrusting on hard substrata. Zooids rounded distally and polygonal proximally, variable in size, between about 0.34 and 0.45 mm in length. Frontal membrane underlain by a beaded cryptocyst, interspersed with numerous round pores with radiating spines, giving their skeletal openings flower-like shapes at a high magnification (Fig. 17D). The raised rims of the cryptocyst have the texture of a string of smaller beads. Orifice D-shaped, narrow, smooth rimmed, with two large, smooth, raised and heavily calcified, rounded tubercles just below the proximal rim on either side of the orifice. Opesiales are narrowly oval slits, about 0.005 mm inserted at an angle through the cryptocyst directly under the large orificial tubercles. The specimen found did not have avicularia and there were no ooevia present, although a partially developed ooevium was present in a zooid near the growing edge (Fig. 17B).

Diagnosis. *Micropora* with small zooids about 0.34–0.45 mm long, heavily developed tubercles below the proximal rim on either side of orifice, angled, narrow opesia just beneath them, and with frontal shield with rounded pores with radiating spines.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.342	0.450	0.342–0.450	0.396	0.043	6
Wz	0.234	0.360	0.234–0.360	0.291	0.042	6
Lo	0.045	0.054	0.045–0.054	0.051	0.005	6
Wo	0.090	0.108	0.090–0.108	0.101	0.009	6

Notes. Zooids of this specimen are both smaller and more fortified by the heavily developed tubercles around the orifice than those of *Micropora* specimens previously reported from Brazil by Marcus (1949, 1955) as *Micropora coriacea*. Specimens identified by Marcus have larger zooids and interzooidal avicularia, perhaps the same as Smitt's *Micropora* species from Florida

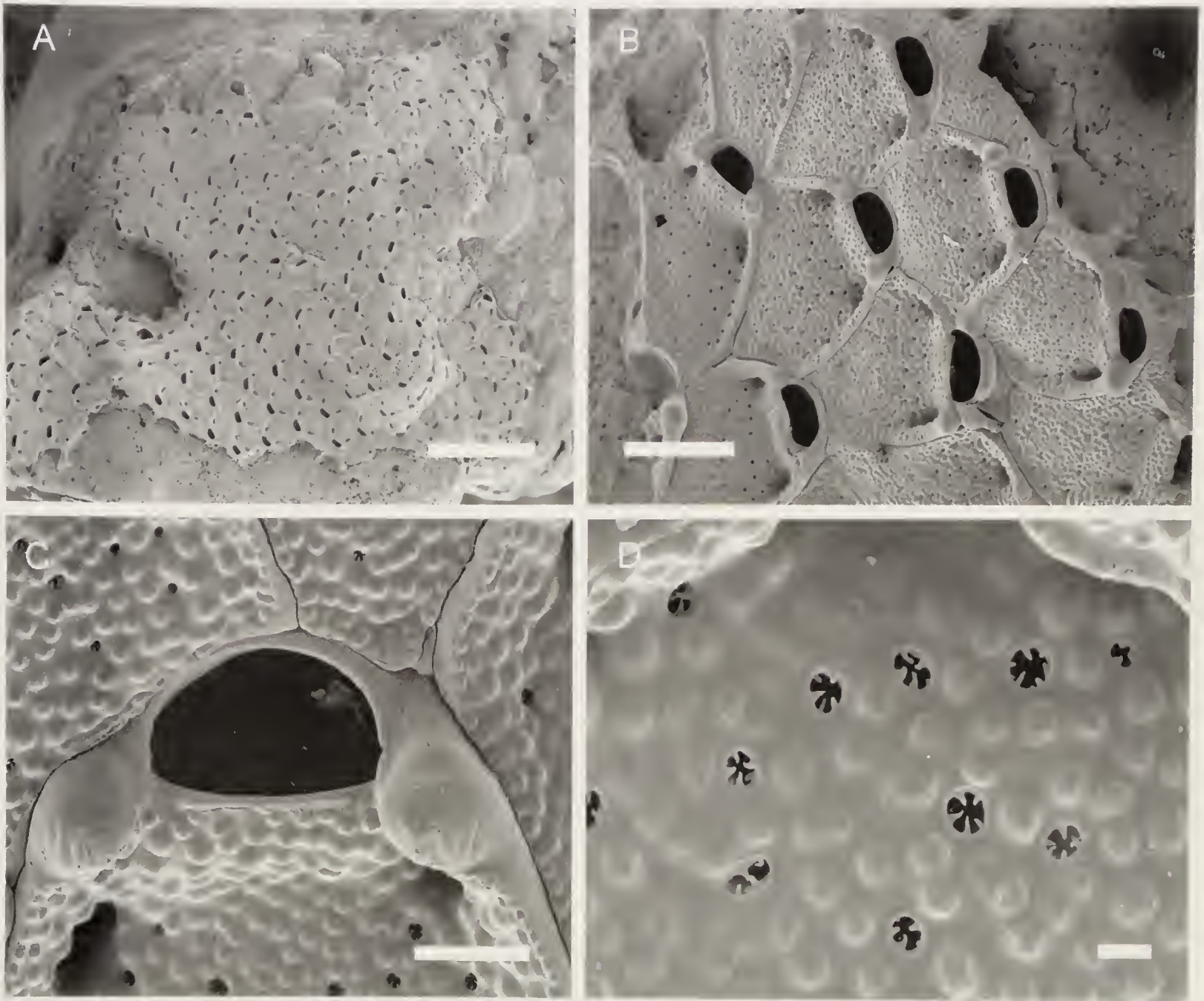


Figure 17. *Micropora angustiscapulis*. MICHB. Hassler Box 19, MCZ 137433. A. Encrusting colony. Scale bar = 1,000 μm . B. Group of zooids, one with developing oocidium. Scale bar = 200 μm . C. Close-up of orifice and tubercles. Scale bar = 50 μm . D. Morphology of frontal pores. Scale bar = 10 μm .

since redescribed as *Micropora acuminata* Winston, 2005 (Winston, 2005).

Distribution. Brazil: Bahia.

Specimens Examined. *Canda alsia*. Hassler Box 19, MCZ 137433. North of Salvador. *Comparative specimens:* MZUSP (balsam slide n. 402; specimen IO/USP 91), *Micropora coriacea*, Marcus det., Espírito Santo, Brazil.

Genus *Mollia* Lamouroux, 1816

Mollia elongata Canu and Bassler, 1928

Figures 18, 19

Mollia elongata Canu and Bassler, 1928a: 62, pl. 1, figs. 6–9; Marcus, 1949: 16, pl.

4, fig. 18; Braga, 1968: 8; Vieira et al., 2008: 19.

Description. Colony encrusting on hard substrata in a single layer, attached to the substratum by tubular pores originating from the basal walls of zooids (Fig. 19F). Zooids are oval in shape, the shallow cryptocystal shelf descending sharply from the mural rim, which has a fine beaded texture, to the underlying frontal cryptocystal textured with large beads of calcification. The opesia is bell shaped, with lateral opesiules for attachment of retractor muscles. The proximal rim of the opesia has a

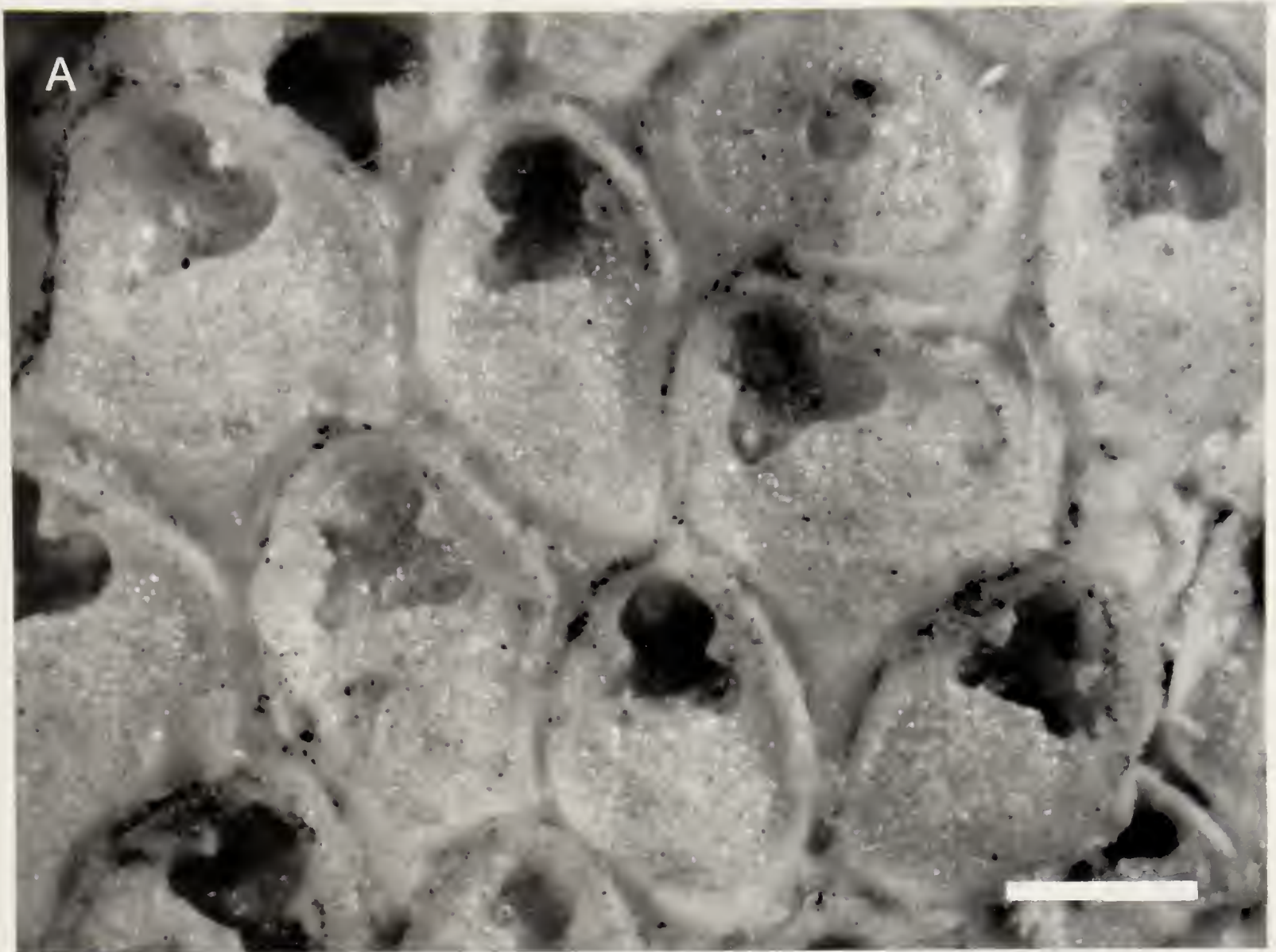


Figure 18. *Mollia elongata*. NMNH 8539. Light micrograph of type material of Canu and Bassler. Scale bar = 100 μ m.

convex curve or two short scalloped denticles. The operculum rests on two calcified hinges at the distal rims of the opesiules. Zooids are connected to each other by several short thick calcified tubes. Adjoining zooids may be so close to each other that the tubes are unseen or long enough to give a lace-like effect to the colony surface. No avicularia, but kenozooids, either completely calcified frontally or with a central opening, occur irregularly. Ooecia are prominent and helmet shaped, imperforate, and heavily calcified. The distal portion, immersed in the distal zooid wall, has the same large-beaded calcification texture as zooids; the proximal rim is smooth.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.486	0.558	0.486–0.558	0.516	0.027	6
Wz	0.288	0.324	0.288–0.324	0.309	0.014	6
Lop	0.126	0.162	0.126–0.162	0.144	0.016	6
Wop	0.144	0.216	0.144–0.216	0.170	0.028	6
Lo	0.081	0.090	0.081–0.090	0.089	0.004	6
Wo	0.108	0.126	0.108–0.126	0.116	0.009	6
Lov	0.162	0.216	0.162–0.216	0.180	0.022	6
Wov	0.216	0.252	0.216–0.252	0.227	0.016	6

Notes. Part of the *Hassler* specimen has zooids connected to each other by longer calcified tubes than those found in the Canu and Bassler type specimens (NMNH 8539). Marcus (1949) gave a good description and

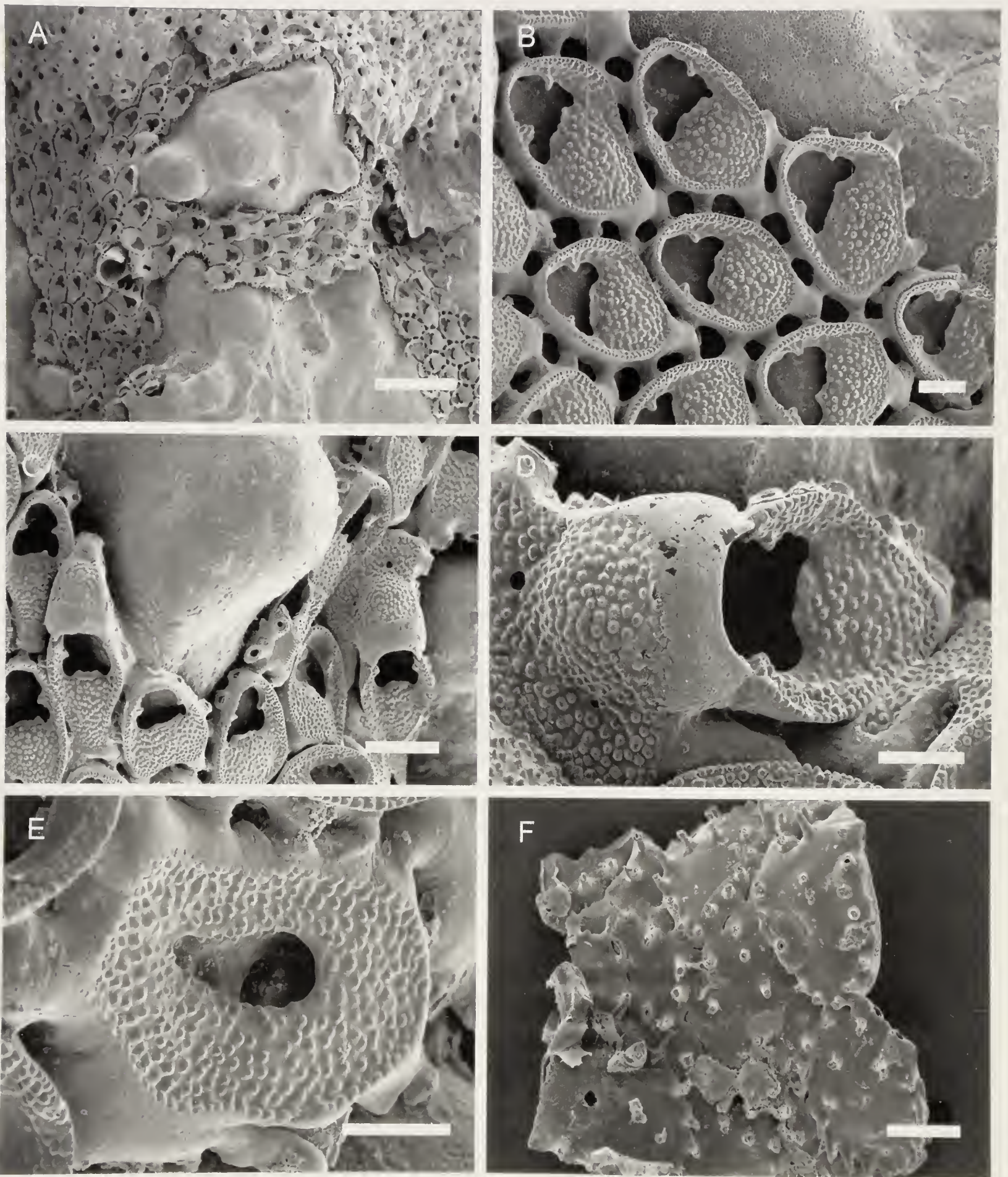


Figure 19. *Mollia elongata*. Hassler Box 35, MCZ 137434. A. Encrusting colony on its substratum. Scale bar = 1,000 μm . B. Group of autozooids. Scale bar = 100 μm . C. Zooids, two with oecia, growing around projection of substratum. Scale bar = 300 μm . D. Zooid with oecium. Scale bar = 100 μm . E. Close-up of overcalcified zooid. Scale bar = 100 μm . F. Abfrontal surface to show attachment tubules. Scale bar = 200 μm .

illustration of this species, including description of the vestibular arch.

Distribution. Brazil: Bahia, Espírito Santo, Rio de Janeiro.

Specimens Examined. *Mollia elongata*. Hassler Box 35, MCZ 13743. Off Cabo Frio, Rio de Janeiro state, Brazil. *Mollia elongata* syntypes, NMNH 8539, 'Norseman' Station 347, Brazil (Fig. 13). MZUSP (slides n. 403 and n. 673; IO/USP 93), *Mollia elongata*, Marcus det., no locality in label but supposedly Espírito Santo (Marcus, 1949).

Family Onychocellidae Jullien, 1882

Genus *Floridina* Jullien, 1882

Floridina proterva **New Species**

Figure 20

Holotype. *Floridina proterva*. Hassler Box 21, MCZ_137435. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name *proterva* (f.) is based on the feminine form of the Latin adjective *protervus*, bold, pert, impudent, saucy.

Description. Colonies encrusting and unilaminar. Zooids rounded pentagonal, distal half with rounded borders, proximal corners sharp edged, relatively large in size, 0.50 mm or more in length by 0.40 mm in width. Opesia trifoliate with elongate laterally to proximolaterally directed opesiules and a convexly curved proximal edge. Finely beaded cryptocyst underlies the rest of the frontal membrane, raised around and just below the opesia and at the zooid rims, but depressed proximally. Vicarious avicularia occur between some of the zooids. They are close to autozooids in length, but narrower and diamond shaped to pentagonal, with a long sharply pointed distal end. Their calcification pattern similar to that of zooids, and (in this skeletal material) there is an elongate opening. In living colonies a winged chitinous mandible would be found. Ovicells are endozooidal. Fertile zooids are marked by a small cap of smooth imperforate calcification. The distal rim of the orifice is enlarged by the cap's proximal curve.

Diagnosis. Similar to *Floridina antiqua* in overall morphology, but with larger zooids and much longer avicularia.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.486	0.540	0.486–0.540	0.519	0.021	6
Wz	0.378	0.450	0.378–0.450	0.405	0.030	6
Lop	0.090	0.108	0.090–0.108	0.102	0.009	6
Wop	0.090	0.126	0.090–0.126	0.105	0.014	6
Lo	0.036	0.045	0.036–0.045	0.038	0.004	6
Wo	0.108	0.144	0.108–0.144	0.129	0.014	6
Lov	0.414	0.576	0.414–0.576	0.525	0.057	6
Wov	0.216	0.324	0.216–0.324	0.270	0.043	6
Lav	0.180	0.216	0.180–0.216	0.198	0.011	6
Wav	0.180	0.234	0.180–0.234	0.210	0.019	6

Notes. This species has larger zooids and larger avicularia than *Floridina antiqua*, a Florida and Caribbean species that has been reported from Brazil only from the northern archipelago of Fernando do Noronha (Kirkpatrick, 1890). The size of the avicularia (some are longer than autozooids) is striking.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Floridina proterva*. Hassler Box 21, MCZ 137435. Off Cabo Frio, Rio de Janeiro state, Brazil.

Superfamily Cellarioidea Fleming, 1828

Family Cellariidae Fleming, 1828

Genus *Cellaria* Ellis and Solander, 1786

Cellaria brasiliensis **New Species**

Figures 21, 22

Holotype. Cel2. Hassler Box 22, MCZ 137436. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. Named for the country of Brazil. Brasil (the Portuguese form of the name) combined with the Latin location suffix *-ensis*, place where [something occurs].

Description. Colony erect, narrowly cylindrical, jointed, branches evenly bifurcating, colony attached at base by chitinous rhizoids. Autozooids are hexagonal, somewhat rounded at their distal ends, with

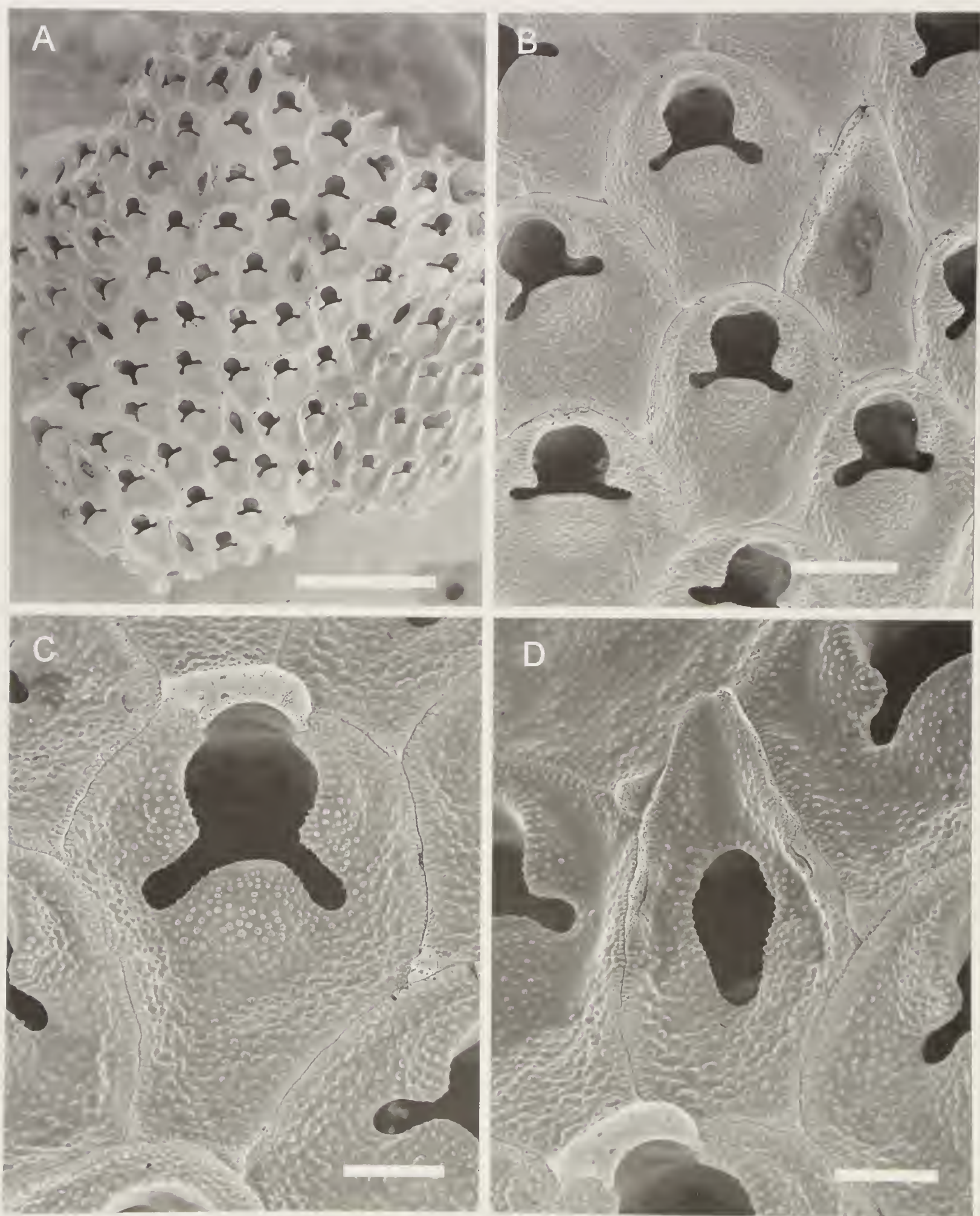


Figure 20. *Floridina proterva*. FLHB. Hassler Box 21, MCZ 137435. A. Colony encrusting nodular substratum. Scale bar = 1,000 μm . B. Group of autozooids and an avicularium. Scale bar = 200 μm . C. Zooid with oecium. Scale bar = 100 μm . D. Close-up of interzoecial avicularium. Scale bar = 100 μm .

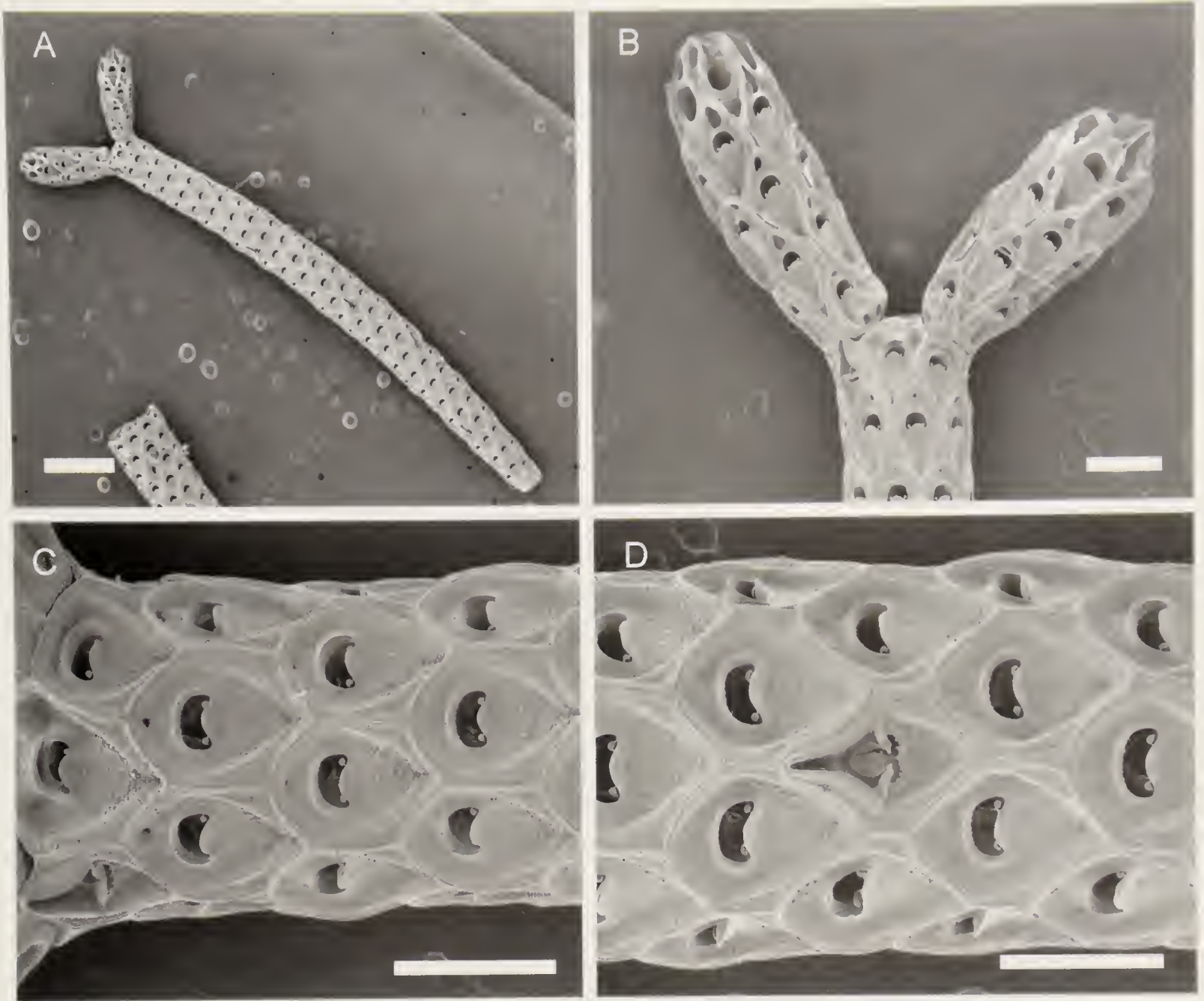


Figure 21. *Cellaria brasiliensis*. Cel2. Hassler Box 22, MCZ 137436. A. Branching erect colony. Scale bar = 1,000 μm . B. Branch bifurcation and new branch tips. Note thornlike avicularium just below bifurcation. Scale bar = 100 μm . C. Close-up of distal end of internode. Scale bar = 300 μm . D. Autozooids and avicularium. Scale bar = 300 μm .

clearly distinct margins, a granular, raised rim extending from lateral walls, and a sunken cryptocyst from which the orifice-opesia area protrudes. This has the shape of a wide, proximally curved, smooth-rimmed crescent, with two rounded denticles in the proximal corners of the crescent. Avicularia are few, scattered, but most common near branch bifurcations and zooids with oocidia. Like autozooids they have a hexagonal shape, but with a sharp pointed distal end surrounding the rostrum and mandible. The rostrum is triangular and takes up the

distal half of the avicularian zooid; it is reinforced by a smooth rim of calcification and has strong, calcified condyles almost meeting at its lower edge. Fertile internodes are broader than those with only autozooids. The fertile zooids are also broader. Ovicells are internal and can be recognized by the round to oval pore above the orifice of the zooid.

Diagnosis. Differs from the other Brazilian *Cellaria* in having avicularia with triangular rostrum; *Cellaria brasiliensis* differs from *C. louisorum* in having fertile zooids with a convex proximal rim.

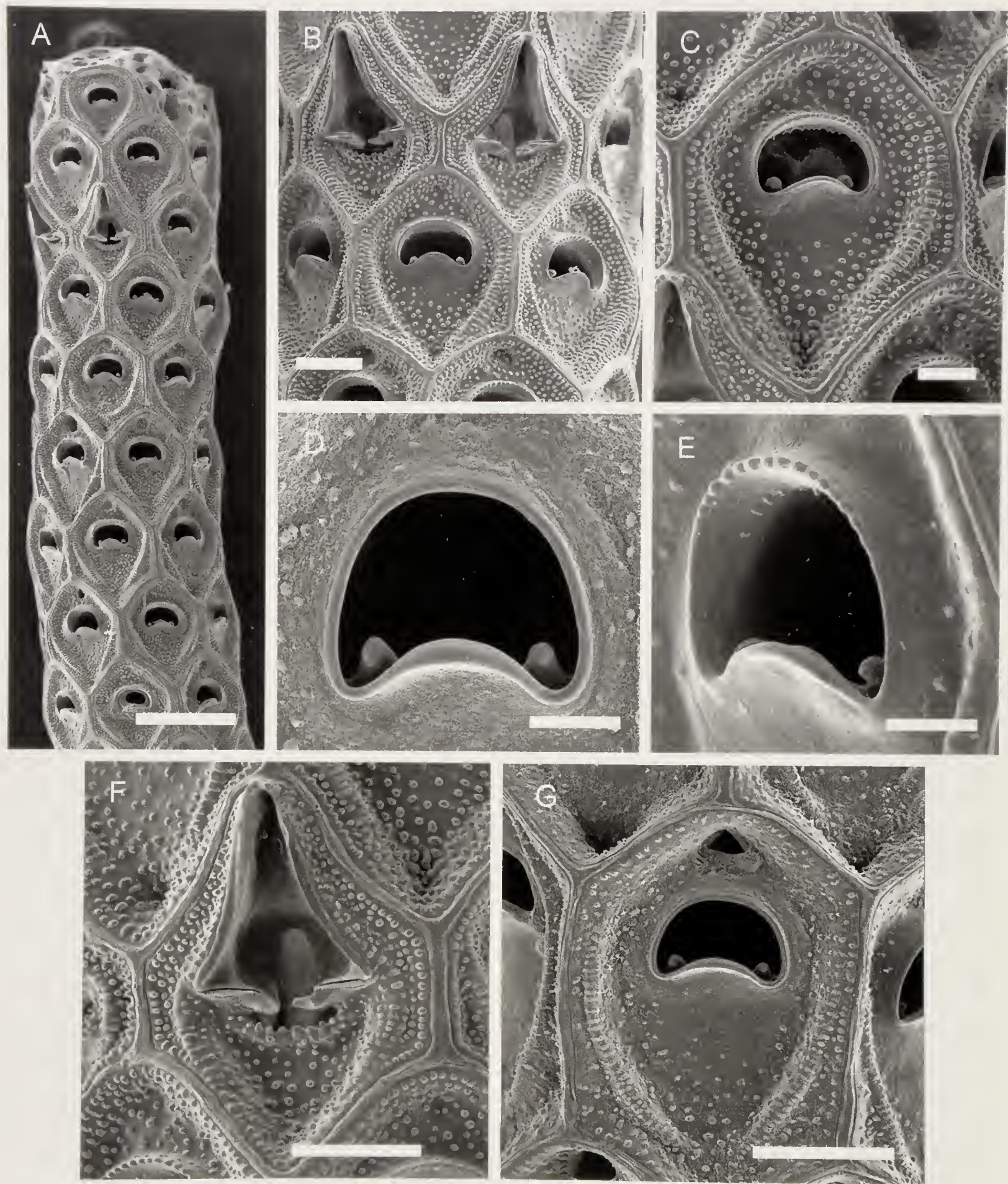


Figure 22. *Cellaria brasiliensis*. CL33. Hassler Box 33, MCZ 137437. A. Fertile internode. Scale bar = 300 μ m. B. View of two adjacent avicularia. Scale bar = 200 μ m. C. Close-up of fertile zooid. Scale bar = 50 μ m. D. Close-up of orifice showing rounded denticles. Scale bar = 30 μ m. E. Oblique view of orifice. Scale bar = 30 μ m. F. Close-up of avicularium. Scale bar = 100 μ m. G. Close-up of fertile zooid. Scale bar = 100 μ m.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.324	0.414	0.324–0.414	0.377	0.026	12
Wz	0.216	0.270	0.216–0.270	0.230	0.017	12
Lop	0.063	0.081	0.063–0.081	0.071	0.005	12
Wop	0.090	0.126	0.090–0.126	0.106	0.009	12
Lav	0.324	0.414	0.324–0.414	0.380	0.030	11
Wav	0.180	0.234	0.180–0.234	0.205	0.015	11
Lavo	0.180	0.234	0.180–0.234	0.196	0.017	11
Wavo	0.090	0.126	0.090–0.126	0.106	0.013	11

Notes. This is the second species of *Cellaria* to be described from the Brazilian coast. It differs from *Cellaria subtropicalis* (below) in its narrower branch width and the pointed avicularia and rounded ooecia openings. The avicularia of *Cellaria brasiliensis* resembles those recently described for *Cellaria lousorum* Winston and Woollacott, 2009, from Barbados, but the last species is distinct in having fertile zooids with wider opesia with a concave proximal rim.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. Hassler Box 22, MCZ 137436. Off Cabo Frio, Rio de Janeiro state, Brazil. Both *Cellaria* species occurred in the sample photographed. Cel2-1 to Cel2-6 = *C. subtropicalis*. Cel2-7 to Cell2-11 = *C. brasiliensis* (Fig. 21). Hassler Box 33B, MCZ 137437 off Cabo Frio, Rio de Janeiro state, Brazil (Fig. 23).

Cellaria subtropicalis Vieira, Gordon, Souza and Haddad, 2010
Figure 23

Cellaria subtropicalis Vieira et al., 2010a:
11, figs. 12-16.

Description. Colonies erect, cylindrical, jointed symmetrically bifurcated branches, about 0.6–1.3 mm diameter, with rhizoids in inner angle of axis and attached to substratum by chitinous rhizoids at colony base. Autozooids are rhomboidal to hexagonal in shape, in alternating whorls of 6–16, separated by raised ridges. Frontal membrane underlain by concave and granular cryptocyst. Crescentic opesia with its proximal rim convex and slightly raised into a rounded

proximal lip. A pair of large rounded, forward-projecting denticles found at the outer proximal corners of opesia; a few inconspicuous minute denticles occur at the inner distal rim. Avicularia common, similar in size to autozooids, with a high-arched rostrum occupying their distal half and with a rounded mandible and stout, ridge-like mandibular pivots. Ovicell distal to maternal autozoid, completely immersed, its aperture semielliptical to subtriangular.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.324	0.414	0.324–0.414	0.365	0.024	12
Wz	0.252	0.324	0.252–0.324	0.278	0.020	12
Lop	0.072	0.099	0.072–0.099	0.086	0.011	12
Wop	0.117	0.162	0.117–0.162	0.136	0.013	12
Lav	0.342	0.396	0.342–0.396	0.378	0.018	9
Wav	0.216	0.288	0.216–0.288	0.250	0.023	9
Lavo	0.162	0.198	0.162–0.198	0.184	0.017	9
Wavo	0.162	0.198	0.162–0.198	0.172	0.013	9

Notes. This species of *Cellaria* was the first to be described from Brazilian waters. It is clearly distinguished by the shape of the rostrum of the vicarious avicularium. The holotype specimen from Rio de Janeiro has unjointed basal internodes with regular branching, and rhizoids at its axis.

