

Phacelocyathus flos (Pourtalès, 1878)

Paracyathus flos Portalès, v*1878: 201.

Phacelocyathus flos. –Cairns, 1979: 144-146, pl. 27, figs. 1-4, Map 41 (synonymy and description). –Cairns et al., 1991: 47 (listed). –Humann, v.1993: 174-175, colour fig. –Cairns et al., 1994: 4 (listed).

Caryophyllia flos. –Castañares & Soto, 1982: Table 2 (listed).

Diagnosis: Small corallites usually ceratoid (straight) and greatly flared; larger corallites usually cylindrical. Largest corallite (USNM 61943) 15.6 x 13.1 mm in CD, 15.4 mm in height, and 9.1 mm in PD. Costae inconspicuous, granular, often covered with smooth, translucent calcareous deposits. Upper quarter of corallum, including distal edges of all septa and theca near calice, usually pigmented black or reddish-brown; however, coralla of about 25% of specimens examined entirely white. Septa hexamerally arranged in 4 cycles (S1-2>S4>S3), up to 3 pairs of S5 (54 septa) present in largest corallites. S1-2 highly exsert and often thick, appearing swollen. S3 more exsert but slightly less wide than S4, the S4 adjacent to S1 being slightly wider than those adjacent to S2. P1-2 equal in size, narrow, and recessed low in fossa. P3 substantially larger (*i.e.*, 3 times as thick and 4 times as wide as P1-2) and stand much higher in fossa. P3 have broad, rounded distal edges; straight, vertical axial edges that extend closer to columella than P1-2; and thick peripheral edges that border not only S3 but the 2 adjacent S4 as well. Sometimes peripheral edge of the P3 is dissected into 3 components, as though paliform lobes (P4) are splitting from the P3 even before S5 form. Columella papillose, in older corallites some of the papillae fusing to form an elongate lamella.

Discussion: The records reported below extend the known distribution of *P. flos* to Mexico (Cozumel), Belize, and Puerto Rico, as well as establishing a shallower depth range of 20-355 m. The deeper range of 560 m reported by CAIRNS (1979), as well as several other records deeper than 400 m, were based on dead specimens and therefore are not now considered valid for establishing a depth range. Most records of this species are from less than 200 m, often from cave ceilings and the undersides of ledge overhangs (HUMANN 1983). Its common name is the 'twotone cup coral' (HUMANN 1983).

New Records: P-1395, 1 corallum of 8 corallites, USNM 61938; Gos-39, 1, USNM 80996; Gos-112/78, 1, USNM 80994; JSL-I-1332, 1, IRCZM; JSL-I-3660, 12, USNM 94742; DBL-879, and 1022, Runaway Bay, Jamaica, 34-40 m, 6: 5 (USNM 80995), 1 (UMML 8.383); DBL-1428, Runaway Bay, Jamaica, 24 m, 2, USNM 46079 and 80979; Palancar Reef, Cozumel, Mexico, 20 m, 1, USNM 77654; Freeport, Grand Bahamas, 50 m, 1, USNM 61937; Margarite Reef, La Parguera, Puerto Rico, 90-92 m, 2, USNM 61943; 16°48.2'N, 88°04.5'W, 128 m, 2, USNM 99292.

Types: See CAIRNS (1979).

Distribution: Bahamas; northeastern Gulf of Mexico; Antilles; western Caribbean; off Guyana; off Recife, Brazil (CAIRNS 1979: map 41); 20-355 m.

Genus *Anomocora* Studer, 1878

Diagnosis: Corallum colonial and recumbent, producing relatively small but elongate corallites. New corallites tend to bud extratentacularly from edge zone with random periodicity, invariably detaching from parent before a third generation bud appears, resulting in corallites with open or broken bases. Theca thin and endothecal dissepiments widely spaced, resulting in a low density corallum. Paliform lobes usually present on higher cycle septa; columella trabecular.

Type Species: *Coelosmilia fecunda* Pourtalès, 1871, by monotypy.

Discussion: In the course of re-examining specimens of *Anomocora fecunda* and *Asterosmilia prolifera*, they were found to be inseparable regarding generic level characters, *i.e.*, they both bud extratentacular coralla from the edge zone, which detach from the parent corallum resulting in basally open corallites; and they have paliform lobes before the penultimate septal cycle; endothecal dissepiments; and a papillose columella. The genus *Asterosmilia* Duncan, 1867, based on the type species *A. abnormalis* (DUNCAN 1864), may still be retained for similar species that do not asexually bud daughter corallites, and would include species such as: *A. profunda* (Duncan, 1864) and *A. duncani* Vaughan, 1925, among others (see CAIRNS & WELLS 1987). But the following species, that were previously

placed in *Asterosmilia*, all of which have asexual budding of coralla from the edge zone or parricidal budding resulting in coralla with open bases, and are transferred to *Anomocora*: *A. exarata* (DUNCAN 1867), n. comb.; *A. marchadi* (CHEVALIER 1966), n. comb.; *A. prolifera* (POURTALES 1871), n. comb.; *A. gigas* (VAN DER HORST 1931), n. comb.; and *A. irregularis* (CAIRNS 1995b), n. comb.

***Anomocora fecunda* (Pourtales, 1871)**

Coelosmilia fecunda Pourtales, v*1871: 21-22, pl. 1, fig. 12, pl. 6, figs. 14-15.

Anomocora fecunda. –Ludwick & Walton, 1957: 2081 (listed). –Keith & Weber, v.1970: 271 (isotopic analysis). –Cairns, 1979: 127-129, pl. 24, figs. 6-8, Map 35 (synonymy and description). –Hubbard & Wells, v.1986: 138, figs. 29-30. –Viada & Cairns, 1987: 132, –?Estalella, 1987:13-14, figs. 4A-B. –Prah & Erhardt, 1989: 547. –Cairns et al., 1991: 47 (listed). –Cairns et al., 1994: 4 (listed).

Coenosmilia fecunda. –Zibrowius, v.1980: 131-133 (in part: pl. 67, figs. A-K).

Diagnosis: Corallum elongate (up to 10 cm) and cylindrical (GCD up to 10 mm), tapering slightly towards base, which is invariably open or broken, the result of detachment from the theca of parent corallite. Coralla often slightly curved, lying in a recumbent posture, each parent corallite bearing several smaller buds oriented perpendicular to the parent, as well as scars of previous bud detachments. Budded corallites rarely exceed 20 mm in length before detachment. Costae low, continuous ridges; corallum white. Theca thin (about 0.3 mm) and tabular endothelial dissepiments widely spaced (1 every 4 mm), producing a low-density, brittle corallum. Septa hexamerally arranged in 4 cycles: S1>S2>S3>S4. Axial edges of S2 sometimes bear several elongate, ribbon-like paliiform lobes that intermingle with the columella. Axial edges of S3 often bear a small, lamellar paliiform lobe or several slender ribbons, as on the S2. S4 rudimentary or absent. Columella not well formed, composed of a loose mingling of ribbon-like elements.

Discussion: Like *Coenosmilia arbuscula*, *A. fecunda* is fairly common between 100-200 m. The minimum bathymetric range of the species may be extended to 37 m, based on the record from R/V Hidalgo-316, made at Gorda Bank, Honduras.

Although similar to *C. arbuscula*, *A. fecunda* differs in having more elon-

gate, cylindrical coralla with costae forming thin, continuous ridges. Budding appears to be random, each bud detaching from the theca of its parent corallite before a third generation appears, resulting in a broken, often open, base of most corallites. Furthermore, *A. fecunda* has more widely spaced dissepiments and thus a lower density corallum; small paliform lobes (P2 and P3); and a poorly formed columella.

New Records: P-596, 6, USNM 80436; O-4225, 5, USNM 62510; BLM, SOFLA-32, 2, USNM 71964 and 71989; Hidalgo-316, 1, USNM 85738; Hidalgo-319, 12, USNM 85739; Aleutian Bounty, 26°30'N, 84°50'W, 640 m, 1, FSBC I; EJ81-24, 4, FSBC I; EJ81-29, 2, FSBC I; 26°16'N, 84°04'W, 139-148 m, 2, USNM 83441; 25°00'N, 84°00'W, 128 m, 12, USNM 62504.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: Bahamas, Caribbean, eastern Gulf of Mexico, northeastern Brazil (off Maranhão), St. Peter and St. Paul Rocks (CAIRNS 1979: map 35); 37-640 m. Eastern Atlantic: Azores, Madeira, Canary Islands; 130-540 m (ZIBROWIUS 1980).

***Anomocora prolifera* (Pourtales, 1871), new combination**

(Figs. 148-150)

Ceratocyathus prolifer Pourtales, v*1871: 19-20, pl. 3, figs. 8-10.

Astrosmilium prolifer. -?Alloiteau & Tissier, 1958: 243-245, pl. 2, figs. 4 a-b, 4'a-b.

Astrosmilium prolifera. -Kenny et al., 1975: 116, fig. 13. -Cairns, 1979: 138-140, pl. 26, figs. 5-6, 8, map 39 (synonymy and description). -Zibrowius, v.1980: 140-141, pl. 73, figs. A-N, pl. 107, fig. J (synonymy and description). -Hubbard & Wells, v.1986: 138-139, figs. 31-32. -Cairns & Wells, 1987: 38-39, table 3. -Prah & Erhardt, 1989: 548. -Cairns et al., 1991: 47 (listed). -Cairns et al., 1994: 4 (listed).

Diagnosis: Corallum ceratoid (cornute), up to 17 mm in GCD and 50 mm in length. Some coralla attach through a slender pedicel to a substrate, such as a dead *Deltocyathus* corallum (Fig. 150), but most coralla originate by asexual budding from the edge zone just beneath calicular edge. Buds detach at a very small size, and are virtually never seen while still attached to parent corallum, but in exceptional circumstances (Fig.

149). Asexual budding results in a daughter corallum with a small, usually open, irregularly fractured basal end 1.0-1.2 mm diameter. Another result of bud detachment is that the parent corallum often bears several small, concave detachment scars, usually less than 1 mm in diameter, which may be aseptate. Parricidal budding also very common, resulting in 1, or sometimes 2, daughter corallites (Fig. 148) from a parent corallum. Costae usually well formed and granular; corallum white. Septa hexamerally arranged in 4 cycles (S1-2>S3>S4), larger coralla with some pairs of S5. Broad paliform lobes usually present before S3. Columella papillose, occasionally lamellar. Endothecal dissepiments present, especially in elongate coralla.

Discussion: The new records listed below extend the known distribution from southern Florida to off Onslow Bay, NC and add records to southwestern Florida and Suriname. The known bathymetric range is marginally increased from 32-311 m to 30-329 m. The bathymetric range of 5-1383 m given by PRAHL & ERHARDT (1989) is unsubstantiated and improbable.

New Records: O-3210, 20, USNM 80732; O-4302, 1, USNM 80733; O-5699, 1, USNM 80737; BLM, SOFLA-32, 2, USNM 71963; BLM, SOFLA-36, 20, USNM 71961-62; BLM, James Island Area Block 380-19, 2, USNM 75695; BLM OS-05, 3, USNM 71662-63; Alpha Helix-16, 9, USNM 79506; Delaware II-121, 1, FSBC I; west of Cedar Keys, FL, 55 m, 1, USNM 46803.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: southeastern US from Onslow Bay, NC (33°49'N, 76°34'W) to off Pensacola, FL; Bay of Campeche, Mexico; northern coast of South America from Colombia to French Guiana and north to Martinique (CAIRNS 1979: map 39); 30-329 m. Eastern Atlantic: Madeira; Canary Islands; off Spanish Sahara; 110-125 m (ZIBROWIUS 1980).

***Anomocora marchadi* (Chevalier, 1966), new combination**

Dasmomilia marchadi Chevalier, v*1966a: 944-949, pl. 5, figs. 3-4, text-figs. 11-13.

