

LITTORAL COMPOUND ASCIDIANS (TUNICATA) FROM SÃO SEBASTIÃO, ESTADO DE SÃO PAULO, BRAZIL

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Abstract. — Compound ascidians were collected during a two-year survey of intertidal and shallow subtidal habitats near São Paulo, Brazil. Among the fourteen species recorded, *Distaplia bermudensis* and *Botryllus giganteum* are new to São Sebastião, and *Didemnum psammathodes*, *Trididemnum orbiculatum*, and *Symplegma rubra* are new to South America.

This paper describes species encountered in the São Sebastião Channel (Fig. 1), near São Paulo, Brazil, during a study of recruitment, growth and reproduction of compound ascidians there (Rocha 1988, 1991). The specimens were collected in the intertidal and subtidal zones, by diving or during low tides, monthly from January 1985 to March 1987. Some specimens were taken from ceramic settling-plates, others from the natural rocky substrate and from under boulders. Not every species occurred at each locality. This may reflect differences in ecology or just collecting success.

Ascidians from this region have been described by Van Name (1945), Bjornberg (1956), Millar (1958), Rodrigues (1962, 1966, 1977) and Rocha (1988). Ascidians from other Brazilian waters have been described by Van Name (1945), Moure et al. (1954), Millar (1961, 1977), C. Monniot (1969/1970), Costa (1964, 1969a, 1969b, 1969c, 1969d, 1969e, 1969f), and Simões (1981). References to some older papers that mention Brazilian ascidians will be found in Van Name's (1945) monograph.

The synonymy of some species is extensive. We provide references to recent West Atlantic records of the species we recorded. For a more comprehensive but older list of synonymies see Van Name (1945).

Of the fourteen species collected, *Didemnum psammathodes* (Sluiter, 1895), *Tridi-*

demnum orbiculatum (Van Name, 1902), and *Symplegma rubra* C. Monniot, 1972 are new records for South America. *Distaplia bermudensis* Van Name, 1902 and *Botryllus giganteum* Aron & Sole-Cava, 1991 are reported for the first time from São Sebastião. *Didemnum speciosum* (Herdman, 1886), *Diplosoma listerianum* (Milne-Edwards, 1841), *Symplegma brakenhielmi* (Michaelson, 1904), *Botryllus tuberatus* Ritter & Forsyth, 1917, and *Botryllus niger* (Herdman, 1886) were already recorded from São Sebastião under the names *Didemnum candidum* Savigny, 1816, *Diplosoma macdonaldi* Herdman, 1886, *Symplegma viride* Herdman, 1886, *Botryllus primigenus* Oka, 1928, *Botrylloides nigrum* Herdman, 1886, respectively. Of the compound ascidians registered on the previous surveys of São Sebastião, only *Polyandrocarpa anguinea* (Sluiter, 1898), recorded by Van Name (1945) and Rodrigues (1962) under the name *Polyandrocarpa maxima* (Sluiter, 1904), was not found in the present survey.

Vouchers of the material examined have been deposited in the Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP), and in the National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (USNM).