Distribution. Brazil: Rio de Janeiro, São Paulo, Santa Catarina, 43–151 m.

Specimens Examined. Cel2. Off Cabo Frio, Rio de Janeiro state, Brazil. Both *Cellaria* species occurred in the sample photographed. Cel2-1 to Cel2-6 = *C. subtropicalis*. Cel2-7 to Cell2-11 = *C. brasiliensis*. Hassler Box 21, MCZ 137439. Hassler Box 33, *Holotype*: MZUSP 0045, 14.vii.1966, Angra dos Reis (Station 283), Ilha Grande, Rio de Janeiro, Brazil, 43 m (alcohol 70%).

Superfamily Cribrillinoidea Hincks, 1879

Family Cribrillinidae Hincks, 1879

Genus *Puellina* Jullien, 1886

Puellina sp.

Figure 24

Description. Colony encrusting, frontal surface of zooids composed of rows of

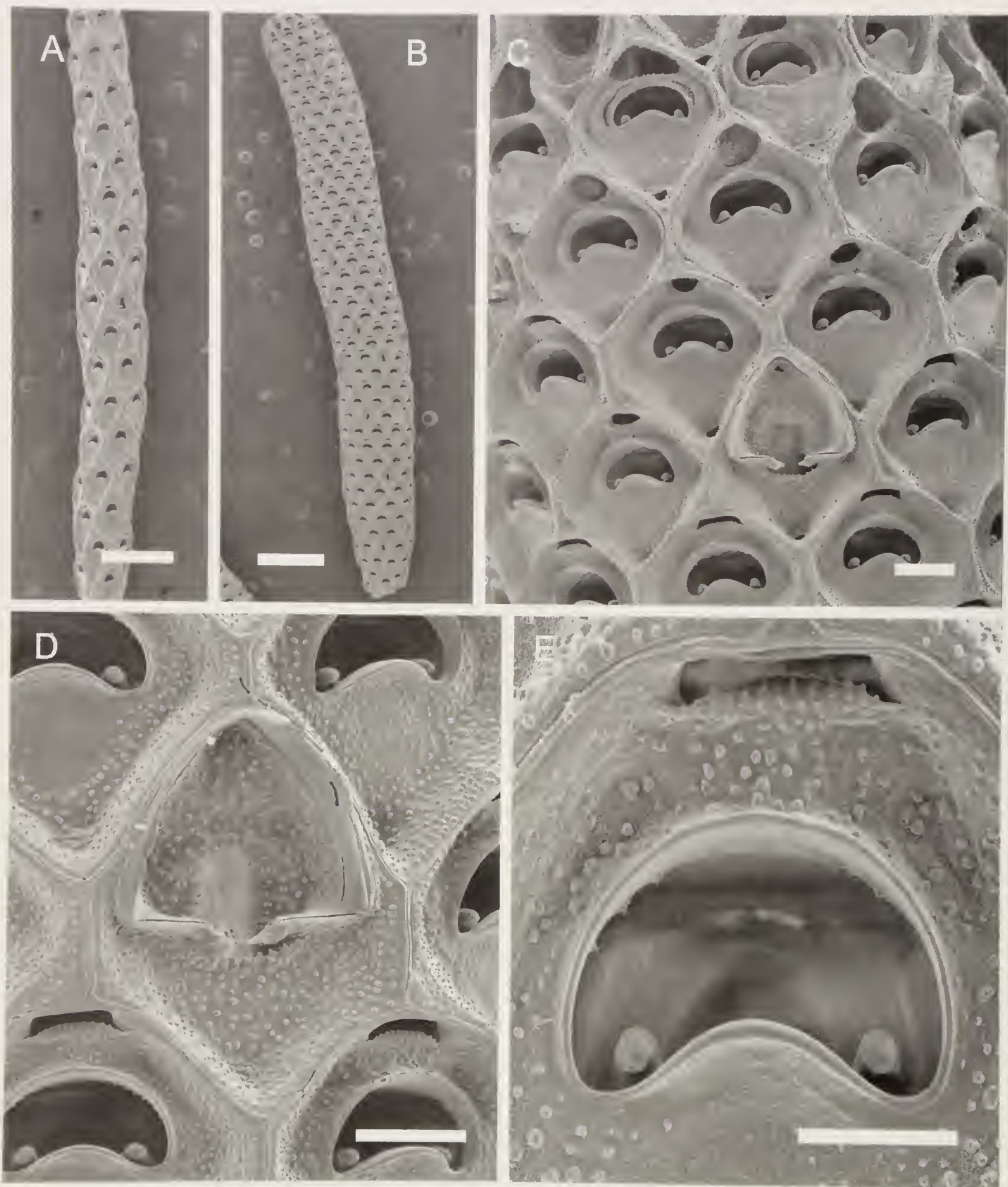


Figure 23. *Cellaria subtropicalis*. A. Branch internode of colony. Cel2. Hassler Box 22, MCZ137439. Scale bar = 500 μ m. B. CEL3. Hassler Box 21. Fertile branch internode. Scale bar = 1,000 μ m. C. CEL3. Hassler Box 21. Group of zooids with one avicularium. Scale bar = 100 μ m. D. CEL3, Hassler Box 21. Close-up of large avicularium with wide subtriangular rostrum. Scale bar = 100 μ m. E. CEL3. Hassler Box 21. Close-up of distal end of fertile zooid showing denticles of orifice and opening of oecium. Scale bar = 50 μ m.

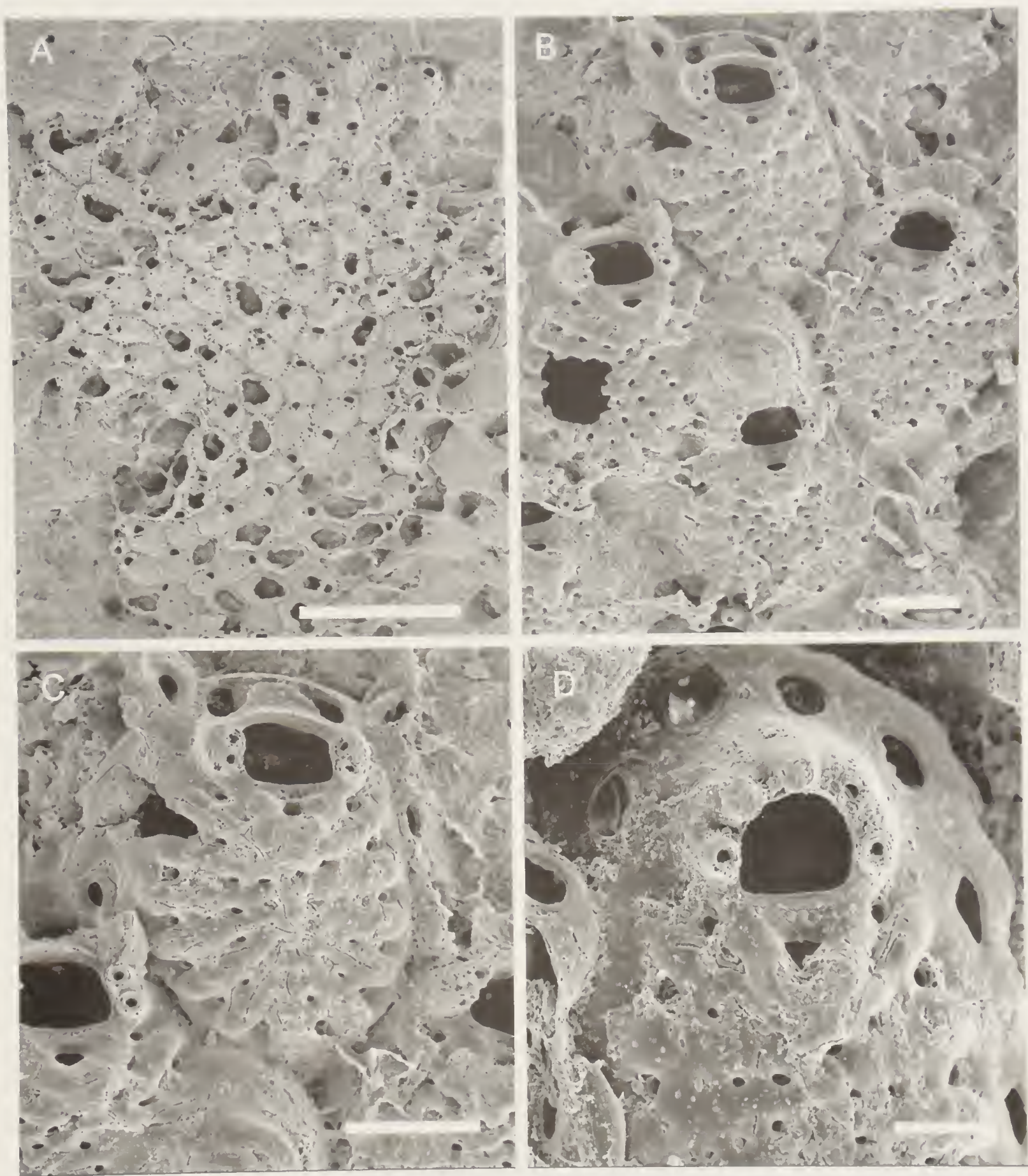


Figure 24. *Puellina* sp. PHB19. Hassler Box 19, MCZ 137440. A. Worn and broken encrusting colony skeleton. Scale bar = 1,000 μm . B. Group of zooids, one with oecium. Scale bar = 100 μm . C. Close-up of an autozoid. Scale bar = 100 μm . D. Distal end of autozoid showing five oral spines and the V formed by fusion of the first row of costae. Scale bar = 50 μm .

radiating costae, with rows of pores between them (about 14, counting the V-shaped first pair). The orifice is semicircular with a narrow, smooth rim. Below the orifice is a smooth bar of calcification, and the first pair of costae comes to a sharp point with a large lacuna. The rest of the costae are relatively flat, without raised outer tubercles or a pronounced midline ridge. There are five distal spines on autozooids and four on zooids with ooecia. No avicularia are present. Ooecia are helmet shaped and imperforate with a central tubercle.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.324	0.414	0.324–0.414	0.377	0.026	12
Wz	0.216	0.270	0.216–0.270	0.230	0.017	12
Lop	0.063	0.081	0.063–0.081	0.071	0.005	12
Wop	0.090	0.126	0.090–0.126	0.106	0.009	12
Lav	0.324	0.414	0.324–0.414	0.380	0.030	11
Wav	0.180	0.234	0.180–0.234	0.205	0.015	11
Lavo	0.180	0.234	0.180–0.234	0.196	0.017	11
Wavo	0.090	0.126	0.090–0.126	0.106	0.013	11

Notes. The poor condition of this colony, skeletal, abraded, and with many zooids broken, makes it impossible to identify and/or name this specimen. It appears to belong in the *P. innominata* group. We describe it as far as possible here and illustrate it so that those who may someday find better specimens can recognize and name it.

Distribution. Brazil: Bahia.

Specimens Examined. *Puellina* sp. MCZ 137440. Hassler Box 19, North of Salvador, Bahia state, Brazil.

Puellina octospinata New Species

Figure 25

Holotype. *Puellina octospinata*. Hassler Box 38, MCZ 137441. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species epithet is a compound of the combining form of the Latin numeral eight, *octo-*, and *spinatus*, from the Latin noun *spina* (f.) thorn, bearing thorns, and the suffix *-atus*, possessing. The name describes its large number of (up to 8) oral spines.

Description. Colony encrusting in a single layer. Zooids oval in shape, with a frontal shield made up of 14–16 fused costae in a radiating pattern, their outer edges thick and well separated, with rows of about five round to rounded rectangular intercostal pores between them. The apertural bar formed by the first pair of costae meets like a pair of clasped hands, is not sharply projecting, and has no obvious lacuna above it. The orifice is semicircular to U-shaped, with a smooth rim and seven or eight oral spines surrounding it. Interzooidal avicularia are small, with short, triangular rostra and rounded bases. Ooecia are helmet shaped and imperforate. When fully developed, they envelope all but four of the oral spines.

Diagnosis. Small *Puellina* with 14–16 costae, seven or eight oral spines, and inconspicuous triangular avicularia.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.306	0.414	0.306–0.414	0.363	0.035	6
Wz	0.234	0.324	0.234–0.324	0.270	0.034	6
Lo	0.045	0.054	0.045–0.054	0.053	0.004	6
Wo	0.054	0.063	0.054–0.063	0.059	0.005	6
Lov	0.126	0.144	0.126–0.144	0.135	0.010	4
Wov	0.144	0.162	0.144–0.162	0.153	0.010	4
Lav	0.054	0.054		0.054		1
Wav	0.036	0.036		0.036		1

Notes. Because the zooids are very small and look very similar unless highly magnified, members of the genus *Puellina* have only recently come under taxonomic scrutiny. When SEM is used, many characters of zooids, avicularia, and ooecia can help to identify and distinguish species. This species, although, like the previous one, with many broken and bored zooids, has a distinctive suite of characters, 14–16 costae, 7–8 oral spines, and inconspicuous triangular avicularia that allow us to describe and name it here. More than 6 oral spines seem to be unusual in *Puellina* species. The only other species with 7 spines described so far is *Puellina septemcryptica* described by Dick et al. (2006) from Hawaii, and that species has sharply projecting ends on the apertural bar (particularly on zooids with

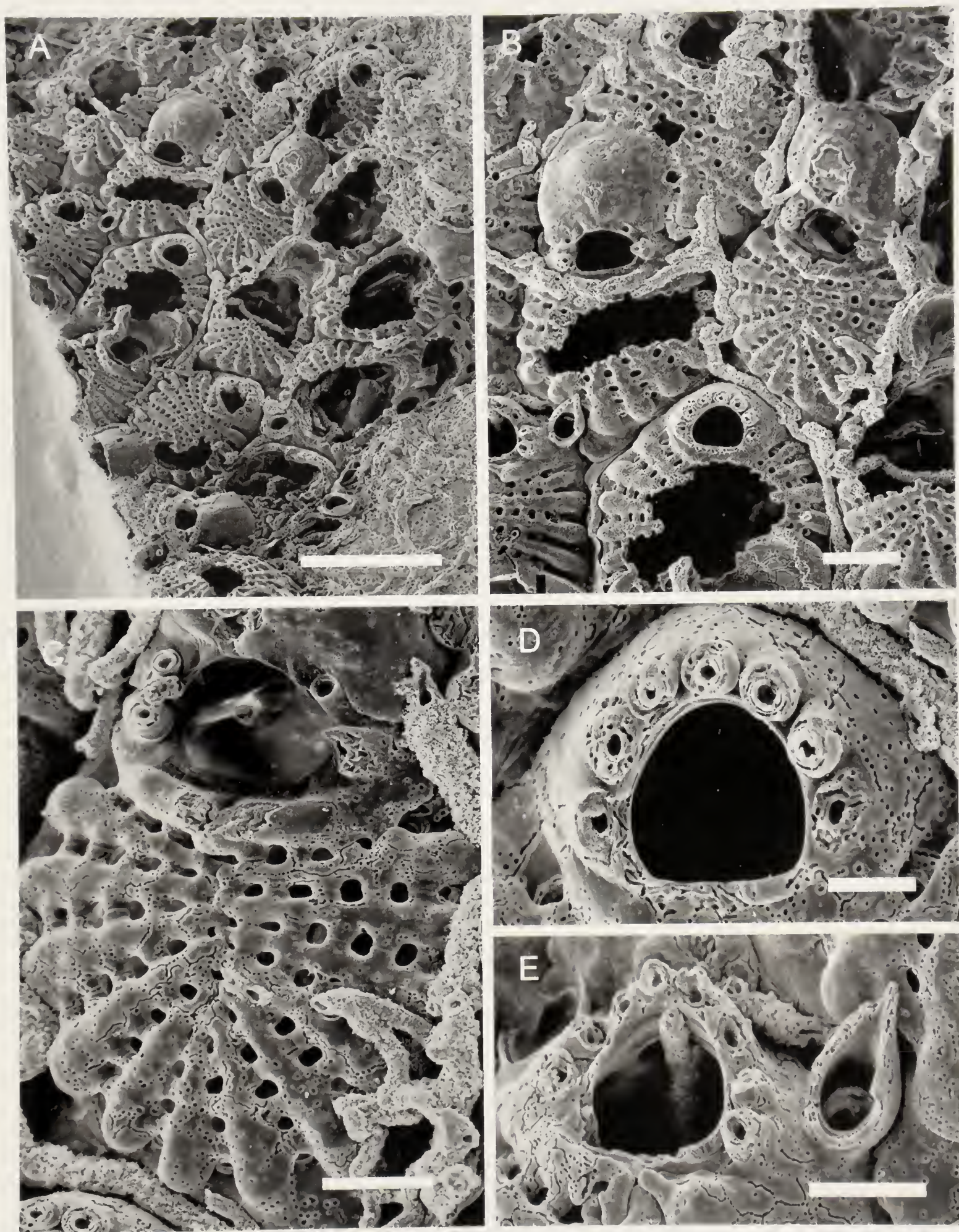


Figure 25. *Puellina octospinata*. Pue38. Hassler Box 38, MCZ 137441. A. Portion of encrusting colony. Scale bar = 300 μ m. B. Group of zooids, two with oecia. Scale bar = 100 μ m. C. Close-up of a zooid with an oecium showing morphology of costae and distal spines. Scale bar = 50 μ m. D. Orifice with seven spines. Scale bar = 30 μ m. E. Orifice with eight spines and adjacent avicularium. Scale bar = 50 μ m.

ooecia) and larger avicularia with a raised and elongate pointed rostrum with a serrate margin.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Puellina octospinata*. Hassler Box 38, MCZ 137441. Off Cabo Frio, Rio de Janeiro, Brazil.

Superfamily Hippothooidea Busk, 1859

Family Hippothoidae Busk, 1859

Genus *Hippothoa* Lamouroux, 1821

Hippothoa cf. *flagellum* Manzoni, 1870

Figure 26

Hippothoa flagellum Manzoni, 1870: 328; Hayward and Ryland, 1999: 88, figs. 17C, D, 18; Hayward and McKinney, 2002: 42, fig. 18F–I.

Description. Colony is uniserial, zooids connected to each other by an elongate stolonlike proximal region; the rest of the autozoid is ovoid, convex, with longitudinally striated calcification covering everything but the operculum. Orifice is egg shaped, with a circular anter, two small rounded condyles, and a shallow proximal sinus. The orifice is raised on a low peristome. Female zooid has an attenuated teardrop shape, the ooecium is helmet shaped with a small central conical peak and imperforate. Its orifice is broad and shallow, not similar to the autozoid orifice, but with a similar condyle between the round anter and the very broad and shallow sinus.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.216	0.342	0.216–0.342	0.291	0.048	6
Wz	0.126	0.180	0.126–0.180	0.159	0.021	6
Lo	0.045	0.063	0.045–0.063	0.054	0.006	6
Wo	0.036	0.045	0.036–0.045	0.038	0.004	6
Lov	0.108	0.108		0.108		1
Wov	0.144	0.144		0.144		1

Notes. This colony consisted of only 12 autozooids and one female zooid and had undergone some regeneration (one autozoid orifice) and breakage (the stolonate connec-

tions and one side of the female zooid orifice); this small colony resembles those from São Sebastião reported by Marcus (1941) as *Hippothoa distans* MacGillivray (now *Hippothoa calcicola* Winston and Vieira, 2013, NOT *H. distans* MacGillivray, 1868). Morris (1980) redescribed *H. distans*, an Australian species distinct in having a broader and shallower orifice than those of *H. calcicola* and *H. flagellum*. The orifice shape of female zooids seems closest to the *Hippothoa flagellum* described in the British Isles by Hayward and Ryland (1999) and in the Adriatic by Hayward and McKinney (2002).

Distribution. Reported from temperate to tropical seas in shallow coastal waters. Some records of this species may belong to distinct, but still undescribed species.

Specimens Examined. *Hippothoa* cf. *flagellum*. Hassler Box 45, MCZ 137442. Off Cabo Frio, Rio de Janeiro state, Brazil.

Family Trypostegidae Gordon, Tilbrook and Winston in Winston, 2005

Genus *Trypostega* Levinsen, 1909

Trypostega tropicalis **New Species**

Figure 27

Holotype. *Trypostega tropicalis*. Hassler Box 19, MCZ 137443. North of Salvador, Bahia state, Brazil.

Etymology. The species name comes from the Latinized geographic term for tropical, of the tropics. The species is named for its location in the more tropical waters of Brazil.

Description. Colony encrusting. Zooids trimorphic. Large autozooids, maternal zooids with ooecia, and between many of them, tiny rounded dwarf zooids with a rounded keyhole-shaped orifice. Autozooids oval to subrhombic in outline, fairly flat except for a projecting umbo below the orifice. Except for the area of this umbo the entire gymnocystal shield is covered by smooth to faintly striated calcification, spotted with 40–60 round, evenly spaced, funnel-shaped pores. Autozoid orifice has a round anter, sharply projecting condyles, and a shallow, sinuate, bowl-shaped sinus.

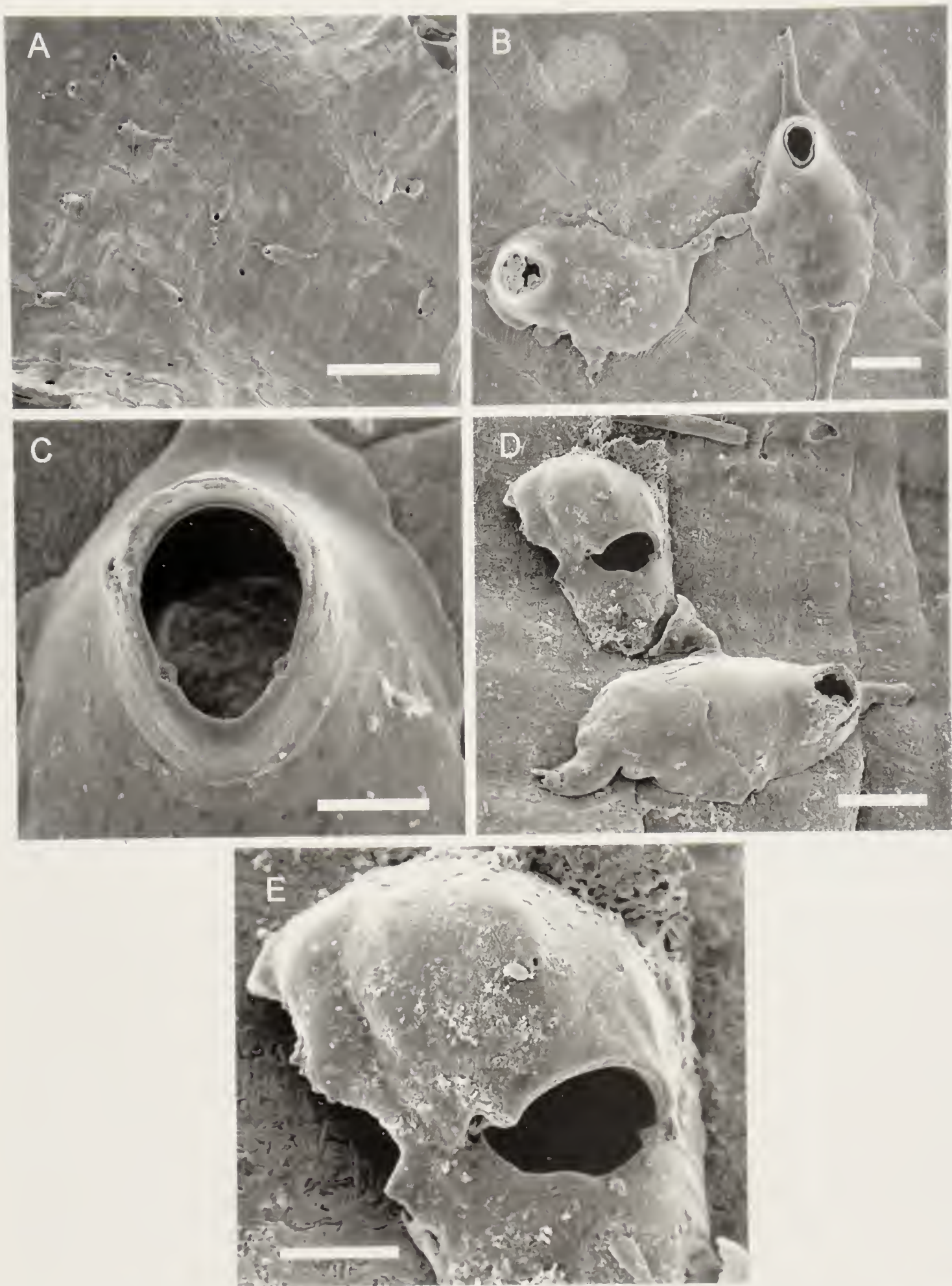


Figure 26. *Hippothoa flagellum*. HYP45. Hassler Box 45, MCZ 137442. A. Portion of uniserial colony. Scale bar = 1,000 μm . B. Two autozooids. Scale bar = 100 μm . C. Close-up of autozoid orifice. Scale bar = 30 μm . D. Female zooid and autozoid. Scale bar = 100 μm . E. Close-up of distal end of female zooid, showing broken, but clearly shallow orifice. Scale bar = 50 μm .

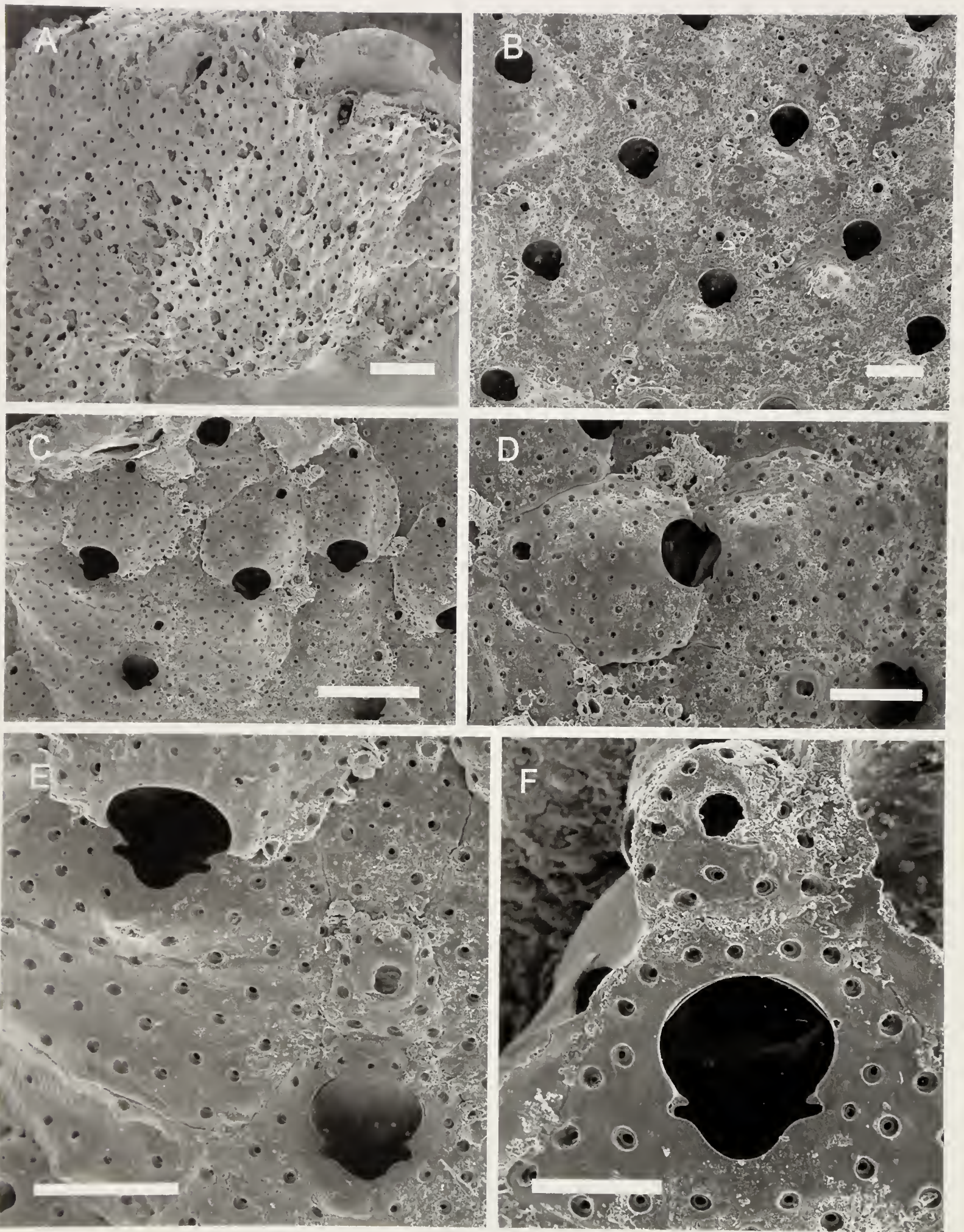


Figure 27. *Trypostega tropicalis*. TRHB2. Hassler Box 19, MCZ 137443. A. Colony encrusting calcareous substratum. Scale bar = 1,000 μm . B. Group of autozooids. Scale bar = 100 μm . C. Three zooids with oecia. Scale bar = 200 μm . D. Zooid with oecium and zoeciules. Scale bar = 100 μm . E. Close-up showing orifices of female zooid, autozooid, and zoeciule. Scale bar = 100 μm . F. Zoeciule and distal end of an autozooid. Scale bar = 50 μm .

Ooecia are large, round, and fairly flat with a central longitudinal ridge and punctate calcification like that of autozooids; each incorporates a dwarf zooid at its distal end. The orifice of female zooids is very similar in shape to that of autozooids.

Diagnosis. *Trypostega* with oval to sub-rhombic autozooids, orifice with round anter and sinuate bowl-shaped sinus, frontal gymnocrystal shield with 40–60 funnel-shaped pores, and dwarf zooids with a row of 8–12 pores around the keyhole orifice. Female zooids with similar orifice in shape to that of autozooids.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.378	0.504	0.378–0.504	0.435	0.053	6
Wz	0.234	0.342	0.234–0.342	0.285	0.038	6
Lo	0.072	0.090	0.072–0.090	0.081	0.008	6
Wo	0.054	0.072	0.054–0.072	0.060	0.009	6
Lov	0.180	0.234	0.180–0.234	0.213	0.021	6
Wov	0.198	0.234	0.198–0.234	0.216	0.011	6
Lovo	0.054	0.072	0.054–0.072	0.069	0.007	6
Wovo	0.072	0.090	0.072–0.090	0.080	0.007	6
Lzcl	0.072	0.144	0.072–0.144	0.105	0.026	6
Wzcl	0.090	0.126	0.090–0.126	0.102	0.015	6

Notes. This species can be distinguished from the Caribbean *Trypostega striatula* (Smitt) by the smaller size of its zooids, the very shallow and curved sinus of their orifices, and the lack of dimorphism between orifices of autozooids and female zooids. The two species also differ in dwarf zooid morphology: those of *T. tropicalis* are small and rounded in shape, and those of *T. striatula* are larger and more variable in size relative to autozooids of the colony and have an orifice with a shallow and straight poster.

Distribution. Brazil: Bahia.

Specimens Examined. *Trypostega tropicalis*. Hassler Box 19, MCZ 137443. North of Salvador, Brazil.

Superfamily *Incertae sedis*.

Family Vitrimurellidae **New Family**

Diagnosis. Neocheilostomina with gymnocrystal frontal shield with large foramina.

Zooid orifice dimorphic, with shallow-shaped sinus delimited by fused costae; costate shield limited to a very small area proximal to orifice, with two to four costae. Condyles present. Oral spines absent. Avicularia present or absent. Ooecia cap-shaped, closed by operculum.

Notes. The genus *Vitrimurella* (see below) has been of uncertain placement, partly because the genus name used previously, *Tremoschizodina* Duvergier, 1921, is based on a fossil that has no resemblance to the Recent species. The Harmer notebook drawing of Duvergier's species shows a bilaminar colony with a porous frontal shield, an orifice with a thick, imperforate rim, small avicularia, and a small porous ooecium (<http://bryozoa.net/library/harmernotes/tremoschizodina.html>). In some Atlantic species, here assigned to *Vitrimurella*, the frontal shield is gymnocrystal, and the proximal sinus is delimited by joined costae like those of some fossil Trypostegidae (e.g., *Trilophora* Lang, 1916; *Boreasina* Voigt and Hillmer, 1983; and *Grammothoa* Voigt and Hillmer, 1983), suggesting affinities between *Vitrimurella* and Hippothooidea. Trypostegidae supposedly evolved from a pliophloeine ancestor (Voigt and Hillmer, 1993; Gordon, 2000).

At least two species assigned to *Vitrimurella*, *Vitrimurella gemina* (Tilbrook 2006) n. comb. and *Vitrimurella lepida* (Hayward, 1988) n. comb., have ooecia with proximal median suture, very reminiscent of those in *Figularia*. Disparately, costate ooecia were described in *Figularia pulcherrima* Tilbrook, Hayward and Gordon, 2001, which could be better assigned to a distinct genus, maybe related to both *Figularia* and *Vitrimurella*. The characteristics of ooecial foramina described above suggest *Vitrimurella* as highly derived cribrilid. Thus, *Vitrimurella* could be related to some species attributed to *Figularia* sensu lato, but the genus is very heterogeneous and requires revision. In *Vitrimurella*, the costae are also limited to a very small area proximal to orifice, without palmata, thus distinct from *Lepralia figularis* Johnston, 1847, type

of *Figularia* Jullien, 1886. Due these inconsistency, and until a revision of cribriomorph is done, we consider the systematic position of Vitrimurellidae uncertain.

Type genus. *Vitrimurella* new genus.

Vitrimurella New Genus

Description. Colony encrusting, frontal wall made up of smooth, translucent, faintly striated calcification, penetrated by large indented pores. Zooid orifices dimorphic. Autozooid orifice semicircular anteriorly with pointed condyles and a shallow V-shaped sinus, the low peristome has a thickened, expanded, proximal edge. Ovicelled zooid orifices of zooids with oocia are shallower, with a slightly convex poster. Avicularia present or absent. Oocium cap-shaped, barely protruding from the surface, closed by the operculum, with an extra row of pores around its distal margin.

Notes. The type species of *Tremoschizodina*, *Tremoschizodina pisciformis*, described by Duvergier (1921) is a Miocene fossil, not at all similar morphologically to the four living species known. It has a bilaminar colony form, with a porous frontal wall, an orifice surrounded by a thick, imperforate rim, small frontal avicularia and a porous oocium, "small, endozooidal" according to Harmer.

We erect the genus *Vitrimurella* for some recent species of *Tremoschizodina*, thus *Vitrimurella anatina* (Canu and Bassler, 1928) n. comb., *Vitrimurella fulgens* (Marcus, 1955) n. comb., and *Vitrimurella lata* (Smitt, 1873). The genus also includes two Indo-Pacific species previously assigned to *Figularia*, thus *Vitrimurella lepida* (Hayward, 1988) n. comb. from Mauritius and *Vitrimurella gemina* (Tilbrook, 2006) n. comb. from the Solomons Islands. The Atlantic species are distinct from the two Indo-Pacific species in having only two costae rather than four costae.

Type species. *Gemellipora lata* Smitt, 1873.

Etymology. The genus name is a combination of the Latin adjective *vitrius*, glass, and *murella*, a diminutive feminine form of the Latin noun *murus*, wall.

Vitrimurella fulgens (Marcus, 1955) **New Combination**

Figures 28, 29

Tremoschizodina fulgens Marcus, 1955: 308, figs. 80, 81; Vieira et al., 2008: 29.

Description. Colony encrusting in single layer. Zooids oval in shape, relatively flat proximally, more convex distally around the orifice rim, their margins distinct. Frontal shield with smooth to laterally striated calcification, with evenly spaced pores, large saucer-shaped depressions around a small basal pore. Zooid orifices dimorphic; those of autozooids differ from those of zooids with oocia. Autozooid orifices are round anteriorly with sharp down-turned condyles and a shallow V-shaped sinus; those of zooids with oocia are shallower, with a barely convex sinus. The rim is surrounded by a smooth peristome, narrow distally and laterally, but shaped like a man's dress shirt collar proximally. The oocia are narrow caps. A distal row of pores apparent in young material zooids; most of them become embedded in secondary calcification in older zooids. Large avicularia with a semicircular base, complete crossbar, and an elongate rostrum that is expanded and may be tripartite at its tip to match the shape of the mandible (Fig. 28F).