Asteromilia marchadi. -Cairns, 1979: 140-142, pl. 26, figs. 7, 9-10, Map 40 (synonymy and description). -Zibrowius, v.1980: 141-142, pl. 74, figs. A-K (synonymy and description).

—Cairns & Wells, 1987: 38-39 (Table 3). —Prahl & Erhardt, 1989: 548. —Cairns et al., 1991: 47 (listed). —Cairns & Keller, 1993: 249-250, figs. 6A. —Cairns et al., 1994: 7. —Cairns & Zibrowius, 1997: 131-132, figs. 17a-b (synonymy and description).

Discussion: *Asterosmilia marchadi* was recently described by CAIRNS & ZIBROWIUS (1997) and thus will not be redescribed herein. *A. marchadi* is similar to *A. prolifera*, has similar geographic and bathymetric ranges, and is sometimes found at the same stations. *A. marchadi* can be distinguished by having poorly developed P3, a junction of the axial edges of each pair of S3 before its adjacent S2, a brownish corallum, S1 more exert and broad than S2, and thecal buds that remain attached longer and have a larger base of detachment (*i.e.*, 1.5-2.0 mm diameter). Parricidal budding is also much less common.

New Records: P-710, 10, USNM 99295; P-711, 2, USNM 99296; P-717, 1, USNM 46789; P-718, 17, USNM 46784, 80506; P-761, 8, USNM 46798.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: off northeastern Florida; off Pensacola, Florida; southern Caribbean from Colombia to Península de Paria, Venezuela; 35-229 m (CAIRNS 1979: map 40). Eastern Atlantic: from Spanish Sahara to Gabon; 32-85 m (ZIBROWIUS 1980). Elsewhere: Philippines, Indonesia, South China Sea, Maldives, southwest Indian Ocean; 32-210 m (CAIRNS & ZIBROWIUS 1997).

Genus *Coenosmilia* Pourtalès, 1874

Diagnosis: Corallum colonial, producing small, bushy colonies by extratentacular budding from edge zone just below calice. Pali and paliform lobes absent; columella trabecular. Tabular endothecal dissepiments present.

Type Species: *Coenosmilia arbuscula* Pourtalès, 1874, by monotypy.

***Coenosmilia arbuscula* Pourtalès, 1874**

Coenosmilia arbuscula Pourtalès, v*1874: 39-40, pl. 7, fig. 1. –Cairns, 1979: 130-132, pl. 24, figs. 9-11, Map 36 (synonymy and description). –Rezak et al., v.1985: 225 (listed: stn 119, Diaphus Bank: 28°05'N, 90°41'W, 44-74 m). –Prahll & Erhardt, 1989: 547-548. –Cairns et al., 1991: 47 (listed). –Cairns et al., 1994: 4 (listed).

Coenosmilia fecunda. –Zibrowius, v.1980: 131 (in part: pl. 68, figs. A-F). [Not *Coelosmilia fecunda* Pourtalès, 1871]

Diagnosis: Each corallite bears 2-4 daughter corallites, which are equally spaced around its calicular perimeter. Because corallites remain firmly attached to their parent, a small bushy corallum often results, larger coralla composed of up to 5 successive generations. Corallites ceratoid, typically 10-15 mm in height and 7-10 mm in GCD; founder corallites sometimes larger. Costae ridged and finely dentate; corallum white. Theca robust (0.5-0.6 mm thick) and endothecal dissepiments closely spaced. Septa hexamerally arranged in 4 cycles: S1>S2>S3>S4. Axial edges of S1-2 straight and smooth, those of S3 slightly dentate, and those of S4 highly dentate. Columella well developed, papillose.

Discussion: This species is relatively common between 100-200 m, and is often collected together with *Anomocora fecunda* and *Asterosmilia prolifera*. The bathymetric range may be extended to as shallow as 74 m based on the report of *C. arbuscula* by REZAK *et al.* (1985) from Diaphus Bank (see synonymy). The record of '*Coenosmilia* n. sp.' by REZAK *et al.* (1985), however, is unsubstantiated.

New Records: SB-3467, 2, USNM 80235; B-A DS34, 1, USNM 80190; BLM, SOFLA-32, 3, USNM 71974 and 80099; BLM, SOFLA-35, 12, USNM 71972, -75, -79, -80, -83, 72688; BLM, SOFLA-36, 7, USNM 71973, -76, 75683; BLM, SOFLA-38, 20, USNM 71977, -78, -81, -82, -88; JSL-II-1845, 1, USNM 86802; JSL-I-2585, 4, USNM 89360; USGS, VIII-A-3, 1, USNM 80355; CSA Pinnacle site 4, 2, CSA; 26°16'N, 84°04'W, 139-148 m, 1, USNM 83443; 25°00'N, 84°00'W, 126 m, 3, USNM 99298; R/V Cape Hatteras, 15°32.4'N, 81°39.8'W, 50-85 m, 4, FSBC I.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: throughout Bahamas and Caribbean

to Guyana, South America; northern Gulf of Mexico to southwestern Louisiana (27°49'N, 91°54'W); 74-622 m (CAIRNS 1979: map 36). Eastern Atlantic: Azores, Madeira, Canary Islands; 130-540 m (ZIBROWIUS 1980).

Genus *Pourtalosmilia* Duncan, 1884

Diagnosis: Bushy colonies formed by extratentacular budding from near calicular margin; anastomosis of adjacent corallites common. Corallites subcylindrical and elongate. Septotheca granular. Septa usually arranged in 4 cycles, with a crown of pali before septa of penultimate cycle (P3). Columella well developed, fascicular. Vesicular endothecal dissepiments abundant.

Type Species: *Blastosmilia pourtalesi* Duncan, 1878 [= *Pourtalosmilia anthophyllites* (Ellis & Solander, 1786)], by monotypy. Although no species were listed by DUNCAN (1884) in the original description of *Pourtalosmilia*, this genus was established as a new name for the junior homonym *Blastosmilia* (Duncan, 1878, not Etallon, 1859), which included only one species: *B. pourtalesi*.

Pourtalosmilia conferta Cairns, 1978

(Fig. 22)

Bathycyathus sp. Ludwick & Walton, 1957: 2081, fig. 13C1.

Bathycyathus maculatus. -Keith & Weber, v.1970: 271 (USNM 46857). [Not *Bathycyathus maculatus* Pourtalès, 1874]

?*Coenocyathus* sp. Avent, King & Gore, 1977: 200 (listed).

Pourtalosmilia conferta Cairns, *1978a: 12, pl. 1, figs. 1-6; 1979: 207 (listed). -Cairns et al., 1994: 8.

Diagnosis: (from CAIRNS 1978a): Large, densely-branched colonies up to 22 cm tall and 19 cm in diameter. Elongate corallites up to 6 cm; corallites often anastomose laterally, producing a compact, reinforced corallum with many small cavities, the cavities providing niches for various other organisms. Calices up to 11 mm in GCD. Theca finely granular (not costate); corallum uniformly white. Septa hexamerally arranged in 4 cycles (SI-

2>S3>S4). A crown of 12 well-formed P3 encircles a fascicular columella. Vesicular endotheca abundant.

Discussion: Although not included in my revision of the deep-water Caribbean azooxanthellates (CAIRNS 1979), *P. conferta* was fully described and illustrated a year earlier (CAIRNS 1978a) and little can be added to that account, except for the added distributional records listed below.

New Records: JSL-I-1200: large colony (IRCZM 12:133), 1 fragment (USNM 75209); JSL-II-3104, 1 fossil slab carbon-dated at 13,170 yrs BP \pm 80 years (USNM 93277), remainder of colony at DISL; Circé-25, 4 corallites, USNM 75654; Circé-28, 2 corallites, USNM 75659; Circé stn 29, 2 corallites, USNM 75661; CSA Pinnacle site 7, 3, CSA; USGS-AE-9701-77, 1 colony, USNM 99365.

Types: All types deposited at the NMNH (see CAIRNS 1978a). **Type Locality:** 34°57.5'N, 75°19.5'W (off Cape Hatteras, NC), 119-173 m.

Distribution: Despite the 6 additional records reported above and 2 previously overlooked references (LUDWICK & WALTON 1957 and KEITH & WEBER 1970), *P. conferta* is known from only 17 collections, a third of which are from the Mobile Pinnacles in the northeastern Gulf of Mexico. The distribution of this species is disjunct (Fig. 22), known from: off Cape Hatteras; east and south Florida coasts; north central Gulf of Mexico (off Louisiana, Mobile Pinnacles, and off Pensacola); near Rio de Janeiro; and St. Paul Rocks, Brazil; 55-191 m. The latitude of 25°05'N given by CAIRNS (1978a) for the location at Ilha Raza Guaratiba, Brazil should have read 25°05'S.

Family **TURBINOLIIDAE** Milne Edwards & Haime, 1848

Genus **Deltocyathoides** Yabe & Eguchi, 1932

Diagnosis: Corallum unattached, bowl-shaped, with a rounded base, and a calice circular in cross section; regeneration from basal fragments common but transverse division not present. Costae ridged and serrate; intercostal regions deep, narrow, and not pitted. Higher cycle costae origi-

nate by bi- or trifurcation. Septa hexamerally arranged in 4 cycles. Pali before all but last septal cycle; columella papillose.

Type Species: *Deltocyathoides japonicus* Yabe & Eguchi, 1932 (= *Deltocyathus orientalis* Duncan, 1876), by original designation.

***Deltocyathoides stimpsonii* (Pourtalès, 1871)**

Leptocyathus stimpsonii Pourtalès, v*1871: 12, pl. 3, figs. 1-3.

Peponocyathus stimpsonii. –Cairns, 1979: 115-117, pl. 22, figs. 5-7, not pl. 20, fig. 11, Map 31 (synonymy and description). –Zibrowius, v.1980: 115-116, pl. 60, figs. A-M (synonymy and description). –Viada & Cairns, 1987: 132. –Cairns et al., 1991: 47 (listed).

Peponocyathus australiensis. –Cairns et al., 1994: 4 (listed). [Not *Deltocyathus italicus* var. *australiensis*]

Deltocyathoides stimpsonii. –Cairns, 1997:17, pl. 4, fig. g, pl. 7, fig. e.

Diagnosis: Corallum spherical, rarely exceeding 7 mm in CD. Base of corallum sometimes irregular or asymmetrical, caused by asexual budding from a parent fragment, but transverse division does not occur. Costae equal in width, each costa bearing a row of outward projecting granules, as well as much smaller spines that project into intercostal furrow. Corallum white. Septa hexamerally arranged in 4 cycles: S1>S2>S3>S4, axial edges of S4 fusing to their adjacent P3. Rod-shaped or lamellar pali usually present before S2 and S3. Columella composed of 6-8 granular papillae, 6 often aligned with the S1, resembling P1.

Discussion: The only substantive record of *D. stimpsonii* since 1979 was that of VIADA & CAIRNS (1987) from off southwestern Louisiana. This species was at one time thought to be synonymous with the Indo-Pacific species *Peponocyathus australiensis* (DUNCAN 1870) (see CAIRNS 1989, 1994), but was later (CAIRNS 1997) considered to be a separate species, geographically isolated from *D. australiensis* in separate oceans.

New Records: EJ81-20, 3, FSBC I; EJ81-22, 1, FSBC I; off Alligator Reef Lighthouse, FL, 182-213 m, 1, USNM 81000; 'east coast of Florida', depth unknown, 5, USNM 61854-56.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: southeastern US from off Charleston, SC (31°52.8'N, 78°29.5'W) to southwestern Florida; off southwestern LA; Campeche Bank, Mexico; Straits of Florida; Lesser Antilles; one isolated record off Maranhão, Brazil; 110-553 m (CAIRNS 1979: map 31). Eastern Atlantic: Madeira; Azores; 200-600 m (ZIBROWIUS 1980).