Family Polyclinidae

Polyclinum constellatum Savigny, 1816

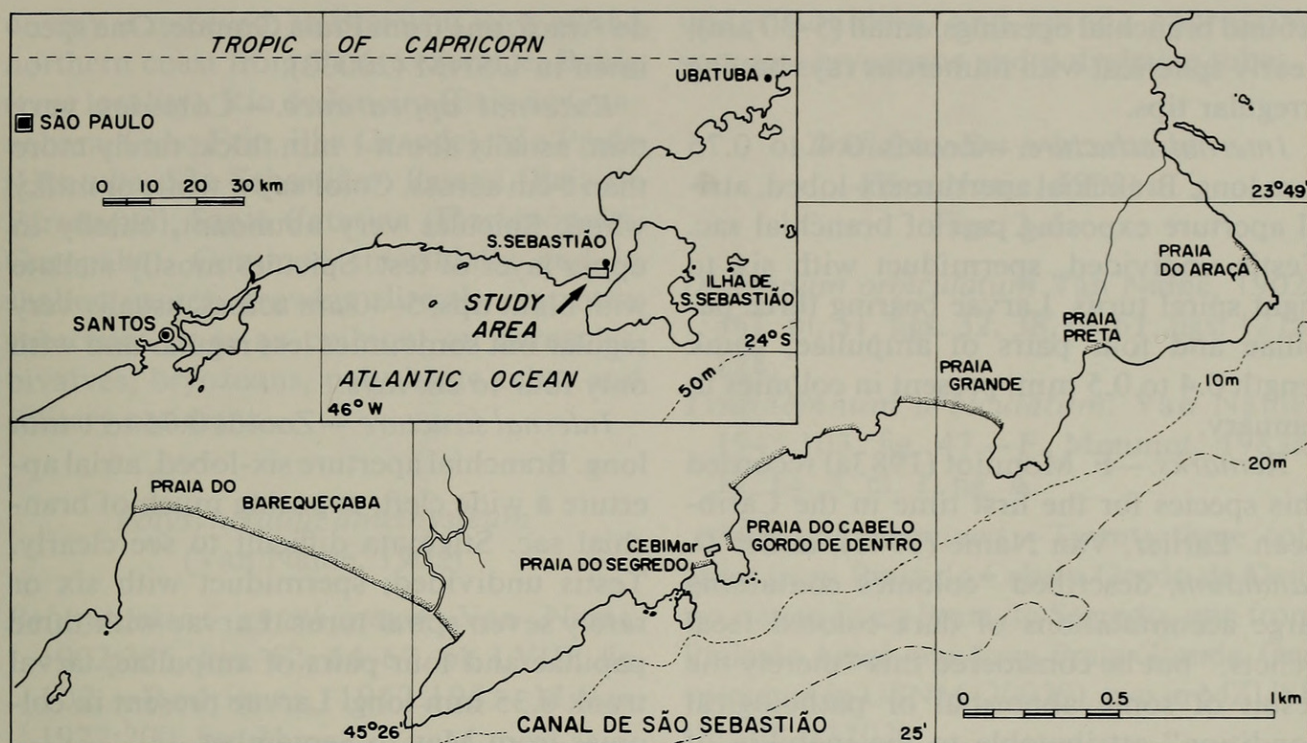


Fig. 1. Map showing localities where specimens were collected and the marine station of the University of São Paulo (CEBIMar).

Polyclinum constellatum Savigny, 1816:189, pl. 4, fig. 2, pl. 18, fig. 1.—Van Name, 1945:68, fig. 28, pl. 13, figs. 2-3.—Bjornberg, 1956:164.—Millar, 1958:498, 1962:62.—Rodrigues, 1962:194.—Costa, 1969a:192, fig. 1.—F. Monniot, 1972:958, fig. 4, 1983b:417, pl. 1.—Simões, 1981:19, figs. 4-6.—Goodbody, 1984:29.

Material examined.—Eight colonies from Praia do Araçá, one from Praia Grande, and two from Praia do Cabelo Gordo de Dentro. One specimen in USNM (20037), two in MZUSP (11190, 11191). Colonies collected in October 1985 and 1986 and July 1986 had well-formed gonads. October colonies had larvae.

Distribution and habitat.—Distributed widely throughout warm waters. In the Atlantic: Florida, Mexico (Yucatan), Colombia (Sabanilla), Caribbean Islands, Bermuda. In Brazil: Rio de Janeiro (Urca, Niterói) and São Paulo (Ubatuba, São Sebastião, Santos, Cananeia). Colonies found in shallow water, often exposed during very low tides.

Family Didemnidae

Didemnum psammathodes (Sluiter, 1895)

Leptoclinum psammathodes Sluiter, 1895: 11.

Didemnum psammathodes: F. Monniot, 1983a:31, fig. 13, pl. 2, figs. B and E.—Goodbody, 1984:30.

Didemnum candidum: Van Name, 1945 (in part):83, fig. 35.

Material examined.—Five colonies from Praia do Segredo, three from Praia do Cabelo Gordo de Dentro, two from Praia do Araçá, one from Praia Grande. One specimen in USNM (20036), three in MSUSP (11193, 11194, 11195).

External appearance.—Macroscopic structure of colonies closely resembles that of *D. speciosum*, differing only in color, which is brown or grayish-brown due to large accumulations of fecal pellets in common cloacal cavities and even in the substance of the test; these pellets absent around common cloacal apertures, where tunic is transparent. Spicules scarce, more abundant

around branchial openings, small (5–30 μm), nearly spherical with numerous rays having irregular tips.

Internal structure.—Zooids 0.4 to 0.75 mm long. Branchial aperture six-lobed, atrial aperture exposing part of branchial sac. Testis undivided, spermiduct with six to eight spiral turns. Larvae bearing three papillae and four pairs of ampullae, trunk length 0.4 to 0.5 mm, present in colonies in January.

Remarks.—F. Monniot (1983a) recorded this species for the first time in the Caribbean. Earlier, Van Name (1945), under *D. candidum*, described “colonies containing large accumulations of dark-colored fecal pellets,” but he considered this “merely the result of some abnormal or pathological condition” attributable to the inability of the water current to carry off waste material. In São Sebastião the species is very common. It grows side by side with *D. speciosum* and attains large sizes, so that a “pathological condition” seems highly unlikely.

Distribution and habitat.—Recorded widely from tropical waters under many different names (see Eldredge 1967). In the Atlantic: Guadeloupe, Curaçao. In Brazil: São Paulo (São Sebastião). Colonies common intertidally, under boulders or on vertical surfaces, and growing over other ascidians, sponges and bryozoans.

Didemnum speciosum (Herdman, 1886)

Leptoclinum speciosum Herdman, 1886: 274, pl. 36, figs. 1–8.

Didemnum speciosum: Millar, 1977:197, fig. 20.—Simões, 1981:29, figs. 14–17.

Didemnum candidum: Van Name, 1945 (in part):83, fig. 35, pl. 13, fig. 4.—Moure et al., 1954:235.—Bjornberg, 1956:164.—Rodrigues, 1962:194.—Costa, 1969b:202, fig. 4.