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.594	0.774	0.594–0.774	0.684	0.047	12
Wz	0.360	0.684	0.360–0.684	0.453	0.086	12
Lo	0.144	0.180	0.144–0.180	0.167	0.014	12
Wo	0.144	0.162	0.144–0.162	0.158	0.008	12
Lov	0.126	0.144	0.126–0.144	0.131	0.009	4
Wov	0.162	0.198	0.162–0.198	0.180	0.015	4
Lavz	0.828	0.828		0.828		1
Wavz	0.324	0.324		0.324		1
Lavm	0.684	0.684		0.684		1
Wavm	0.180	0.180		0.180		1

Notes. First record of this species since Marcus's description (1955).

Distribution. Brazil: Espírito Santo, Rio de Janeiro.

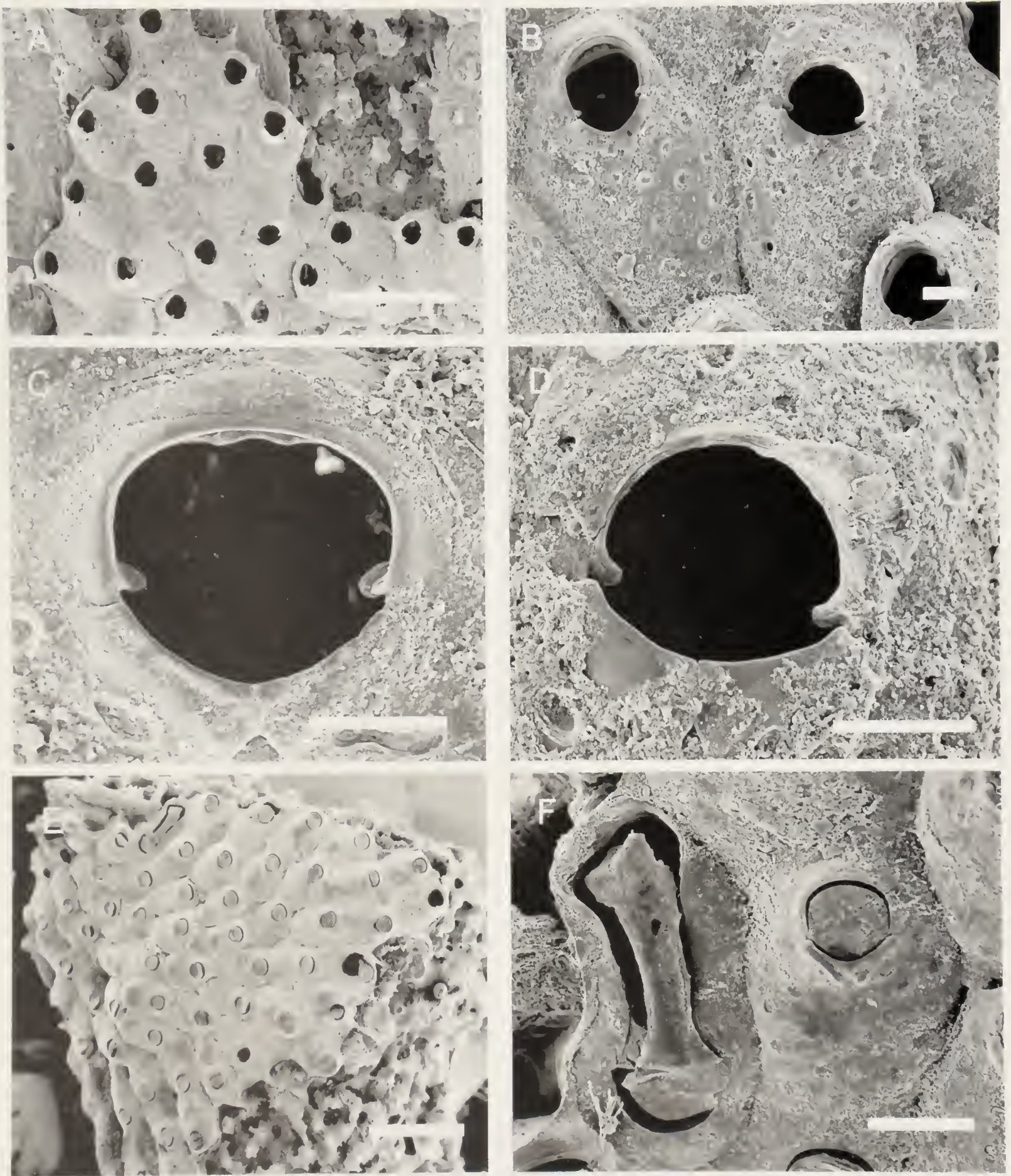


Figure 28. *Vitrimurella fulgens*. A–D. TRE36. E, F. MCZ 137444. A. Group of zooids at growing edge of colony. Scale bar = 1,000 μm . B. Autozooid and female zooid. Scale bar = 100 μm . C. Autozooid orifice. Scale bar = 100 μm . D. Female zooid orifice. Scale bar = 100 μm . E. Uncleaned colony with opercula and avicularian mandible (upper left) intact. Scale bar = 1,000 μm . F. Close-up of avicularium with mandible. Scale bar = 200 μm .

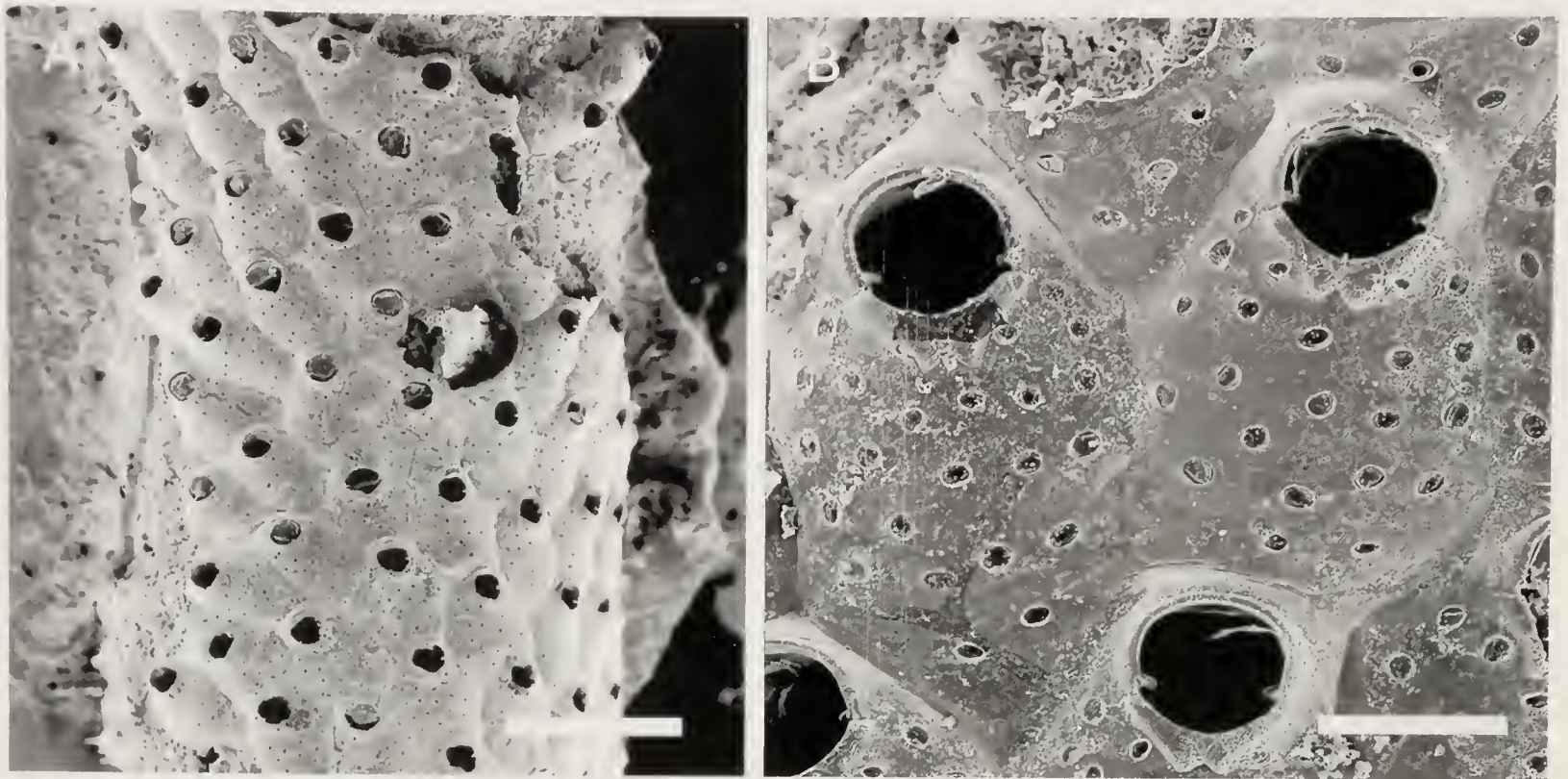


Figure 29. *Vitrimurella fulgens*. TRE38. MCZ 137445. A. Colony showing autozooids and female zooids. Scale bar = 1,000 μm . B. Two autozooids showing frontal shield pores and orifice structure. Scale bar = 200 μm .

Specimens Examined. *Vitrimurella fulgens*. Hassler Boxes 36 and 38, MCZ 137444 and MCZ 137445. Off Cabo Frio, Rio de Janeiro state, Brazil.

Superfamily Arachnopusioidea Jullien, 1888

Family Arachnopusiidae Jullien, 1888

Genus *Poricella* Canu, 1904

Poricella frigerosa **New Species**

Figure 30

Holotype. *Poricella frigerosa*. Hassler Box 3, MCZ 137446. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name is a compound of the Latin adjective *frigerus*, chilly, cold, icy, etc., and the feminine form of the Latin suffix, *-osus*, abundance of, for the type locality, off Cabo Frio.

Description. Colony encrusting. Zooids oval, small, frontal shield calcification extremely rough textured and granular, but with a flatter central medallion of two or three round to kidney-shaped pores. Some small marginal pores also, but they may be occluded by the heavy calcification so that margins may not be clearly defined. The orifice is transversely oval distally, almost

flat proximally, with barely noticeable condyles and three or four orificial spines. The orifice is protected proximally by an anchor-shaped spike of calcification (often broken, so that only the rough-textured conical base remains). Large interzooecial avicularia are spaced quite regularly between zooids, their bases at about the level of the orifice of adjacent autozooids. They vary in size from about half to about three-quarters the length of an autozoooid but have a rounded base, a complete crossbar, and an elongate rostrum, pinched in at its center and wider at both ends; the straight distal end curves forward at the tip. Some avicularia have more pointed rostra, these are either smaller or in areas where the colony frontal surface is worn and bored. Ooecia are covered with the same thick and rugose calcification as zooids except for two or three small lateral pores. Only two spines can still be seen embedded in the ooecium calcification. Ooecia open above the operculum.

Diagnosis. Encrusting *Poricella* with three or four orificial spines, frontal wall with anchor-shaped mucro, two or three round to oval pores in a central cluster in the rugose calcification, and with very large

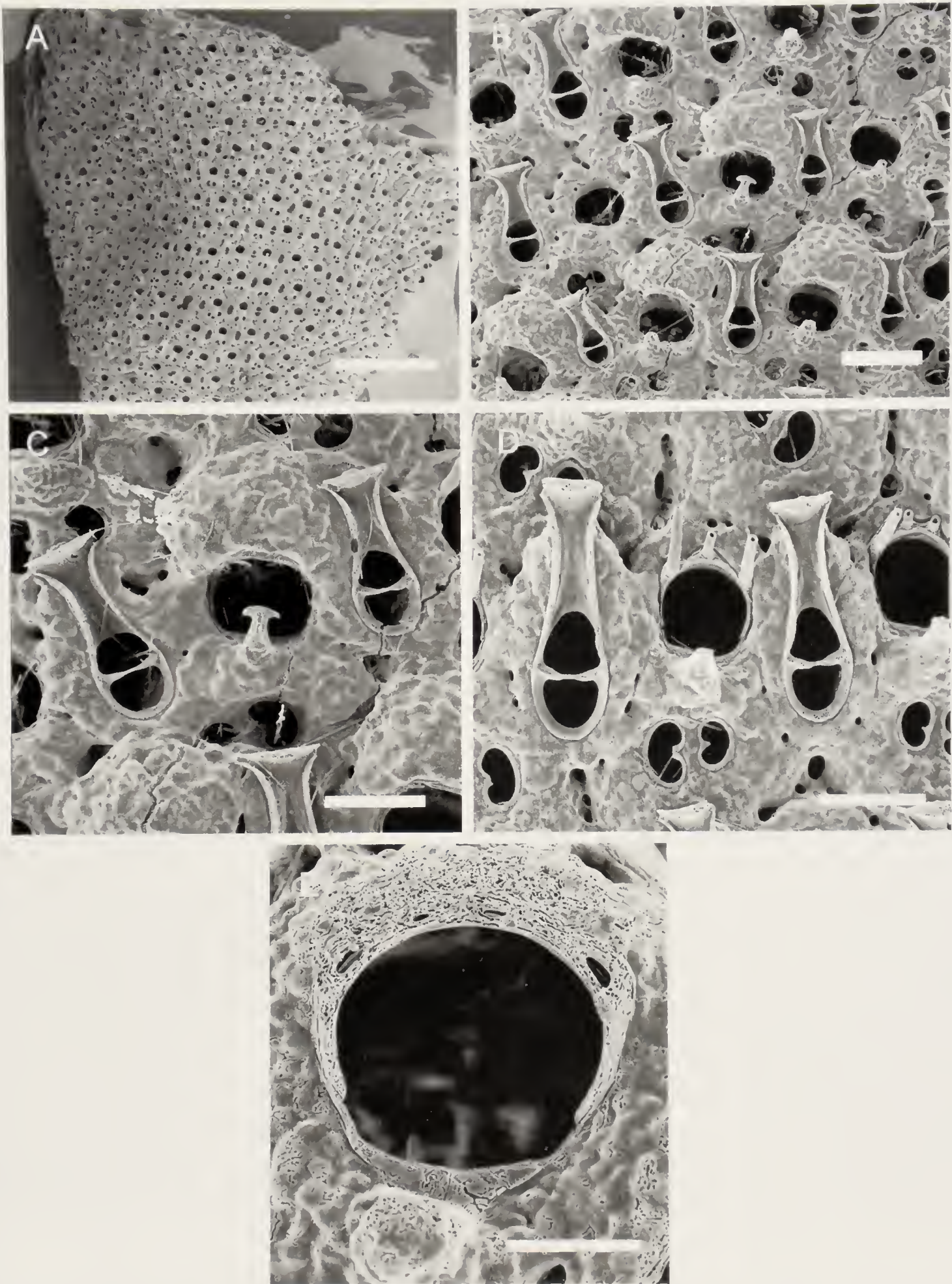


Figure 30. *Poricella frigerosa*. A–C. Hassler Box 37, MCZ 137446. D, E. Hassler Box 39, MCZ_137447. A. Overview of colony. Scale bar = 2,000 μm . B. Group of zooids with flat-tipped avicularian rostra. Scale bar = 300 μm . C. Close-up of zooid with an oecium and with an anvil-shaped suborificial projection. Scale bar = 200 μm . D. Autozooid with three orificial spines, two large frontal pores, and very large interzoecial avicularia. Scale bar = 200 μm . E. Primary orifice. Scale bar = 100 μm .

and regularly spaced interzooecial avicularia with flat-topped rostra.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.612	0.792	0.612–0.792	0.720	0.052	12
Wz	0.396	0.684	0.396–0.684	0.488	0.089	12
Lo	0.162	0.198	0.162–0.198	0.176	0.014	12
Wo	0.162	0.216	0.162–0.216	0.182	0.017	12
Lov	0.270	0.306	0.270–0.306	0.279	0.015	6
Wov	0.342	0.432	0.342–0.432	0.390	0.034	6
Lav	0.288	0.576	0.288–0.576	0.464	0.088	12
Wav	0.108	0.216	0.108–0.216	0.158	0.027	12

Notes. Cook (1977) reviewed fossil and Recent species of *Tremogasterina*, making Smitt's *T. mucronata* a part of a *T. mucronata* complex because of its apparent morphological variability. *Poricella frigerosa* is part of this complex. The Hassler material is very similar to the specimen of *T. mucronata* Cook illustrated from Kingstown Harbour, St. Vincent, eastern Caribbean (Cook, 1977: pl. 1, figs. B, C, pl. 5, fig. C). There is also the problem that no one seems to have reexamined Smitt's material. There was no material of this species in the MCZ's Smitt collection (Winston, 2005), and the illustrations in the original description (Smitt, 1873: figs. 113–115) show colonies with mostly pointed avicularia, without crossbars. This might mean that the parts of colonies illustrated were old and abraded; it might also mean that a different species, or one or more species, were included. In fact, Smitt's illustrations are closer to the colonies illustrated by Cook (1977: pl. 6, figs. E, F) as *T. mucronata* (now assigned to *Poricella*) from Jamaica and Puerto Rico, respectively, than to those from the east Antilles and Brazil.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Poricella frigerosa*. Hassler Box 37, MCZ 137446, and Hassler Box 39, MCZ 137447. Off Cabo Frio, Rio de Janeiro state, Brazil.

Genus *Arachnopusia* Jullien, 1888

Arachnopusia haywardi Vieira, Gordon, Souza and Haddad, 2010

Figure 31

Arachnopusia haywardi Vieira et al., 2010a: 18, figs. 30–39.

Description. Colony encrusting in a single layer. Zooids large, oval in shape, with a convex thickly calcified frontal shield with about 8–14 pores. Most of the pores have a thick rod- to mushroom-shaped spicule projecting into the center of the pore. Zooid margins apparent in young colonies but not clearly demarcated in older colonies with thicker frontal shields. The peristome is low and thick, the secondary orifice oval in shape. Five hollow distal spines can be seen around the primary orifice where peristomes are still developing. Some zooids have a pore or small avicularium at the midline of the proximal rim of the peristome. Larger triangular distolaterally directed avicularia, the largest with calcified condyles, occur on the frontal shields of some zooids, especially in connection with oecia. Ooecia are transversely oval with a narrow, less-calcified frontal area. Anestrula tatiform, with a round frontal membrane and nine hollow spines.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.612	0.846	0.612–0.846	0.729	0.082	6
Wz	0.504	0.558	0.504–0.558	0.531	0.019	6
Lo	0.126	0.144	0.126–0.144	0.132	0.009	6
Wo	0.162	0.180	0.162–0.180	0.173	0.009	6
Lov	0.198	0.252	0.198–0.252	0.222	0.022	6
Wov	0.288	0.396	0.288–0.396	0.333	0.041	6
Lav	0.126	0.270	0.126–0.270	0.207	0.049	6
Wav	0.072	0.324	0.072–0.324	0.156	0.092	6

Notes. This species is similar in size to *Arachnopusia pusae* of Marcus (1955), but that species has larger pores in the frontal shield that lack the partial calcareous ocellations found in *haywardi*; it also lacks the large triangular avicularia (although it has many smaller triangular avicularia). Vieira et al. (2010a) described this species from continental shelf off São Paulo, SE Brazil, but the characterized colonies were well calcified and sometimes broken; some *Hass-*

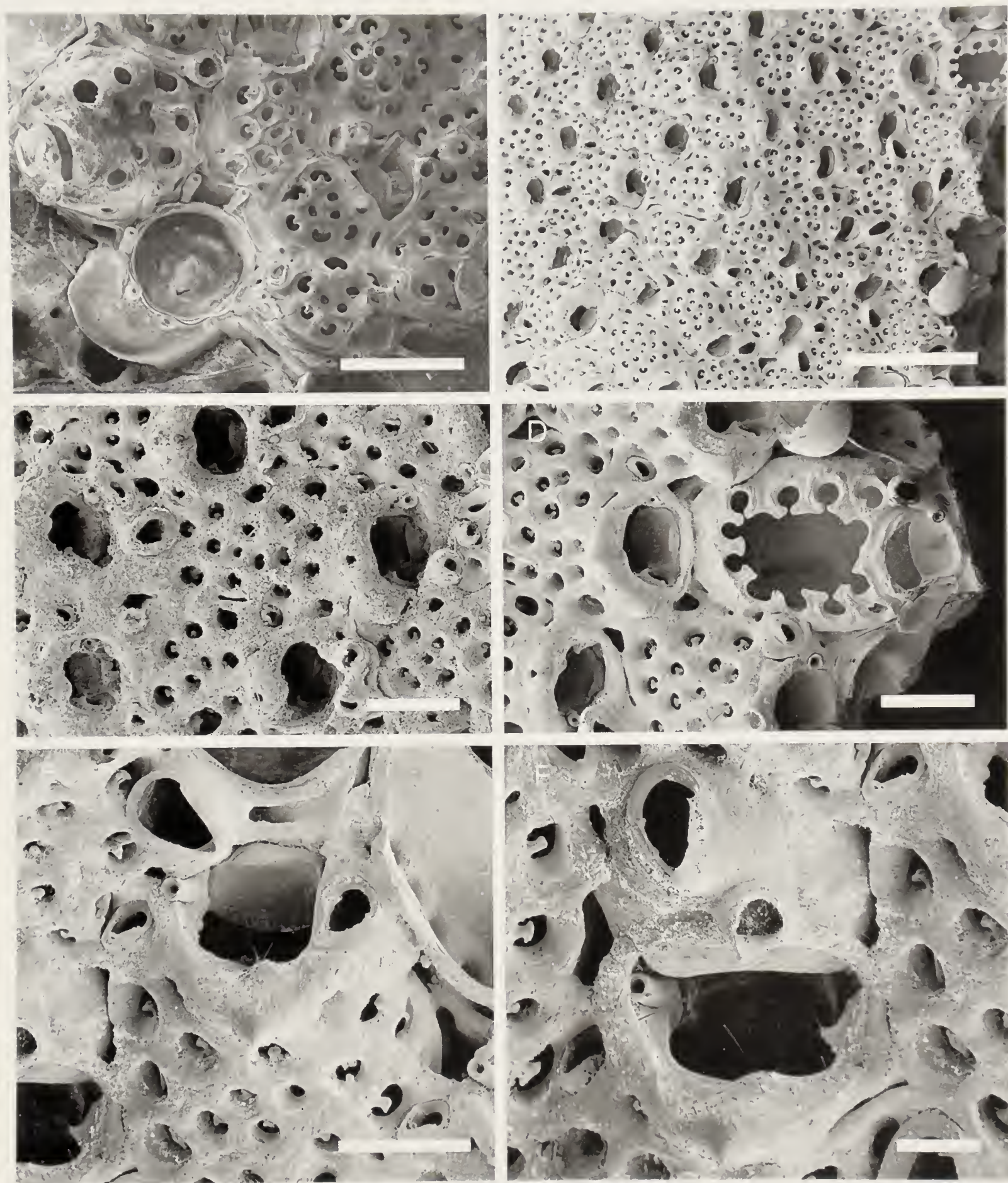


Figure 31. *Arachnopusia haywardi*. A. Hassler Box 20, MCZ 137448. Ancestrula and periancestrular zooids. Scale bar = 300 μm . B–F. Hassler Box 34, MCZ 137449. B. Portion of colony. Scale bar = 1,000 μm . C. Group of autozooids. Scale bar = 250 μm . D. Development of frontal shield. Scale bar = 250 μm . E. Autozooid and avicularia. Scale bar = 200 μm . F. Zooid with avicularium on oecium surface. Scale bar = 100 μm .

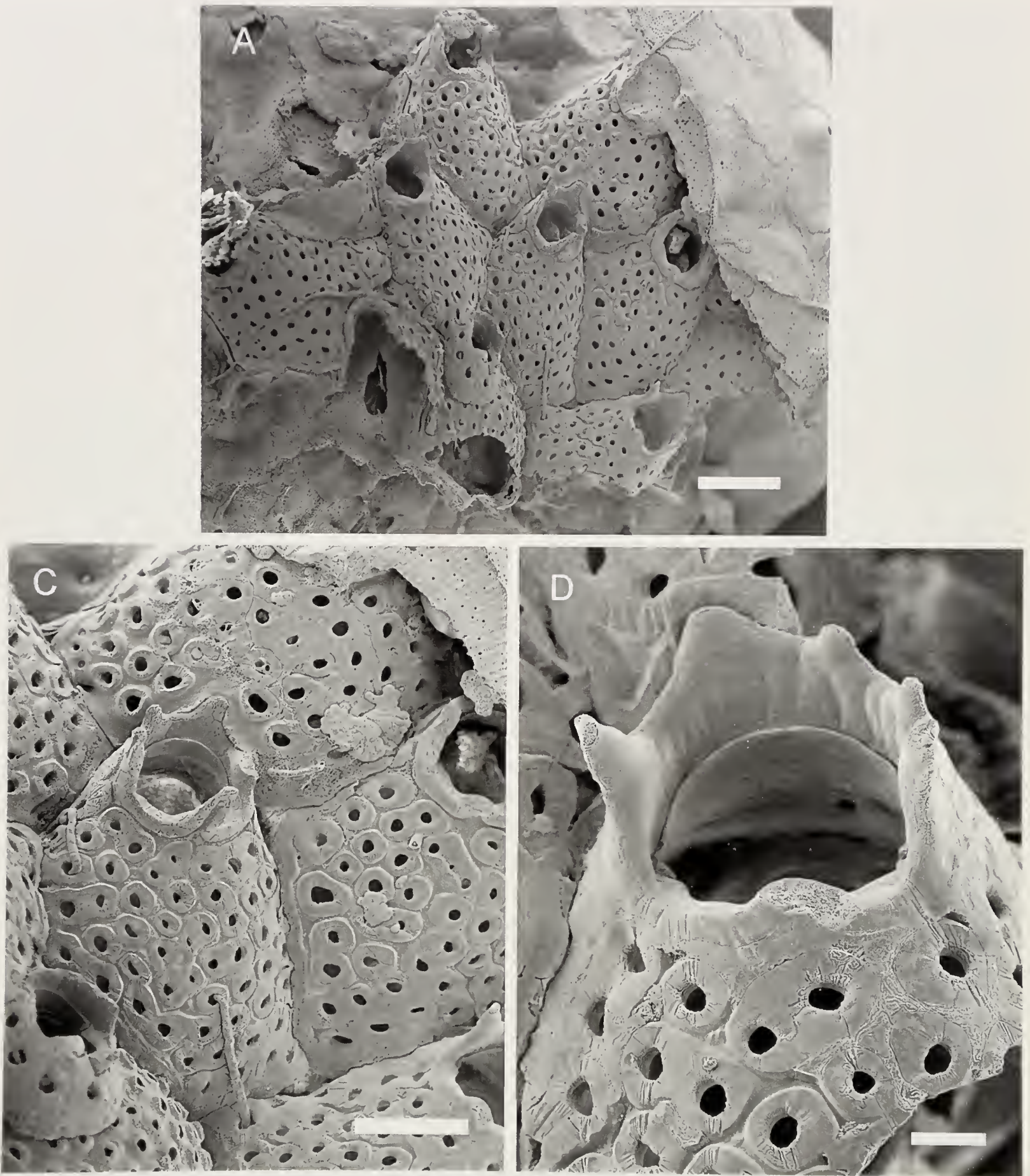


Figure 32. *Exechonella* sp. Hassler Box 19, no specimen. A. Encrusting colony fragment. Scale bar = 300 μm . B. Group of zooids. Zooid on lower left with regenerated peristome. Scale bar = 200 μm . C. Close-up of peristome. Scale bar = 50 μm .

ler specimens are young and less calcified, allowing the characteristics of orifice, frontal shield, and oral avicularia to be seen clearly. The ancestrula, not seen in the type material, is tatiform, with a round frontal membrane and 9 hollow spines.

Distribution. Brazil: Rio de Janeiro, São Paulo.
Specimens Examined. *Arachnopusia haywardi*. Hassler Box 20, MCZ 137448, and Hassler Box 34, MCZ 137449. Off Cabo Frio, Rio de Janeiro, Brazil. *Holotype*: MZUSP 0322, REVIZEE St. 6658. Off São Paulo.

Family Exechonellidae Harmer, 1957

Genus *Exechonella* Duvergier, 1921

Exechonella sp.

Figure 32

Description. Colony encrusting. Zooids very large, calcification of frontal surface consists of flat round to irregular collars encircling large foramina. The primary orifice is not visible in this fragment of a colony, being surrounded by a crown-like five-pointed peristome. Frontal shield with 45–60 pores with raised and wide rim. No avicularia observed.

Notes. The colony fragment found in the *Hassler* material consists of several partially broken and overgrown zooids. Because of the high peristome the primary orifice could not be seen. Although the colony appears different from *Exechonella brasiliensis* Canu and Bassler 1928, we consider that the fragmentary *Hassler* material is insufficient to describe to the species level, but we include it here to make others aware of its existence. Note: no measurement data for this species.

Distribution. Brazil: Bahia.

Specimens Examined. Specimen no longer exists. EXEC. Hassler Box 19, North of Salvador, Bahia state, Brazil.

Family Lepraliellidae Vigneaux, 1949

Genus *Celleporaria* Lamouroux, 1821

Celleporaria atlantica (Busk, 1884)

Figures 33A–D, 34, 35

Cellepora mamillata: Ridley, 1881: 54.

Cellepora mamillata var. *atlantica* Busk, 1884: 199 (part), pl. 35, fig. 4 (Bahia).

Holoporella atlantica: Marcus, 1955: 310, figs. 85–90.

Celleporaria atlantica: Vieira et al., 2008: 25.

Description. Colonies encrusting, rough textured, often multilayered by frontal budding. Zooids at the growing edge of colonies are more ovoid in shape and flatter and smoother than those from older and frontally budded layers in which zooids develop more irregularly polygonal and

erect shapes, with projecting peristomes, umbos, and avicularia. The frontal shield consists of rippled and granular calcification with only a few small marginal pores. The primary orifice is circular anteriorly, smooth rimmed, with narrow condyles and a shallow sinus. It can only be seen in zooids at the growing edge where the peristome and avicularium-bearing umbo have not developed. Mature zooids have a thick peristome with a proximal sinus. On one side of the sinus the peristome rises into a conically pointed umbo on the side of which is a small, vertically opening oval avicularium with a sharp-toothed rostrum. Five kinds of avicularia occur in this species. A peristomial avicularium may become very large, the umbo growing to take up most of the distal end of the zooid adjacent to the peristome. It develops a more elongate subtriangular rostrum with more massive teeth. Very small, slightly asymmetrical, leaf-shaped avicularia are associated with the small marginal pores. Characteristic large pointed, spatulate avicularia occur between zooids. They have the same granular calcification as zooids, and the heavily fortified openings of palate and rostrum top the avicularium body but are more or less parallel to the surface of the colony rather than being tilted at an angle like those of the enlarged umbonate avicularia. No ooecia were found in *Hassler* specimens. According to Marcus (1955) they are globular, imperforate caps, with a pointed spike at the ooecium peak or a small avicularium on its surface.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lzc	0.522	0.756	0.522–0.756	0.651	0.082	6
Wzc	0.306	0.414	0.306–0.414	0.351	0.042	6
Lzf	0.486	0.720	0.486–0.720	0.599	0.081	12
Wzf	0.324	0.540	0.324–0.540	0.413	0.054	12
Lo	0.108	0.144	0.108–0.144	0.125	0.016	12
Wo	0.126	0.162	0.126–0.162	0.141	0.015	12
Lav1	0.234	0.648	0.234–0.648	0.358	0.125	11
Wav1	0.072	0.252	0.072–0.252	0.162	0.069	11
Lav2	0.198	0.234	0.198–0.234	0.211	0.014	7
Wav2	0.126	0.324	0.126–0.324	0.170	0.069	7

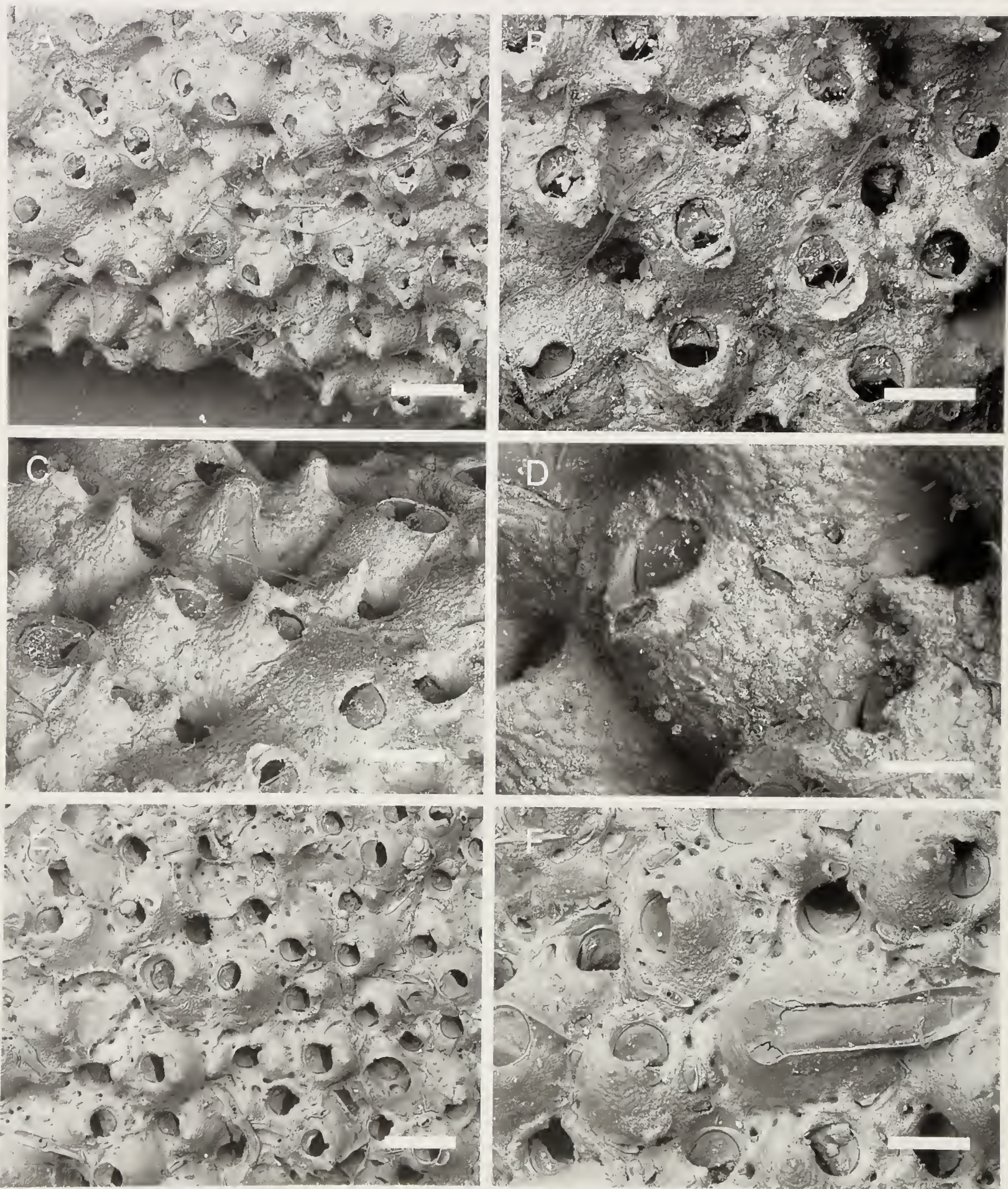


Figure 33. A–D. *Celleporaria atlantica*. NHMUK 1887.12.9.769, lectotype, off Bahia, Brazil. A. Scale bar = 300 μm . B. Scale bar = 200 μm . C. Scale bar = 200 μm . D. Scale bar = 100 μm . E, F, *Celleporaria fusca*. NHMUK 1887.12.9.770, off Possession Island, Australia. E. Scale bar = 300 μm . F. Scale bar = 200 μm .

Notes. Marcus (1955) gave a detailed description of this species. It was the most abundant species in the *Hassler* samples from off Cabo Frio.