Genus *Sphenotrochus* Milne Edwards & Haime, 1848

Diagnosis: Corallum cuneiform, with a rounded base and a calice elliptical in cross section. Costae variable in ornamentation (smooth or granular) and in length (continuous from calice to base, or fragmented into short, parallel ridges). Costae independent in origin; no thecal pits or pores. Septa in 3 or 4 cycles. Pali and paliform lobes absent; columella lamellar.

Type Species: *Turbinolia crispa* Lamarck, 1816, by subsequent designation (MILNE EDWARDS & HAIME 1850a: xvi).

Sphenotrochus auritus Pourtalès, 1874

(Figs. 21, 151-156)

Sphenotrochus auritus Pourtalès, v*1874: 37, pl. 6, figs. 14-15. –Moseley, 1881: 158 (mentioned) –Not Wells, 1956: F360, fig. 258, 1a-b (= *S. senri* Wells, 1945). –Laborel, 1970: 155 (listed); 1971: 175 (listed). –Cairns, 1979: 207 (listed). –Cairns, 1989: 38 (mentioned). –Cairns, 1997: (listed, compared).

Not *Sphenotrochus auritus* var. Lindström, v.1877: 11-12, figs. 21-22 (= *S. lindstroemi*, n. sp.).

–Wells, 1935: 531 (listed). –Cairns & Wells, 1987: 36.

Sphenotrochus sp. Tommasi, 1970: 55 (listed). –?Zibrowius, 1988: 136 (listed).

Description: Each wedge-shaped corallum bears broad, planar thecal faces that meet in rounded or narrow, planar thecal edges, the edges consisting of 3 broad costae. Largest corallum (Monitaverão) 9.7 x 6.2 mm in CD and 13.4 mm in height; largest syntype (Fig. 155) 7.2 x 4.0 mm in CD and 7.3 mm in height, these 2 coralla representing the extremes in GCD:LCD. Calice elongate (GCD:LCD = 1.56-1.65-1.80), the corallum narrowing aborally to a thin, linear to fishtail-shaped base, the triangular fish-tail projections extending as much as 2.2 mm (Figs. 151-152) but charac-

teristic only of larger coralla. Coralla of less than 5 mm GCD usually have a rounded base. GCD:HT = 0.71-1.09. Costal ornamentation distinctive. On lower central region of both thecal faces, at a height of about 1.3 mm above the base (or about the height of the original substrate inclusion), 9 costae (C1-3) radiate upward as continuous ridges for approximately 2 mm (Figs. 152-153). The 2 principal C1 and their flanking C3, which form the edge of the corallum, do not radiate from this region. Each of these 18 costae (9 on each face) then fragments into shorter ridges and subsequently forms 2 parallel rows of elongate granules per costa. At a distance of 5-8 mm from the base a third row of granules is added to each costa, and at a distance of over 8 mm from the base a fourth row or granules may be added. Short costae also radiate downward (aborally), from the point of substrate inclusion to the base of corallum. Short, discontinuous costae also run perpendicular to the C2 that is closest to the edge (principal) C1, this costal ornamentation associated with the 4 C3 adjacent to the 2 edge C1 and covers the fishtail-like spurs. Corallum white.

Septa hexamerally arranged in 3 cycles (24 septa): S1-2>S3. S1-2 moderately exsert (about 1.2 mm), having vertical axial edges that appear to be thick, but instead are the result of rather large granules on axial edge. Lower axial edges of the 2 S2 and 4 S1 associated with central faces of corallum solidly fused to columella, whereas axial edges of the 4 S2 located toward the narrow edges of the corallum fuse to the columella but less strongly and lower in fossa. Axial edges of the 2 edge S1 usually do not fuse to columella. S3 only slightly less exsert and about $\frac{3}{4}$ width of S1-2, but all septa equal in thickness at calicular edge; S3 have thin, dentate axial edges. Fossa relatively shallow, containing a well-developed, blade-like lamellar columella with a smooth, continuous distal edge.

Discussion: *Sphenotrochus auritus* is compared to *S. lindstroemi* in the account of the latter species, but small coralla of *S. auritus* (before the formation of basal spurs) are remarkably similar to *S. senni* Wells, 1945, known from the Middle Miocene to Late Pliocene of the Caribbean (CAIRNS & WELLS 1987). *S. senni* may well be the ancestor of *S. auritus* or even be conspecific; more specimens of both forms are needed to make this evaluation.

The records listed below are believed to be the first legitimate records of *S. auritus* since it was described in 1874.

New Records: P-686, 1, USNM 87612; O-2075, 92 juvenile coralla, USNM 87613; Emilia-251, Baia de Ilha Grande, Brazil, 18 m, 5: 4, MNRJ 570, 1, USNM 99301; Saldanha 031, 19°43'S, 39°34'W, depth unknown, 5, MNRJ 613; Saldanha-1743, 3, USNM 84353; Akaroa-92, 3, USNM 99300; "Station 8201", 34°35'S, 54°02'W, 15 m, 25 II 1992, 2, MNRJ 569; Astro Garoupa-15, 22°10'34"S, 40°58'55"W, 30 m, 4, MNRJ.

Types: Seven syntypes from Hassler station 20 off Cabo Frio, Brazil are deposited at the MCZ: 6 numbered 2755 and 1 numbered 2788. Two additional uncataloged syntypes, also from the Hassler 1871-1872 expedition (stations 9-10?), from 11°49'S, 37°10-27'W, are also deposited at the MCZ. Type Locality: Cabo Frio, Brazil (64 m) and 11°49'S, 37°10'W (off São Cristóvão, Brazil), 22-33 m.

Distribution: Known only from the Atlantic coast of South America from Suriname to Uruguay (Fig. 21); 15-64 m.

***Sphenotrochus lindstroemi*, new species**

(Figs. 21, 157-161)

Sphenotrochus auritus var. Lindström, v.1877: 11-12 (in part: specimens from St. Barthelemy, figs. 21-22). -Wells, 1935: 531 (listed). -Cairns & Wells, 1987: 36.

Description: Corallum pocket-shaped, having slightly convex thecal faces that meet laterally in gently rounded thecal edges and aborally in a full (not compressed), rounded base. Opposing thecal edges and faces roughly parallel to each other above a height of about 4 mm. Holotype 6.4 x 3.9 mm in CD and 11.6 mm in height. Of the 2 large specimens, the range of GCD:LCD is 1.64-1.79 and the GCD:HT is 0.55-0.70. Intercostal furrows distinctive only within 2-3 mm of calicular edge, where they define equal-width costae 2 or 3 granules in width, the granules being short and usually oblique in orientation. Remaining theca covered with smooth, longitudinally oriented granules 0.1-0.8 mm in length and 0.1 mm in width that are not arranged in any particular pattern or radiation. Corallum white.

Septa hexamerally arranged in 3 cycles (24 septa): S1-2>S3. The morphology of the septa and columella is the same as described for *S. auritus*.

Discussion: Three Recent and one Neogene Caribbean species of *Sphenotrochus* are characterized as having short, discontinuous costae, each costa composed of up to 4 parallel, aligned granules: *S. auritus* Pourtalès, 1874; *S. gilchristi* Gardiner, 1904 (southwest Indian Ocean); *S. senni* Wells, 1945 (Middle Miocene to Late Pliocene, Caribbean); and *S. lindstroemi*. Species having this morphology were previously placed in the subgenus *Eusthenotrochus* (see CAIRNS 1997). *S. lindstroemi* is most similar to *S. gilchristi*, differing in having a slightly differently shaped corallum (the thecal edges and faces of *S. gilchristi* diverge outward), and in having spinose axial septal edges. *S. lindstroemi* is easily distinguished from *S. auritus* and *S. senni* by its simple longitudinal arrangement of costal granules, lack of fishtail basal spurs, and its fuller corallum. And, although not many records are known of either species, *S. lindstroemi* appears to occur north of *S. auritus*.

The largest of the 7 specimens reported as *S. auritus* var. by LINDSTRÖM (1877) from St. Barthelemy (SMNH 120) is only 4.1 mm in GCD (Figs. 160-161), but it would appear to be a juvenile specimen of *S. lindstroemi*, not the fossil species *S. senni*, as suggested by CAIRNS & WELLS (1987).

Etymology: This species is named in honor of GUSTAF LINDSTRÖM, for his pioneering work on the deep-water corals of St. Barthelemy and the Virgin Islands (LINDSTRÖM 1877).

Types: Holotype: Chain 35-43, USNM 87609. Paratypes: P-775, 1, USNM 87611; St. Barthelemy, 22 m, 7, SMNH 120. **Type Locality:** 8°53'N, 59°04'W (off Guyana), depth unknown.

Distribution: Península de Guajira, Colombia; ?Tortola, Virgin Islands (LINDSTRÖM 1877); St. Barthelemy, Leeward Islands (LINDSTRÖM 1877); off Guyana; 22-78 m (Fig. 21).

***Sphenotrochus andrewianus moorei*, new subspecies**

(Figs. 7, 162-167)

Sphenotrochus sp. Cairns, 1978a: 11 (listed). —Cairns et al., 1994: 4 (listed).

Description: Corallum triangular, having slightly convex thecal faces,

rounded thecal edges, and an acutely angled basal region (edge angle 12° - 25°), unless the corallum incorporated an irregularly-shaped sand grain in its base, producing a globular or spatulate shape to the basal end. Corallum small, the holotype only 3.1 x 2.1 mm in CD and 4.5 mm in height; largest corallum (USNM 89365) 3.4 x 2.5 mm in CD and 5.6 mm in height. GCD:LCD = 1.36-1.74; GCD:HT = 0.61-0.69. Among the 111 specimens available, there were no cases of asexual budding. Costae fragmented on basal 1 mm of corallum, but above this level costae smooth and continuous to calicular edge, about 0.2 mm in width, and separated by deep and narrow (75 μ m in width) intercostal furrows. Occasionally, as in the holotype, the 2 principal edge costae (C1) and their flanking C3 are composed of short, discontinuous granules from base to calice, or, particularly in the case of the C3, progressively discontinuous near the calice. Corallum white.

Septa hexamerally arranged in 3 cycles (24 septa): S1-2>S3, the complete third cycle inserted at a GCD of about 1.2 mm. S1-2 moderately exsert (about 0.35 mm), having slightly sinuous axial edges that connect to the columella through a series of processes, not a solid fusion (Fig. 162). As with other species of western Atlantic *Sphenotrochus*, the 6 S1-2 originating from the lateral faces fuse to columella highest in fossa, the 4 S2 in the end half-systems fuse slightly lower, and the 2 principal S1 lower still. S3 less exsert (0.25 mm) and about $\frac{1}{2}$ width of S1-2, having irregularly dentate axial edges. Fossa shallow, containing a prominent lamellar columella.

Discussion: Comparison of *S. andrewianus moorei* to typical eastern Atlantic *S. andrewianus* show very few differences. Coralla of the western Atlantic populations appear to be more diminutive, the typical subspecies attaining a GCD of 5.5 mm. Also, there seems to be a tendency for a more consistent fragmentation of the edge costae of *S. a. moorei*, whereas they are usually continuous in the eastern Atlantic subspecies; however, there is overlapping variation in both subspecies. *S. andrewianus andrewianus* is known from the western Mediterranean, and the region bounded by Great Britain, the Azores, and Senegal at depths of 12-150 m (ZIBROWIUS 1980). Based on the size difference and the pronounced geographic separation of the two populations, the western Atlantic form is considered to be a subspecies.

Etymology: This subspecies is named for DONALD R. MOORE (1921-1997), distinguished mollusk paleontologist, who collected some of the specimens in the type series.