Material examined.—Eleven colonies from Praia do Segredo, one from Praia do Cabelo Gordo de Dentro, two from Praia

do Araçá, one from Praia Grande. One specimen in USNM (20033).

External appearance.—Colonies very thin, usually about 1 mm thick; rarely more than 5 cm across. Color snow white or milky white. Spicules very abundant, chiefly in upper layer of test. Spicules mostly stellate with blunt tips, 5–40 μm across, usually very regular but sometimes less regular and with only four to six rays.

Internal structure.—Zooids 0.75 to 1 mm long. Branchial aperture six-lobed, atrial aperture a wide cleft, exposing much of branchial sac. Stigmata difficult to see clearly. Testis undivided; spermiduct with six or rarely seven spiral turns. Larvae with three papillae and four pairs of ampullae; larval trunk 0.35 mm long. Larvae present in colonies from May to September.

Remarks.—Van Name (1945) identified southern Brazilian didemnids like this one as *Didemnum candidum*. *D. candidum*'s presence in the Caribbean was contested by Millar (1962), who called the material from Curaçao *D. conchyliatum* (Sluiter, 1898), as did F. Monniot (1983a) in identifying specimens from Guadeloupe. Millar (1977) resurrected Herdman's (1886) *D. speciosum*, an abundant didemnid from the northern and northeastern Brazilian shelf. He pointed out that the only difference between *D. speciosum* and *D. conchyliatum* is the size of the larval trunk: 0.25–0.40 mm for the former species and 0.43–0.50 mm for the latter. Examination of specimens of *D. conchyliatum* from Guadeloupe deposited in the National Museum of Natural History, Paris, showed that both zooids and larvae are slightly larger than the present material. The characteristics of our specimens are very similar to what Millar (1977) notes. Colors of the colonies, according to F. Monniot (1983a), also can be different. We believe that *D. conchyliatum* and *D. speciosum* are both valid species.

Distribution and habitat.—The overall distribution of *Didemnum speciosum* must remain uncertain until its extensive syn-

onymy is resolved. In Brazil: at least off the northern coast from Pará to Sergipe, Bahia (type locality), Rio de Janeiro (Baia de Guanabara, Cabo Frio, Ilha Grande), São Paulo (Ubatuba, São Sebastião), Paraná (Baia de Paranaguá), Santa Catarina (Florianópolis, Garopaba). Common intertidally and in shallow water, growing directly on rocky substrates or as an epibiont on barnacles, bivalves, bryozoans, polychaete tubes and solitary ascidians.

Polysyncraton amethyestum
(Van Name, 1902)

Polysyncraton amethyestum Van Name, 1902:366, figs. 62, 64–67. pl. LVIII, fig. 102.—Rodrigues, 1962:195.—Millar, 1977:200, fig. 21.

Didemnum (Polysyncraton) amethyestum: Van Name, 1945:95, fig. 41, pl. 18, fig. 3.—Moure et al., 1954:236.—Millar, 1958:499.—Costa, 1969b:203, fig. 5.

Didemnum amethyestum: Plough, 1978:67.

Material examined.—Eight colonies from Praia do Segredo, two from Praia Grande. One specimen in USNM (20035), three in MZUSP (11204, 11205, 11206). Gonads present during most of the year. Larvae present in fall and spring specimens.

Remarks.—Our specimens agree well with Van Name's (1902, 1945) descriptions. The colonies, however, are larger, with more common cloacal openings, and the zooids with fewer testicular lobes. This last character seems to be rather variable: five (Van Name 1902), five to six (Van Name 1945), four to six (Moure et al. 1954), four to five (Millar 1977).

Distribution and habitat.—Bermuda (type locality), Puerto Rico, Colombia, Florida. In Brazil: Ceará, Pernambuco (Recife), Bahia, Rio de Janeiro (Rio de Janeiro, Cabo Frio), São Paulo (São Sebastião, Cananéia), Paraná (Baia de Paranaguá), Santa Catarina (Garopaba). Colonies common intertidally, in crevices and abandoned sea-urchin holes,

under boulders, and among encrusting sponges, bryozoans and polychaete tubes.

Trididemnum orbiculatum
(Van Name, 1902)
Figs. 2–5

Didemnum orbiculatum Van Name, 1902: 361, pl. 51, figs. 32, 38, pl. 61, figs. 127a, 128.