Busk (1884) described *Cellepora mamillata* var. *atlantica* based on specimens collected from Australia and Brazil. We have examined the Challenger specimens,

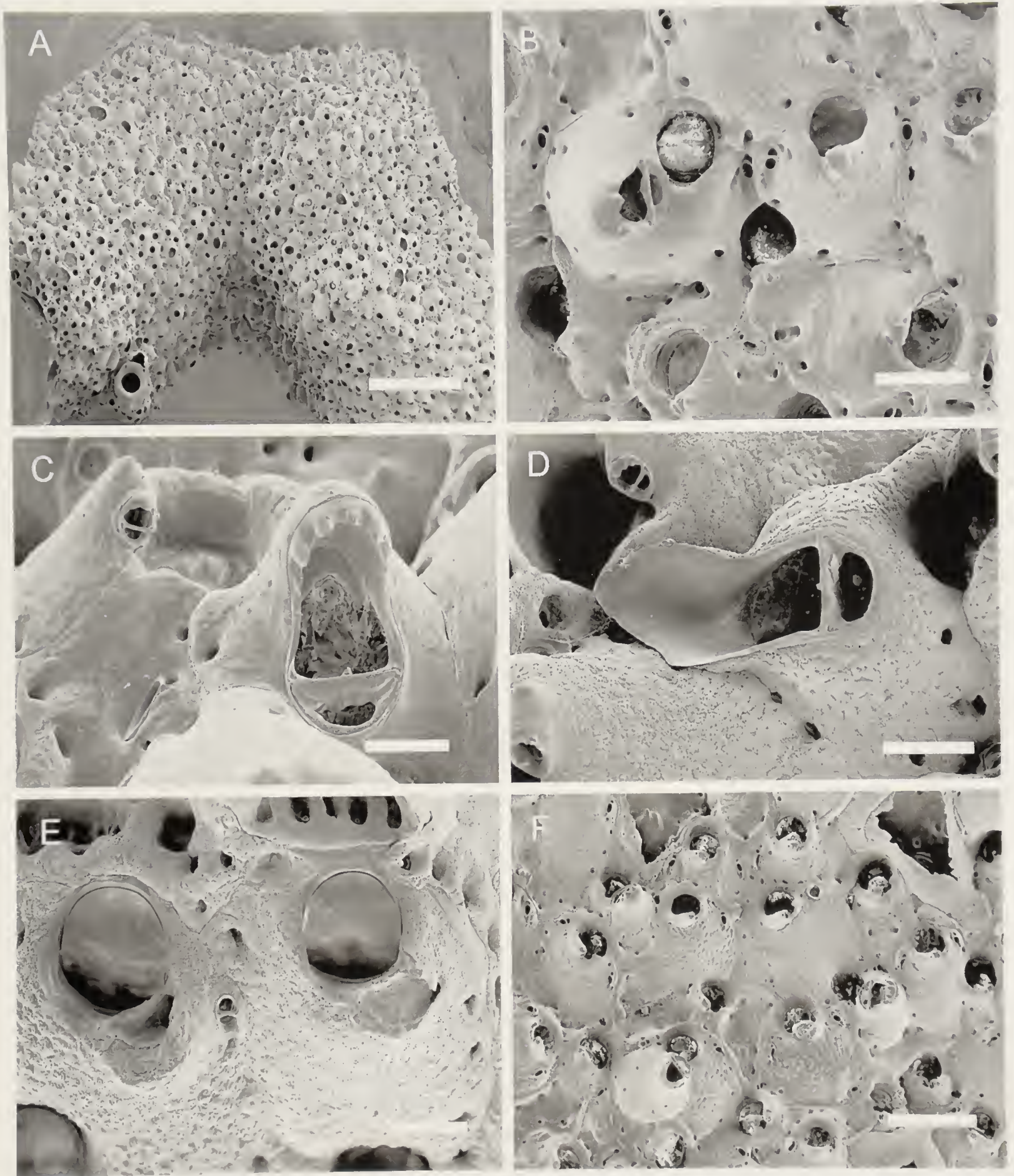


Figure 34. *Celleporaria atlantica*. A–E. Hassler CPA, MCZ 137450. F. Hassler Box CPAL, MCZ_137454. A. Part of multilaminar encrusting colony. Scale bar = 2,000 μm . B. Group of autozooids showing variation in peristomial avicularia. Scale bar = 200 μm . C. Large subtriangular avicularium. Scale bar = 100 μm . D. Large spatulate avicularium. Scale bar = 100 μm . E. Growing edge with primary orifices partly visible. Scale bar = 100 μm . F. Zooids near growing edge of colony. Scale bar = 400 μm .

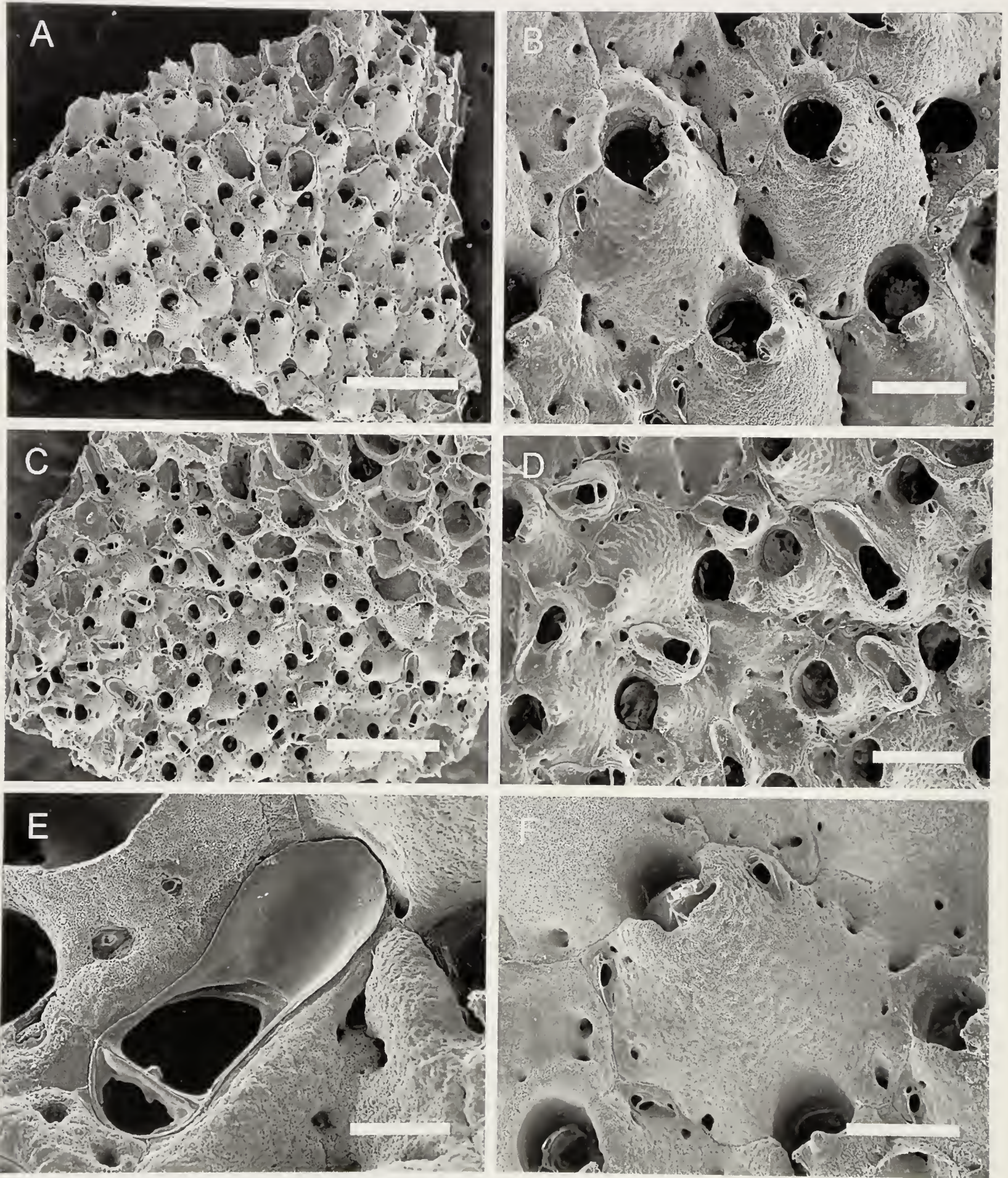


Figure 35. *Celleporaria atlantica*. A, B. Hassler, MCZ 137450. C, D. Hassler, MCZ 137454. E, F. Hassler CPHB4, MCZ 137452. A. Zooids near growing edge. Scale bar = 1,000 μm . B. Oval shaped zooids near growing edge. Scale bar = 200 μm . C. Zooids in frontally budded area. Scale bar = 1,000 μm . D. Close-up of erect frontally budded zooids and large spatulate avicularia. Scale bar = 300 μm . E. Spatulate avicularium showing crossbar morphology. Scale bar = 100 μm . F. Small triangular avicularia developing from marginal pores. Scale bar = 200 μm .

which revealed that the specimens from Possession Island (NHMUK 1887.12.9.770; Figs. 33E, F) are distinct from those from Bahia (Figs. 33A–D). The Australian specimens resemble those figured by Ryland and Hayward (1992) under the name *Celleporaria fusca* (Busk, 1854). One colony from Bahia, Brazil (NHMUK 1887.12.9.769), is here selected as lectotype of *Celleporaria atlantica*. *Celleporaria atlantica*, now known only from Brazil, is characterized by an almost rounded orifice with a shallow and wide sinus and by the presence of variably shaped avicularia: a suboral avicularium placed on the pointed umbo with a sinusoid lateral area present in the zooids, leaf-shaped avicularia associated with the small marginal pores, and pointed, spatulate avicularia occurring between zooids.

Distribution. Brazil: Bahia, Espírito Santo, Rio de Janeiro.

Specimens Examined. *Celleporaria atlantica*. Hassler Box 26, MCZ 137450; Box 30, MCZ 137451; Box 31, MCZ 137452; Box 44, MCZ 137453; and Box 45, MCZ 137454. All off Cabo Frio, Rio de Janeiro, Brazil. Hassler Box 26, MCZ 137450; Box 30, MCZ 137451; Box 31, MCZ 137452; Box 44, MCZ 137453; and Box 45, MCZ 137454. All off Cabo Frio, Rio de Janeiro, Brazil. Lectotype (selected here): NHMUK 1887.12.9.769. Off Bahia, Brazil. MZUSP (specimen CEBIMar 30), *Holoporella atlantica*, Marcus det., Pierre Drach leg., Espírito Santo, 1948.

Celleporaria mordax (Marcus, 1937)

Figure 36

Holoporella mordax Marcus, 1937a: 123, pl. 24, figs. 65A–F.

Celleporaria mordax: Rocha, 1995: 76; Vieira et al., 2008: 25.

Description. Colony encrusting on hard substrata, forming multilayered encrustations by frontal budding. Zooids variable in shape and orientation, more regular in primary layers than in frontally budded layers in which oval to polygonal zooids

may be oriented in different directions. Frontal surface calcification thick and verrucose, zooid margins becoming indistinct in frontally budded areas, marked only by a few large areolae. Primary orifice semicircular, with one or two U-shaped sinuses, usually one deeper and one shallower, in the proximal margin. A conical rostrum bearing on one side a small vertically positioned oval avicularium is placed below the proximal margin of the orifice. Scattered large interzoecial avicularia, with crossbars and subtriangular beaklike mandibles, are raised at an angle on the colony surface. The ooecium is a shallow imperforate cap the same texture of calcification as the frontal and rostra of avicularia, opening into the peristome of the maternal zooid. Zooids with ooecia have peristomes raised above the primary orifice; these are higher laterally than proximally.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.324	0.360	0.324–0.360	0.348	0.019	6
Wz	0.288	0.342	0.288–0.342	0.312	0.019	6
Lo	0.072	0.126	0.072–0.126	0.104	0.018	6
Wo	0.108	0.144	0.108–0.144	0.132	0.015	6
Lov	0.090	0.126	0.090–0.126	0.105	0.018	6
Wov	0.216	0.252	0.216–0.252	0.231	0.014	6

Notes. This species, which Marcus (1937a) described from 20 m in the Bay of Santos, São Paulo state, is common subtidally in that area. It is unusual among western Atlantic *Celleporaria* species in having an orifice with more than one proximal indentation. In zooid size it is also considerably smaller than *Celleporaria atlantica*, the other species found in the Hassler material.

Distribution. Brazil: Rio de Janeiro, São Paulo.

Specimens Examined. *Celleporaria mordax*. Hassler Box 34, MCZ 137455. Off Cabo Frio, Rio de Janeiro state, Brazil. *Syntypes*: MZUSP (uncatalogued specimens), *Holoporella mordax*, Marcus det., Santos, São Paulo, Brazil.

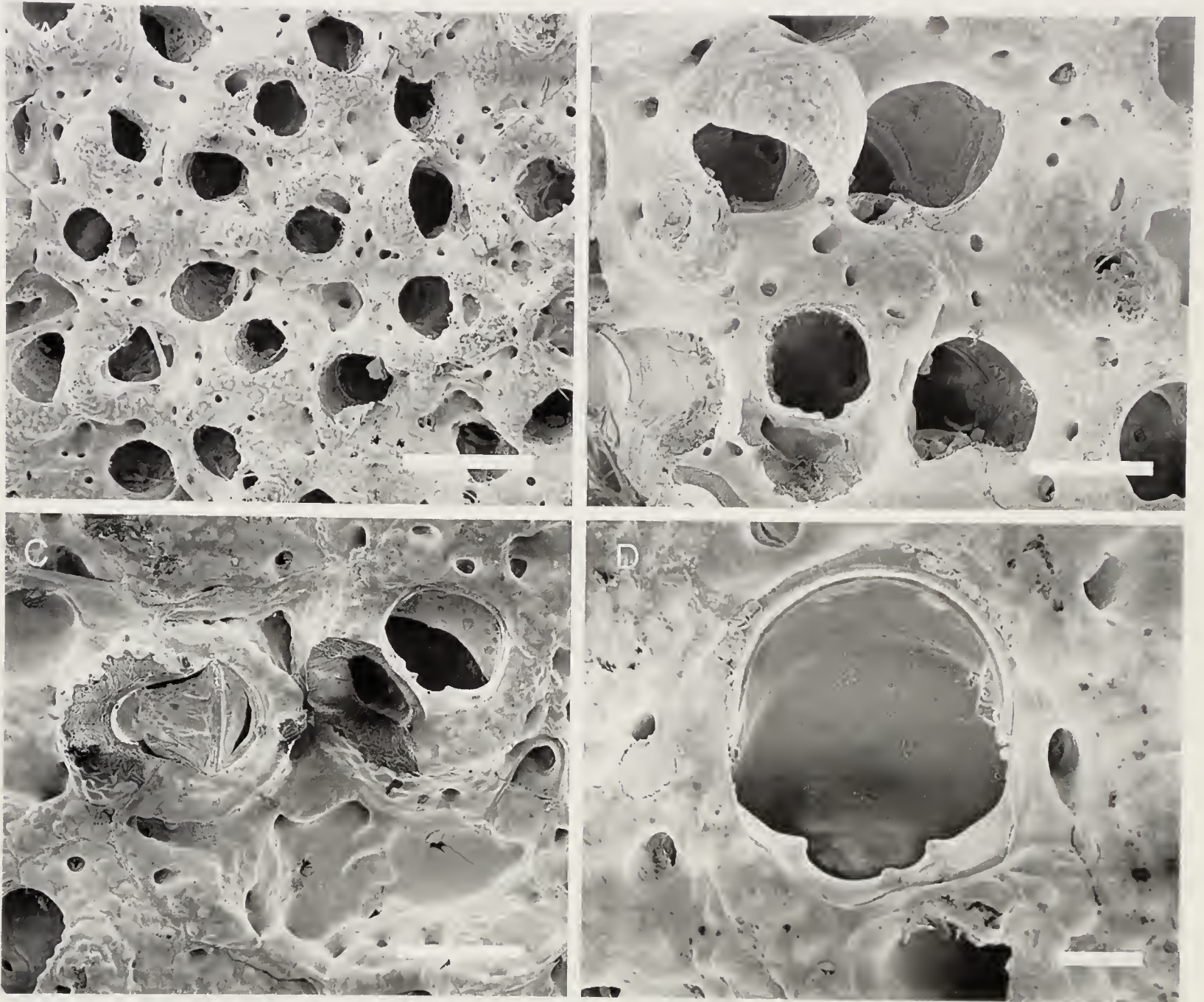


Figure 36. *Celleporaria mordax*. Hassler Box 34, MCZ 137455. A. Group of frontally budded zooids. Scale bar = 300 μ m. B. Group of zooids, one with oecium. Scale bar = 150 μ m. C. Area with raised subtriangular avicularium. Scale bar = 150 μ m. D. Close-up of orifice showing two asymmetric sinuses. Scale bar = 40 μ m.

Family Romancheinidae Jullien, 1888

Genus *Exochella* Jullien, 1888

Exochella frigidula **New Species**

Figure 37

Holotype. *Exochella frigidula*. Hassler Box 25, MCZ 137456. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. From the Latin adjective *frigidulus*, diminutive of *frigidus*, cold, for its collection off Cabo Frio.

Description. Colony encrusting in one or more layers. Zooids convex, oval to rhombic in shape. In early ontogeny zooid frontal shield calcification is granular with large rectangular marginal pores; as zooids age,

heavy secondary calcification gives frontal shields a wavy ridged surface in which the pores and zooid margins are almost obscured. Primary orifice with semicircular anter, small sloping condyles, and a broad, shallow, U-shaped sinus. It has two to four hollow spines on the distal rim. As zooids mature, a peristome develops around the lateral and proximal edge of the orifice, and a bifid lyrula projects from its lower rim, eventually meeting the peristome to form two calcified rings. Long narrowly triangular avicularia with heavy rims and complete crossbars are located on one or both sides of the zooids at the midpoint of lateral walls and oriented laterally, giving zooids bearing

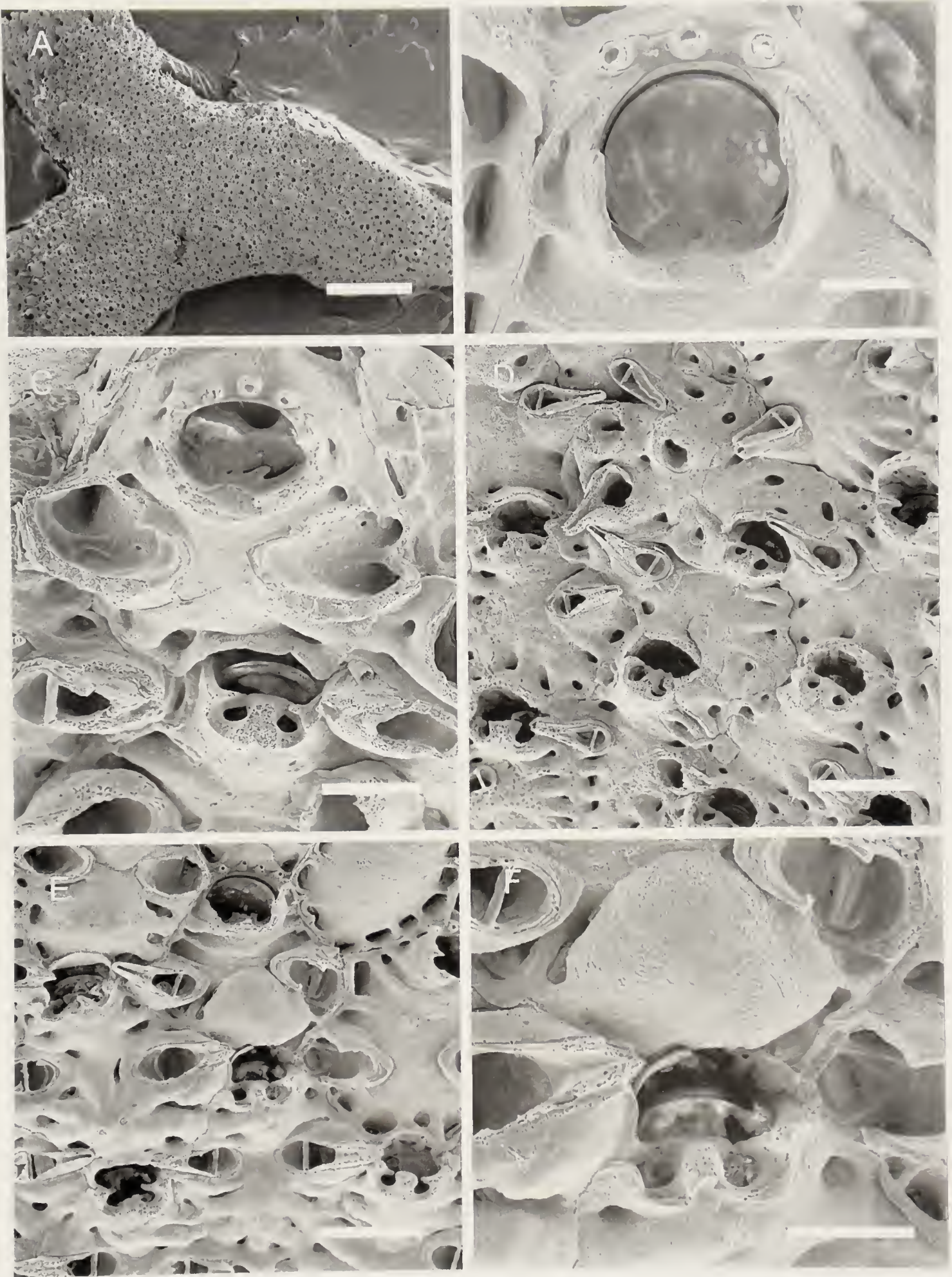


Figure 37. *Exochella frigidula*. EXHB. Hassler Box 25, MCZ_137456. A. Overview of encrusting colony. Scale bar = 2,000 μm . B. Primary orifice. Three distal spines. Scale bar = 50 μm . C. Autozoid at growing edge. Avicularia and frontal shield calcification developing. Scale bar = 100 μm . D. Group of mature autozooids. Scale bar = 200 μm . E. Another group of zooids, one with an oocidium. Scale bar = 200 μm . F. Close-up of oocidium. Scale bar = 100 μm .

two avicularia a distinct rhombic shape. Ooecia are flattened-globular in shape with imperforate, granular calcification.

Diagnosis. *Exochella* with more transversely oval orifice than those of *Exochella tropica* Winston and Woollacott, 2009, and with laterally directed avicularia at zooid midpoint.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.396	0.522	0.396–0.522	0.456	0.046	6
Wz	0.324	0.486	0.324–0.486	0.384	0.058	6
Lo 1	0.081	0.099	0.081–0.099	0.090	0.006	6
Wo 1	0.108	0.126	0.108–0.126	0.122	0.008	6
Lov	0.126	0.198	0.126–0.198	0.165	0.026	6
Wov	0.162	0.180	0.162–0.180	0.171	0.010	6
Lav	0.108	0.180	0.108–0.180	0.156	0.027	6
Wav	0.054	0.072	0.054–0.072	0.063	0.010	6
Lo 2	0.090	0.108	0.090–0.108	0.101	0.009	6
Wo2	0.090	0.126	0.090–0.126	0.105	0.015	6

Notes. *Exochella frigidula* is distinguished by its more transversely oval orifice and its laterally directed avicularia located at zooid midpoint in contrast to *Exochella tropica* (in which the primary orifice is hoof shaped, frontal calcification more ribbed, and avicularia located below the zooid midpoint and oriented more asymmetrically). Only *Exochella longirostris* has been reported in Brazilian waters (Vieira et al., 2008), but the specimens reported by Marcus (1937a) from São Paulo are smaller than *Exochella* n. sp. and refer to a distinct species. Hayward (1995) suggested *E. longirostris* to be a strictly Magellanic species with a range extending from southern Chile to the Falkland Islands. *Exochella frigidula* is distinct from *E. longirostris* in having larger avicularia and in its more transversely oval orifice.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Exochella frigidula*. Hassler Box 25, MCZ 137456. Off Cabo Frio, Rio de Janeiro state, Brazil. MZUSP, *Exochella longirostris*, E. Marcus det., Ilha de São Sebastião, Brazil, 02.ix.1938. MZUSP (uncatalogued), several colonies from Santos, São Paulo, E. Marcus det., 1936.

Family Metrarabdotosidae Vigneaux, 1949

Genus *Metrarabdotos* Canu, 1914

Metrarabdotos jani **New Species**

Figure 38

Trigonopora unguiculatum: Marcus, 1955: 304, fig. 70. NOT *Metrarabdotos unguiculata* Canu and Bassler, 1928b: 128, pl. 23, figs. 6–9.

Metrarabdotos unguiculatum: Santana et al., 2009: 59, figs. 2A–C.

Holotype. *Metrarabdotos jani*. Hassler Box 37, MCZ 137457. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. From the genitive of the Latin noun *Janus*, January (Portuguese *Janeiro*), referring to the type locality off Rio de Janeiro.

Description. Colony encrusting. Zooids large, elongate, oval to polygonal. In most zooids the orifice is placed to one side of the distal rim. An avicularium with a long, curved, pointed rostrum is placed with its base below the orifice on the lateral wall and with the point of the rostrum reaching the edge of the distal edge of the peristome. Where a zooid has a pair of avicularia the orifice is placed between them. Frontal shield calcification consists of large tubercles except at the lateral and proximal edges, where a row of large marginal pores is adjacent to the clearly delimited lateral wall junctions. The primary orifice is surrounded by a low peristome with rugose outer calcification and a proximal U-shaped, denticulate sinus. Embryos are brooded in maternal zooids with very large ooecia, which give the zooids an irregular teardrop shape. They are as long as autozooids, but much wider, with a wide crescent-shaped opening, and have the same tuberculate calcification with marginal pores as the autozooids. The ooecium is also imperforate with the same tuberculate calcification and has a few extra marginal pores.

Diagnosis. *Metrarabdotos* similar to *Metrarabdotos unguiculatum* Canu and Bassler, 1928, but distinct in having a centrally imperforate ooecium.

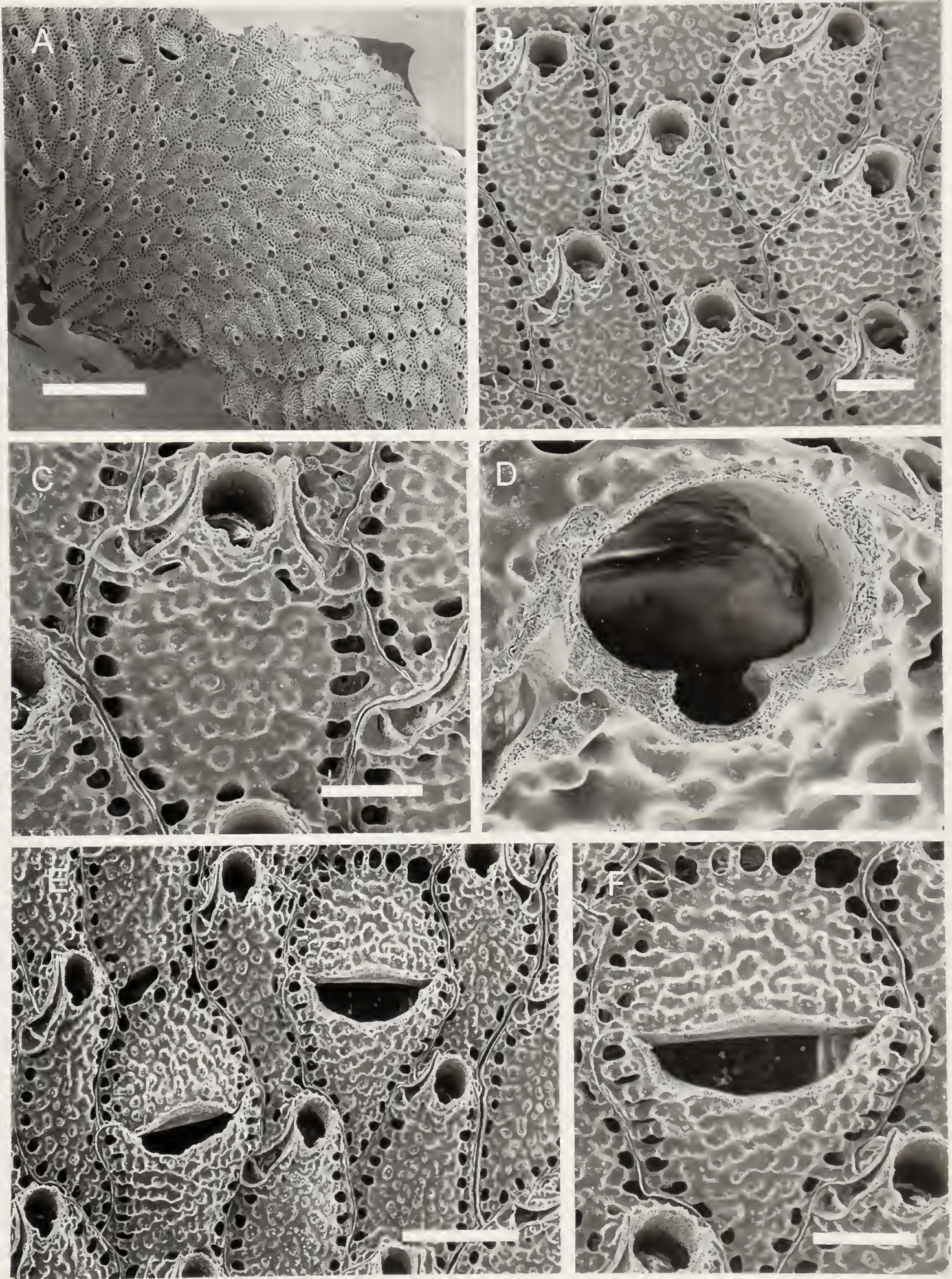


Figure 38. *Metrarabdotos jani*. Hassler Box 37, MCZ 137457. A. Overview of encrusting colony. Scale bar = 2,000 μ m. B. Group of autozooids. Scale bar = 300 μ m. C. Autozoid with two lateral avicularia. Scale bar = 200 μ m. D. Secondary orifice. Scale bar = 70 μ m. E. Two female zooids and autozooids. Scale bar = 500 μ m. F. Close-up of maternal zooid with oecium. Scale bar = 250 μ m.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.792	0.990	0.792–0.990	0.900	0.058	12
Wz	0.450	0.558	0.450–0.558	0.512	0.029	12
Lo 2	0.144	0.198	0.144–0.198	0.177	0.019	12
Wo 2	0.126	0.162	0.126–0.162	0.134	0.012	12
Lov	0.936	1.170	0.936–1.170	1.050	0.092	6
Wov	0.630	0.810	0.630–0.810	0.762	0.068	6
Lav	0.270	0.450	0.270–0.450	0.345	0.060	12
Wav	0.090	0.126	0.090–0.126	0.105	0.013	12
Lgz0	0.108	0.180	0.108–0.180	0.147	0.029	6
Wgz0	0.414	0.486	0.414–0.486	0.450	0.025	6

Notes. This species is very similar to *Metrarabdotos unguiculatum* but differs in having a centrally imperforate, rather than porous, ooecium. The specimen illustrated by Santana et al. (2009) shows zooids with ooecia at the growing edge of the colony, with entire extra rows of marginal pores visible around their distal and lateral edges. The *Hassler* specimen does not show a growing edge, and zooids, including maternal zooids, are more heavily calcified, but a few extra marginal pores are still visible on the ooecia. Marcus (1955) describes his material from Espírito Santo as having ooecia that are areolated on the border and frontally nodular (also seen in balsam slide specimen deposited at the MZUSP), which fits the description of the new species. Living specimens are dark-red in color (Marcus, 1955).

Distribution. Brazil: Bahia, Espírito Santo states, Rio de Janeiro.

Specimens Examined. *Metrarabdotos jani*. Hassler Box 37 and Box 43, MCZ 137457. Off Cabo Frio, Rio de Janeiro state, Brazil. MZUSP (balsam slide n. 613), *Trigonopora unguiculata*, E. Marcus det., Espírito Santo, Brazil, 35 m.

Infraorder Lepraliomorpha Gordon, 1989

Superfamily Smittoidea Levinsen, 1909

Family Smittinidae Levinsen, 1909

Genus *Parasmittina* Osburn, 1952

Parasmittina simpulata **New Species**

Figure 39

Parasmittina areolata: Canu and Bassler, 1928a: 87, pl. 6, fig. 4. NOT *Smittina areolata* Canu and Bassler, 1927a: 23, pl. 5, figs. 6–8.

Holotype. *Parasmittina simpulata*. Hassler Box 34, MCZ 137458. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name *simpulata* is an adjective compounded from the Latin noun *simpulum*, a small ladle, and the female form of the Latin suffix *-atus*, possessing, in reference to the ladle shape of the spatulate avicularia.

Description. Colony encrusting. Zooids elongate subrectangular to polygonal with large areolae at zooid margins and otherwise imperforate except for the pores at the bases of frontal avicularia. Frontal shield calcification tuberculate and thick. The orifice has a sparsely beaded distal rim, rounded condyles with ribbed edges, and a small anvil-shaped lyrula. One or two distal spines and a low to laterally projecting peristome surround the primary orifice. There are three types of variably sized avicularia occurring in different arrangements: a raised triangular distolaterally oriented avicularium may be found on one side of the orifice, with another proximally directed oval avicularium at about the level of the lyrula. Some zooids have two oval avicularia, some have one oval and triangular avicularium, while in others a large proximal to slightly proximolaterally directed spatulate avicularium takes up most of one side of the zooid. Such zooids may also have a small oval avicularium on the opposite side of the orifice below the peristome, but the peristomes of zooids with the spatulate avicularia are often longer and the peristome opening of those zooids constricted into a pyriform shape. No ooecia were present on the one *Hassler* specimen.

Diagnosis. Medium-sized *Parasmittina* species, with beaded orifice, ribbed condyles, and a suite of three types of avicularia, proximally directed giant spatulate and small oval avicularia, and distolaterally directed triangular avicularia.

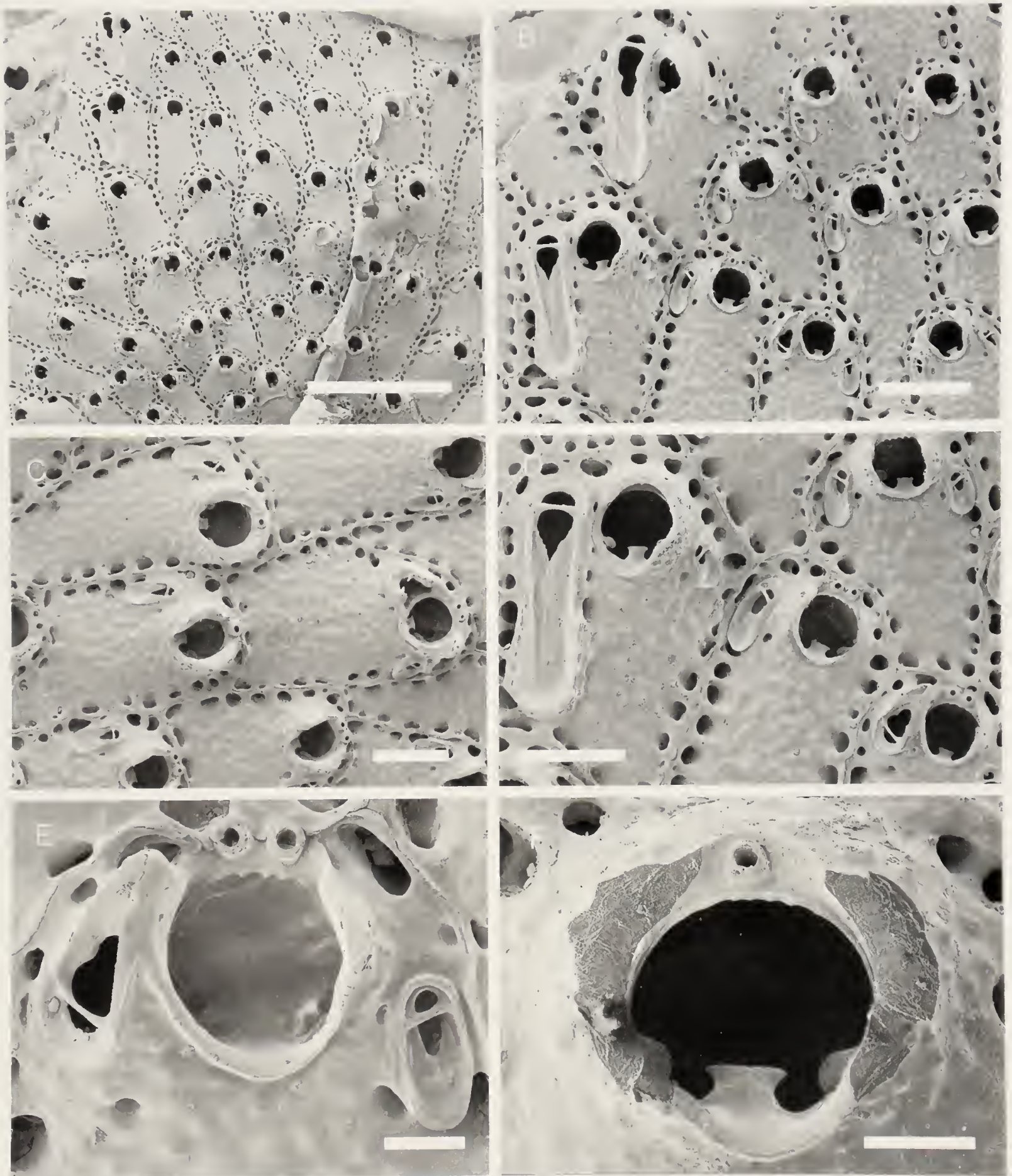


Figure 39. *Parasmittina simulata*. Hassler Box 34, MCZ 137458. A. Portion of encrusting colony. Scale bar = 1,000 μm . B. Zooids with very large spatulate avicularia. Scale bar = 300 μm . C. Zooids with small spatulate and triangular avicularia. Scale bar = 200 μm . D. Zooid with large and small spatulate avicularia and a triangular avicularium. Scale bar = 200 μm . E. Distal end of zooid with, triangular and spatulate avicularia, and orifice with beaded distal rim and two oral spines. Scale bar = 50 μm . F. Orifice with beaded rim and one oral spine. Scale bar = 50 μm .