Records/Types: Holotype: Hillsborough Bay, Florida, 23 m, 30 August 1974, USNM 87614. Paratypes: as for holotype, 2, USNM 99305; Alb-2619, 5, USNM 14436; FH-7106, 36, USNM 22022; FH-7123, 1, USNM 99306; SB-48, 2, USNM 99307; BLM-OCS 4C, 6, USNM 49143, -45; BLM-OCS 5B, 19, USNM 49149-52, -54, -58; BLM-OCS 5C, 7, USNM 49155; between second and third reefs, off Broward County, FL, 18 m, 20, USNM 89365; 26°01'N, 80°06'W (Lloyd State Park, FL), 15 m, 12, USNM 87593; 29°42'N, 84°11'W, 15 m, 1, UMML; Hawk Channel, near Fowey Light, FL, 9 m, 1, UMML; 1.6 km off Miami Beach, FL, 24 m, 1, UMML; Virginia Key, FL, depth unknown, 1, UMML.
Type Locality: Hillsborough Bay, Florida, 23 m.

Distribution: Continental shelf of southeastern US from North Carolina (33°38'N, 77°36'W) to Cape San Blas, FL (Fig. 7); 9-42 m.

Superfamily **FLABELLOIDEA** Bourne, 1905

Family **FLABELLIDAE** Bourne, 1905

Genus **Flabellum** Lesson, 1831

Diagnosis: Corallum solitary; fixed or free; conical, campanulate, or highly compressed. Epithecate, lacking costae but usually bearing fine, chevron-shaped growth ridges that peak at major septa. Base not reinforced with stereome or thecal rootlets; transverse division lacking. Calicular edge smooth to lacerate. Pali and dissepiments lacking. Columella rudimentary, composed of the fusion of lower, axial edges of lower cycle septa.

Type Species: *Flabellum pavoninum* Lesson, 1831, by monotypy.

Flabellum (F.) floridanum Cairns, 1991

Not *Flabellum cuneiforme* var. *fragile* Vaughan, v*1900: 63.

Flabellum fragile Cairns, *1977b: 14-15, pl. 2, figs. 1, 4-9; 1979: 148-149, pl. 29, figs. 1-3, 7, Map 43 (synonymy and description). -Cairns et al., 1991: 48 (listed). -Cairns, 1991b: 34.

Flabellum floridanum Cairns, *1991b: 34. -Cairns et al., 1994: 5 (listed).

Diagnosis: Corallum trochoid to turbinate, sometimes becoming cylindrical with continued growth. Small specimens occasionally attached to substrate, but most coralla unattached, having an elongate, often bent, cylindrical pedicel up to 4 mm in length and 1.7-2.0 mm in diameter (PD:GCD = 0.09-0.11), and a slightly broader basal disc up to 2.9 mm in diameter, containing 6 septa. Calicular edge of well-preserved coralla slightly serrate, a small apex corresponding to each septum. Largest corallum (USNM 48297) 19.6 x 17.7 mm in CD and 29 mm in height. Epitheca usually encrusted with serpulids, foraminiferans, sponges, and/or bryozoans. Corallum white. Septa hexamerally arranged in 4 complete cycles in every corallum examined: S1-2>S3>S4. Axial edges of S1-3 usually slightly sinuous. Fossa deep, containing an elongate rudimentary columella uniting the axial edges of the S1-2.

Discussion: Although several new records are reported below, the known distribution of *F. floridanum* is not expanded. All but one lot of this species were collected from 80-183 m. The questioned locality of "? off São Paulo, Brazil" (see CAIRNS 1979:149), based on specimens from *Wladimir Besnard*-318 (USNM 62154), were re-examined and found not to be conspecific, having a much narrower corallum and only 3 cycles of septa.

The name *F. floridanum* was introduced by CAIRNS (1991b) as a replacement name for *F. fragile* Cairns, 1977, in order to avoid homonymy with *Flabellum cuneiforme* var. *fragile* Vaughan, 1900.

New Records: BLM, SOFLA-32, 8, USNM 72013, -15-17; BLM, SOFLA-36, 13, USNM 72014, -18, -19, 76444; 26°16'28"N, 84°03'31"W, 137-141 m, 6, USNM 83431; 26°16'34"N, 84°04'22"W, 139-148 m, 1, USNM 83442; EJ77-136, 192 m, 1, USNM 48297.

Types: All types are deposited at the USNM and FSBC I (see CAIRNS 1977b).

Type Locality: 27°37'N, 84°21'W (west of Egmont Key, western coast of Florida), 91 m.

Distribution: Western coast of Florida from Florida Keys to Panama City; Campeche Bank; 80-366 m (CAIRNS 1979: map 43).

Genus *Javania* Duncan, 1876

Diagnosis: Corallum solitary; attached; ceratoid to trochoid. Epithecate, base and pedicel reinforced with layers of stereome; transverse division lacking. Calicular edge lacerate. Pali and dissepiments absent. Columella rudimentary fusion.

Type Species: *Javania insignis* Duncan, 1876, by monotypy.

Javania cailetti (Duchassaing & Michelotti, 1864)

(Figs. 168-169)

Desmophyllum cailetti Duchassaing & Michelotti, *1864: 66, pl. 8, fig. 11.

Desmophyllum eburneum Moseley, v*1881: 162, pl. 6, figs. 1, 1a-b.

Desmophyllum nobile Verrill, v*1885: 150-151.

Javania cailetti. -Cairns, 1979: 154-157, pl. 28, figs. 8-12, pl. 30, figs. 1, 4, Map 44 (synonymy and description). -Zibrowius, 1980: 157-159, pl. 82, figs. A-L (synonymy and description). -Cairns, 1982a: 46-49, pl. 14, figs. 9-12. -Rezak et al., v.1985: 225 (listed: stn 115, Geyer Bank). -Zibrowius, 1988: 136 (listed). -Prahll & Erhardt, 1989: 549. -Cairns et al., 1991: 48 (listed). -Cairns, 1994: 29-30, pl. 10, figs. g-i. -Cairns et al., 1994: 5 (listed). -Stolarski, v.1995: 34-36, figs. 10A-J (microstructure).

Desmophyllum cristagalli. -Hubbard & Wells, 1986: 136, figs. 25-26. [Not *D. cristagalli* Milne Edwards & Haime, 1848]

Not *Javania cailetti*. -Pires, 1997: 183 (=Polymyces fragilis).

Diagnosis: Corallum ceratoid, straight, and slightly flared. Corallum firmly attached, the pedicel reinforced with concentric layers of dense texture, the PD:GCD ranging from 0.2-0.6. Calicular edge lacerate, a triangular apex corresponding to each SI-3. Largest known corallum (holotype of *D. nobile*) 36 x 32 mm in CD (exclusive of costae), 21.5 mm in PD, and 51 mm in height. Theca usually smooth and porcelaneous; however, some coralla bear ridged costae (C1-3) in upper corallum, in some cases becoming quite prominent (see Discussion). Corallum white. Septa hexam-

erally arranged in 4 complete cycles (48 septa): S1-2>S3>S4, larger coralla sometimes having pairs of S4 in end half-systems resulting in 64 septa. S1-2 highly exsert, having straight vertical axial edges; S3 moderately exsert, with straight to slightly sinuous axial edges; S4 often not exsert. Fossa deep; columella a fusion of lower axial edges of S1-2.

Discussion: The holotype of *J. nobile* (VERRILL 1885) is noteworthy as being the largest known corallum, the northernmost record in the western Atlantic, and the corallum with the most highly developed costae and most exsert septa, up to 5 mm and 15 mm, respectively. Similarly large and prominently costate specimens are known from Lydonia Canyon (USNM 82015-016), off Jamaica (USNM 80964; Figs. 168-169), and Burdwood Bank (see CAIRNS 1982a: pl. 14, figs. 11-12), although the last mentioned corallum is relatively small. Although these coralla are interpreted as extreme variations of *J. cailleti*, they are herein referred to as the '*nobile*' form of the species.

The shallowest western Atlantic record of *J. cailleti* (30 m) was reported by HUBBARD & WELLS (1986), and the deepest (1809 m) herein (USNM 82015). Only about 15% of known collections were made at depths shallower than 200 m. The records listed below do little to extend the known distribution of the species, but the 2 *Alvin* records are the first reports of the species in the gap between Nova Scotia and Georgia.

New Records: BLM, SOFLA-32, 1, USNM 72001; BLM, SOFLA-35, 1, USNM 72002; BLM, SOFLA-36, 5, USNM 71996-97, 72008, 75684, 76451; BLM, SOFLA-38, 47, USNM 71998-72000, 72003-07; JSL-I-1354, 1, IRCZM; JSL-I-1355, 1, IRCZM; JSL-I-1500, 1, USNM 73191; JSL-I-2582, 1, USNM 87785; JSL-II-809, 1, IRCZM 12:148; BL-203, 1, USNM 5822; Gos-1643, 1, USNM 99304; Gos-112/78, 3, USNM 80991, 80964; Alvin-1268, 1, USNM 82015; Alvin-1270, 1, USNM 82016; BLM-OCS 6H, 2, USNM 49160-61; CSA Pinnacle site 7, 1, CSA; 25°16'23"N, 84°15'17"W, 159-166 m, 20, USNM 83448.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: from Banquereau Bank, Nova Scotia (44°28'N, 57°13'W) to Suriname, including Caribbean and eastern Gulf of Mexico to southwestern Louisiana; southeastern Brazil off southern Rio

Grande do Sul (CAIRNS 1979: map 44); 30-1809 m. Elsewhere: widespread, including eastern Atlantic; Burdwood Bank: southern Chile; Galápagos; British Columbia; Japan; Arabian Sea; 400-2165 m (CAIRNS 1994).

Genus *Polymyces* Cairns, 1979

Diagnosis: Corallum solitary; attached; ceratoid to trochoid. Epithecate, basally reinforced by symmetrically or asymmetrically arranged, contiguous, hollow rootlets; transverse division lacking. Calicular edge lacerate to serrate. Pali absent and dissepiments absent. Columella rudimentary fusion.

Type Species: *Rhizotrochus fragilis* Pourtalès, 1868, by original designation.

Polymyces fragilis (Portalès, 1868)

(Figs. 171-172)

Rhizotrochus fragilis Pourtalès, v*1868: 134-135.

Rhizotrochus tulipa Pourtalès, v*1874: 39, pl. 6, figs. 10-19.

Monomyces fragilis. -Cerame-Vivas & Gray, 1966: 263 (listed).

Polymyces fragilis. -Cairns, 1979: 158-160, pl. 30, figs. 2-3, 5-8, Map 45 (synonymy and description). -Zibrowius, 1988: 136 (listed). -Cairns, 1991a: 22 (listed). -Cairns et al., 1991: 48 (common name). -Cairns et al., 1994: 8.

Javania cailleti. -Pires, v.1997: 183. [Not *D. cailleti* Duchassaing & Michelotti, 1864]

Diagnosis: Corallum invariably attached, the pedicel reinforced with 6 pairs of rootlets (see Discussion), the rootlets increasing the PD to 3.2-6.0 mm, resulting in a PD:GCD of about 0.3. Calicular edge moderately serrate, those of forma *tulipa* being lacerate. Largest corallum (P-876) 29 x 27 mm in CD and 52 mm in height. Inner theca of some specimens thickened with stereome. Colour of corallum variable: most coralla homogeneously white, but about 20% of specimens examined have a reddish brown corallum with white rootlets, and those specimens from Barbados (forma *tulipa*) often have a black striped theca. Septa hexamerally arranged in 4 complete cycles: S1>S2>S3>S4. S1-2 slightly exsert, the S1 only slightly wider than the S2. Axial edges of septa highly sinuous. Fossa deep; columella rudimentary.