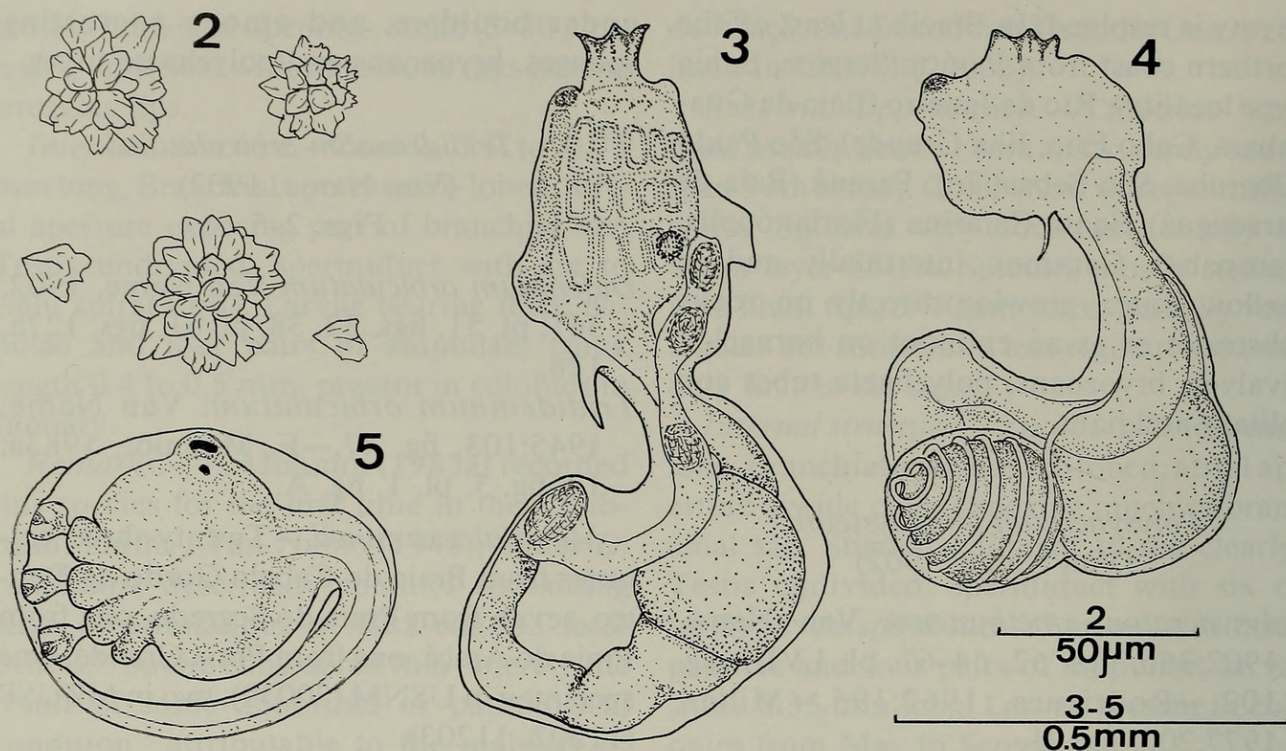
Trididemnum orbiculatum: Van Name, 1945:103, fig. 47.—F. Monniot, 1983a: 12, fig. 3, pl. 1, fig. A.

Material examined.—Twenty-three colonies from Praia do Cabelo Gordo de Dentre, seven from Praia do Segredo, one from Praia do Araçá, one from Praia Grande. One specimen in USNM (20039), two in MZUSP (11202, 11203).

External appearance.—Colonies encrusting of variable thickness (1–4 mm), up to 40 mm across. Test firm, transparent, general color light or dark gray, yellowish, greenish or dun-colored. In some colonies a black spot is easily visible on the anterior end of the endostyle, and sometimes other darkened spots mark each of the six lobes of the zooids' branchial apertures. Spicules usually of regular shape, 7–58 μ m across, abundant, lying in superficial layer of test. Spicules sometimes absent or scarce, of irregular shape, with striated rays and broken or divided tips (Fig. 2).

Internal structure.—Zooids 0.6 to 0.85 mm long (Fig. 3). Branchial siphon with six lobes; atrial siphon forms a short, smooth-margined tube, projecting from middle of thorax, usually directed backward. Rounded lateral organs at level of second row of stigmata, distinguishable by aggregation of spicules around them. Testis undivided, surrounded by five to seven (usually six) coils of spermiduct (Fig. 4). Larval trunk 0.4–0.6 mm long with three papillae and four pairs of ampullae (Fig. 5).

Remarks.—Millar (1962) identified specimens from Curaçao as *T. orbiculatum*. However, the irregularly shaped spicules and



Figs. 2–5. *Trididemnum orbiculatum*: 2, spicules; 3, immature zooid in lateral view; 4, zooid with testis; 5, larva.

the two-lobed testis of his specimens put his determination in doubt. Millar (1977) described northern Brazilian material as *Trididemnum* sp. The spicules (50–88 μm) in that material are larger than in our specimens; the lack of mature gonads and larvae in Millar's specimens precludes a definitive conclusion about their identity. F. Monniot (1983a), in her discussion of *T. orbiculatum*, points out that this species is very similar to *T. tethidis* Van Name, 1945, of which only immature Florida specimens are known, and that larvae of this last species are needed to confirm its identity. In our material we found some mature colonies that agree well with the description of *T. tethidis*. In these colonies, spicules are scarce or absent and zooids have a black spot on the anterior end of the endostyle. The larvae from these colonies are identical to larvae from the other *T. orbiculatum* colonies, suggesting that *T. tethidis* and *T. orbiculatum* are indeed synonymous. The specimens from Guadeloupe (F. Monniot 1983a) seem to differ from the present material only in their more narrow range of spicule size and

in having a few more coils (eight) in their spermiducts.