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.450	0.684	0.450–0.684	0.585	0.100	6
Wz	0.324	0.396	0.324–0.396	0.360	0.025	6
Lo	0.090	0.126	0.090–0.126	0.111	0.014	6
Wo	0.090	0.108	0.090–0.108	0.099	0.010	6
Lav1	0.162	0.612	0.162–0.612	0.447	0.162	6
Wav1	0.108	0.144	0.108–0.144	0.129	0.014	6
Lav2	0.126	0.270	0.126–0.270	0.180	0.050	6
Wav2	0.054	0.144	0.054–0.144	0.081	0.034	6

Notes. Canu and Bassler (1928a) recorded *Parasmittina areolata* from Bahia (12°48'S, 38°W, 49 m depth), identifying the Brazilian material with a Hawaiian species they had described previously (Canu and Bassler, 1927a). Their figure (pl. 6, fig. 4) shows a specimen very similar to that in the *Hassler* material, but their measurements appear to have been taken from their original description. Soule and Soule (1973) describe and illustrate Hawaiian material of *P. areolata* and give measurements that correspond in zooid length and width with those of the original description by Canu and Bassler from Hawaii (mean Lz 0.806 mm, mean Wz 0.386 mm; Soule and Soule, 1973: 392, table 8). The Brazilian material we have described and named here as *Parasmittina simpulata* is smaller than *areolata* and differs from it also in its avicularian profile. Avicularia of *areolata* include a large spatulate avicularium, but the smaller avicularia are for the most part narrow and often paired, like those of *P. spathulata* (Smitt) rather than oval. Soule and Soule also described short triangular frontal avicularia found in the type specimen (USNM 8443), but they were smaller (mean Lav 0.120 mm [Soule and Soule, 1973: table 8] vs. 0.180 mm for those of *P. simpulata*) and almost median in position.

Parasmittina barbadensis Winston and Woollacott, 2009, is similar in having an orifice with a sparsely beaded rim and condyles with ruffled edges, as well as both oval and triangular avicularia, but it does not

have (at least in the limited material from the *Hassler* collection) any giant spatulate avicularia. It is also larger in size (mean Lz 0.804 mm, Wz 0.510 mm; Winston and Woollacott, 2009: 262).

Distribution. Brazil: Bahia, Rio de Janeiro.

Specimens Examined. *Parasmittina simpulata*. Hassler Box 34, MCZ 137458. Off Cabo Frio, Rio de Janeiro state, Brazil.

Parasmittina loxoides New Species

Figure 40

Smittina trispinosa var. *loxa* Marcus, 1939: 144, pl. 10, fig. 16. NOT *Smittina trispinosa* var. *loxa* Marcus, 1937b: 225, figs. 23C, 24.

Holotype. *Parasmittina loxoides*. Hassler Box 34, MCZ 137459. On stub with *Celleporaria mordax* and *Nellia oculata*. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name *loxoides*, *loxa*-like, refers to its misidentification of the specimens from Brazil with *Parasmittina loxa*, described from St. Helena.

Description. Colony encrusting, multi-laminar. Zooids subrectangular to polygonal. Frontal calcification rugose, with pebbled to rippled texture, with large areolae inside zooid margins. Orifice round in outline with a very shallow flat-topped lyrula and two downward-facing condyles, distal rim smooth, not beaded. Triangular lateral to proximolaterally directed avicularia occur on the frontal shield adjacent to ooecia and in the vicinity of the peristome; small oval avicularium may be present at the lateral or proximal margins of the zooids. Large spatulate avicularia rarely present, positioned lateral to the orifice, distally directed. Peristome round in outline even when ooecia present, not developing a secondary sinus. Ooecia with same rugose calcification on distal and lateral rims, with a round central porous inner area.

Diagnosis. *Parasmittina* with large areolae, orifice with very shallow flat-topped lyrula, downward-facing condyles, small

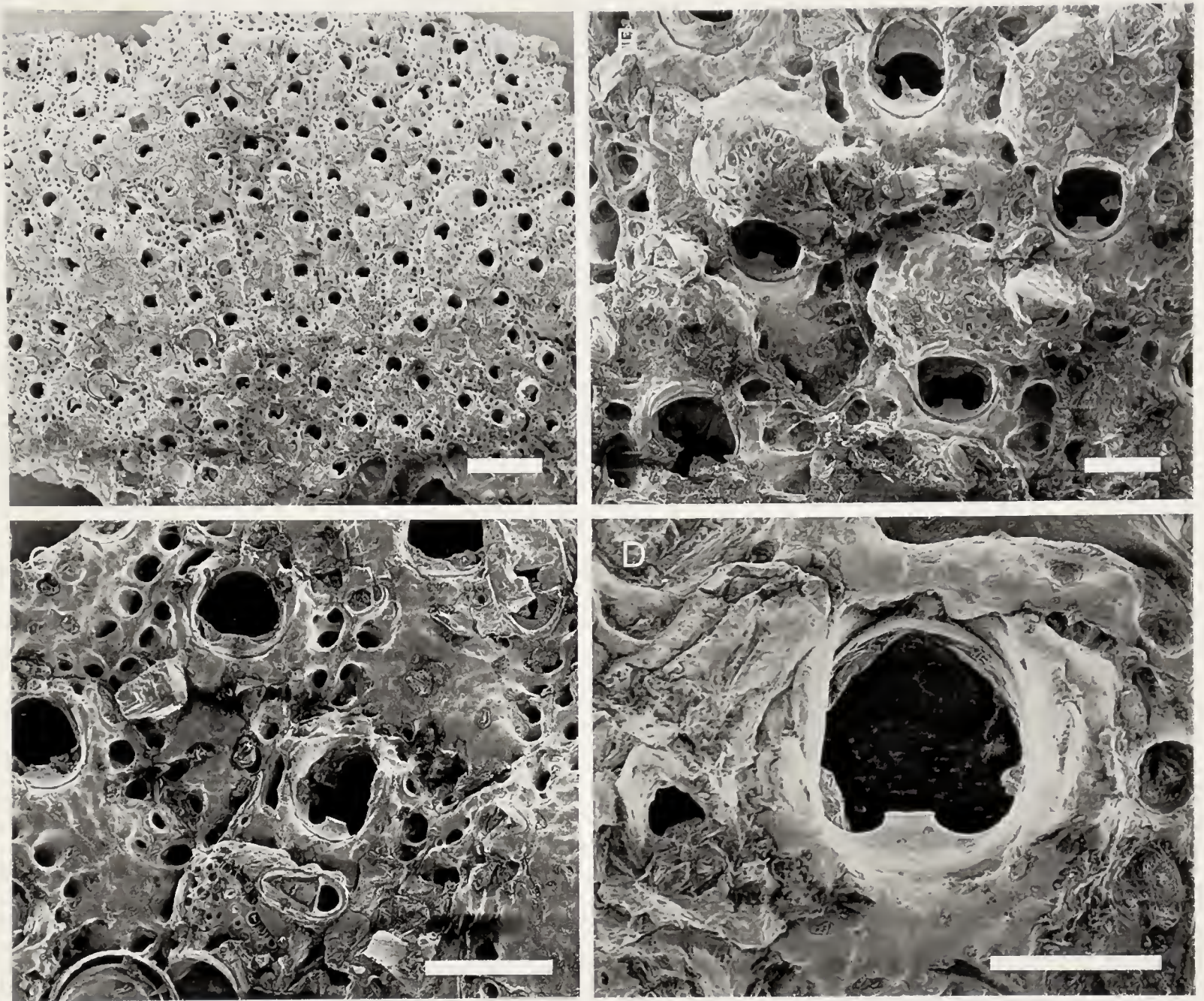


Figure 40. *Parasmittina loxoides*. Hassler Box 34, MCZ 137459. A. Portion of multilayered encrusting colony. Scale bar = 500 μ m. B. Zooids with oecia and triangular avicularia. Scale bar = 100 μ m. C. Group of zooids. One with oecium. Scale bar = 200 μ m. D. Primary orifice with small lyrula and no beaded rim. Scale bar = 100 μ m.

triangular avicularia, and distally directed giant spatulate avicularia (see Fig. 40C; zooid at right top).

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.306	0.396	0.306–0.396	0.360	0.038	6
Wz	0.216	0.270	0.216–0.270	0.240	0.019	6
Lo	0.081	0.099	0.081–0.099	0.090	0.006	6
Wo	0.090	0.108	0.090–0.108	0.096	0.009	6
Lov	0.162	0.198	0.162–0.198	0.180	0.011	6
Wov	0.234	0.270	0.234–0.270	0.246	0.019	6
Lav	0.108	0.126	0.108–0.126	0.113	0.009	4
Wav	0.054	0.054	0.054–0.054	0.054	0.000	4

Notes. The balsam slide specimens found in the Marcus collection are badly pre-

served, and the holotype specimen from Santa Helena (Marcus 1937b) has been destroyed; thus, it is not possible to recognize the morphological characteristics of *Parasmittina loxa* (Marcus) to compare with Brazilian specimens. Marcus (1939) distinguished the Brazilian specimens as having more avicularia (up to 4 per zooid) and, in the presence of large avicularia, obliquely distally directed.

Distribution. Brazil: São Paulo, Rio de Janeiro.

Specimens Examined. *Parasmittina loxoides*. Hassler Box 34, MCZ 137459. On stub with *Celleporaria mordax* and *Nellia oculata*. Off Cabo Frio, Rio de Janeiro state,

Brazil. *Parasmittina loxa*. *Holotype*: Hassler Box 34, MZUSP (slide specimen), *Smittina trispinosa* var. *loxa*, Marcus det., Santa Helena.

Superfamily Schizoporelloidea Jullien, 1882

Family Schizoporellidae Jullien, 1883

Genus *Stylopoma* Levinsen, 1909

Stylopoma auranticum Canu and Bassler, 1928

Figure 41

Stylopoma auranticum Canu and Bassler, 1928a: 78, pl. 4, figs. 3, 4; Vieira et al., 2008: 28.

Description. Colony encrusting, becoming multilayered by frontal budding. Zooids are rectangular to irregularly polygonal and small relative to orifice size. Frontal shield with porous rough-textured, slightly ribbed calcification, which develops into a raised umbo in the center of the zooid. The orifice usually positioned at one side of the distal end of the zooid and angled to allow room for a small frontal avicularium. In zooids that lack frontal avicularia, the orifice may have a more central position. Orifice keyhole shaped, smooth-rimmed, the anter is semicircular, and is divided from a funnel-shaped poster by comma-shaped condyles, smooth and rounded at the tips. The peristome is very low and decorated with only a few tubercles. Frontal avicularia are rounded proximally, triangular distally, and lie flat against the frontal shield surface. No interzoecial avicularia were present in this material, and none were mentioned by Canu and Bassler in their original description. The ooecium is very large, globular, and rough textured, covering parts of several zooids. It has a granular, porous calcification similar to that of autozooids, with ribs between the marginal pores. The ooecium opens on the side; its opening is a blunt-edged triangle, guarded by almost touching, crab claw-like extensions from either side of the base of the opening. There are no avicularia on the ooecia.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.450	0.540	0.450–0.540	0.501	0.035	6
Wz	0.360	0.504	0.360–0.504	0.423	0.051	6
Lo	0.117	0.126	0.117–0.126	0.120	0.005	6
Wo	0.126	0.135	0.126–0.135	0.128	0.004	6
Lov	0.540	0.630	0.540–0.630	0.581	0.037	4
Wov	0.576	0.720	0.576–0.720	0.648	0.061	4

Notes. This species has not been reported from Brazil since its original description, but the distinctive orifice shape and ooecium morphology, particularly the triangular side opening of the ooecium with its “crab claws,” can be seen clearly in Canu and Bassler’s illustrations.

Distribution. Brazil: Pernambuco, Bahia.

Specimens Examined. *Stylopoma auranticum*. Hassler Box 17, MCZ 137460. North of Salvador, Bahia state, Brazil. Cotypes, USNM 8550, *Stylopoma aurantiacum*, off Recife, Pernambuco, Brazil.

Stylopoma carioca New Species

Figure 42

Holotype. *Stylopoma carioca*. Hassler Box 32, MCZ 137461. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. Carioca, the name for a native or inhabitant of the city of Rio de Janeiro. Used here as a noun in apposition, the Carioca *Stylopoma*.

Description. Colony encrusting, becoming multilayered by frontal budding. Zooids are rectangular to irregularly polygonal. Frontal shield with porous rough-textured, ribbed calcification that develops into a raised nonporous umbo in the center of the zooid. The orifice is usually positioned centrally at the distal end of the zooid. Orifice longer than wide and smooth rimmed; the anter is semicircular and is divided from a poster by tablike condyles, smooth and rounded at the tips; poster with a small funnel-shaped median sinus. The peristome is very low and rough-textured. Frontal avicularia are rounded proximally, triangular distally, and lie flat against the frontal shield surface. A broken interzoecial avicularium

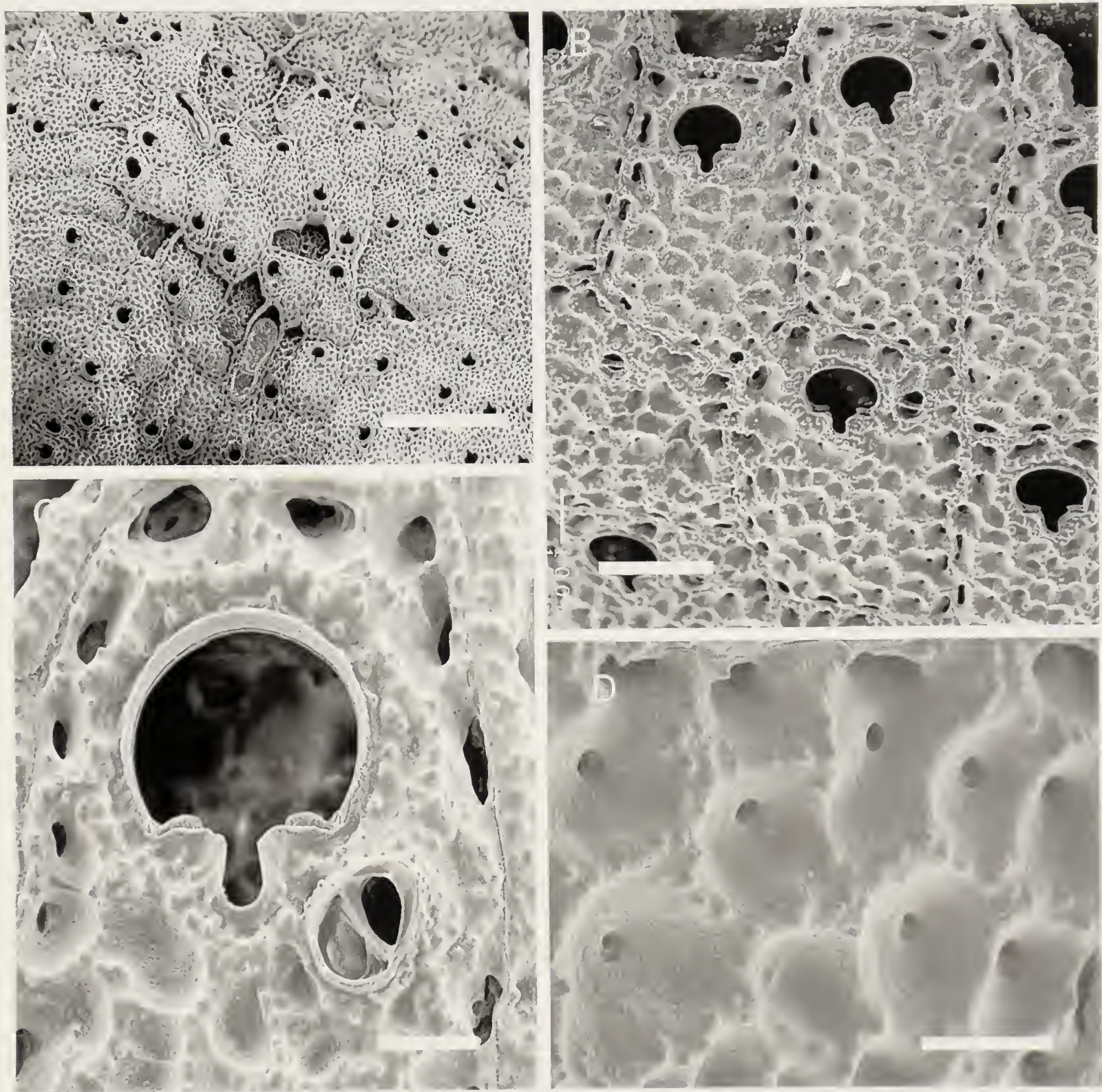


Figure 41. *Stylopoma aurantiacum*. STY32B. MCZ 137460. A. Frontally budded area of colony with two large spatulate avicularia. Scale bar = 1,000 μm . B. Group of autozooids. Scale bar = 200 μm . C. Autozoid orifice showing condyles and position of frontal avicularium. Scale bar = 50 μm . D. Frontal surface rounded tubercles with small depressed pores. Scale bar = 50 μm .

was present in this material, autozoid sized. The oocidium is autozoid sized, flattened, and rough-textured; it has a granular, porous calcification similar to that of autozooids, with ribs between the marginal pores. The oocidium opens on the side; its opening is rounded, guarded by asymmetrical, almost touching, crab claw-like extensions from

either side of the base of the opening. There are no avicularia on the oocidia.

Diagnosis. *Stylopoma* with porous rough-textured, ribbed calcification, which develops into a raised nonporous umbo in the center of the zoid, D-shaped orifice with small tab-like condyles rounded at the tips, and posterior with a small funnel-shaped median sinus.

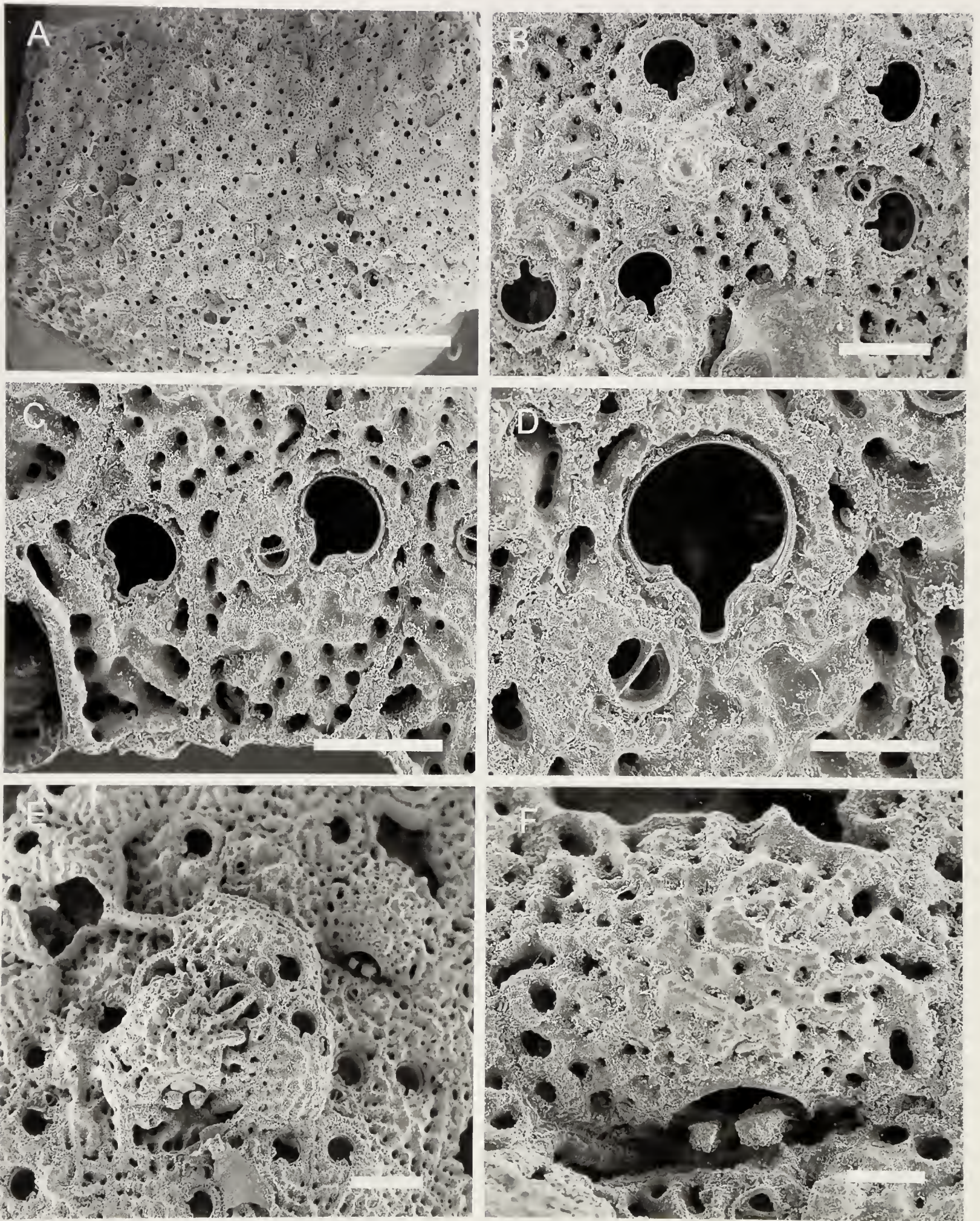


Figure 42. *Stylopoma carioca*. STYLO. Hassler Box 32, MCZ 137461. A. Overview of multilaminar colony with several large oecia visible. Scale bar = 2,000 μm . B. Group of autozooids, note central tubercles. Scale bar = 200 μm . C. Two autozooids. Scale bar = 200 μm . D. Close-up of orifice with wine-glass shaped sinus. Scale bar = 100 μm . E. Oecia and zooids. Scale bar = 300 μm . F. Broadly oval oecia with crab claw extensions blocking opening. Scale bar = 100 μm .

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.540	0.810	0.540–0.810	0.666	0.102	6
Wz	0.342	0.540	0.342–0.540	0.450	0.078	6
Lo	0.144	0.180	0.144–0.180	0.155	0.014	6
Wo	0.144	0.162	0.144–0.162	0.150	0.009	6
Lov	0.630	0.702	0.630–0.702	0.672	0.034	6
Wov	0.630	0.864	0.630–0.864	0.762	0.078	6
Lav	0.324	0.468	0.324–0.468	0.378	0.056	6
Wav	0.108	0.180	0.108–0.180	0.156	0.025	6

Notes. This species differs from other *Stylopoma* species in orifice shape, with small tablike condyles (rounded at the tips) and in having a poster with a small funnel-shaped median sinus.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Stylopoma carioca*. Hassler Box 32, MCZ 137461. Off Cabo Frio, Rio de Janeiro state, Brazil.

Stylopoma rotundum New Species

Figure 43

Holotype. *Stylopoma rotundum*. Hassler Box 32, MCZ 137462. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species is given the name *rotundum*, the neuter form of the Latin adjective *rotundus*, round, circular, for the shape of the suboral avicularia.

Description. Colony encrusting to tubular, and multilayered. Zooids rectangular to polygonal. Their relatively flat frontal surface is covered by a porous, granular, pustulose calcification, the round pores sunken between the beaded edges of the tubercles (Fig. 43E) and sometimes much smaller pores at tubercle peaks. Orifices are placed on the side of the distal edges of zooids at varying angles to the direction of growth of the colony. The orifice is semicircular anteriorly, with a granular rim. It has thick condyles ending in blunt down-curved hooks and a long, round bottomed, teardrop-shaped sinus. It is surrounded by a low-beaded peristome. Many of the zooids have short, rounded frontal avicularia with a rostrum raised at a steep angle from the frontal

surface; they are placed below and beside the orifice and oriented in variable directions. There are also scattered, spatulate avicularia, larger, but variable in size; they are found especially in the vicinity of ooecia. The ooecia are very large and globular, transversely oval from above, with calcification similar to that of the frontal, but with a ribbed appearance and the addition of more tiny pores on the summits of the tubercles. The opening is on the side and is semicircular; like the last species, the base of the opening is almost closed by thick, rough-textured, clawlike extensions from either side of the opening.

Diagnosis. *Stylopoma* with frontal surface of zooids covered by porous and granular calcification, a semicircular orifice with thick condyles ending with blunt down-curved hooks, and teardrop-shaped sinus. *Stylopoma rotundum* is distinct from other species reported in Brazil in having small rounded frontal avicularia placed below and beside the orifice.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.612	0.756	0.612–0.756	0.684	0.057	6
Wz	0.324	0.450	0.324–0.450	0.399	0.050	6
Lo	0.126	0.144	0.126–0.144	0.137	0.009	6
Wo	0.108	0.135	0.108–0.135	0.122	0.009	6
Lav	0.324	0.522	0.324–0.522	0.405	0.084	6
Wav	0.144	0.270	0.144–0.270	0.212	0.052	6

Notes. This species differs from *Stylopoma auranticum* in zooid calcification, orifice shape, ooecium shape, the shape of the orifice opening, the morphology and position of the frontal avicularia, and the presence of spatulate as well as frontal avicularia. *Stylopoma rotundum* is distinct from *Stylopoma spongites* (Pallas) in having rounded frontal avicularia placed below and beside the orifice rather than equilaterally triangular (Tilbrook, 2001) and in the clawlike obstructions to the opening of the ooecia.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Stylopoma rotundum*. Hassler Box 32, MCZ 137462. Off Cabo Frio, Rio de Janeiro state, Brazil.

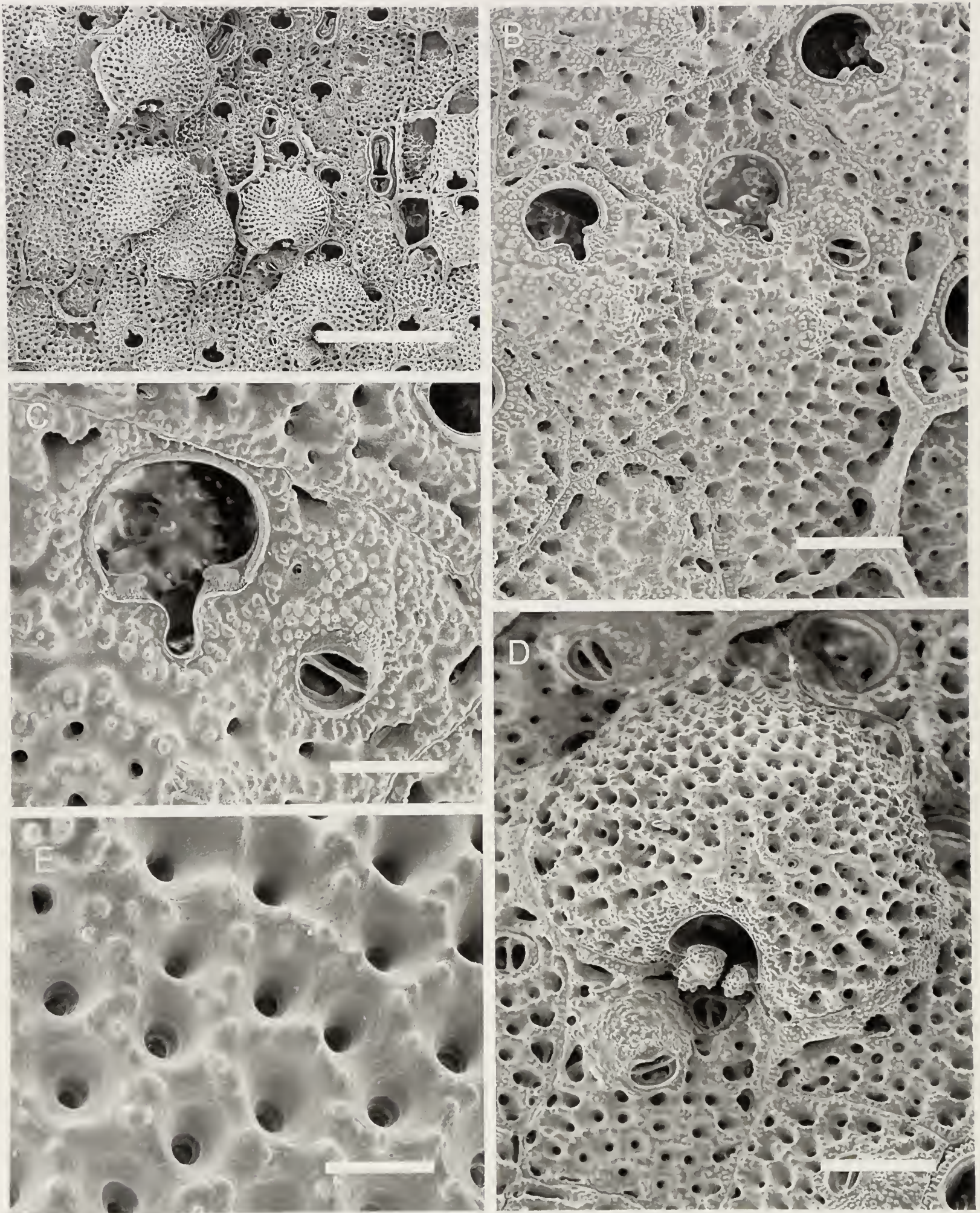


Figure 43. *Stylopoma rotundum*. STY32A. MCZ 137462. A. Group of zooids, oecia, and footprint-shaped spatulate avicularia. Scale bar = 1 000 μ m. B. Group of autozooids. Scale bar = 200 μ m. C. Distal end of zooid showing orifice and condyles and position triangular frontal avicularia. Scale bar = 100 μ m. D. Oecium with crab claw extensions and raised suboral avicularium. Scale bar = 200 μ m. E. Raised beaded surface texture of frontal shield ringed depressed pores. Scale bar = 50 μ m.

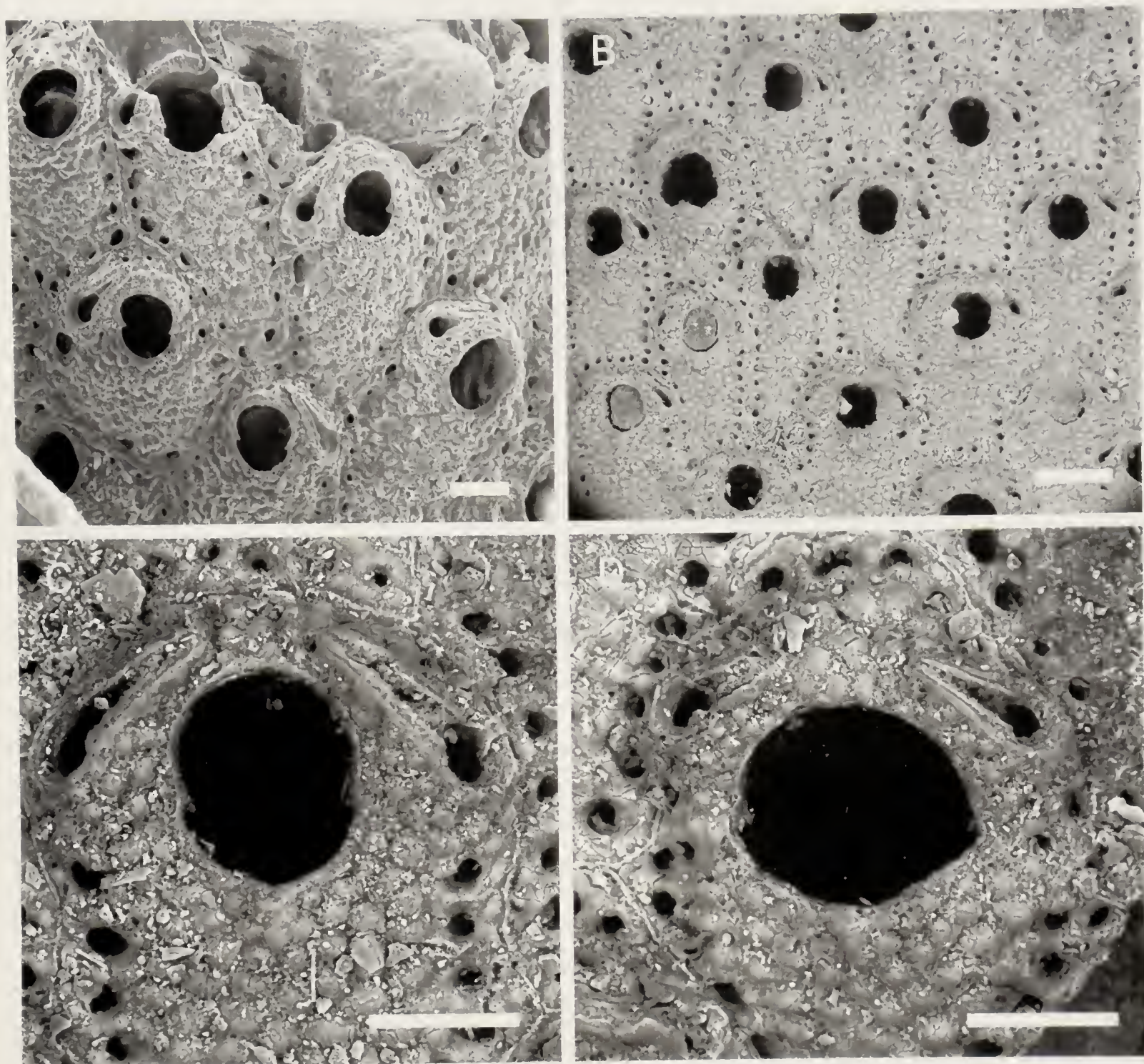


Figure 44. *Hippaliosina imperfecta*. A. Hassler Box 28, MCZ 137463. B–D. NMNH 8563, *Gephyrophora imperfecta*, type material of Canu and Bassler, SEM images. A. Autozooids at edge of colony. Scale bar = 100 μ m. B. Group of autozooids and female zooid. Scale bar = 200 μ m. C. Distal end of autozooid showing orifice and avicularia. Scale bar = 100 μ m. D. Maternal zooid orifice and avicularia. Scale bar = 100 μ m.

Family Hippaliosinidae Winston, 2005

Genus *Hippaliosina* Canu, 1918

Hippaliosina imperfecta (Canu and Bassler, 1928)

Figure 44

Gephyrophora imperfecta Canu and Bassler, 1928a: 86, pl. 7, fig. 1.

Hippaliosina imperfecta: Marcus, 1949: 26, pl. 7, fig. 40; 1955: 306, figs. 78–79; Vieira *et al.*, 2008: 29.

Description. Colony encrusting. Zooids rounded hexagonal to polygonal in shape, with thickly granular frontal shield calcification and a row of large marginal pores. Elongate avicularia with round base and spear-shaped rostra are found beside the orifice and oriented distolaterally; they are usually single but occasionally paired. Orifices dimorphic, those of autozooids are figure 8-shaped with an anter and poster almost equal in size, condyles down-curved, poster U- to slightly V-shaped. Orifices of

maternal zooids (not found in single small Hassler fragment) are broader and shallower. Brooding takes place in these zooids, which are also wider than autozooids, but otherwise similar to them.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.396	0.504	0.396–0.504	0.468	0.041	6
Wz	0.270	0.324	0.270–0.324	0.285	0.024	6
Lo	0.099	0.117	0.099–0.117	0.108	0.006	6
Wo	0.072	0.108	0.072–0.108	0.093	0.012	6
Lav	0.108	0.144	0.108–0.144	0.126	0.018	5
Wav	0.036	0.054	0.036–0.054	0.045	0.009	5

Notes. *Hippaliosina rostrigera* and *H. imperfecta* are very similar in morphology; the clearest distinction is in the position of the avicularia, which begin above the orifice in *rostrigera* and beside the orifice in *imperfecta*. In both species the orientation of the avicularia is similar, but the rostra of *H. rostrigera* often curve slightly. There are also differences in orifice size, about 0.108 mm long in *H. rostrigera* vs. 0.15 mm long in *H. imperfecta* (Winston, 2005).