Discussion: *Polymyces fragilis* is very similar to *Flabellum floridanum*, the 2 species almost indistinguishable in calicular view. *P. fragilis* is distinguished by having basal rootlets and thus an attached mode; a slight dichotomy in the sizes of the S1 and S2; a slightly more serrate calicular edge; a flared, not subcylindrical, corallum; a less frequently encrusted theca; and a much wider geographic distribution. Although their ranges overlap, they were rarely collected at the same stations.

A cross section or fracture through the base of a corallum reveals 2 concentric thecal walls, the inner theca about 1.6 mm in diameter, containing the 6 S1, and the outer theca 3.2-4.1 mm in diameter, which is divided into 6 compartments by complete, vertical partitions resembling septa that are aligned with the S2. Thus the 6 S1 of the inner core are offset from the outer 6 "S2" partitions. The 6 chambers formed by these partitions extend 3-4 mm above the base, at which point another 6 partitions originate between the outer and inner theca, these upper partitions aligned with the S1. This has the effect of bifurcating the 6 basal chambers into 12 chambers. These 12 chambers (rootlets) extend upward another 4-5 mm, gradually narrowing to a distal aperture of about 0.5 mm. With height, each of the 12 upper rootlets bends toward its adjacent S2, the 'right hand' bifurcated rootlet of each basal chamber coming to be placed adjacent to the 'left hand' bifurcated rootlet of the adjacent chamber. Thus the individual components of these 6 apparent pairs of rootlets actually have their origin in different basal chambers. The distal tips of each of the 12 rootlets communicate with the inner polyp via small (about 0.5 mm in diameter) pores flanking each S2 about 8-9 mm above the base. The ontogenetic development of rootlets, however, is opposite to the order described above, rootlets appear to form from top-down, not down-up. Few coralla of the proper developmental stage are available for analysis, but one extraordinary juvenile specimen from Gos-1863 (Fig. 172) shows that rootlet development probably occurs as follows. At a corallum height of 7-9 mm 12 strands of tissue extend over the calicular edge from 12 small vertical slits, one on both sides of each of the 6 S2. Already at this stage there are ridges (the future internal partitions of the outer chambers) on the lower corallum resembling costae, the ridges associated with the S2 extending to the base, those associated with the S1 extending only about halfway to the base. Thus as the 12 strands of tissue grow downward they are channelized into 6 chambers. In time, small sheets of theca form perpendicular to the

S1-2 costae/partitions, adjacent sheets eventually fusing with one another to form the outer theca of the rootlets, as well as growing downward to the base of the corallum. With a slight increase in corallum height, the 12 calicular slits are formed into pores that maintain connection of the rootlets to the inner polyp. Thus, quite small coralla less than 5 mm in height will not have rootlets, but may have already developed some incipient S1-2 partitions that resemble ridged costae. This developmental sequence is also supported by a specimen from off South Carolina (USNM 78447), which, at a height of 2-3 mm, was encrusted by a stylasterid on one side of its pedicel preventing rootlets from forming directly adjacent to the pedicel. Instead, rootlets formed on the stylasterid, but did not reach the base of the corallum, which remained of small diameter.

Despite the additional records reported below, the geographic and bathymetric ranges of this species are not increased beyond that which was previously known. The common name of *P. fragilis* is the 'twelve-root cup coral' (CAIRNS *et al.*, 1991).

New Records: Eastward-10892, 68-72 m, 6, USNM 80905; Combat-457, 1, USNM 61990; JSL-I-2586, 1, USNM 89352; B-A DS32, 2, USNM 62230; BLM, James Island Area Block 198-2, 1, USNM 99320; BLM, James Island Area Block 380-11, 1, USNM 99351; Vema 15-1, 7, USNM 61811 and 61971; Endeavor-1, 1, USNM 77434; R/V Cape Hatteras SA-6/3, 31°23'N, 78°57'W, 498-512 m, 4, USNM 78440; R/V Cape Hatteras SA-6/4, 31°37'N, 78°41'W, 440-450 m, 1, USNM 78447; FH-7282, 5, USNM 99352; stn "L2", off Cape Lookout, NC, 110 m, 10, USNM 45662; Isla Contoy, Quintana Roo, Mexico, 100-200 m, 1, USNM 98468; 32°44'N, 78°05'W, 204-213 m, 1, USNM 79501; off Sambo Key, FL, 216 m, 7, USNM 61974; off Sombrero Light, FL, 183-210 m, 5, USNM 61973; off Alligator Reef, FL, 182-213 m, 20, USNM 81302; south of Key West, FL, 165 m, 3, USNM 61963; Western Dry Rocks, FL, 20, USNM 61969.

Types: See CAIRNS (1979).

Distribution: Warm temperate and tropical western Atlantic from off Cape Hatteras (35°08'N, 75°10'W) to Rio Grande do Sul, Brazil (30°59'S, 49°51'W); eastern Gulf of Mexico; throughout Caribbean (CAIRNS 1979: map 45); 75-822 m.

Family **GUYNIIDAE** Hickson, 1910Genus **Guynia** Duncan, 1872

Diagnosis: Corallum solitary; ceratoid to cylindrical (scoleoid); free or laterally attached, sometimes producing chains of individuals. Epitheca longitudinally and circumferentially ridged. Rows of mural spots occur in every interseptal space. Two cycles of septa. Pali absent; columella a twisted ribbon (see CAIRNS 1989: table 3).

Type Species: *Guynia annulata* Duncan, 1872, by monotypy.

***Guynia annulata* Duncan, 1872**

(Figs. 170, 173)

Guynia annulata Duncan, v*1872: 32, pl. 1, figs. 1-8. -Cairns, 1979: 164-165, pl. 32, figs. 1-3, Map 48 (synonym and description). -Zibrowius, v.1980: 161-162, pl. 83, figs. A-Q (synonymy and description). -Castañares & Soto, 1982: table 1 (listed). -Rezak et al., 1985: 225 (listed). -Cairns et al., 1986: 187-188, 3 figs. -Cairns & Wells, 1987: 42-43, pl. 11, figs. 8-9, 12-13 (fossil occurrence). -Cairns et al., 1991: 48 (listed). -Cairns et al., 1994: 5 (listed). -Cairns & Zibrowius, 1997: 150 (synonymy). -Cairns, 1999b: Table 1 (fossil occurrence listed).

Diagnosis: Corallum cylindrical and quite small, rarely over 1 cm in length and 1.3 mm in CD, although longest known corallum (Alpha Helix-16) 13 mm long (Fig. 173). Coralla sometimes firmly attached to a substrate (e.g., a bivalve shell, another coral, an echinoid spine) along entire thecal edge, but more often attached to small sand grains and/or foraminiferans randomly along theca. Theca usually bears 2 sets of ridges: 8 longitudinal ridges that correspond to the primary septa; and numerous closely-spaced (21 in 3.6 mm), transverse, circumferential ridges, both kinds of ridges forming a grid-like pattern of rectangles. Within each rectangle are 2 chalky white spots, symmetrically arranged on either side of the S2. These spots correspond to small depressions (dimples) on the inner theca, and transform to thecal pores early in digenesis. Septa usually octamerally arranged in 2 cycles, the primary septa being much thicker and more exsert than the secondary septa, their axial edges being very sin-

uous. Secondary septa recessed in calice, often difficult to see in an intact corallum. Columella consists of a single twisted lath or a trefoil ribbon.

Discussion: This small, inconspicuous coral, once known only from the North Atlantic, is now known to occur in almost all tropical and temperate regions (CAIRNS & ZIBROWIUS 1997). It is easily overlooked because of its resemblance to a serpulid worm tube. The records listed below extend the known distribution of this species to the southern Caribbean (Aruba: Alpha Helix-16) and off Guyana (Chain 35-43).

New Records: P-931, 1, part of USNM 62995; B-A DS10, 2, USNM 79503; B-A DS45, 1, USNM 99319; JSL-II-2582, 1, USNM 99317; Wagenaar Hummelinck-1442, 1, USNM 99316; Chain 35-43, 1, USNM 99315; Alpha Helix-16, 108, USNM 79508; DBL-998, Discovery Bay, Jamaica, 60 m, 1, USNM 83720; DBL-2501, Discovery Bay, Jamaica, depth unknown, 2, part of USNM 80354; Discovery Bay, Jamaica, 183 m, 1, part of USNM 93183; BLM 1974-17, 1, UMML 8.1440; BLM 1974-18, 2, UMML 8.1441; BLM-1974-19, 3, UMML 8.1442; BLM 1974-22, 2, UMML 8.1443; BLM 1974-33, 11, UMML 8.1442; due east of Tampa, FL, 5, UMML; west of Anna Maria Key, FL, 1, UMML.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: Bermuda; Gulf of Mexico; Bahamas; Caribbean (CAIRNS 1979: map 48); Guyana; 30-653 m. Early Pliocene of Dominican Republic (CAIRNS & WELLS 1987), Costa Rica, and Panama (CAIRNS 1999b). Elsewhere: cosmopolitan in tropical and temperate regions; 28-384 m (CAIRNS & ZIBROWIUS 1997).

Genus *Schizocyathus* Pourtalès, 1874

Diagnosis: Corallum solitary and ceratoid (often slightly curved). Longitudinal parricidal budding very common. Epithecal wall smooth or hispid, bearing 12 rows of mural spots, one row flanking each S2. Three cycles of septa. Paliform lobes on S3; columella absent or papillose (see CAIRNS 1989: table 3).

Type Species: *Schizocyathus fissilis* Pourtalès, 1874, by monotypy.

Schizocyathus fissilis Pourtalès, 1874

(Figs. 176-177)

Schizocyathus fissilis Pourtalès, v*1874: 36-37, pl. 6, figs. 12-13. –Cairns, 1979: 166-167, pl. 32, figs. 4-7, Map 49 (synonymy and description). –Zibrowius, v.1980: 166-167, pl. 85, figs. A-Q (description). –Viada & Cairns, 1987: 132-133. –Cairns et al., 1991: 48 (listed). –Cairns et al., 1994: 5 (listed). –Cairns, 1995b: 545, figs. 27-29 (fossil occurrence); 1999b: Table 1 (listed).

Description/Discussion: Corallum ceratoid, becoming subcylindrical and usually cornute with greater size. Largest known corallum 25 mm in length; coralla rarely exceed 3.5 mm in diameter. Virtually all coralla examined attached to an elongate, wedge-shaped fragment of a parent corallum, sometimes 3 or 4 generations still attached to one another. Only one daughter corallum buds from the distal region (usually near upper edges of a pair of P3) of a sector ($\frac{1}{6}$, $\frac{1}{3}$, or $\frac{1}{2}$) of its parent corallum, the parent corallum longitudinally dividing into 2-6 fragments in the process of asexual reproduction. The longitudinal fracture is accomplished by a linear dissolution of the theca on either side of each S2, eventually isolating a thin (0.15 mm), elongate piece of theca that bears only the rudimentary S2 (see CAIRNS 1979: pl. 32, fig. 5). When these slivers fall away from the theca, the corallum is predisposed to fragment into 6 equal wedges, each of which contains an S1 and 2 flanking S3. Each of these wedges is capable of asexually producing another corallum (as mentioned above), but the 6 slivers that bear only the S2 do not appear to be capable of further propagation. Epitheca usually smooth, but occasionally may be hispid (Figs. 176-177) or finely corrugated. Theca bears 6 pairs of thin, closely-spaced, opaque white lines that flank each S2 (the lines of future dissolution), as well as 12 rows of small (0.15 mm), opaque, white spots, a row flanking each S1. Calice circular, the epitheca rising to level of upper peripheral septal edges.