Distribution and habitat.—Bermuda (type locality), Curaçao, Guadeloupe. In Brazil: São Paulo (São Sebastião). Colonies under low intertidal boulders or on subtidal ceramic plates.

Diplosoma listerianum
(Milne-Edwards, 1841)

Leptoclinum listerianum Milne-Edwards, 1841:295.

Diplosoma macdonaldi: Herdman, 1886: 315, pl. 42, figs. 1–4.—Van Name, 1945: 109, fig. 51, pl. 12, fig. 5.—Costa, 1969b: 201, fig. 1.—Plough, 1978:67 fig. 29, pl. VIII.—Simões, 1981:33, figs. 18–20.—Rocha, 1988:30, fig. 5.

Diplosoma listerianum: Rowe, 1966:457, figs. 1–5; Millar, 1978:104.—F. Monniot, 1983a:41, fig. 18.—Goodbody, 1984:31.

Material examined.—Thirty-nine colonies from Praia do Segredo, two from Praia Grande, one from Praia do Araçá. One specimen in USNM (20040), four in MZUSP

(11198, 11199, 11200, 11201). Gonads and larvae present in specimens from the whole year round.

Remarks.—The type locality of *D. macdonaldi* Herdman, 1886 is in Bahia. Van Name (1945) used this name for specimens from São Sebastião. However, according to Rowe (1966), who examined the type specimen, and F. Monniot (1974, 1983a), who compared the specimens from the Antilles, Bermuda, Azores, and France, all reports of *D. macdonaldi* are in fact of *D. listerianum*: the species are synonymous.

Distribution and habitat.—Bermuda, South Carolina, Florida, West Indies, Guiana Shelf. In Brazil: Bahia, Rio de Janeiro (Rio de Janeiro, Niterói), São Paulo (São Sebastião). Colonies in shallow water under boulders, sometimes attached directly to rocky substrate but more often growing on other organisms such as ascidians and bryozoans, and on artificial substrate (plastic, ceramic, or wood).

Family Polycitoridae

Distaplia bermudensis Van Name, 1902

Distaplia bermudensis Van Name, 1902:349, pl. 49, figs. 15, 18, 19, pl. 59, figs. 108, 111, pl. 62, fig. 130b.

Distaplia bermudensis: Van Name, 1945:146, fig. 70, pl. 16, fig. 2.—Millar, 1958:500, fig. 3, 1962:68.—Costa, 1969c:279, fig. 3.—F. Monniot, 1972:960, fig. 4.—Millar, 1977:188, fig. 14.—Plough, 1978:60, fig. 27, pl. III, IV.—F. Monniot, 1983c:1000, fig. 3.

Material examined.—Eighteen colonies from Praia do Segredo, four from Praia Grande. One specimen in USNM (20032), four in MZUSP (11209, 11210, 11211, 11212).

Distribution and habitat.—Bermuda (type locality), North Carolina, Florida, Antilles, Guadeloupe. In Brazil: along Pará and Maranhão coasts, Rio de Janeiro, São Paulo (Ubatuba, São Sebastião). Colonies in shallow water, on the undersurfaces of boulders.

Clavelina oblonga Herdman, 1880

Clavelina oblonga Herdman, 1880:724.

Clavelina oblonga: Van Name, 1945:136, figs. 63, 64, pl. 16, fig. 6.—Bjornberg, 1956:165.—Millar, 1958:500.—Millar, 1962:68.—Rodrigues, 1962:196.—Costa, 1969c:277, fig. 1.—Plough, 1978:58, fig. 25, pl. II.—Simões, 1981:36, figs. 21–23.—F. Monniot, 1983c:1000.—Rocha, 1988:32, fig. 6.

Material examined.—Twelve colonies from Praia do Cabelo Gordo de Dentro, two from Praia do Araçá. One specimen in USNM (20034), two in MZUSP (11207, 11208). Gonads present in colonies collected from November to July. Larvae present from November to May.

Distribution and habitat.—Bermuda (type locality), North Carolina to Florida, West Indies, West Africa. In Brazil: Rio de Janeiro (Niterói, Rio de Janeiro), São Paulo (Ubatuba, São Sebastião, Santos), Santa Catarina (Florianópolis). Colonies in shallow water and intertidal, attached to vertical walls and to artificial substrates such as buoys, iron pilings, and ceramic plates.

Family Styelidae

Symplegma brakenhielmi (Michaelsen, 1904)