Canu and Bassler (1928a) originally described the species under *Gephyrophora*; Marcus (1949) explained why this placement was not appropriate and transferred the species to *Hippaliosina* along with *Hippaliosina rostrigera* (Smitt, 1873), further discussing the differences in 1955. The genus now contains 17 living and fossil species.

Distribution. Brazil: Bahia, Espírito Santo, Rio de Janeiro.

Specimens Examined. *Hippaliosina imperfecta*. Hassler Box 28, MCZ 137463. Colony under *Nevianipora* colony base. Off Cabo Frio, Rio de Janeiro state, Brazil. *Holotype*: NMNH 8563, *Gephyrophora imperfecta*, Canu and Bassler col., 'Rathbun' station 356, 1876, Todos os Santos Bay, Salvador, Bahia. MZUSP (uncatalogued, IO/USP 73), *Hippaliosina imperfecta*, E. Marcus det., no locality in label but supposedly Espírito Santo (Marcus 1949, 1955). MZUSP (balsam slide n. 625),

Hippaliosina imperfecta, E. Marcus det., Espírito Santo, Brazil, 35 m.

Family Marcusadoreidae **New Family**

Diagnosis. Colony encrusting, uni- to multiserial, sometimes with tubular branches. Autozooids large, frontal shield convex, irregularly perforated by pseudopores and with large marginal areolar pores. Primary orifice with condyles, without spines, lyrula, or sinus. Peristome well-developed around the orifice, sometimes with peristomial avicularium. Ooecia prominent, with calcified entoecium and ectoecium, with aperture opening inside peristome and not closed by operculum.

Notes. Vieira et al. (2010b) erected the genus *Marcusadorea* to include three species of Schizoporelloidea, but with family unplaced. The genus has a peristome with suboral avicularium and a peristomial opening of the ooecium, like some Smittinidae Levinsen, 1909, and Bitectiporidae McGillivray, 1895, but with two calcified layers (ento- and ectoecium) like those of Schizoporellidae. The external appearance of ooecia is identical to *Saevitella* Bobies, 1956 (see Berning, 2012), but that genus differs in having the ooecium closed by the operculum (cleithral) rather than opening above the operculum (acleithral) as in *Marcusadorea*. Owing to these inconsistencies, we erect here a new family of Schizoporelloidea for *Marcusadorea* (for additional comments on the generic assignment see Vieira et al. [2010b]).

Type genus. *Marcusadorea* Vieira, Migotto, and Winston, 2010

Genus *Marcusadorea* Vieira, Migotto, and Winston, 2010

Marcusadorea corderoi (Marcus, 1949)

Figure 45

Coleopora corderoi Marcus, 1949: 18, figs. 23–25; Vieira et al., 2008: 30.

Marcusadorea corderoi Vieira et al., 2010b: 61, figs. 6–11.

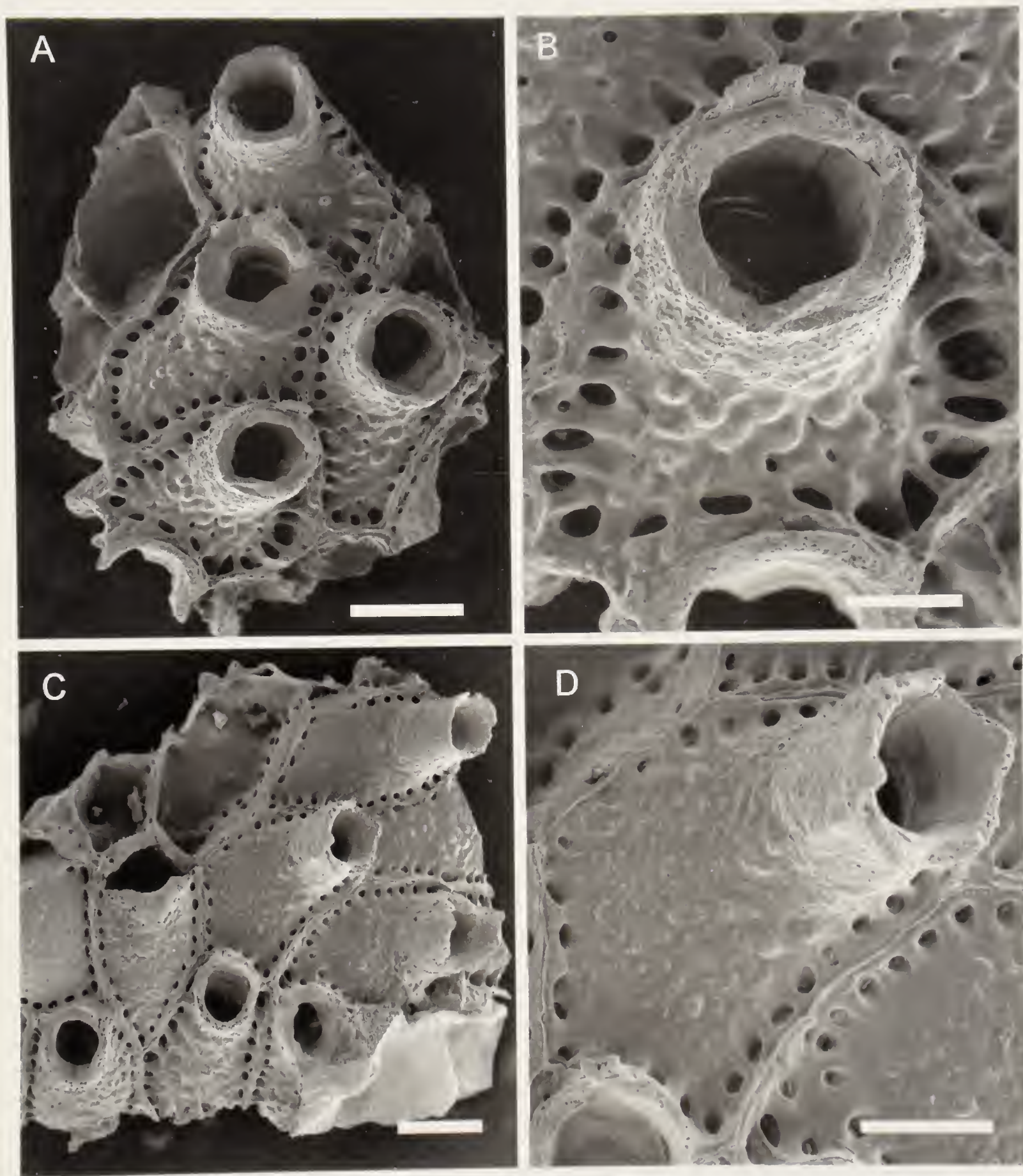


Figure 45. *Marcusadorea corderoi*. A, B. Specimen 1. C, D. Specimen 2. Hassler Box 33, MCZ 137438. Hassler Box 36, MCZ 137479. A. Colony fragment with thickened, abraded peristomes. Scale bar = 500 μ m. B. Close-up of mature, heavily calcified zooid. Scale bar = 200 μ m. C. Zooids near growing edge with longer more delicate peristomes. Scale bar = 500 μ m. D. Less calcified, younger zooid. Scale bar = 300 μ m.

Description. Colonies encrusting, unilaminar. Autozooids irregularly polygonal to rectangular, large, separated by raised lateral walls. Frontal shield convex, surface

granular with few small pores sometimes obscured in increasing calcification; large marginal areolar pores conspicuous. Primary orifice bell-shaped, wider proximally,

anter arched, U-shaped, separated from broad and shallow poster by barely projecting condyles. Orifice obscured by tubular peristome, entire; secondary orifice mostly rounded to oblong, with U- to V-shaped proximal edge. Suboral avicularia absent in *Hassler* colonies; they have a curved and cuspidate mandible, positioned laterally on inner side of peristome. Ooecia absent in *Hassler* colonies, but the type specimens have prominent ooecia, globular, with porous surface, opening inside the peristome.

Notes. *Marcusadorea corderoi* differs from *Marcusadorea tubulosa* (Canu and Bassler, 1928) in having larger zooids and a different shape of suboral avicularia. This species is also distinct in having zooids with an almost rounded secondary orifice at the end of the peristome in contrast to the incomplete U-shaped slit in *Marcusadorea jamaicensis* Vieira, Migotto and Winston, 2010, the broader proximal V-shaped to U-shaped gap in *M. tubulosa*, and the quadrangular to subtriangular one in *Marcusadorea efatensis*.

Distribution. Brazil: Rio de Janeiro, Espírito Santo.

Specimens Examined. *Marcusadorea corderoi*. Hassler Box 33, MCZ 137438. Hassler Box 36, MCZ 137479. Off Cabo Frio, Rio de Janeiro state, Brazil. *Holotype*: MZUSP (one colony split into slides n. 632.4 and two balsam slides n. 629), *Coleopora corderoi*, E. Marcus det., Espírito Santo, Brazil.

Family Microporellidae Hincks, 1879

Genus *Fenestrulina* Jullien, 1888

Fenestrulina constellata **New Species**

Figure 46

Holotype. *Fenestrulina constellata*. Hassler Box 45, MCZ 137464. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name is from the Latin adjective, *constellatus*, studded with stars, starry.

Description. Colony encrusting in a single layer. Zooids rounded, hexagonal, lateral margins distinct, frontal shield smoothly convex to the central ascopore, which is located at about the midpoint of the zooid.

The denticulate ascopore is a rounded heart shape, distal edges almost touching. The area immediately adjacent to the ascopore laterally and proximally is imperforate, but the margins of the frontal shield have two to three lines of star-shaped pores. At high magnification the pore structure consists of a wheellike ultrastructure with a calcified central circle, with a small pore at its center and irregular rays of calcification radiating to the edges of the pores. The semicircular orifice is smooth rimmed, with a single closely spaced row of similar pores distal and lateral to the rim and a cluster of pores between its proximal margin and the ascopore. There are no orificial spines. No ooecia occurred on this colony.

Diagnosis. *Fenestrulina* with larger zooids than *Fenestrulina ampla* Canu and Bassler, 1928, orifice without spines and with some star-shaped pores around it; ascopore in the shape of an almost complete circle, placed at the midpoint of the zooids.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.648	0.738	0.648–0.738	0.678	0.041	6
Wz	0.414	0.468	0.414–0.468	0.453	0.021	6
Lo	0.135	0.162	0.135–0.162	0.146	0.009	6
Wo	0.198	0.216	0.198–0.216	0.210	0.009	6
R-A	0.108	0.144	0.108–0.144	0.126	0.016	6

Notes. Only three species have previously been described from Brazil. Marcus's "*Fenestrulina malusii*" from Espírito Santo state, has four orificial spines and fewer pores (Marcus, 1955). The second species, *Fenestrulina ampla* Canu and Bassler, 1928, was originally described from off Rio de Janeiro by Canu and Bassler (1928a) (holotype USNM 8560) and was characterized by large zooids and a frontal shield with some large stellate pores. Further study by Vieira et al. (2010b), redescribed the species, characterizing the species by having a small crescentic ascopore slightly raised and placed slightly distal to the zooid midpoint, and a primary orifice with 3 oral spines in zooids without ooecia. In contrast *Fenestrulina constellata* lacks oral spines

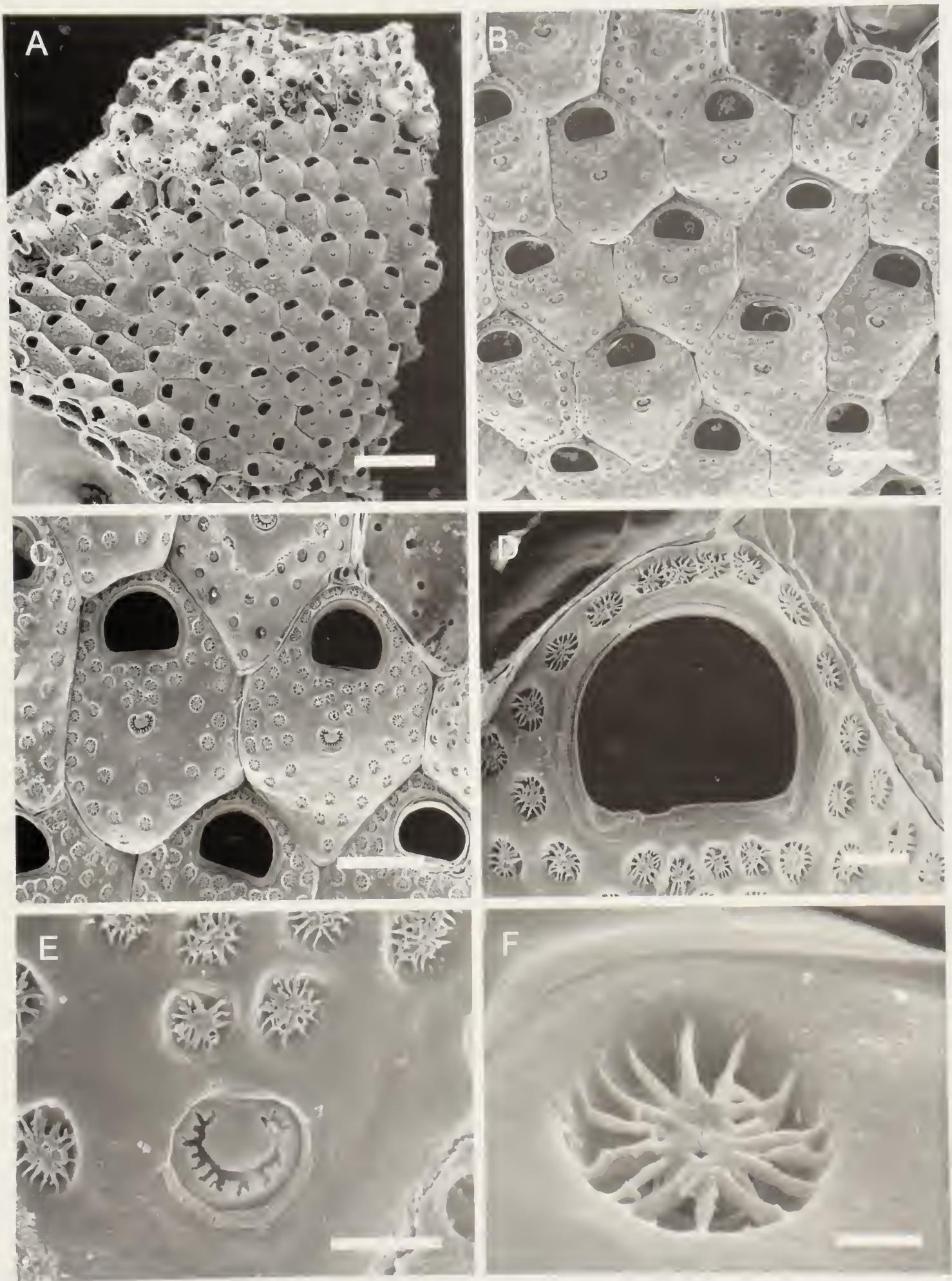


Figure 46. *Fenestulina constellata*. Hassler Box 45, MCZ 137464. A. Colony encrusting *Celleporaria*. Scale bar = 1,000 μm . B. Zooids near growing edge of colony. Scale bar = 300 μm . C. Two autozooids showing pattern of pores on frontal shields. Scale bar = 200 μm . D. Orifice shape. Scale bar = 50 μm . E. Ascopore. Scale bar = 50 μm . F. Close-up of calcified spokes of a pore. Scale bar = 10 μm .

and has an ascopore in the shape of an almost completely closed circle, placed at the midpoint of the zooid. In *F. ampla*, the denticulate crescent of the ascopore is enclosed in a complete circle. The recently described species, *Fenestrulina commensalis* Vieira and Stampar, 2014, differs from *F. constellata* in having a single oral spine, narrower orifice (0.154–0.172 mm wide), different shape of ascopore and presence of abfrontal zooidal surface with 1–2 pore chambers.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Fenestrulina constellata*. Hassler Box 45, MCZ 137464. Off Cabo Frio, Rio de Janeiro state, Brazil.

Family Lacernidae Jullien, 1888

Genus *Rogicka* Uttley and Bullivant, 1972

Rogicka joannae Vieira, Gordon, Souza and Haddad, 2010

Figure 47

Rogicka joannae Vieira et al., 2010a: 23, figs. 52–57.

Description. Colony encrusting, unilaminar. Autozooids irregularly polygonal to oval, convex, separated by deep grooves. Frontal shield raised more distally than proximally, with irregularly spaced cribellate pseudopores. Orifice D-shaped, rounded distally and with a shallow, broadly U-shaped sinus and conspicuous rectangular condyles. Three or four series of long distal spines. Avicularia absent. Ooecia globular, closed by maternal zooids, with some small cribellate pores.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.540	0.630	0.540–0.630	0.588	0.032	6
Wz	0.342	0.414	0.342–0.414	0.381	0.037	6
Lo	0.126	0.162	0.126–0.162	0.146	0.012	6
Wo	0.126	0.162	0.126–0.162	0.144	0.016	6
Lov	0.216	0.324	0.216–0.324	0.274	0.043	6
Wov	0.270	0.342	0.270–0.342	0.324	0.031	6

Notes. This species was recently described from the continental shelf off São

Paulo (Vieira et al., 2010a). It is distinct from *Rogicka scopae* (Canu and Bassler, 1928), also described from Brazil, in having cribellate pores, a shallow U-shaped sinus, and 3 or 4 series of spines.

Distribution. Brazil: Rio de Janeiro, São Paulo.

Specimens Examined. *Rogicka joannae*. Hassler Box 32, MCZ 137465. Off Cabo Frio, Rio de Janeiro state, Brazil. *Holotype*: MZUSP 0304 (gold-coated specimen), Brazil, project REVIZEE South SCORE, RV 'Prof. Wladimir Besnard', station 6678. *Paratypes*: MZUSP 0305, Brazil, project REVIZEE South SCORE, RV 'Prof. Wladimir Besnard', station 6678; MZUSP 0306–0307, station 6681. *Comparative material*: *Mastigophora scopae* Canu and Bassler, USNM 8573 (holotype specimen), Bahia, Brazil, 49 m.

Superfamily Celleporoidea Johnston, 1838

Family Celleporidae Johnston, 1838

Genus *Buffonellaria* Canu and Bassler, 1927b

Buffonellaria variavicularis **New Species**

Figure 48

Holotype. *Buffonellaria variavicularis*. Hassler Box 35, MCZ 137466. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name is a combination of the Latin adjective *varius*, different, with *avicularis*, provided with avicularia.

Description. Colony encrusting in one or more layers. Zooids oval to polygonal, frontally budded zooids more erect. Frontal shield consists of wavy, granular calcification, with small marginal pores and a few additional, small pores in the proximal part of the wall. Frontally budded zooids have an irregular orientation and secondary calcification may occlude marginal pores, making zooid boundaries hard to see. The orifice is smooth rimmed, with a slightly less than semicircular anter, two large, rounded condyles, and a deep rounded V-shaped posterior sinus. Avicularia are of several sizes and shapes. Large avicularia with spear-shaped, triangular rostra with

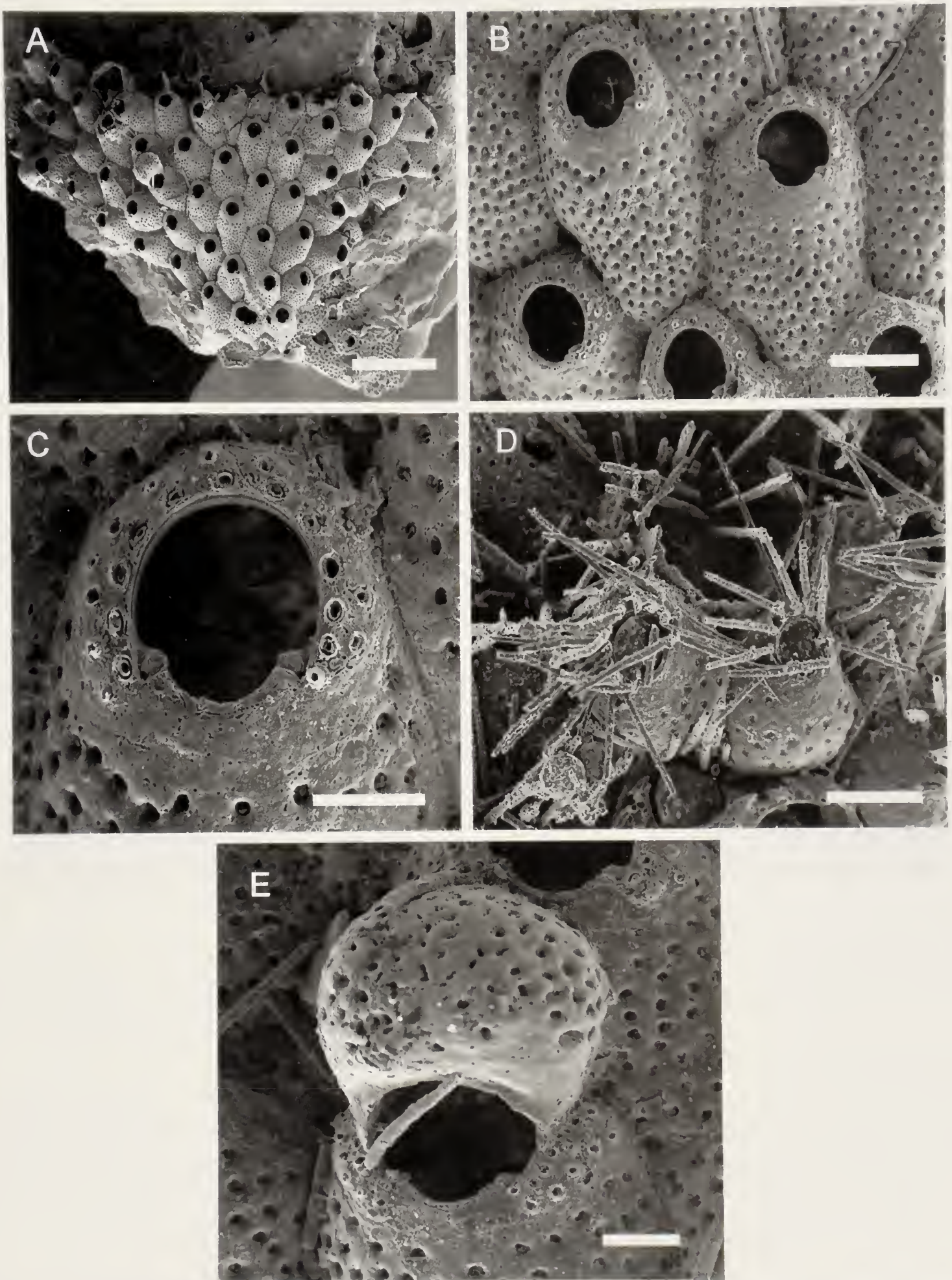


Figure 47. *Rogickae joannae*. Hassler Box 32, MCZ 137465. A. Encrusting colony. Scale bar = 1,000 μm . B. Group of autozooids with only spine bases remaining around orifice. Scale bar = 200 μm . C. Close-up of orifice. Scale bar = 100 μm . D. Zooids with intact orificial spines. Scale bar = 200 μm . E. Oocidium. Scale bar = 100 μm .

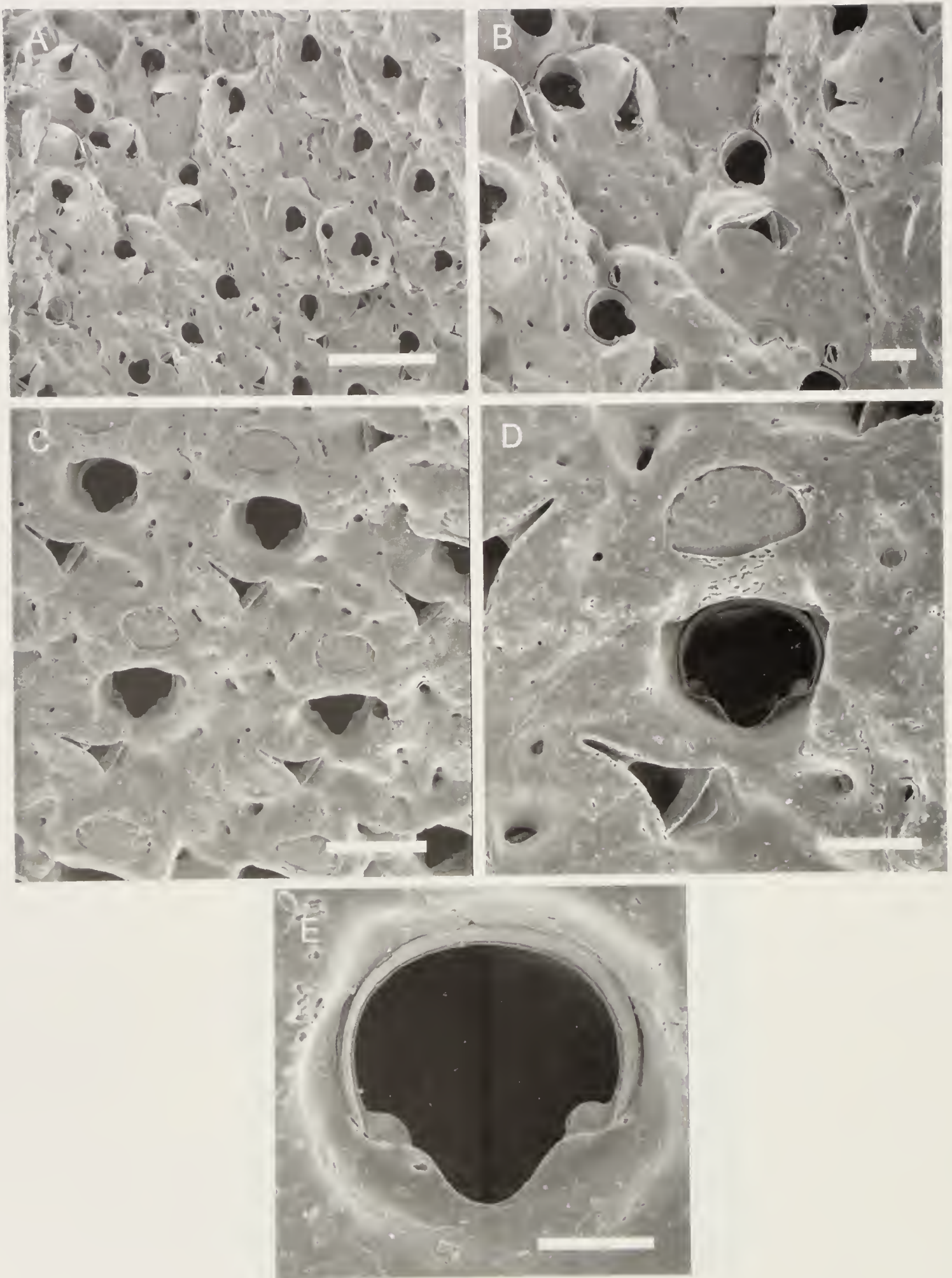


Figure 48. *Buffonellaria variavicularis*. Hassler Box 35, MCZ 137466. A. Part of the colony. Scale bar = 500 μ m. B. Autozooids with bulbous frontal avicularia. Scale bar = 100 μ m. C. Group of zooids with oecia. Scale bar = 200 μ m. D. Close-up of a zooid with an oecium. Scale bar = 100 μ m. E. Autozoid orifice. Scale bar = 50 μ m.

complete crossbars are raised on a large rounded umbo to one side and/or below the orifice; in the largest, this umbo takes up much of one side of the frontal shield. They are usually oriented distolaterally or laterally. Some zooids also have a smaller umbo on the other side of the orifice with a small, more oval avicularia with a serrated rostrum. In addition, some additional large triangular avicularia may occur between zooids, perhaps remaining from a budded-over layer of the colony. Ooecia are hemispherical, with the same heavy, wavy granular calcification, with a few marginal pores and a central oval to semicircular entoecial area with a radiating pattern of calcification. Ooecia open above and perpendicular to the zooid orifice.

Diagnosis. *Buffonellaria* with smooth-rimmed orifice, two large rounded condyles, deep rounded V-shaped sinus, and avicularia of several sizes and shapes: large spear-shaped avicularium with triangular rostrum on a large rounded umbo, and small and oval latero-oral avicularia.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.432	0.540	0.432–0.540	0.513	0.042	6
Wz	0.378	0.450	0.378–0.450	0.405	0.027	6
Lo	0.117	0.144	0.117–0.144	0.126	0.010	6
Wo	0.108	0.126	0.108–0.126	0.117	0.010	6
Lov	0.108	0.162	0.108–0.162	0.129	0.021	6
Wov	0.180	0.342	0.180–0.342	0.243	0.057	6
Lav	0.162	0.324	0.162–0.324	0.252	0.056	6

Notes. This is the first record of a *Buffonellaria* species from Brazil. The species is somewhat similar to *Buffonellaria ensifera* described by Winston and Woollacott (2009) from Barbados, but in that species the enlarged avicularium has a body that extends almost to the proximal end of the frontal shield of the autozooid bearing it.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Buffonellaria variavicularis*. Hassler Box 35, MCZ 137466. Off Cabo Frio, Rio de Janeiro state, Brazil.

Genus *Turbicellepora* Ryland, 1963

Turbicellepora brasiliensis New Species

Figure 49

Holotype. *Turbicellepora brasiliensis*. Hassler Box 19, MCZ 137467. North of Salvador, Bahia state, Brazil.

Etymology. The species name refers to the country where the species was found. Brasil (the Portuguese form of the name) is combined with the Latin location suffix *-ensis*, place where [something occurs].

Description. Colony encrusting. Zooids rectangular, proximal portion relatively flat, distal end raised in a wide peristome. Frontal shield calcification is faintly granular and imperforate except for sparse marginal pores. The orifice is hoof shaped, the anter semicircular, with pointed condyles dividing it from a slightly narrower and shallower U-shaped sinus. No oral spines. It is surrounded by a broad flat-rimmed peristome reaching almost to the lateral walls. Two oval avicularia are distally to distolaterally oriented and raised at an angle on rounded umbos on either side of the orifice. They have an almost complete crossbar with two pointed supports and a slightly pointed rostrum. No interzoocial avicularia. No ooecia present in the Hassler specimen.

Diagnosis. *Turbicellepora* with an orifice having a more deeply V-shaped poster than that of *Turbicellepora winstonae*, and with latero-oral avicularia not incorporated into the peristome.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.360	0.468	0.360–0.468	0.408	0.042	6
Wz	0.234	0.342	0.234–0.342	0.291	0.037	6
Lo	0.090	0.126	0.090–0.126	0.116	0.013	6
Wo	0.090	0.108	0.090–0.108	0.099	0.008	6

Notes. The Hassler specimen consists of a small, nonreproductive portion of a colony, but the autozooid characters are distinctive. It is similar in its morphology to another

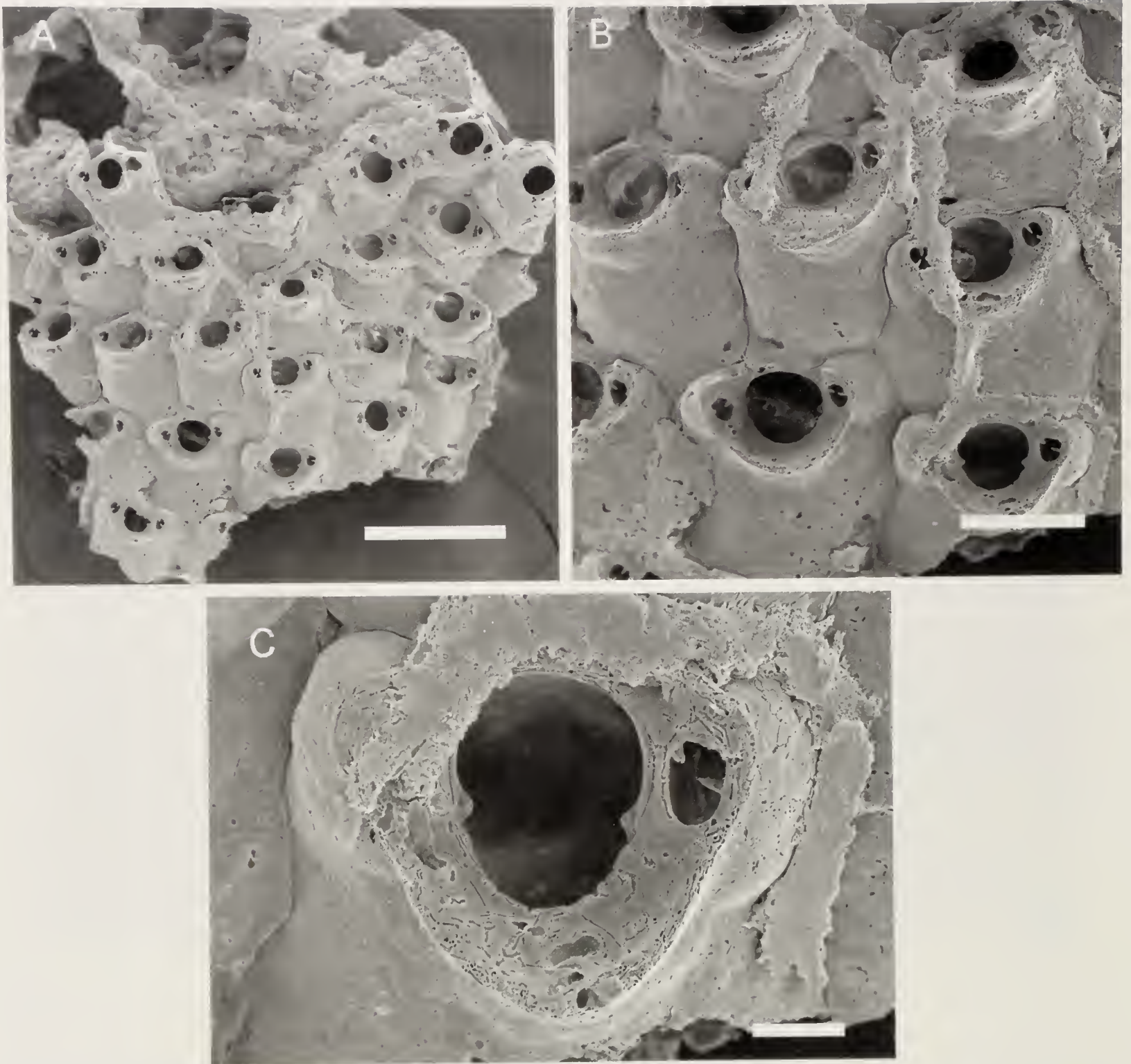


Figure 49. *Turbicellepora brasiliensis*. Hassler Box 19, MCZ 137467. A. Colony fragment. Scale bar = 500 µm. B. Group of autozooids. Scale bar = 200 µm. C. Autozoid orifice and peristomial avicularium. Scale bar = 50 µm.

Brazilian species, *Turbicellepora winstonae* Vieira et al. 2010a, from off Espírito Santo and Rio Grande do Sul states. However the orifice of that species has a more deeply V-shaped poster, and the lateral oral avicularia are not incorporated into a wide flat peristome as in *T. brasiliensis*.

Distribution. Brazil: Bahia.

Specimens Examined. *Turbicellepora brasiliensis*. Hassler Box 19, MCZ 137467. North of Salvador, Bahia state, Brazil.

Family Phidoloporidae Gabb and Horn, 1862
Genus *Fodinella* Tilbrook, Hayward and Gordon, 2001

***Fodinella atlantica* New Species**

Figure 50

Holotype. *Fodinella atlantica*. Hassler Box 19-5, MCZ 137468. North of Salvador, Bahia state, Brazil.