Septa hexamerally arranged in 3 cycles: S1>S3>S2. S1 thick and slightly exsert, sometimes bearing a small, papillose paliform lobe. S2 rudimentary (0.10 mm wide) and nonexsert, having a minutely serrate axial edge. S3 slightly exsert and about $\frac{1}{2}$ width of the S1, but lower in fossa each S3 bears a broad paliform lobe that increases the width of the septum 2 to 3-fold, the upper edges of the P3 horizontal and minutely serrate. Axial edge of a P3 from one system fuses with that of another P3 from an adjacent system, forming a solid, V-shaped fusion, the apex of which is aligned with the

flanked S1. Thus, when the corallum fragments into 6 sectors, these 2 solidly fused P3, along with the enclosed S1 and peripheral theca form a self-contained volume, triangular in cross section. A columella is usually absent, but some specimens have a small, papillose columella.

The new records reported herein do not extend the geographic or bathymetric ranges for this species. *S. fissilis* is more commonly known from depths greater than 200 m, but at least 8 lots have been collected at depths shallower than 200 m, the shallowest (Oregon-3203) at 88 m (CAIRNS 1979).

New Records: B-A DS10, 2, USNM 82017; Eastward-26533, 1, USNM 61931; LGL, E2-2, 1, USNM 76839; mid-west coast of Barbados, 183 m, 2, USNM 94735; Barbados, depth unknown, 8 fragments, USNM 80986.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: east coast of US from Cape Kennedy, Florida to southwestern Louisiana (27°45'N, 92°29'W); Bahamas; Antilles; Yucatan Channel; off Honduras (not southern Caribbean); 88-640 m (CAIRNS 1979: map 49). Late Pliocene of Panama (CAIRNS 1995b). Eastern Atlantic: area bounded by Portugal, the Azores, and Morocco; 410-100 m (ZIBROWIUS 1980).

Genus *Stenocyathus* Pourtalès, 1871

Diagnosis: Corallum solitary; cylindrical; attached initially, but usually becoming free. Base and pedicel reinforced with granular coenosteum. Rows of thecal spots occur in every interseptal region. Three cycles of septa. Pali before S2; columella one twisted lath (see CAIRNS 1989: table 3).

Type Species: *Coenocyathus vermiformis* Pourtalès, 1868, by monotypy.

Stenocyathus vermiformis (Portalès, 1868)

(Fig. 178)

Coenocyathus vermiformis Portalès, v*1868: 133-134.

Stenocyathus vermiformis. -Cairns, 1979: 168-170, pl. 32, figs. 8-10, pl. 33, figs. 1-2, Map 50

(synonymy and description; not record from 21°48'S, 40°03'W). –Zibrowius, 1980: 163-165, pl. 84, figs. A-Q (synonymy and description). –Cairns et al., 1991: 48 (common name). –Cairns et al., 1994: 8. –Cairns, 1995a: 94-95, pl. 30, figs. c-g (synonymy and description).

Diagnosis: Corallum cylindrical, maintaining the same diameter from base to calice; elongate, up to 54 mm in length (G-1102), but rarely exceeding 3 mm in CD; and scolecoïd, usually having an irregular course with frequent episodes of rejuvenescence. Most western Atlantic coralla examined are free, having broken from their original attachment, the broken face usually regenerating a calice, which results in a bipolar corallum having 2 opposite calices. In the few attached specimens observed (Fig. 178), often 2 coralla will originate at right angles from a common granular basal coenosteum. Theca smooth, but occasionally attached to foreign objects by a granular coenosteum. A row of opaque white spots occurs on the theca in each interseptal space, the rows paired on either side of an S2. Septa hexamerally arranged in 3 cycles (S1>S2>S3), but pairs of S3 often missing, even in large coralla, resulting in 22, 20, and 18 septa, and 5, 4, and 3 pali, respectively. Axial edges of S1-2 highly sinuous, whereas those of S3 straight. The 6 P2 are also highly sinuous and the columella is a single twisted lath, or may be absent altogether.

Discussion: The only substantive western Atlantic records of this species reported since 1979 were those reported by CAIRNS *et al.* (1994) from off southwestern Louisiana. Although *S. vermiformis* is known to occur as shallow as 30 m in the Pacific (CAIRNS, 1995a), the only record from shallower than 200 m in the western Atlantic are those from G-703 (see CAIRNS 1979) at 165 m, most other records concentrating between 200 and 400 m. The shallower (128 m) and also southernmost western Atlantic record previously reported by CAIRNS (1979) from off Cabo de São Tomé, Brazil, was incorrectly identified.

The common name of *S. vermiformis* is the 'worm coral' (CAIRNS *et al.* 1991).

New Record: Atlantis 20-28, 12, USNM 80984.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: southeastern US from off Charleston, South Carolina (31°49.6'N, 78°45.8'W) to southwestern Louisiana (27°48'N, 91°34'W); Bahamas; off Havana, Cuba; Yucatan; Lesser Antilles; St. Peter and Paul Rocks; Brazil (Maranhão and off Recife); 165-835 m (CAIRNS 1979: map 50). Elsewhere: widespread in all oceans except for eastern Pacific and Antarctic; 30-1229 m (CAIRNS 1995a).

Superfamily **VOLZEIOIDEA** Melnikova, 1974

Family **GARDINERIIDAE** Stolarski, 1996

Genus **Gardineria** Vaughan, 1907

Diagnosis: Corallum solitary, cylindrical to turbinate, attached by a polycyclic base and/or short, contiguous basal rootlets; rejuvenescence not uncommon. Epitheca finely wrinkled, epitheca of upper calicular edge separated from upper peripheral septal edges by a shallow, circular groove. Internal stereome sometimes present. Paliform lobes present before S2 and sometimes S3. Columella papillose or absent.

Type Species: *Gardineria hawaiiensis* Vaughan, 1907, by original designation.

Gardineria paradoxa (Pourtalès, 1868)

(Figs. 183-184)

Haplophyllia paradoxa Pourtalès, v*1868: 140-141.

Duncania barbadensis Pourtalès, v*1874: 45, pl. 9, figs. 5-7. -Fowler, 1890: 405-409, pl. 28, figs. 1-3 (histology).

Gardineria paradoxa. -Wells, v.1973: 51. -Cairns, 1979: 160-161, pl. 31, figs. 4-6, 10, Map 46 (synonymy and description). -Cairns et al., 1991: 48 (listed). -Cairns, 1999a: 128-129, fig. 22b (synonymy).

Diagnosis: Corallum initially trochoid, becoming cylindrical with greater height. Polycyclic base asymmetrically developed, resulting in a baso-lateral attachment to substrate (Fig. 183; see Discussion). Corallum up to 16 mm in CD and 41 mm in height. The smooth, circular epitheca

rises above level of septa, forming a circular groove separating it from upper, peripheral septal edges. Most coralla show evidence of rejuvenescence, manifested by a series of up to 22 successive ridges, or lips, that encircle the theca. Internal stereome well developed. Corallum white. Septa irregularly developed: 19-22 (usually 20) primary septa and an equal number of rudimentary secondary septa. Primary septa sometimes distinguishable as 10 larger and 10 slightly narrower septa, the narrower septa bearing 1-3 paliform lobes, the larger primary septa without axial lobes. Rudimentary secondary septa developed only in largest coralla, otherwise represented by low, slightly convex ridges in smaller coralla. Fossa shallow; columella papillose, consisting of 2-35 elements.

Discussion: The asymmetric polycyclic base of this species, which results in a baso-lateral attachment, appears to result from a top-down process similar to that of rootlet formation in *Polymyces*, not the result of several concentric thecal walls that originate from the basal disc, as in *G. minor*. In *G. paradoxa*, the tissue must repeatedly overflow the theca but always on one side of the corallum, resulting in a series of partial, compartmentalized rings that increase the attachment to the substrate. These rootlet-like structures differ from those of *Polymyces* in that they are irregular in shape and occur in layers.

No new records of this rarely collected species have been reported from the western Atlantic since 1979; however, 2 records were reported from the western Pacific (CAIRNS 1999a). *G. paradoxa* is more commonly collected at depths greater than 200 m, only 3 records known from less than 183 m.

New Records: None.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: Florida Keys; throughout Greater and Lesser Antilles; Yucatan Channel; 91-700 m (CAIRNS 1979: map 46). Elsewhere: Banda Sea; Vanuatu region; 285-498 m (CAIRNS 1999a).

***Gardineria simplex* (Pourtales, 1878)**

(Figs. 22, 180-181)

Colangia simplex Pourtales, v*1878: 206-207, pl. 1, figs. 18, 18a (in part: BL-22); 1880a: 97 (listed). -?Goreau & Wells, 1967: 448 (listed). -?Wells & Lang, 1973: 57 (listed). -Zibrowius, 1974: 24. -Castañares & Soto, 1982: Table 1 (listed).

Gardineria minor Wells, v*1973: 49-53 (in part: figs. 36 e, g). -Cairns, 1979: 162-163 (in part: pl. 31, figs. 7-9; G-889, G-899, G-983, G-984, G-986, P-1387, SB-3494, Alb-2324, USNM 46632, Theodore Tissier-187).

Gardineria simplex. -Cairns, 1978a: 11 (listed); 1979: 163 (lectotype designated), 207. -Cairns et al., 1994: 5 (listed). -Stolarski, v.1996: 362 (listed).

Description: Corallum initially ceratoid or trochoid, often becoming cylindrical with greater height. Polycyclic base asymmetrically developed, resulting in a baso-lateral attachment; however, asymmetry in a basal cross section may result from rootlets that have developed on only 1 side of the corallum, as in *Polymyces* and *G. barbadensis*. Largest known corallum (lectotype) cylindrical, measuring 10.6 x 10.4 mm in CD and 11.5 mm in height. Epitheca finely wrinkled and often encrusted. Rejuvenescence not common; internal stereome not present; corallum white.

Septa hexamerally arranged in 3 cycles (S1>S2>S3), the third cycle complete at a CD of about 4 mm and some indication of a fourth cycle appearing at a CD of 8 mm, but when present, S4 are rudimentary and irregularly developed, often occurring only deep within fossa. The smooth-edged, circular epitheca usually rises above the level of S1, forming a circular groove separating it from upper, peripheral edges of all septa. Inner edges of S1 straight and vertical, bearing 1 small paliform lobe at its lower axial edge. S2 about $\frac{2}{3}$ width of the S1, have slightly irregular axial edges, and bear 2 or 3 paliform lobes on their lower axial edge. S3 not well developed, consisting of a series of 5-8 elongate septal spines. In the largest of coralla, S4 are expressed as a series of small, disjunct septal spines, usually occurring low in fossa. Fossa deep, containing a papillose columella consisting of 2-15 cylindrical elements.

Discussion: *Gardineria simplex* and *G. minor* are very similar and may eventually be found to be ecological variants or subspecies separated by depth. Their similarity has caused confusion in previous identifications (see synonymy). *G. simplex* appears to be the larger of the 2 species, attaining a CD of 10.6 mm vs 5.9 mm for *G. minor*. *G. simplex* also appears to in-

sert septa at a slower rate, S4 beginning to appear only at a CD of about 7 mm vs 3.1 mm for *G. minor*. (*G. minor* has a full fourth cycle at a CD of 4-5 mm, whereas *G. simplex* never attains a full fourth cycle). Also, *G. simplex* seems to have less exert septa, a deeper fossa, and fewer columellar elements. Bathymetrically, *G. simplex* is usually found in deeper water (46-241 m), whereas *G. minor* is usually collected in shallower water (2-146 m).

The records of *Colangia simplex* from Jamaica at 12 m (GOREAU & WELLS 1967; WELLS & LANG 1973) pertain to specimens later identified as paratypes of *G. minor* (USNM 53505), but are nonetheless herein considered to be valid *G. simplex*. This would be the shallowest record of *G. simplex*, but there is a second label with this lot indicating a greater collection depth of 30 m. The records below are then the only valid records of the species since its original description.

New Records: G-956, 6, USNM 99356; Eastward-19483, 1, USNM 80897; Eastward-30178, 1, USNM 99357; DBL-1425, Discovery Bay, Jamaica, 91 m, 1, USNM 80895; Discovery Bay, Jamaica, 183 m, 1, attached to USNM 93183.