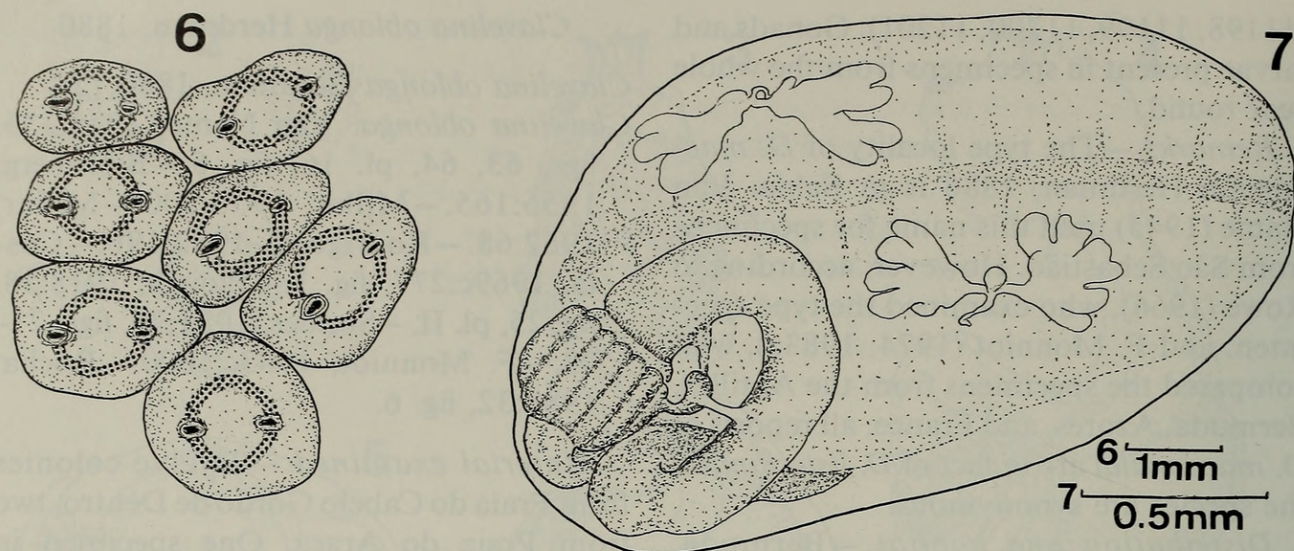
Diandrocarpa brakenhielmi Michaelsen, 1904:50.

Symplegma brakenhielmi: C. Monniot, 1983:429, fig. 3A–E.

Symplegma viride: Van Name, 1945:232, figs. 139, 140c, 140d, pl. 18, fig. 2.—Costa, 1969f:321 (part).—Rocha, 1988:35, fig. 7.

Material examined.—Twenty-three colonies from Praia Cabelo Gordo de Dentro, one from Praia do Araçá. One specimen in USNM (20029), three in MZUSP (11185, 11186, 11187). Ripe gonads and larvae were found in summer and fall specimens.

Remarks.—C. Monniot (1983) recognizes three species in the tropical West Atlan-



Figs. 6–7. *Symplegma rubra*: 6, group of living zooids in dorsal view (the coarser dots represent the red rings); 7, ventral side of a zooid.

tic: *Symplegma viride* Herdman, 1886, *S. brakenhielmi* (Michaelson, 1904), and *S. rubra* C. Monniot, 1972. There are several records from the Brazilian coast under the name *S. viride*. The accounts of Bjornberg (1956) and Millar (1958, 1977) do not provide sufficient information for correct identification of their material. Rodrigues (1962) mentions three populations, but without description; Costa (1969f) gives a table with some characteristics of these populations, one of them having transparent colonies. Re-examination of Rodrigues' (1962) material from this population showed less dense packing of zooids in the colony, pyriform or only slightly lobed testes, and no ovary. These differences may reflect immaturity of these colonies or be representative of another species. Additional material is required to clarify how many *Symplegma* species are present at São Sebastião. The material from Niterói, Rio de Janeiro (Simões 1981), is described as light or dark green with a coral-colored patch between the siphons. This pattern and the outline of the testis (Simões 1981, fig. 40) agree with C. Monniot's (1983) interpretation of *S. viride*.

Distribution and habitat.—Mexico (Vera Cruz: type locality), Florida, Puerto Rico, Bermuda, Guadeloupe. In Brazil: Rio de Janeiro (Ilha Grande), São Paulo (São Se-

bastião). Colonies in shallow water or intertidal, under boulders, on mollusc shells, and on artificial substrates such as buoys, ropes, iron pilings, and ceramic plates.

Symplegma rubra C. Monniot, 1972

Figs. 6–7

Symplegma rubra C. Monniot, 1972:622, fig. 2, E–I, fig. 3; 1983:429, fig. 3F.

Symplegma viride: Rodrigues, 1962:202 (part).—Costa, 1969f:321 (part).

Material examined.—Three colonies from Praia do Cabelo Gordo de Dentro, one from Praia do Segredo. One specimen in MZUSP (11188).

External appearance.—Encrusting colonies about 2 mm thick and 10 cm across. Tunic rose with a bright pink ring linking both siphons. Zooids' arrangement (Fig. 6) as in *S. brakenhielmi*.

Internal structure.—Zooids up to 2.5 mm long. Branchial tentacles 16–18, of two sizes. Branchial sac with 12–13 rows of stigmata. Stomach with 16 external folds and a small, curved pyloric caecum. Gonads with very prominent and multilobed testis (Fig. 7); ovaries absent from our specimens.

Remarks.—The present material resembles *S. rubra* C. Monniot, 1972 in general color and in the shape of the testis, but the

conspicuous pink ring around the siphons has not been noted in the material from Bermuda and Guadeloupe (C. Monniot 1972, 1983). Our zooids are smaller, and they have more branchial tentacles and more external stomach folds. The absence of ovaries may be evidence of sequential hermaphroditism, which C. Monniot (1972) suggests may be typical of *S. rubra*. Re-examination of Rodrigues' (1962) material revealed only immature specimens.