Etymology. The species is named *atlantica*, the feminine form of the Latin adjective

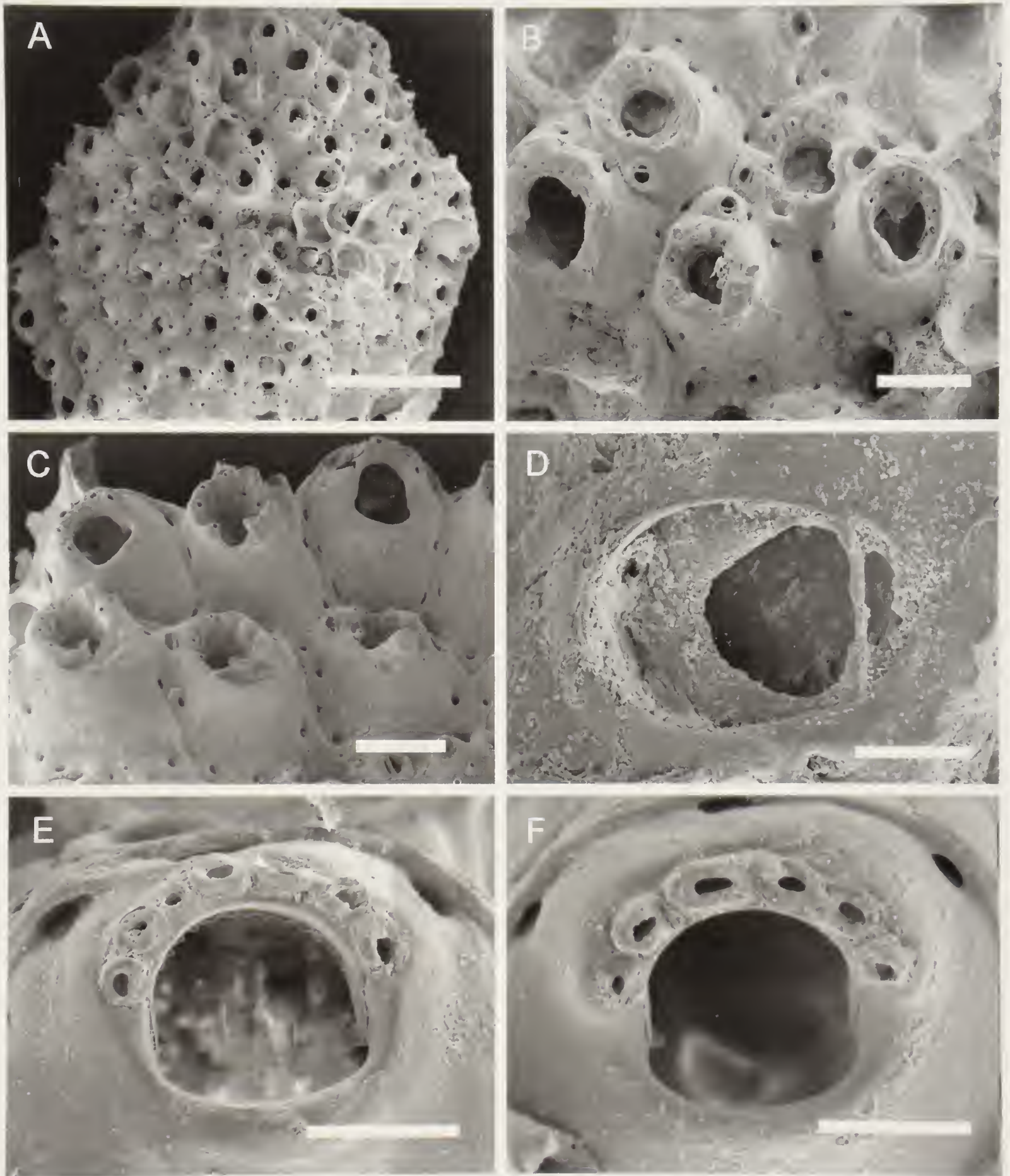


Figure 50. *Fodinella atlantica*. Hassler Box 19, MCZ 137468. A. View of nodular colony. Scale bar = 1,000 μm . B. Group of erect zooids. Scale bar = 200 μm . C. More elongate zooids at the growing edge. Scale bar = 200 μm . D. Close-up of avicularium. Scale bar = 50 μm . E. Zoid orifice, note beaded rim, seven spines. Scale bar = 100 μm . F. Another zoid orifice with six spines. Scale bar = 100 μm .

atlanticus, in recognition of the Atlantic Ocean locality where it was collected.

Description. Colony encrusting in a small spiky nodule. Zooids oval to polygonal,

erect, so that the tops of zooid peristomes project sharply from the colony surface. Frontal shield calcification is smooth and imperforate, except for a few large, marginal

pores. The primary orifice is bell-shaped; it has a straight-sided semicircular anter with a beaded rim, downturned rounded condyles, and a wider, very shallow U-shaped sinus. It is surrounded distally by six or seven tubular spines, which become embedded in the inner wall of the developing peristome. The peristome is denticulate proximally with a proximal sinus when fully developed. Small oval avicularia are positioned on the frontal shield outside the peristome. They have a complete crossbar and a rostrum with a reinforced shelf. No ooecia present in this material.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.378	0.468	0.378–0.468	0.417	0.033	6
Wz	0.288	0.360	0.288–0.360	0.324	0.030	6
Lo	0.117	0.135	0.117–0.135	0.126	0.006	6
Wo	0.108	0.117	0.108–0.117	0.111	0.005	6
Lav	0.090	0.216	0.090–0.216	0.150	0.045	6
Wav	0.072	0.144	0.072–0.144	0.105	0.026	6

Notes. This is the first record of the genus *Fodinella* in the Atlantic.

Distribution. Brazil: Bahia.

Specimens Examined. *Fodinella atlantica*. Hassler Box 19-5, MCZ 137468. North of Salvador, Bahia state, Brazil.

Genus *Plesioleidochasma* Soule, Soule and Chaney, 1991

Plesioleidochasma foliosum **New Species**
Figure 51

Holotype. *Plesioleidochasma foliosum*. Hassler Box 27, MCZ 137469. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name is taken from the neuter form of the Latin adjective *foliosus*, leafy, for its leaf-shaped avicularia.

Description. Colony encrusting and nodular. Zooids subrectangular to polygonal. Frontal shield texture smooth to pebbled, mostly imperforate, with only a few marginal pores, and on some zooids a central tubercle; in heavy calcification zooid outlines may not be clear. Orifice keyhole shaped, with a circular to oval anter,

rounded condyles, and a small rounded to arrow-shaped sinus. Frontal avicularia are leaf shaped, rounded basally, and with a curved triangular rostrum, embedded in frontal shield calcification below and adjacent to the orificial sinus, oriented laterally to slightly distolaterally. Avicularian reinforcement has an elaborate patterning. The three beads of the crossbar thicken and become part of the palate shelf on which the mandible rests and as calcification increases, only four uncalcified windows remain. No ooecia on the *Hassler* specimen.

Diagnosis. *Plesioleidochasma* with leaf-shaped frontal avicularia embedded in frontal shield calcification, with a deeper, narrower, and rounded keyhole-shaped orifice sinus than that of *P. cleidostomum*.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.342	0.432	0.342–0.432	0.375	0.040	6
Wz	0.288	0.396	0.288–0.396	0.345	0.046	6
Lo	0.108	0.144	0.108–0.144	0.129	0.012	6
Wo	0.090	0.108	0.090–0.108	0.104	0.008	6
Lav	0.117	0.144	0.117–0.144	0.128	0.009	6
Wav	0.063	0.090	0.063–0.090	0.077	0.011	6

Notes. Berning (2012) recently amended the generic diagnosis of the genus *Plesioleidochasma* and synonymized it with the genus *Schedocleidochasma* Soule, Soule and Chaney, 1991. This species is similar to the Florida and Brazilian *Plesioleidochasma cleidostomum* (Smitt, 1873), but in that species there are only 3 pores in the avicularian palate, and avicularia have rostra raised at an angle on an umbo, rather than paralleling the frontal wall. The deeper, narrower, rounded keyhole shape of the orifice sinus in the *Hassler* specimen also contrasts with the broad, shallow sinus of *P. cleidostomum*. *Plesioleidochasma porcellanum* (Busk, 1860) is quite distinct from *P. foliosum* in having a wider sinus and elongate-triangular avicularia with an uncalcified semicircular to triangular area (see Berning, 2012). Some specimens previously assigned to *P. por-*

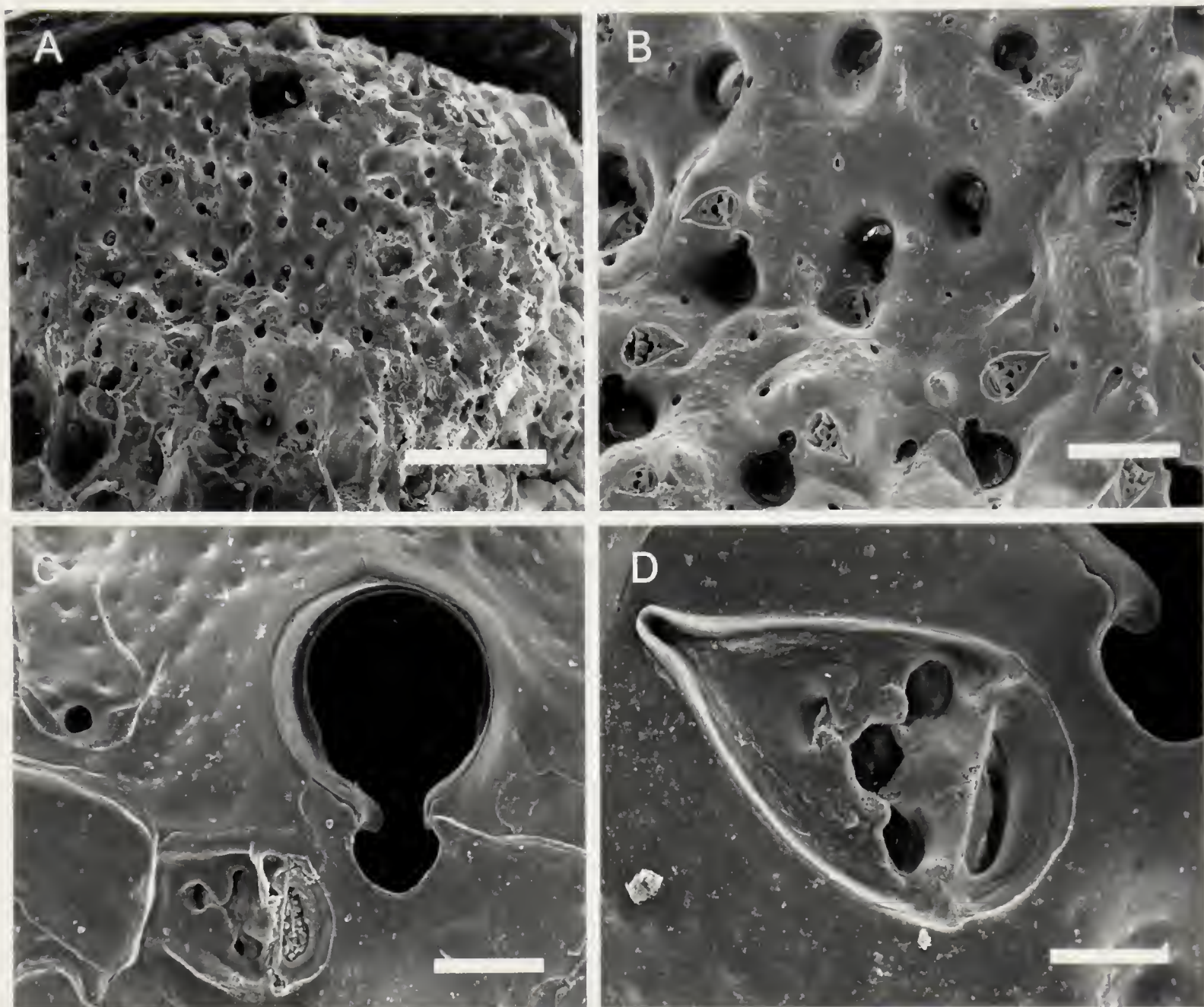


Figure 51. *Plesioleidochasma foliosum*. Hassler Box 27, MCZ 137469. A. Overview of colony. Scale bar = 1,000 μ m. B. Group of frontally budded zooids. Scale bar = 200 μ m. C. Close-up of orifice and avicularium. Scale bar = 50 μ m. D. Close-up of an avicularium. Scale bar = 30 μ m.

cellanum and *P. cleidostomum* from NE and SE Brazil (as *Schedocleidochasma*; see Vieira et al., 2008) are distinct from *P. foliosum* in having slender avicularia; these specimens may belong to an undescribed species.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Plesioleidochasma foliosum*. Hassler Box 27, MCZ 137469. Off Cabo Frio, Rio de Janeiro state, Brazil.

Family Phidoloporidae Gabb and Horn, 1862

Genus *Stephanollona* Duvergier, 1921

Stephanollona angusta Vieira, Gordon, Souza and Haddad, 2010

Figures 52, 53

Hippoporina contracta: Marcus, 1955: 298.

NOT *Lepralia contracta* Waters, 1899: 11, pl. 3, figs. 4–6.

Stephanollona angusta Vieira et al. 2010a: 35, figs. 83–86.

Description. Colony encrusting, uni- to multilaminar. Zooids irregularly polygonal to oval, with imperforate frontal shield and few marginal pores. Orifice rounded and beaded distally, with U-shaped sinus; two large downward-facing condyles reaching the sinus entrance. Six oral spines; fertile zooids with two distalmost spines obscured by oocidium. One or two latero-oral rounded

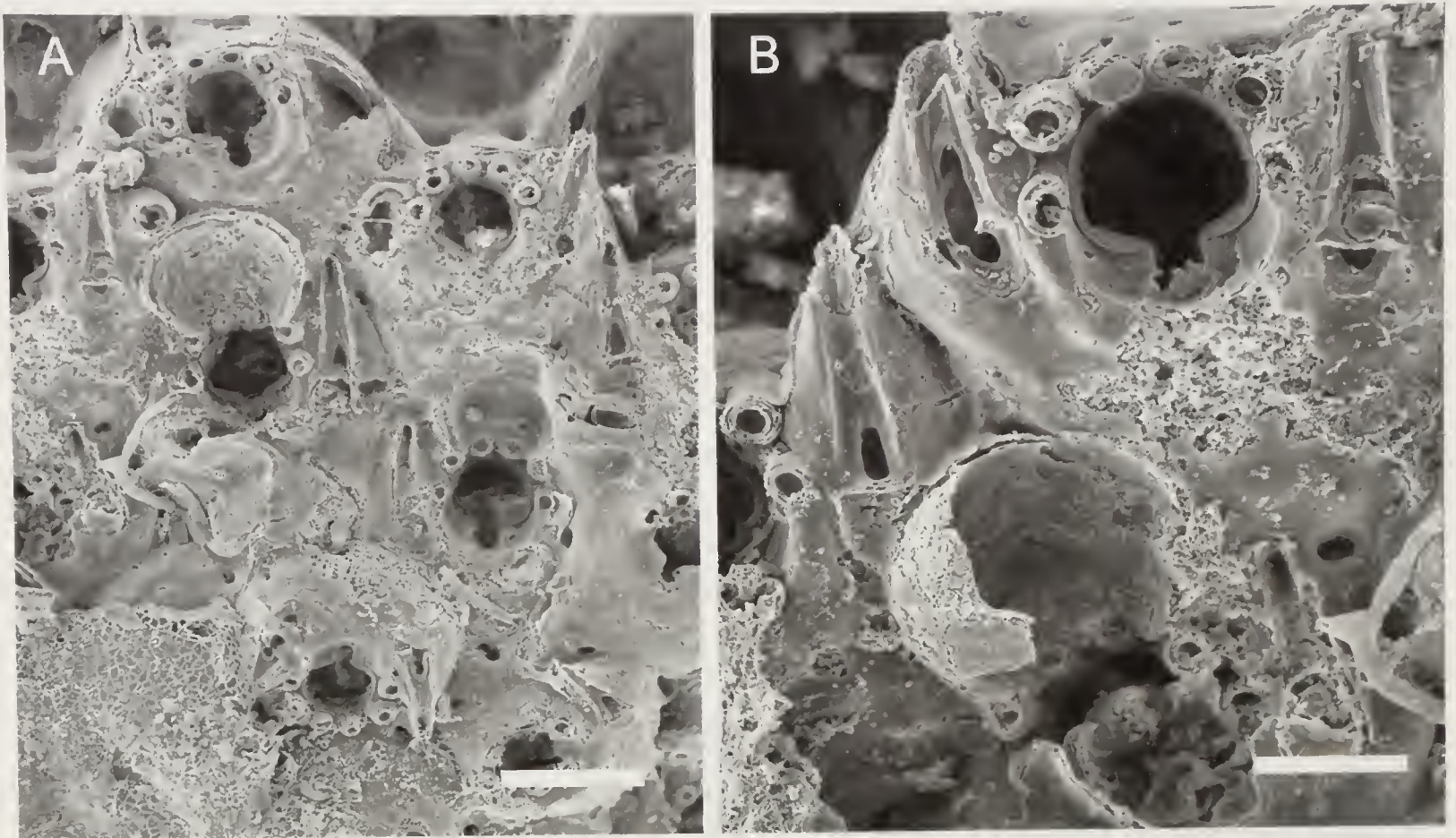


Figure 52. *Stephanollona angusta*. ES32. Hassler Box 32, MCZ 137480. A. Group of zooids with broken or developing oecia. Scale bar = 200 μ m. B. Autozooids with long narrow frontal avicularia. Scale bar = 100 μ m.

avicularia sometimes present. One or two elongate avicularia often present, tapering distally with rounded tip. Oecia subglobular, hyperstomial, smooth surfaced, with small frontal tabula.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.342	0.432	0.342–0.432	0.393	0.031	6
Wz	0.270	0.342	0.270–0.342	0.303	0.026	6
Lo	0.108	0.144	0.108–0.144	0.129	0.012	6
Wo	0.090	0.099	0.090–0.099	0.092	0.004	6
Lov	0.126	0.144	0.126–0.144	0.135	0.010	6
Wov	0.108	0.144	0.108–0.144	0.132	0.015	6
Lav	0.162	0.234	0.162–0.234	0.195	0.026	6
Wav	0.054	0.072	0.054–0.072	0.062	0.009	6

Notes. We have examined Marcus's *Hippoporina contracta* from Esp rito Santo, which is also morphologically similar to recently described *Stephanollona angusta* from Brazil. *Stephanollona asper* (Canu and Bassler, 1923), from NE Atlantic, has a

wider sinus and ligulate avicularia (see Winston, 2005: 113) compared with *S. angusta*; *Stephanollona propinqua* Winston and Woollacott, 2009, from Barbados, differs in the morphology of the orifice. *Stephanollona angusta* differs from *Stephanollona arborescens* Vieira et al., 2010a, in the shape and size of the autozooids, the shape of the orificial condyles and sinus, and the shape and disposition of the avicularia. As a mature colony, *S. arborescens* is also erect with a granular–tubercular surface. The Brazilian species *Stephanollona robustaspinosa* Ramalho, Muricy and Taylor, 2011, is distinct in having oecia with a wide membranous frontal area (Ramalho et al., 2011).

Distribution. Brazil: Rio de Janeiro, S o Paulo.

Specimens Examined. *Stephanollona angusta*. Hassler Box 45, MCZ 137470. Off Cabo Frio, Rio de Janeiro state, Brazil. *Holotype*: MZUSP 0341, Brazil, project REVIZEE South SCORE, RV 'Prof. Vladimir Besnard', station 6678. *Paratypes*:

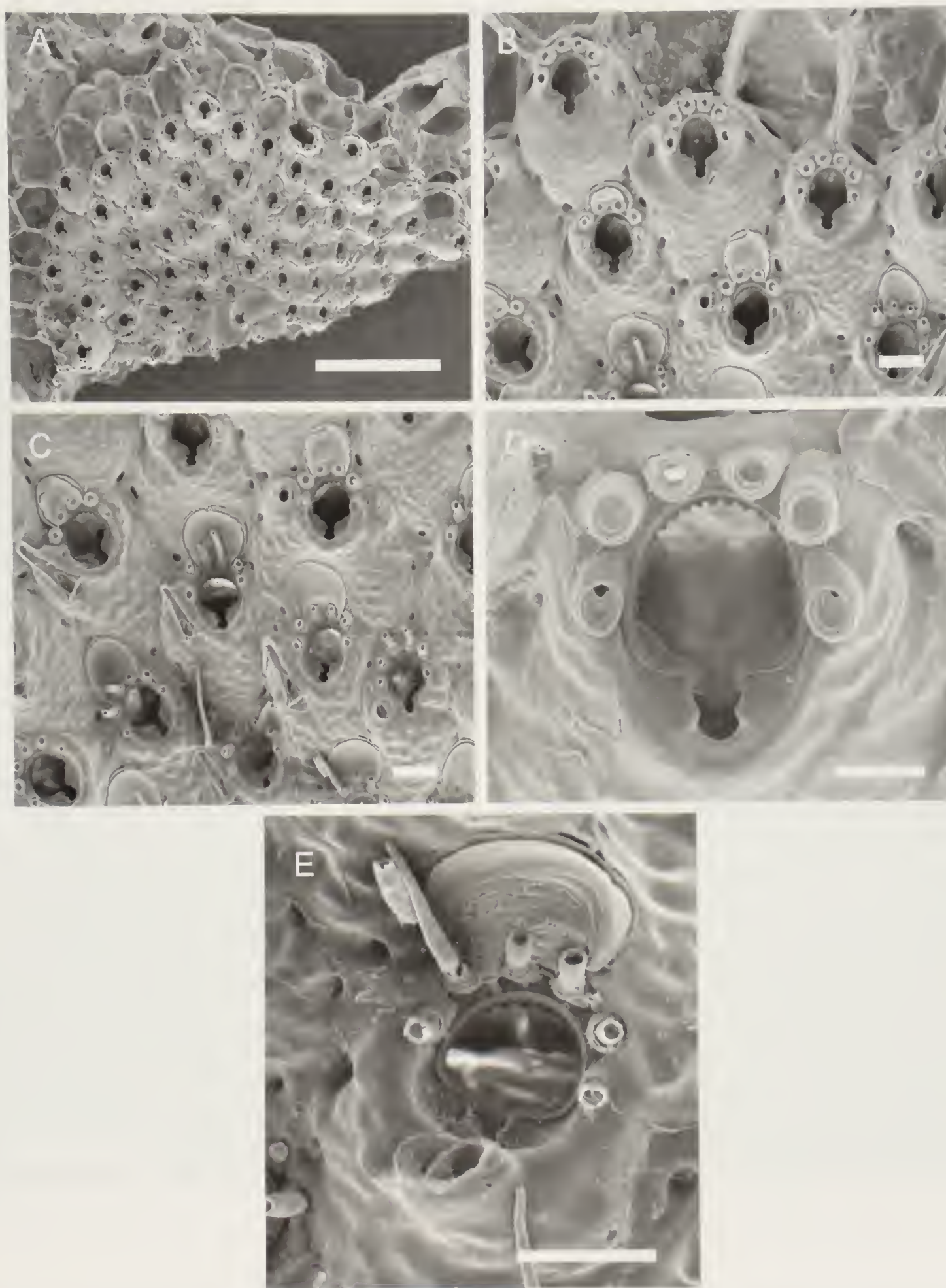


Figure 53. *Stephanollona angusta*. Hassler Box 45, MCZ 137470. A. View of encrusting colony. Scale bar = 1,000 μ m. B. Zooids at growing edge with ooecium plates developing. Scale bar = 100 μ m. C. Group of zooids showing large narrow avicularia. Scale bar = 100 μ m. D. Orifice. Six spines, beaded distal rim, deep sinus. Scale bar = 50 μ m. E. Zooids with small raised suboral avicularia. Scale bar = 100 μ m.

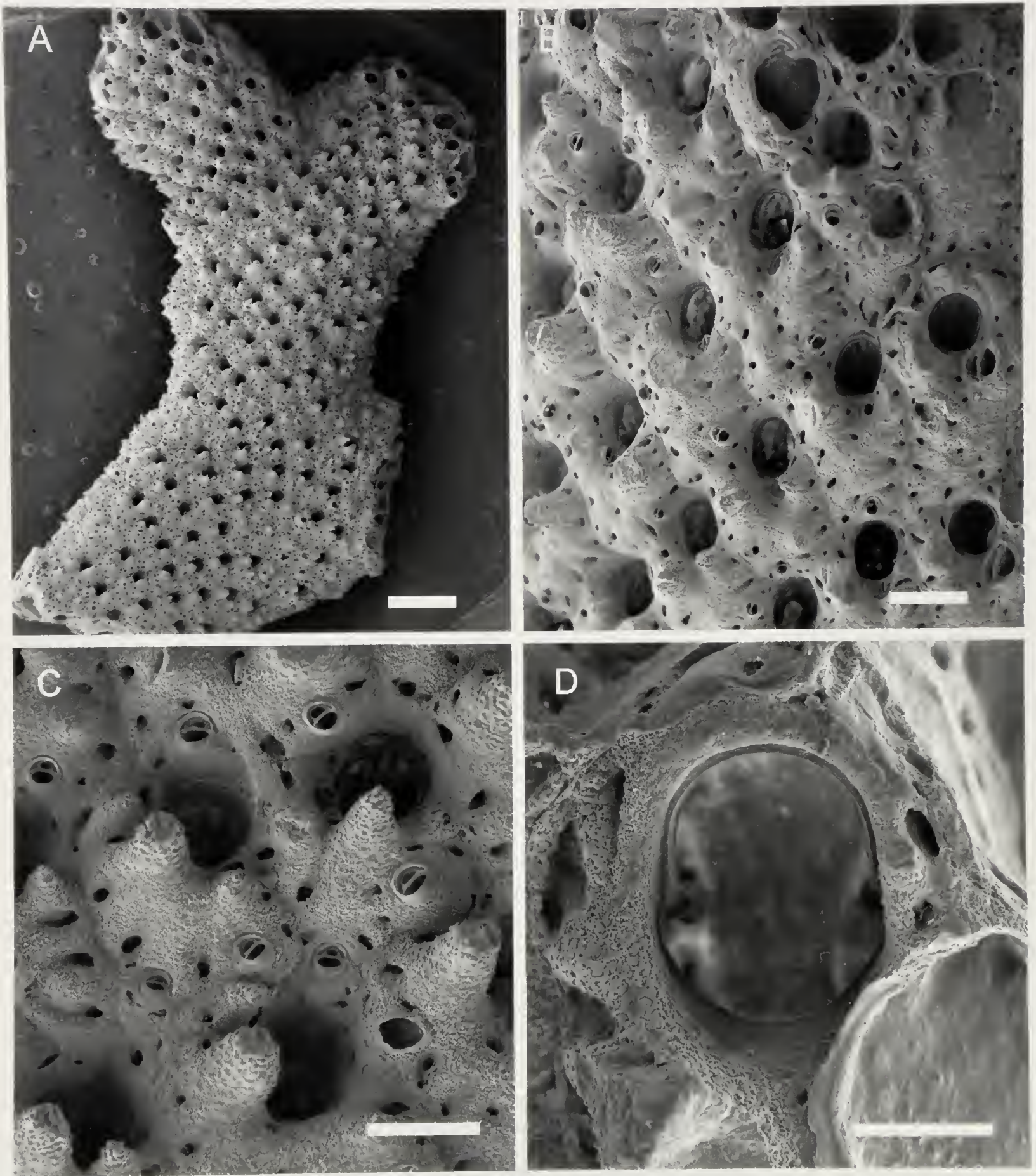


Figure 54. *Cigclisula tuberculata*. Hassler Box 27, MCZ 137471. A. colony branches. Scale bar = 1,000 μm . B. Group of autozooids. Scale bar = 250 μm . C. Closer view of autozooids, showing large tubercles and small oval avicularia. Scale bar = 200 μm . D. Orifice. Scale bar = 100 μm .

MZUSP 0342–0344, Brazil, project REVIZEE South SCORE, RV 'Prof. Wladimir Besnard', station 6678. Additional material: MZUSP 0345, Brazil, project REVIZEE

South SCORE, RV 'Prof. Wladimir Besnard', station 6681. MZUSP (balsam slide n. 624), *Hippoporina contracta*, E. Marcus det., Espírito Santo, Brazil, 35 m.

Family Colatooeciidae Winston, 2005

Genus *Cigclisula* Canu and Bassler, 1927b*Cigclisula tuberculata* **New Species**

Figure 54

Holotype. *Cigclisula tuberculata*. Hassler Box 25, MCZ 137471. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species epithet is from the feminine form of the Latin adjective *tuberculatus*, with tubercles, in reference to the large umbo, and two latero-oral tubercles.

Description. Colony robust, erect, bilaminar, dichotomously branching in right angles. Zooids recumbent, irregularly polygonal, separated by inconspicuous shallow lines. Frontal shield convex, with some marginal oval pores, a large suboral umbo and two smaller latero-oral tubercles. Primary orifice with semicircular anter separated from the slightly concave poster by large downward-facing triangular condyles. Suboral avicularia often present, sometimes small like those found on frontal shield, sometimes large, slightly lateral, obscured with increasing calcification by the latero-oral tubercle. No oral spines. No ooecia on the Hassler specimen.

Diagnosis. *Cigclisula* with larger orifices than those of *Trematooecia arborescens*, often large suboral avicularia, and high central umbo.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.540	0.630	0.540–0.630	0.597	0.035	6
Wz	0.414	0.576	0.414–0.576	0.471	0.060	6
Lo	0.162	0.180	0.162–0.180	0.170	0.009	6
Wo	0.126	0.162	0.126–0.162	0.138	0.015	6
Lov	0.234	0.324	0.234–0.324	0.279	0.037	4
Wov	0.324	0.360	0.324–0.360	0.351	0.018	4

Notes. This species also forms erect bilaminar colonies like those of *Trematooecia arborescens* (Canu and Bassler, 1928) from Brazil and *Cigclisula gemmea* Winston and Woollacott, 2009, from Barbados. *Cigclisula tuberculata* is distinct from *T. arborescens* in having large suboral avicu-

laria and a peristome with only 2 or 3 proximal tubercles; *Cigclisula gemmea* has a hoof-shaped orifice with a shallower poster than that of *C. tuberculata*.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Cigclisula tuberculata*. Hassler Box 25, MCZ 137471. Off Cabo Frio, Rio de Janeiro state, Brazil. *Trematooecia arborescens*. *Lectotype*: USNM 8565, Bahia, Brazil. *Paralectotype*: USNM 542389, Bahia, Brazil.

Genus *Trematooecia* Osburn, 1940*Trematooecia ridleyi* Kirkpatrick, 1890

Figures 55, 56

Cellepora ridleyi Kirkpatrick 1890: 505, fig. 2.

Trematooecia ridleyi: Vieira et al. 2008: 29.

Description. Colony encrusting in a small mound. Zooids erect, oval to rounded polygonal, with lateral and a few frontal pores in very thick calcification. Primary orifice with a greater than semicircular anter and a slightly convex poster. Round secondary orifice at the top of a circular peristome is partly obscured by the thick peristome walls, porous internally, surmounted by several conical tubercles, one of them bearing an oval avicularium with a slightly pointed rostrum on its inner side. Larger spatulate avicularia may be found on the colony surface. Ooecia, overhanging the peristome, hemispherical with thick, rough-textured calcification and a central crescentic membranous window.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.576	0.720	0.576–0.720	0.639	0.054	6
Wz	0.486	0.684	0.486–0.684	0.597	0.068	6
Lo	0.216	0.252	0.216–0.252	0.234	0.011	6
Wo	0.270	0.306	0.270–0.306	0.285	0.014	6
Lov	0.270	0.342	0.270–0.342	0.306	0.051	2
Wov	0.414	0.450	0.414–0.450	0.432	0.025	2
Lav1	0.252	0.306	0.252–0.306	0.275	0.023	4
Wav1	0.144	0.180	0.144–0.180	0.162	0.015	4
Lav2	0.090	0.144	0.090–0.144	0.120	0.019	6
Wav2	0.063	0.099	0.063–0.099	0.081	0.014	6

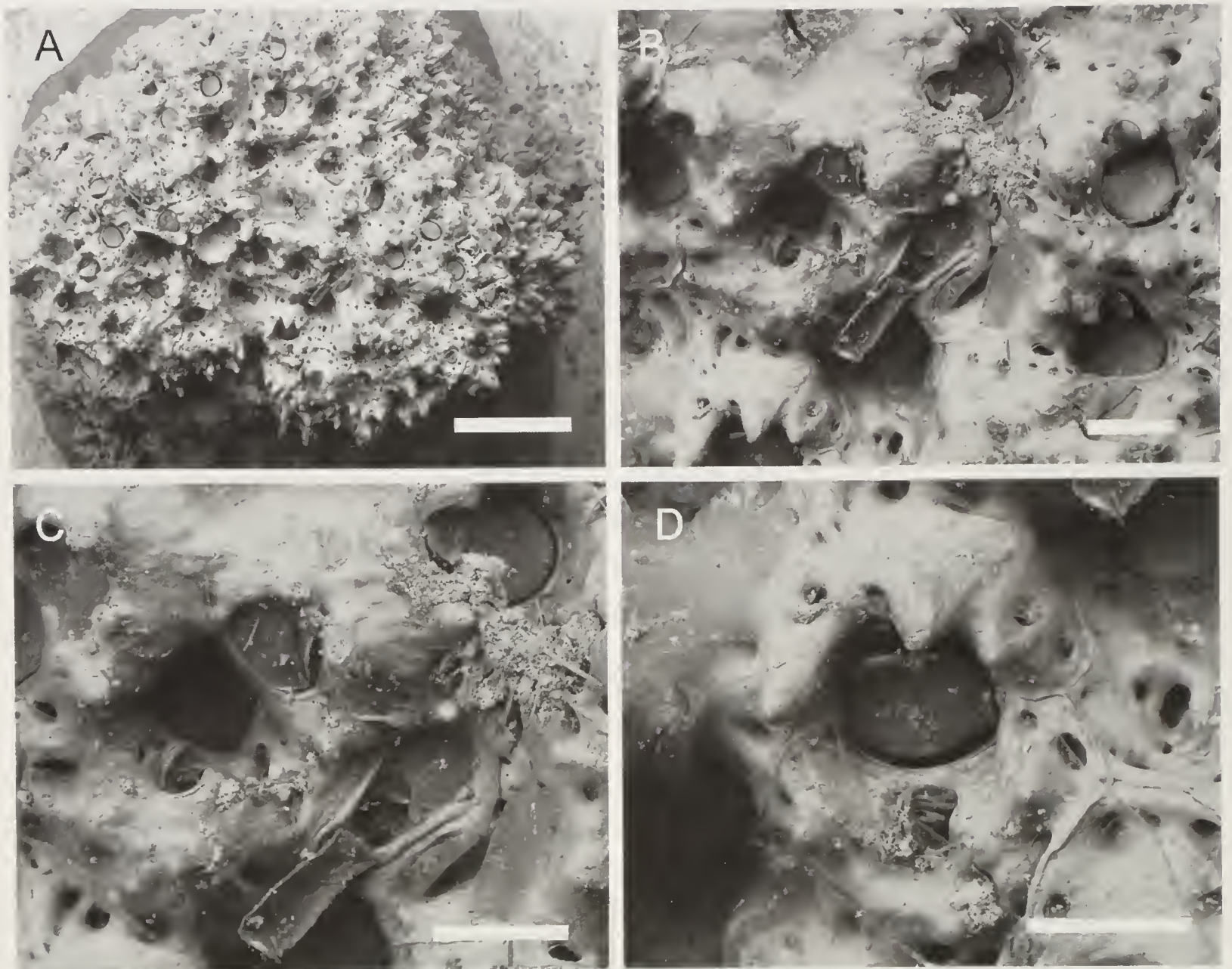


Figure 55. *Trematooecia ridleyi*. NHMUK 1888.4.16.2, holotype. A. Nodular colony. Scale bar = 100 µm. B. Zooids and a spatulate avicularium. Scale bar = 200 µm. C. Zooid with oecia and suboral and spatulate avicularia. Scale bar = 200 µm. D. Autozooid showing most of orifice. Scale bar = 200 µm.

Notes. This species differs from *Trematooecia osburni* Marcus, 1955, also described from Brazil, in the shape of the orifice, presence of a suboral avicularium, and shape of oecia.

Distribution. Fernando de Noronha and off Cabo Frio, Rio de Janeiro state, Brazil.

Specimens Examined. *Trematooecia ridleyi*. Hassler Box 27, MCZ 137472, Off Cabo Frio, Rio de Janeiro state, Brazil. *Holotype:* NHMUK 1888.4.16.2, *Cellepora ridleyi*, Fernando de Noronha, Brazil.

Class Stenolaemata Borg, 1926
 Order Cyclostomata Busk, 1852b
 Suborder Articulina Busk, 1852b
 Family Crisiidae Johnston, 1838

Genus *Crisia* Lamouroux, 1812

Crisia sp.