Types: The lectotype of *C. simplex*, designated by CAIRNS (1979:163), is deposited at the MCZ (5566). The two paralectotypes (MCZ) from a Blake station off Havana were reidentified as *G. minor* by CAIRNS (1979). **Type Locality:** 23°01'N, 83°14'W (off Bahia Honda, Cuba), 183 m.

Distribution: Bahamas; Antilles; Yucatan Channel (Fig. 22); 46-241 m, although one dead and worn specimen was collected from 505 m (Eastward-30178).

Gardineria minor Wells, 1973

(Figs. 179, 182, 185-187)

Gardineria minor Wells, v*1973: 49-53 (in part: figs. 36a-d, f; not USNM 53505). -Cairns, 1979: 162-163, Map 47 (in part: not pl. 31, figs. 7-9, and not G-889, G-899, G-983, G-984, G-986, P-1387, Alb-2324; USNM 46632, Theodore Tissier-187, which are all *G. simplex*; synonymy and description). -Cairns, 1982b: 299, pl. 132, fig. d. -Zlatarski, 1982: 262-263, pl. 115, figs. 1-6, pl. 116, figs. 1-6. -Castañares & Soto, 1982: Table 1 (listed). -Estalella, 1986: 18, fig. 6. -Cairns et al., 1994: 5 (listed). -Cairns, 1995b: 543, figs. 21-26 (Pliocene). -Stolarski, 1996: 362 (listed). -Cairns, 1999b: Table 1 (listed).

Diagnosis: Corallum usually short and squat (tympanoid), cylindrical to subcylindrical. Base of corallum increases in diameter by forming 3 concentric thecal rings (symmetrical polycyclic development): the first thecal ring 0.5-0.6 mm in diameter, containing 0-12 septa; the second ring about 1.3 mm in diameter, containing 12 septa; and the third and usually last thecal ring up to 3.0 mm in diameter, containing 12-48 septa (Fig. 185). Initial thecal ring short and often decreases in diameter with height. Corallum increases in CD by upward growth and expansion of outermost thecal ring. Largest known corallum (holotype) 5.9 mm in CD and 4.4 mm in height. Epitheca finely wrinkled, forming a circular groove between its upper edge and the upper, peripheral edges of the S1-2. Rejuvenescence not common; internal stereome not well developed; corallum white. Septa hexamerally arranged in 4 cycles (S1>S2>S3>S4), the fourth cycle beginning to appear at a CD of 3.5 mm, and a complete fourth cycle present only in large coralla of over 5 mm CD. S1 usually exsert, as much as 0.8 mm, having straight, vertical axial edges. S2 also slightly exsert, about $\frac{1}{2}$ width of the S1, having a small lobate upper region, dentate axial edge, and bearing 1-3 irregular paliform lobes near columella. S3 lacinate for entire length. When present, S4 rudimentary, composed of several aligned, discontinuous septal spines located well below calicular edge. Fossa shallow, containing a papillose columella consisting of 1-20 interconnected papillae.

Discussion: Comparisons to *G. simplex* are made in the account of that species. The records listed below extend the known distribution of *G. minor* to the Gulf of Campeche. Reidentification as *G. simplex* of some specimens previously reported as *G. minor* (see synonymy) reduces the known depth range of *G. minor* to 2-146 m.

G. minor is most often collected in caves and under platy reef corals, such as *Agaricia* and *Mycetophyllia*. Its polyps are pale pink (WELLS 1973).

New Records: SB-961, 1, UMML; Churchill Beach, Grand Bahama Island, 15-17 m, 4, USNM 46631; off St. Lucia, 15-27 m, 5, USNM 46630; Carrie Bow Cay, Belize, 18-31 m, 2, USNM 86019; DBL-1213, Discovery Bay, Jamaica, 79 m, 2, USNM 80993; north of Georgetown, Grand Cayman, 12 m, 5, USNM 99312; off Havana, Cuba, 21 m, 1, USNM 99311.

Types: See CAIRNS (1979).

Distribution: Bahamas; Caribbean; Gulf of Campeche (CAIRNS 1979: map 47); 2-146 m, although most commonly collected in less than 50 m. Late Pliocene (Moín Formation) of Limón, Costa Rica (CAIRNS 1995b).

Suborder **DENDROPHYLLIINA**

Family **DENDROPHYLLIIDAE** Gray, 1847

Genus **Balanophyllia** S. Wood, 1844

Diagnosis: Corallum solitary, ceratoid to trochoid, fixed or free. Synapticulotheca often costate and/or covered with epitheca. Septa arranged in a Pourtalès plan. Pali/paliform lobes may or may not be present; columella papillose to spongy.

Type Species: *Balanophyllia calyculus* S. Wood, 1844, by monotypy.

Balanophyllia floridana Pourtalès, 1868

(Figs. 9, 188-191)

Balanophyllia floridana Pourtalès, v*1868: 137. -Wells, v.1933b: 32, 35, pl. 1, figs. 8-11. -Ceramé-Vivas & Gray, 1966: 263 (listed). -?Goreau & Wells, 1967: 449 (listed). -Not Porter, v.1972: 113 (= *Rhizopsammia* sp.). -?Wells & Lang, 1973: 58 (listed). -Avent, King & Gore, 1977: 200, fig. 11k. -Cairns, 1977a: 134-136, pl. 1, figs. 1-3 (synonymy and description); 1977b: 16-17, pl. 2, figs. 7-8 (synonymy); 1978a: 11 (listed); 1979: 207 (listed). -Zibrowius, 1980: 217 (listed). -Not Castañares & Soto, 1982: Table 1. -Not Hubbard & Wells, v.1986: 142, figs. 36-37 (= *B. cyathoides*). -Cairns et al., 1991: 48 (common name). -Humann, v.1993: 164-165, colour fig. -Cairns et al., 1994: 5 (listed)

Diagnosis: Corallum ceratoid to trochoid, straight, and usually attached by a thick pedicel (PD:GCD = 0.15-0.50) and expanding base. However, if corallum attaches to a small object, the base may completely envelop it and thus be unattached. Largest corallum 23.0 x 17.4 mm in CD and 42 mm in height (WELLS 1933b: USNM 81003). Costae thin and equal in width, spiny as well as porous, and separated by deep intercostal grooves. Lower third to half of theca often worn and encrusted with other organ-

isms. Corallum white. Septa hexamerally arranged in up to 5 cycles, the fourth cycle complete at a GCD of about 6-7 mm, and the fifth cycle complete at a GCD of about 18 mm, pairs of S5 first appearing in end half-systems. S1 and S2 equal in size. Axial edges of each pair of highest cycle septa (S4 or S5) within each half-system fuse, the fused part bearing a paliform lobe aligned with the S3; axial edge of lobe touching columella. Fossa shallow, containing a robust, elongate columella formed of numerous fused, twisted elements.

Discussion: *Balanophyllia floridana* is the most commonly collected of the 9 *Balanophyllia* species known from the western Atlantic, and the only one that occurs in temperate waters off southeastern US, and one of 2 species (along with *B. palifera*) known to occur in the Gulf of Mexico.

One lot of specimens from Alb-2318 (Fig. 190) contained 25 coralla that were affixed to 13 shells of the gastropod *Xenophora conchyliophora* (Born), an average of 1.9 corals per shell. In most cases the corals remained alive and continued to grow after fixation. Four of the 25 coralla were affixed in the radial (down) position (*i.e.*, with the calice directed outward from the gastropod's apex), whereas 21 were affixed in the lateral position: 16 in the 'out' orientation (*i.e.*, calice directed along the axis of gastropod growth), and 5 in the 'in' orientation (*i.e.*, calice directed opposite the axis of gastropod growth), the out position being the more common direction for most laterally affixed corals (FEINSTEIN & CAIRNS 1998).

The common name of this species is the 'porous cup coral' (CAIRNS *et al.* 1991).

New Records: Alb-2313, 9, USNM 10075; Alb-2316, 2, USNM 49096; Alb-2317, 15, USNM 10086; Alb-2318, about 100, USNM 10088; Alb-2387, 2, USNM 10386; Alb-2388, 4, USNM 10818; Alb-2596, 15, USNM 19083 and 19108; Alb-2617, 3, USNM 99384; Alb-2619, 2, USNM 19158; Alb-2639, 1, USNM 14522; Alb-2640, 2, USNM 14601; Alb-2641, 1, USNM 48971; Combat-283, 4, USNM 48971; Combat-384, 4, USNM 48988, and 48991; Combat-457, 21, USNM 48974; O-2727, 3, USNM 48986 and 49010; O-3147, 8, USNM 88893; O-3621, 1, USNM 49011; SB-37, 2, USNM 49008; SB-1571, 2, USNM 48998; SB-1788, 3, USNM 88885; SB-1789, 7, USNM 48980; SB-1902, 1, USNM 48969; SB-1970, 1, USNM 48985; SB-1996, 1, USNM 48994; SB-2008, 10, USNM 88887; SB-2009, 10, USNM 48981; SB-2010, 2, USNM 48997; SB-2020, 2, USNM 48968; SB-2432, 1,

USNM 48993; SB-2523, 2, USNM 49007; SB-2547, 1, USNM 48978; SB-2813, 15, USNM 48972; SB-3033, 1, USNM 88888; SB-3191, 1, USNM 48982; SB-3284, 15, USNM 48996; SB-3407, 10, USNM 49009; SB-4122, 4, USNM 88889; SB-4419, 2, USNM 88890; SB-4420, 1, USNM 88891; SB-5107, 2, USNM 88892; Gos-1481, 13, USNM 48975; Gos-1533, 12, USNM 48976; Gos-1564, 10, USNM 49003; Gos-1575, 5, USNM 61734; Gos-1716, 4, USNM 61735; Gos-1860, 13, USNM 48987, -977; Gos-1866, 20, USNM 48973; Delaware II-008, 1, FSBC I 33155; Delaware II-010, 6, USNM 80494; Delaware II-012, 1, FSBC I 33157; Delaware II-023, 4, USNM 84362; Delaware II-029, 1, USNM 84364; Delaware II-062, 2, USNM 84367; Delaware II-067, 1, USNM 84366; Delaware II-074, 2, USNM 84363; Delaware II-075, 2, USNM 84365; Delaware II-121, 2, USNM 84368; Delaware II-126, 1, FSBC I 33152; Delaware II-132, 1, FSBC I 33153; Delaware II-138, 1, FSBC I 33154; Delaware II-140, 2, USNM 80493; Delaware II-147, 1, FSBC I 33156; FH-7516, about 200, USNM 22037; Pelican 169-7, 1, USNM 48989; Pelican 204-3, 5, USNM 48990; Grampus-5118, 1, USNM 80489; CSA, James Island Area Block 463, stns 4-7, 9, 11, 14, 16, 18-20, about 100 specimens, USNM; BLM, LMRS, O-S01, 13, USNM 88112-116; BLM, LMRS, O-S03, 11, USNM 67853 and 68416; BLM, LMRS, O-S06, 3, USNM 88117; off Fowey Light, FL, 73-155 m, about 450, USNM 48984, 48995, 49002, 49013, 49019, 80457, 80459; south of Key West, FL, 110 m, about 150, USNM 36926, 48970, 48992, 49001, 49015, 49018.

Types: Twenty syntypes of *B. floridana* from 'Bibb'-52 are deposited at the MCZ (5475 and 5585) (see CAIRNS 1977a). The syntype from off Havana could not be located. **Type Locality:** 24°26'N, 81°47'W (off Sand Key, FL), 47 m.