Distribution and habitat.—In Brazil: Rio de Janeiro (Ilha Grande), São Paulo (São Sebastião). Colonies in shallow water, on rocks or artificial (ceramic) surfaces.

Botryllus giganteum

Aron & Sole-Cava, 1991

Botryllus giganteum Aron and Sole-Cava, 1991:271.

Metrocarpa nigrum var. *Giganteum*: Pérès, 1949:205, figs. 26, 27.

Botrylloides nigrum var. *giganteum*: C. Monniot, 1969:628, fig. 3.—Simões, 1981:54, figs. 35–37.

Material examined.—Twelve colonies from Praia do Cabelo Gordo de Dentro, one colony from Praia Grande. One specimen in USNM (20038), five in MZUSP (11175, 11176, 11177, 11178, 11179).

External appearance.—Fleshy colonies, 4–15 mm thick, irregularly rounded, 3–15 cm in diameter, bright red or reddish orange overall. Tunic tough, somewhat rubbery, pale, translucent. Systems elongated, rounded or irregular. The greater the number of zooids, the more irregular are the systems.

Internal structure.—Zooids 2.5–3.5 mm long. Branchial aperture smooth and round. Atrial aperture a narrow horizontal slit in the young zooids, wide open; its anterior border produced into a broad and long languet in older zooids. Branchial tentacles 24, of three sizes in fully developed zooids. Branchial sac with 11–17 (usually 14–16) rows of stigmata; each row with four or five

stigmata near endostyle and dorsal lamina, and two or three between lateral internal longitudinal vessels. Stomach with nine folds and a very small caecum. Anus bilobed and sometimes enlarged at the tip. Testis comprises 5–15 rounded lobes, dorsal to ovaries; ovaries hold only one egg each. Testis present throughout year but ovaries found only in July, October and November, in colonies that had settled on ceramic plates.

Remarks.—Aron & Sole-Cava (1991) raised the variety *giganteum*, described by Pérès (1949), to species status based upon specimens collected at Rio de Janeiro (Urca) and Espírito Santo (Vitória). Our specimens agree with the description given by Simões (1981) and Aron & Sole-Cava (1991, table 4) except that our colonies are thinner and smaller, and our zooids have fewer rows of stigmata and gastric folds. The species seems to be rare. It was not found by Rodrigues (1962), and it was found only once on natural substrate in the present survey. All our other colonies settled instead on experimental ceramic plates (Rocha 1988).

Distribution and habitat.—Senegal (Dakar: type locality). In Brazil: Espírito Santo (Vitória), Rio de Janeiro (Niterói, Rio de Janeiro). The only colony found on natural substrata was growing on the side of a boulder, exposed during low tide.

Botryllus niger (Herdman, 1886)

Botrylloides nigrum Herdman, 1886:50, pl. 1, fig. 8, pl. 3, figs. 19–21.—Van Name, 1945:227, figs. 136c, 137.—Millar, 1962:71.—Rodrigues, 1962:201, pl. 2, figs. 5–7.—Costa, 1969e:300, fig. 1.—C. Monniot, 1972:618.—Plough, 1978:89, fig. 43: Simões, 1981:51, figs. 32–34.—Goodbody, 1984:36.—Rocha, 1988:38, fig. 8. *Botryllus niger*: Aron & Sole-Cava, 1991:274, t. 4.

Material examined.—Thirteen colonies from Praia do Cabelo Gordo de Dentro, four from Praia do Segredo, one from Praia Preta, one from Praia do Araçá. One spec-

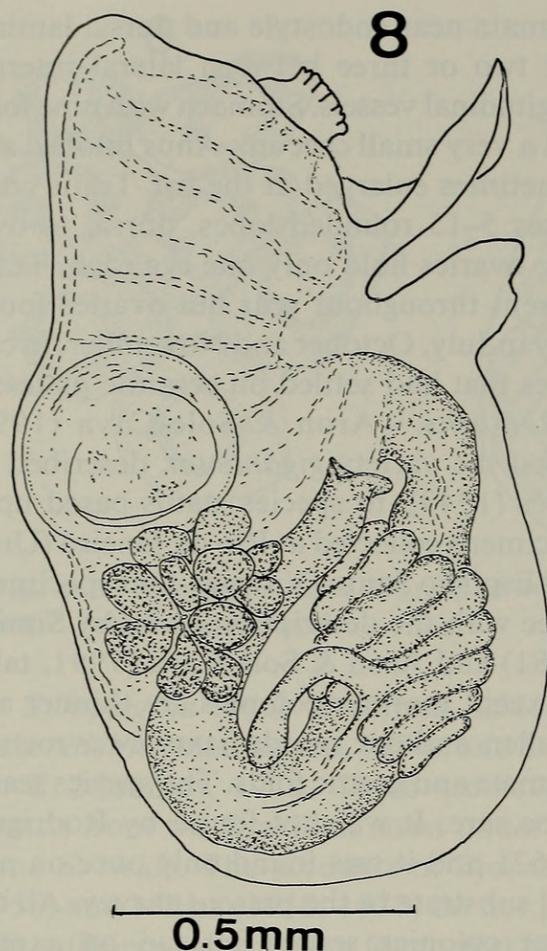


Fig. 8. *Botryllus tabori*: mature zooid in lateral view.

imen in USNM (20031), three in MZUSP (11180, 11181, 11182). Gonads found in all months, except September and November; larvae present in April and August.