Figure 57

Description. Colony erect, biserial. Zooids are long and tubular, the distal end curved outward from the branch, the orifice round; frontal surface with some slitlike pores, rounded at the internal wall of the peristome. No gonozooid on this specimen.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.414	0.648	0.414–0.648	0.528	0.087	6
Wz	0.072	0.108	0.072–0.108	0.093	0.014	6
Do	0.054	0.081	0.054–0.081	0.069	0.009	6

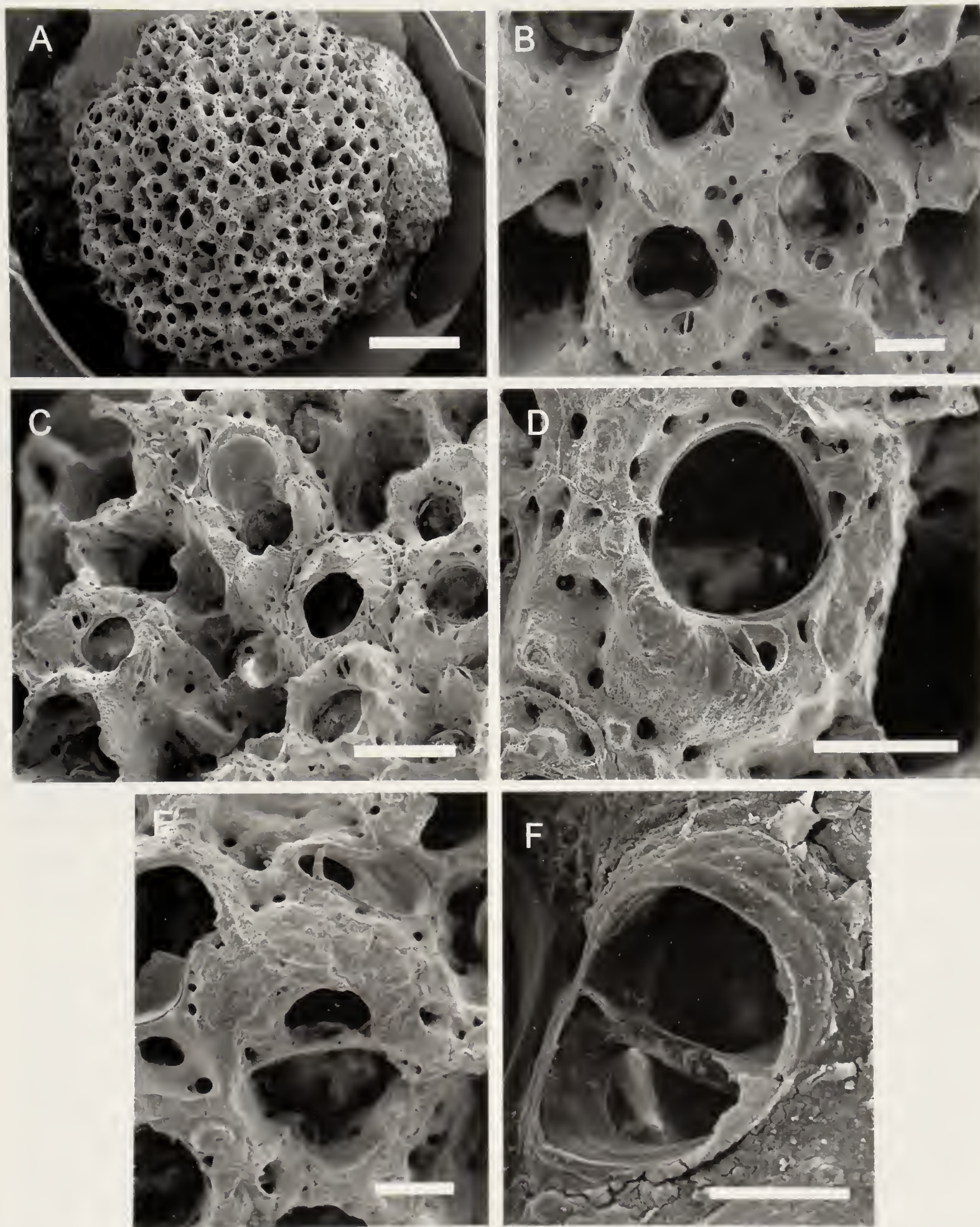


Figure 56. *Trematoecia ridleyi*. Hassler Box 27, MCZ 137472. A. Nodular colony. Scale bar = 2,000 μm . B. Autozooids with suboral avicularia. Scale bar = 200 μm . C. Growing edge with developing zooids, one with developing oocidium. Scale bar = 500 μm . D. Autozooid showing primary orifice. Scale bar = 200 μm . E. Zooid with an oocidium below spatulate avicularium. Scale bar = 200 μm . F. Close-up of suboral avicularium. Scale bar = 50 μm .

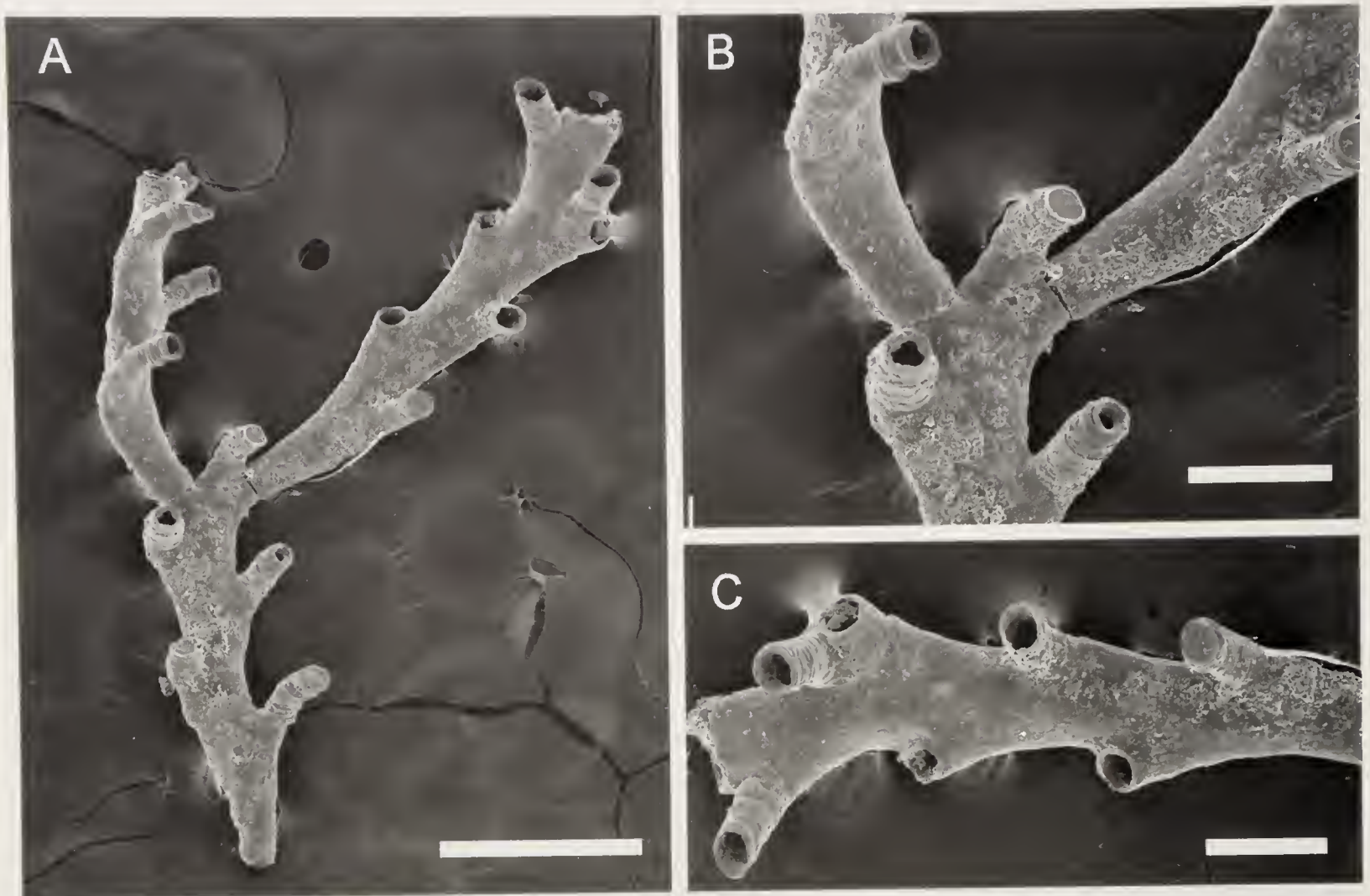


Figure 57. *Crisia* sp. Hassler Box 45, MCZ 137473. A. Colony branches. Scale bar = 500 μ m. B. View of branch bifurcation with single autozooid tube. Scale bar = 200 μ m. C. Zooids with outward-curving peristomes. Scale bar = 200 μ m.

Notes. Since the only *Hassler* specimen from Brazil consists of a small broken portion of a colony with a single bifurcation, three partial branch segments, and no gonozooids, identification to species level is not possible.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. *Crisia* sp. Hassler Box 45, MCZ 137473. Off Cabo Frio, Rio de Janeiro state, Brazil.

Family Plagioeciidae Canu, 1918

Genus *Plagioecia* Canu, 1918

Plagioecia bugei **New Species**

Figure 58

Cyclostomata incertae sedis Buge, 1979: 244, pl. 4, fig. 1.

Holotype. *Plagioecia bugei*. Hassler Box 38, MCZ 137474. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species name is a Latinized patronym in the genitive case. The species is named in honor of French paleontologist Émile Buge, who studied some Brazilian cyclostomes collected by a *Calypso* expedition, including this species.

Description. Colony encrusting, circular in three concentric layers, the inner circle of zooid tubes surmounting two or three rows of short developing zooid tubes descending to a flat, ribbed basal lamella. Fully developed zooid tubes are large, with short peristomes opening in round-to-oval thick-walled orifices. Between the peristomes, calcification consists of wavy concentric ridges with tiny sparsely spaced pores. Outside the raised zone of tubular zooids is a stepped ring of cancellaelike developing zooid tubes, with rough-textured walls having a few tiny calcified spikes scattered on them and membrane-blocked openings with a central pore. The ribbed basal

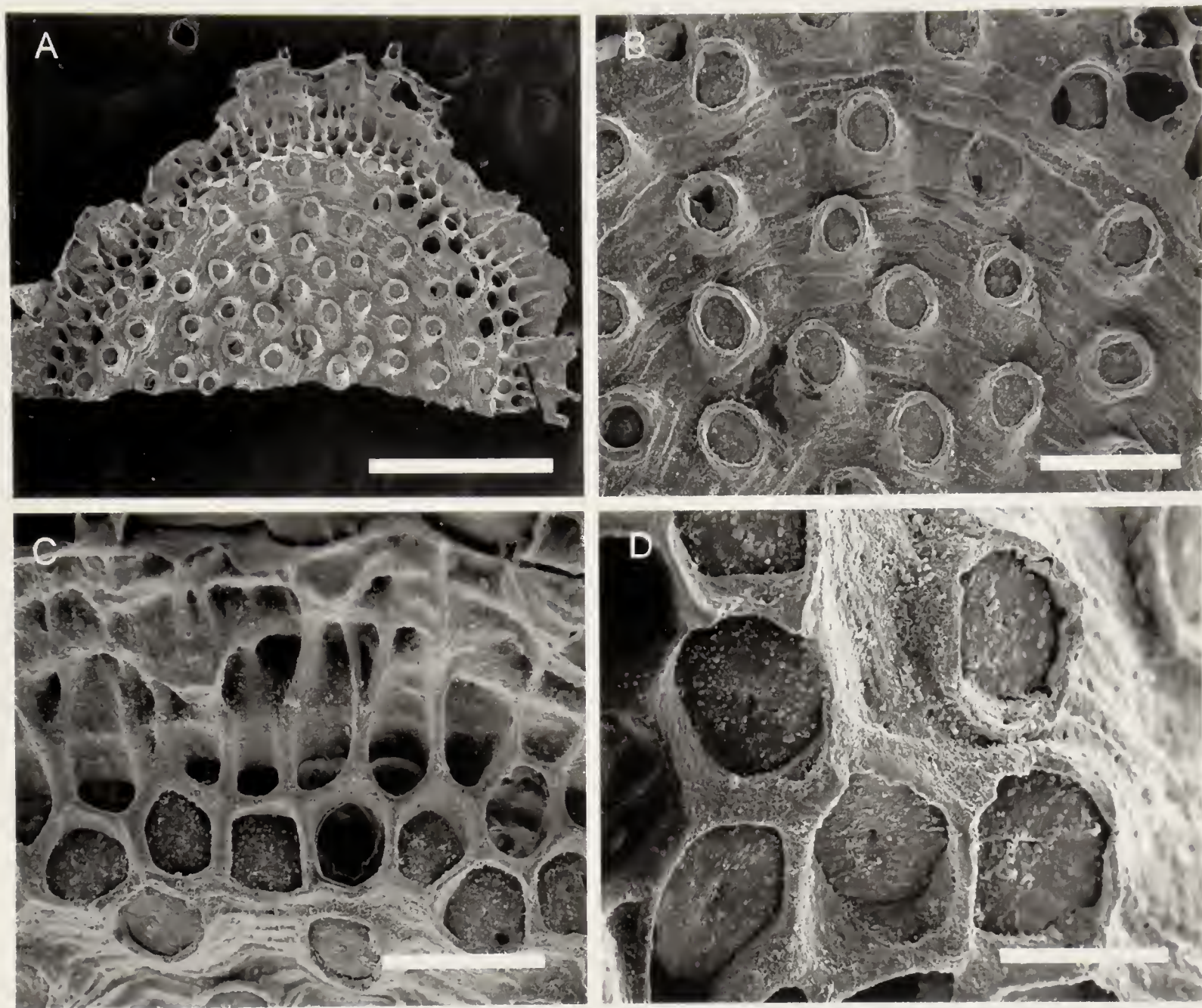


Figure 58. *Plagioecia bugei*. Hassler Box 38, MCZ 137474. A. Remaining half of colony (rest broken off). Scale bar = 1,000 μm . B. Zooid tubes with slightly raised peristomes and thick striated calcification. Scale bar = 200 μm . C. Growing edge of colony. Scale bar = 200 μm . D. Close-up of cancellate structure of colony margins. Scale bar = 100 μm .

lamella extends beyond that. No gonozooids were present in the *Hassler* material. Those of similar *Plagioecia* species form raised porous crescents at the outer edge of the top of the colony between zooid orifices.

Diagnosis. *Plagioecia* with a circle of round, low zooid tubes above two or three rows of developing tubes surrounded by a ribbed basal lamina.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.306	0.396	0.306–0.396	0.351	0.032	6
Wz	0.162	0.216	0.162–0.216	0.186	0.019	6
Lo	0.090	0.126	0.090–0.126	0.110	0.012	6
Wo	0.081	0.090	0.081–0.090	0.089	0.004	6

Notes. The *Hassler* material consists of the broken half of a nonreproductive colony about 2 mm in diameter. A similar colony was found by Buge (1979) who included it in his study without further identification, as it lacked gonozooids and it seemed to combine the characters of two different groups of cyclostomes. The cancellaelike structures and basal lamina resemble those of the Rectangulata, and the zooids resemble those of *Berenicea*. However, Gordon and Taylor (2010) described *Plagioecia parva* from New Zealand seamount material with a colony that also shares these characters, and Böck (Bryozoa.net) illustrated a species from Bass Strait as *Plagioecia*

sarniensis (Norman) that also seems very similar.

Distribution. Brazil: Pernambuco, Rio de Janeiro.

Specimens Examined. *Plagioecia bugei*. Hassler Box 38, MCZ 137474. Off Cabo Frio, Rio de Janeiro state, Brazil.

Suborder Tubuliporina Milne-Edwards, 1838
Family Filisparsidae Borg, 1944

Genus *Nevianipora* Borg, 1944

Nevianipora arcuata **New Species**

Figure 59

Nevianipora rugosa Buge, 1979: 231, pl. 6, figs. 1–4. Vieira et al. 2008: 34. NOT *Diaperoecia rugosa* Osburn, 1940.

Holotype. *Nevianipora arcuata*. Hassler Box 28, MCZ 137475. Off Cabo Frio, Rio de Janeiro state, Brazil. *Paratype:* Hassler Box 43, MCZ 137476. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. Species name *arcuata* is taken from the Latin adjective *arcuatus*, curved in an arch, in reference to its curving, sometimes anastomosing branches.

Description. Colony erect, ridged, branching, supported by calcified struts or pillars made up of a number of kenozooids, which may branch near the base. Similar calcified kenozooids connect some of the branches, which may also anastomose at their tips. Branches vary from 0.58 to 0.85 mm in width. Zooids are long tubes joined together except for free and curving, transversely ringed peristomes. The bundles of zooids that make up the branch can be seen in cross section at the growing tips of some branches. Peristomes are aligned in curving diagonal rows of four or five on the frontal surface of the branches; lateral autozooids have longer peristomes than those of the median autozooids. The basal surface of branches has punctate, transversely wrinkled calcification; similar calcification is found on the pillars, connecting tubes, and the frontal surface of the colony, including the peristomes. At a high magnification the irregular rows of pseudopores have rounded depressions and

central round openings. Zooid orifices are thin rimmed and round to oval. No gonozooids present in this material.

Diagnosis. *Nevianipora* with branches comprising four or five rows of zooids, fewer than in *Nevianipora rugosa* (Osburn), and with an orifice larger than *Nevianipora floridana* (Osburn).

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.684	1.080	0.684–1.080	0.933	0.151	6
Wz	0.216	0.324	0.216–0.324	0.264	0.042	6
Lo	0.162	0.198	0.162–0.198	0.183	0.014	6
Wo	0.126	0.162	0.126–0.162	0.146	0.012	6
BrD	0.594	0.810	0.594–0.810	0.717	0.075	6

Notes. Two species have been reported from Brazil, *Nevianipora floridana* (Osburn) and *Nevianipora rugosa* (Osburn). The Brazilian specimens are conspecific with Buge's *Nevianipora rugosa* from off Recife (Pernambuco) and Abrolhos (Bahia), but some differences are found between Brazilian and NW Atlantic specimens.

Osburn (1940) described *Nevianipora rugosa* (as *Diaperoecia*) from Puerto Rico and North Carolina and reassigned Smitt's *Idmonea Milneana* (not d'Orbigny, 1839) to the species. The species is characterized by wide curving branches, about 0.70–1.0 mm in width, comprising 6–8 rows of autozooids with long and free peristomes. Winston (2005) described zooids free for about half of their length in Smitt's *Milneana* (here reassigned to *N. rugosa*). Hassler specimens, and other specimens identified by Buge (1979) as *N. rugosa*, are distinct in having smaller autozooids than *N. rugosa*, and branches with 4 to 5 rows of autozooids; these specimens are reassigned to a new species, *Nevianipora arcuata*.

Nevianipora arcuata new species differs from *Nevianipora floridana* (Osburn), also reported from Brazil (Ramalho et al. 2009) in having larger zooid orifices (0.16–0.2 mm in *N. arcuata* vs. 0.9–0.1 mm in *N. floridana*).

No gonozooids were present in this material, but Buge (1979) described globu-

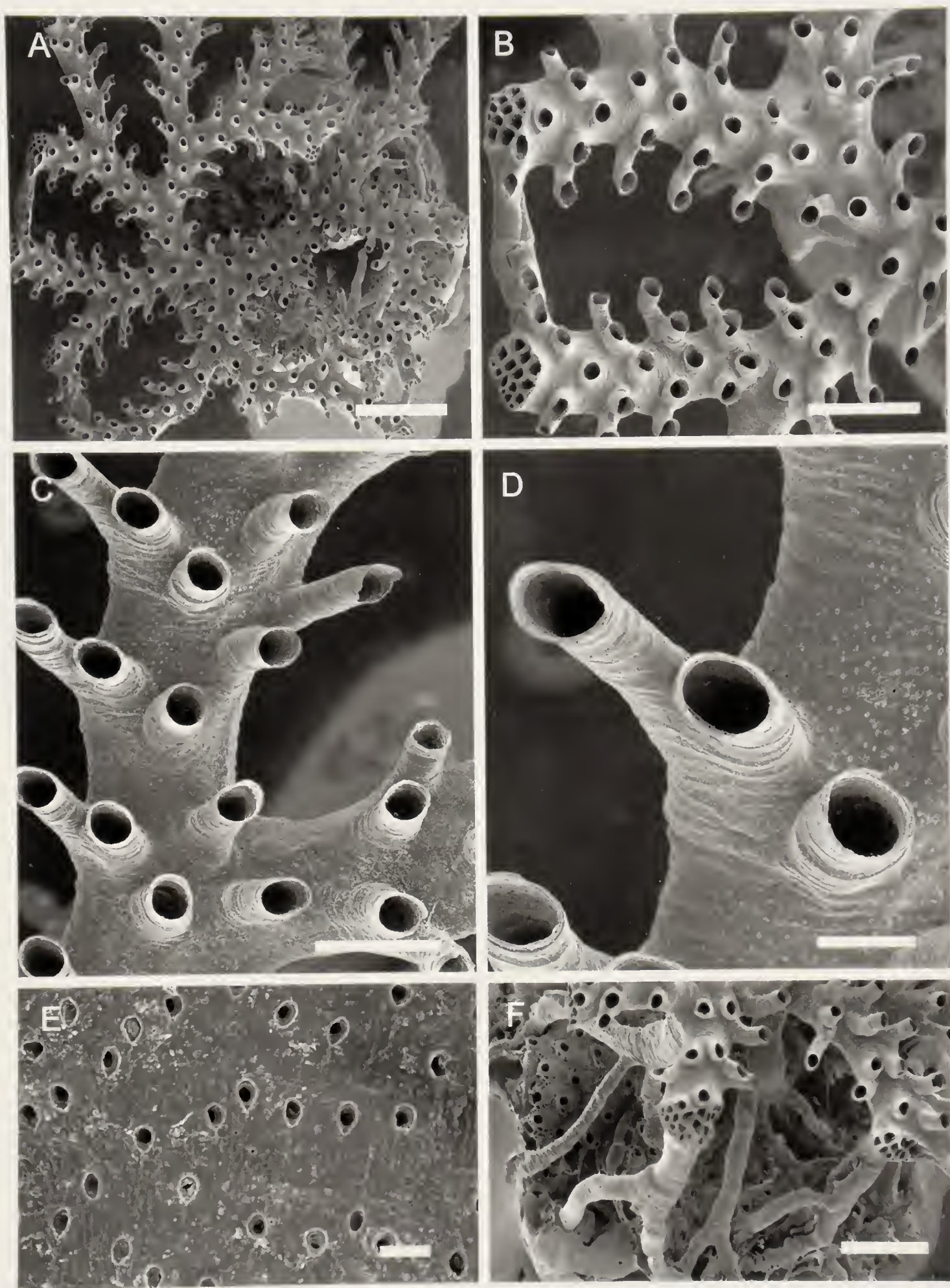


Figure 59. *Nevianipora arcuata*. Hassler Box 28, MCZ 137475. A. Colony showing curving branches. Scale bar = 2,000 μm . B. Branches curving and anastomosing at tips. Scale bar = 1,000 μm . C. Tubular zooids with long oval peristomes. Scale bar = 500 μm . D. Row of three zooids, two partially connate. Scale bar = 200 μm . E. Close-up of oval-teardrop shaped pores. Scale bar = 20 μm . F. Calcified attachment rootlets. *Hippaliosina imperfecta* colony can be seen beneath them. Scale bar = 1,000 μm .

lar gonozooids at the bifurcation 0.90–1.2 mm long and 0.50–0.75 mm wide, crossed by some peristomes, with more pores than those found in surface of the peristomes; the oeciostome is short, wider than long, 0.12–0.14 mm long and 0.18–0.20 mm wide, with transversal oeciopore.

Distribution. Brazil: Pernambuco, Bahia, Rio de Janeiro.

Specimens Examined. *Nevianipora arcuata*. Hassler Box 28, MCZ 137475. Off Cabo Frio, Rio de Janeiro state, Brazil. Hassler Box 43. Off Cabo Frio, Rio de Janeiro state, Brazil. MCZ 137476.

Suborder Rectangulina Waters, 1887

Family Lichenoporidae Smitt, 1867

Genus *Disporella* Gray, 1848

Disporella brasiliiana **New Species**

Figures 60, 61

Holotype. *Disporella brasiliiana*. Hassler Box 29, MCZ 137477. Off Cabo Frio, Rio de Janeiro state, Brazil.

Etymology. The species is named for the country of its origin compounded from Brasil, plus the feminine form of the Latin geographic suffix, *-ianus*, belonging to.

Description. Colony encrusting, small, round to oval in outline, consisting of rows of connate zooid tubes rising to a central peak and surrounded by a colony-wide basal lamina. Zooids growing freely in radial rows; they are oriented in an acute angle to colony surface; peristomes have two to four pointed tips and rough calcification with spiny tubules. Between the rows of zooids are rows of polygonal cancellae, which have very small nodules and spikes on their inner surfaces. The lamella has a few faint ribs but is otherwise delicate and flat. Gonozooid occupying majority of macula center, embedded, with lobes growing between zooid rows; surface porous and covered by coarse reticulate calcification; oeciopore circular, placed at the lobe of gonozooid, larger than peristome orifice and its cancellae, with small tubercles, smaller than those of colony.

Diagnosis. *Disporella* with radial rows of pointed tipped zooids at an acute angle to the

colony surface; calcification rough textured with calcified spines of various sizes.

Measurements. All values are millimeters.

	Min	Max	Range	Mean	SD	N
Lz	0.108	0.540	0.108–0.540	0.346	0.132	18
Wz	0.108	0.216	0.108–0.216	0.161	0.034	18
Lo	0.072	0.135	0.072–0.135	0.102	0.021	18
Wo	0.063	0.090	0.063–0.090	0.077	0.009	18

Notes. The colonies found differ from the Brazilian species *Disporella pila* as described by Marcus (1955), Buge (1979), and Ramalho et al. (2009). The nodules are densely spaced, the long spinules are unlike the star-shaped crowned spinules noted in *D. pila*, and the basal lamina is delicate and flat with only a few faint ribs.

Distribution. Brazil: Rio de Janeiro.

Specimens Examined. Hassler Box 29, MCZ 137477, and Hassler Box 34, MCZ 137478. Off Cabo Frio, Rio de Janeiro state, Brazil.

DISCUSSION

We identified 50 species found in the Hassler Brazilian bryozoan collection, comprising samples from three stations: 11 species collected between 15 and 17 fms (27.4–31 m) off Salvador, NE Brazil, and 11 species from 35 fms (56.7 m) and 32 species from 35–45 fms (56.7–82 m), both stations off Cabo Frio, Rio de Janeiro, SE Brazil. Of 46 cheilostome species, 24 are new; of four cyclostome species, three are also described as new; the other cyclostome, a *Crisia*, could not be determined to species level. The proportion of new taxa described (54%) is similar to the results for the recently described Hassler Barbados bryozoan collection (Winston and Woollacott, 2009), which includes 50% new species in the samples.

The bryozoans described here were collected near localities and in depths similar to collections reported by Canu and Bassler (1928a) and Marcus (1949, 1955) between Salvador and Espírito Santo (North of Rio de Janeiro), who reported 47 and 45 species, respectively. However, it is not surprising that the number of new

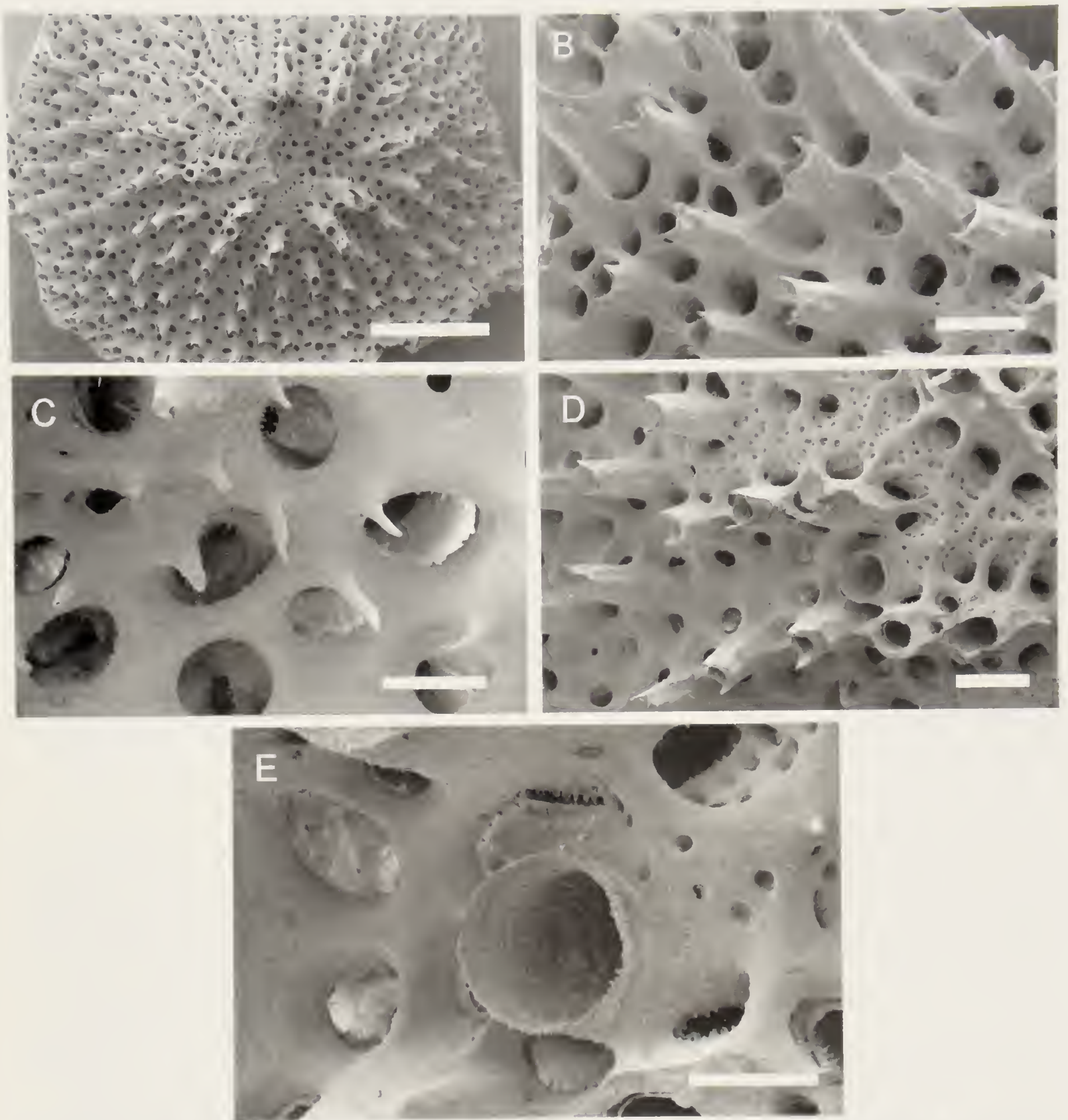


Figure 60. *Disporella brasiliensis*. Hassler Box 29, MCZ 137477. A. View of circular, domed colony. Scale bar = 1,000 μm . B. Zooid tubes with spiny peristomes, and cancellae between them. Scale bar = 200 μm . C. Long calcareous spikes and tiny pustules on surface of cancellae and smaller spines within their openings. Scale bar = 100 μm . D. Zooid rows at edge of gonozooid (note thickened, but porous calcification covering gonozooid cancellae). Circular thin-walled oeciostome, opening between rows. Scale bar = 200 μm . E. Close-up of oeciostome. Scale bar = 100 μm .

species is high. Vieira et al. (2010a) suggested that many new species are yet to be discovered in the Exclusive Economic Zone of Brazil owing to the enormous distance of coastline and continental shelf, including several biogeographic provinces, and to the absence so far of studies on the

bryozoan fauna in much of the area. Of the 50 species collected in Brazil by the *Hassler* Expedition, 25 species (50%) were previously reported in other studies (Kirkpatrick, 1890; Canu and Bassler, 1928a; Marcus, 1949, 1955; Buge, 1979; Santana et al., 2009; Vieira et al., 2010a,b), including seven

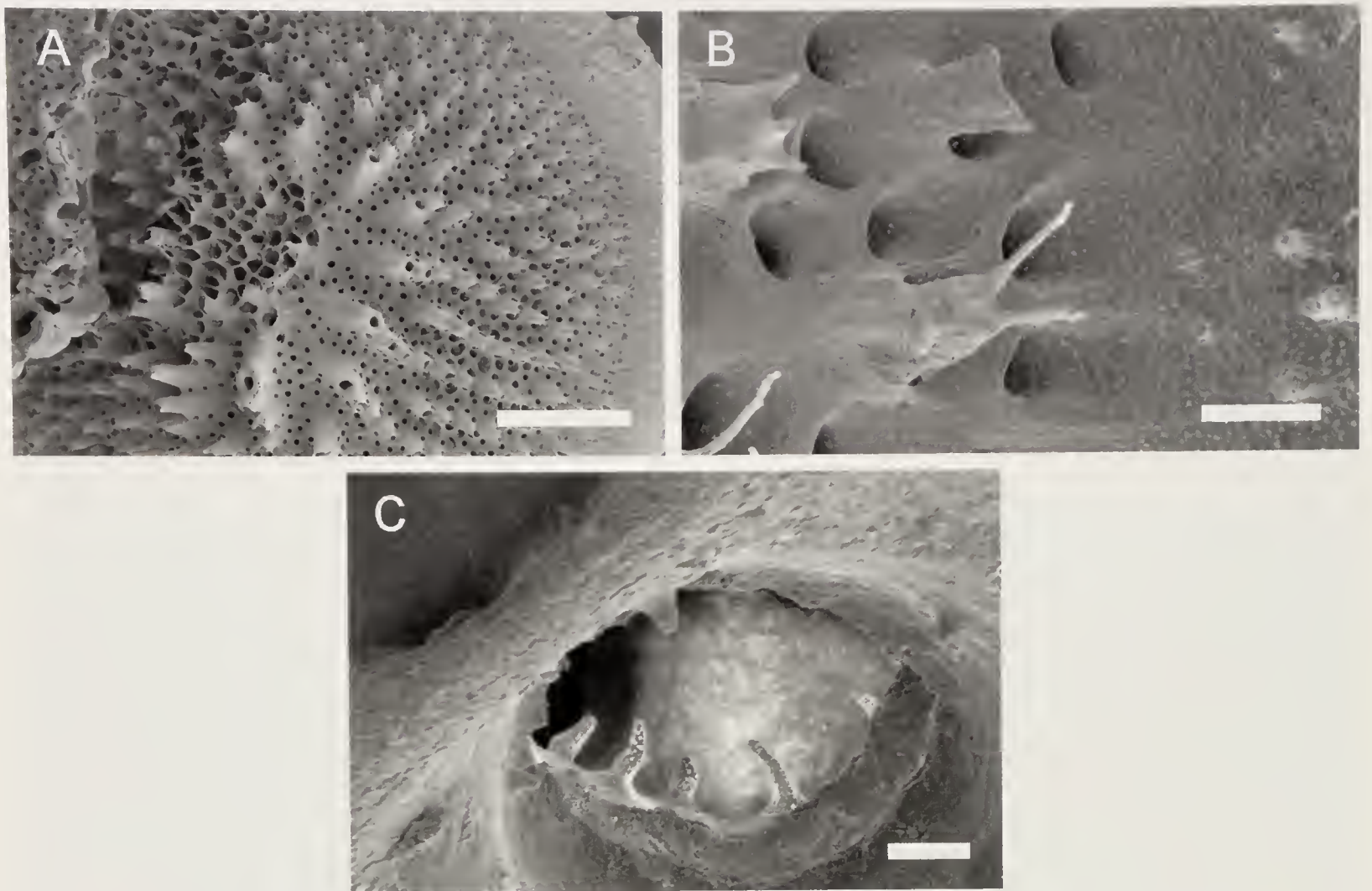


Figure 61. *Disporella brasiliensis*. Hassler Box 34 "Large," MCZ 137478. A. Many rows of zooids in this larger colony. Scale bar = 500 μm . B. Bifurcating or trifurcating spines of zooid peristomes. Scale bar = 200 μm . C. Spines within opening or one of cancellae. Scale bar = 10 μm .

misnamed species: *Canda alsia*, *Labioporella tuberculata*, *Metrarabdotos jani*, *Nevianipora arcuata*, *Parasmittina loxoides*, *Parasmittina simpulata*, and *Plagioecia bugei*.

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