Distribution: Western Atlantic: southeastern US from Cape Hatteras, North Carolina (35°09'N, 75°10'W) to Mississippi; off Havana, Cuba; southeastern Caribbean (Barbados and north of Península de Paria, Venezuela); Rosalind Bank (between Honduras and Jamaica); Holocene of Mississippi Delta off Louisiana (WELLS 1933b; and Mississippi Mud Lumps) (Fig. 9); 13-220 m, although most records from 50-100 m. Eastern Atlantic: off Senegal; Gulf of Guinea; 29-95 m (CHEVALIER 1966b).

Although extremely common off the southeastern coast of the US, *B. floridana* is known from only 5 records in the entire Caribbean. The listing of this species from Panama (PORTER 1972: Pillsbury-405) is incorrect (see

synonymy) and those from Jamaica (GOREAU & WELLS 1967; WELLS 1973) and the derivative listing by CASTAÑARES & SOTO (1982) cannot be verified and therefore are not considered valid. The specimen reported by SQUIRES (1959) from Bermuda is deposited at the AMNH but is too damaged to identify; its depth of 798 m argues against this identification.

Balanophyllia cyathoides (Pourtalès, 1871)

(Fig. 192)

Dendrophyllia cyathoides Pourtalès, v*1871: 45-46, pl. 1, figs. 8-9.

Balanophyllia cyathoides.—Cairns, 1977a: 136-138, pl. 1, figs. 5-8, (synonymy and description); 1979: 172-173, pl. 33, figs. 9-10, pl. 34, figs. 1-2, Map 52 (synonymy and description).

Balanophyllia floridana.—Hubbard & Wells, v.1986: 142, figs. 36-37. [Not *Balanophyllia floridana* Pourtalès, 1868]

Diagnosis: Corallum ceratoid, straight, and attached by a thick pedicel (PD:GCD=0.5-0.6). Often several coralla settle near calicular edge of a larger corallum, producing a bushy quasicolony, sometimes extending to a third generation of fixed coralla (Fig. 192). Largest known corallum (Alb-2157) 12.4 x 8.9 mm in CD. Septa hexamerally arranged in 4 cycles, rarely with pairs of S5 in end half-systems of large coralla. S1-2 highly exsert, forming calicular lancets in well-preserved coralla, but S1 slightly wider, thicker, and more exsert than S2. Well-formed paliform lobes (P3) present. Fossa moderate to shallow in depth, containing a slender, elongate, swirled columella, the elements often solidly fused together.

Discussion: Nothing is added to our knowledge of this species from the single record listed below, but the reidentification of *B. floridana*, as reported by HUBBARD & WELLS (1986), extends the distribution of *B. cyathoides* to Trinidad and broadens the depth range to a shallower depth of 20-45 m. Although similar, *B. cyathoides* differs from *B. floridana* in having larger S1 than S2, better developed paliform lobes, a more slender columella, a wider pedicel, and a tendency towards quasicolonality (Table 4).

New Record: P-595, 1, USNM 99358.

Types: See CAIRNS (1979).

Distribution: Insular Straits of Florida; Yucatan Channel; Lesser Antilles (CAIRNS 1979: map 52); 45-494 m.

***Balanophyllia palifera* Pourtalès, 1878**

(Figs. 193-194)

Balanophyllia palifera Pourtalès, v*1878: 207 (in part: BL-68). -Cairns, 1977a: 140-141, pl. 1, fig. 4, pl. 2, figs. 4-5, 7 (synonymy and description); 1979: 174-175, pl. 34, figs. 3-7, Map 53 (synonymy, description, lectotype designated). -Viada & Cairns, 1987: 133. -Cairns et al., 1994: 5 (listed).

Diagnosis: Corallum ceratoid to subcylindrical, straight, and attached by a thick pedicel (PD:GCD = 0.4-0.5). Corallum relatively small, the largest known specimen (Alb-2152) 10.5 x 9.0 mm in CD and 33 mm in height. A well-developed epitheca, which is often encrusted with calcareous epizoa, usually covers lower $\frac{1}{2}$ to $\frac{3}{4}$ of synapticulotheca. Septa hexamerally arranged in 4 cycles, the S1-2 roughly same size, contributing to 12 calicular lancets. Axial edges of each pair of S4 within a half-system usually do not fuse to one another, the S4 adjacent to the S1 being wider of pair. A crown of 12 well-formed P3 is present, the peripheral edge of each palus separated from the axial edges of S3 by a deep, narrow notch. Fossa of moderate depth, containing an elongate, swirled, labyrinthiform columella.

Discussion: *Balanophyllia palifera* is compared to the other western Atlantic species in Table 4. The only substantive record of this species since 1979 was that of VIADA & CAIRNS (1987) from the northwestern Gulf of Mexico. Most records of *B. palifera* are from 300-500 m, only 2 records from less than 200 m: 53 m (Alb-2157) and 175 m (VIADA & CAIRNS 1987). The 4 new records listed below are also from depths exceeding 200 m, but extend the known range of *B. palifera* to Jamaica and the Bahamas.

New Records: Alb-2354, 1, USNM 62624; G-701, 1, USNM 62622; Gos-112/27, 2, USNM 99359; JSL-I-1355, 1, IRCZM; JSL-II-1519, 2, USNM 94731.

Types: See CAIRNS (1979).

TABLE 4. – Comparison of the nine species of *Balanophyllia* known to occur in the Western Atlantic.

Corallium:	shape; size (GCD max.)	Corallium:	shape; size (GCD max.)	Base:	attachment:	PD;GCD	Epithea	S1-S2	exsertness:	Depth of fossa	Palform lobes	Columnella:	size; shape;	discreteness	Other characters	Distribution:
<i>B. floridana</i> Pourtales, 1868	23.0 mm	Ceratoid;	12.4 mm	Usually	attached;	0.45-0.60	Absent	S1=S2	S5 common	Moderate to	Poorly-defined	Large;	elongate, swirled;	discrete	SE Caribbean;	SE Caribbean;
<i>B. guthriei</i> Pourtales, 1871		Ceratoid;	10.4 mm	Attached;	attached;	0.40-0.50	Thick	S1=S2	S5 absent	Moderate to	Very well-defined	Moderate;	elongate, swirled;	discrete	Gulf of Mexico;	SE Caribbean;
<i>B. patleyi</i> Pourtales, 1878		Ceratoid to sub-	16.9 mm	Attached to	small objects;	0.20-0.50	Occasional	S1=S2	S5 common	Shallow	Well defined	Large;	elliptical in	discrete	America;	America;
<i>B. dimera</i> Cairns, 1977		Ceratoid, usu.	curved;	Attached to	encrusting base;	0.5	Absent	S1=S2	S5 rare	Moderately	Poorly-defined	Large;	elongate;	discrete	Jamaica;	Jamaica;
<i>B. willisi</i> Cairns, 1977		Ceratoid.	slightly flared	Free or attached	Free or attached	0.09-0.35	Occasional	S1>S2	S5 often present	Deep	Absent	Rudimentary;	loose fusion;	not discrete	SE Caribbean	SE Caribbean
<i>B. caribbeana</i> Cairns, 1977		Ceratoid, usu.	17.5 mm	Free or attached	Free or attached	0.07-0.30	Absent	S1>S2	S5 common	Shallow to	moderate	Large	elongate;	not discrete	SE Caribbean	SE Caribbean
<i>B. pittieri</i> Vaughan, 1919		Ceratoid.	curved;	Free or attached	by small pedicel;	0.07-0.30	Absent	S1=S2	S5 common	Shallow to	moderate	Large	elongate;	not discrete	SE Caribbean	SE Caribbean
<i>B. boyeri</i> Cairns, 1979		Ceratoid.	slightly bent;	Attached.	Attached.	0.4-0.5	Absent	S1=S2	S5 rare	Moderately	deep	Small	elongate;	discrete	SE Caribbean	SE Caribbean
<i>B. hadasi</i> Cairns, 1979		Trochoid.	straight to	Firmly at-	Firmly at-	0.4-0.5	Absent	S1=S2	S5 common	Moderate to	deep	Large	elongate;	discrete	SE Caribbean	SE Caribbean

Distribution: Bahamas; Greater and Lesser Antilles; Yucatan Channel; Gulf of Mexico off southwestern Louisiana; 53-708 m (CAIRNS 1979: map 53).

***Balanophyllia dineta* Cairns, 1977**

(Figs. 23, 195-196)

Balanophyllia dineta Cairns, *1977a: 144-147, pl. 4, figs. 5-7 (synonymy and description); 1979: 207 (listed). -Prahl & Erhardt, 1989: 550.

Diagnosis: Corallum ceratoid, often slightly curved, and usually attached to a small object such as a gastropod or bivalve shell through a pedicel of variable diameter (PD:GCD = 0.20-0.50). Largest known corallum (the holotype) 16.9 x 14.0 mm in CD and 18.5 mm in height. Thin epithelial bands sometime cover lower theca. Septa hexamerally arranged in 5 cycles, although a complete fifth cycle is rare (Fig. 196). Coralla with 72 septa, having one pair of S5 in every half-system adjacent to an S1, are common. S1-2 not exsert. Paliform lobes (P3) present. Fossa shallow, containing a large, discrete columella that is elliptical in cross section and convex above, composed of numerous slender swirled elements.

Discussion: *Balanophyllia dineta* is distinguished from the previously described species of *Balanophyllia* by its distinctive columella. It also has a shallow fossa, nonexsert septa, and appears to be restricted to the rather shallow water of the southeastern Caribbean and Guianas (Table 4). The new records reported below extend its known distribution from Guyana to Amapa, Brazil.

New Records: P-671, 8, USNM 46675; P-708, 1, USNM 46676; P-838, 9, USNM 46677; Alb-2120, 2, USNM 7068; O-4459, 2, USNM 62613; Chain 35-35, 8, USNM 62619; Chain 35-36, 20, USNM 62617; Chain 35-38, 52, USNM 62620; Chain 35-39, 14, USNM 62618; Chain 35-43, 4, USNM 62621; Saldanha Pesca N2, 2, 4°27'N, 49°59'W, 116 m, SME.

Types: See CAIRNS (1977a).

Distribution: Southeastern Caribbean from Península de Guajira, Colombia to Guadeloupe, Lesser Antilles; northeastern South America to Amapa, Brazil (4°27'N, 49°59'W); 27-274 m (Fig. 23).

***Balanophyllia caribbeana* Cairns, 1977**

(Figs. 8, 197)

Balanophyllia caribbeana Cairns, *1977a: 141, pl. 2, fig. 6, pl. 3, figs. 1-2; 1979: 207 (listed).
-Prahl & Erhardt, 1989: 550 (listed).

Diagnosis: Corallum ceratoid, occurring in both free and attached states. Unattached, recumbent coralla usually curved, having a small pedicel (PD:GCD to 0.09); attached coralla, often the result of asexual budding from a parent fragment, usually straight, having a larger pedicel (PD:GCD up to 0.35). Largest known corallum (O-5696) 17.5 x 13.0 mm in CD and 40.3 mm in length. Theca thin and porous, which facilitates asexual fragmentation; epithelial bands occasionally present. Septa hexamerally arranged in 5 cycles, the fifth cycle rarely complete. S1 larger than S2, both cycles of septa exsert. Axial edges of highest cycle septa (*i.e.*, S4 or S5) lacinate. Paliform lobes absent. Fossa quite deep, containing a rudimentary columella consisting of a loose concentration of slender elements that originate from lower axial edges of S1-2 and highest cycle septa.

Discussion: *Balanophyllia caribbeana* is compared to *B. pittieri* in the account of that species and in Table 4. At the depth range of 30-100 m, these 2 species complement each other in geographic range within the southern Caribbean, overlapping only between the Gulf of Morrosquillo and Península de Guajira, Colombia (Figs. 8, 9).

New Record: O-5696, 2, USNM 62612.

Types: See CAIRNS (1977a).

Distribution: Southeastern Caribbean from Isla Fuerte, Colombia to St. Vincent, Lesser Antilles (Fig. 8); 33-86 m.