Remarks.—This species is widely known as *Botrylloides nigrum*. However, C. & F. Monniot (1987) argue convincingly that the characters used to distinguish the genus *Botrylloides* from *Botryllus* are too unreliable to maintain this separation and that the name of the older genus, *Botryllus*, should prevail in all cases.

Distribution and habitat.—Distributed widely throughout warm regions. In the Atlantic: Bermuda, Florida, the Caribbean Sea. In Brazil: Espírito Santo (Vitória), Rio de Janeiro (Niterói, Rio de Janeiro), São Paulo (São Sebastião, Santos), Santa Catarina (Florianópolis). Very common in shallow water, sometimes growing directly on rocky surfaces but more often on other organisms

such as algae, sea grasses, sponges, polychaete tubes, and ascidians.

Botryllus tabori Rodrigues, 1962

Fig. 8

Botryllus tabori Rodrigues, 1962:199, pl. 3, figs. 8–11; Costa, 1969e:301, fig. 5.

Material examined.—Six colonies from Praia do Segredo, five from Praia do Araçá, one from Praia Grande. One specimen in USNM (20030), one in MZUSP (11183).

Remarks.—The zooids (Fig. 8) differ from the description of Rodrigues (1962) in having more branchial tentacles (twelve instead of eight) and fewer testis lobes (from five to nine instead of twelve). The atrial aperture most commonly was a wide horizontal opening; rarely, it opened at the end of a siphon.

Distribution and habitat.—In Brazil: Rio de Janeiro (Urca), São Paulo (São Sebastião: type locality). Intertidal colonies on the undersurfaces of boulders, and on algae (mainly *Ulva* sp.), sponges, and solitary ascidians.

Botryllus tuberatus

Ritter & Forsyth, 1917

Botryllus tuberatus Ritter & Forsyth, 1917: 461, pl. 39 figs. 10, 12, pl. 40, fig. 22.—Van Name, 1945:225, fig. 135.—C. Monniot, 1983:426, fig. 2.

Botryllus primigenus: Van Name, 1945:223, fig. 134.—Millar, 1958:505.—Costa, 1969e:301, fig. 4.

Botryllus schlosseri: Bjornberg, 1956:164.

Material examined.—Three colonies from Praia do Segredo, one from Praia Grande. One specimen in MZUSP (11184).

Remarks.—C. Monniot (1983) decided that all western tropical Atlantic *Botryllus* with four rows of stigmata are *B. tuberatus*. He noted that the zooids of this species form systems around common cloacas, in contrast to those of *B. primigenus*, which send their atrial apertures separately to the colony surface. In the present material only a

few zooids within a colony have atrial apertures that open independently in this way; by far most zooids form systems like those in colonies from Guadeloupe (C. Monniot 1983). C. Monniot (1983) does not remark on the enlargement of the gut near the stomach, regularly present in our specimens, but it is apparent in his figure.

The same material that Bjornberg (1956) attributed to *B. schlosseri* was later described by Millar (1958) as *B. primigenus*. By implication, if Monniot's (1983) synonymy holds, those specimens are *B. tuberosus*.

Distribution and habitat.—California (Santa Barbara: type locality), Florida, Tortuga Islands, Guadeloupe. In Brazil: Rio de Janeiro (Urca), São Paulo (Santos, Cananéia, São Sebastião). Colonies were found intertidally on the undersurfaces of boulders, growing directly on the rock or on sponges and algae. They also settle on ceramic plates submerged continuously in shallow water.

Discussion

All the compound ascidians already recorded from intertidal and shallow subtidal habitats at São Sebastião occur as well in the Caribbean region and/or other tropical seas (Rodrigues 1962). Only *Botryllus tabori* seems to be endemic to the Brazilian coast. New records are reported in this paper for *Didemnum psammathodes*, *Trididemnum orbiculatum*, *Distaplia bermudensis*, and *Symplegma rubra*, all known previously from the Caribbean, and some of them distributed elsewhere, as well, in warm waters. *Botryllus giganteus* is known previously from West Africa.

Species distributed widely in warm waters may be newcomers. Worldwide shipping has introduced exotic species into many ports (C. Monniot et al. 1991): São Sebastião, since the sixties, has become Brazil's biggest maritime oil terminal.

In general, the littoral marine fauna of São Paulo can be considered an impover-

ished Caribbean fauna. However the sublittoral ascidian fauna presents antiboreal cold water species (Rodrigues 1966). Evidence of an upwelling of subtropical water in the region of the continental shelf between 20° and 26° S has been known since Emilsson (1961).

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