Genus **Trochocyathus Milne Edwards & Haime, 1848**

Diagnosis: Corallum solitary; discoidal, turbinate, ceratoid or bowl-shaped; attached or free; costal spines present in some species. Transverse division present in some species. Septotheca costate, sometimes covered with a thin epitheca. Discrete pali occur before all but last cycle of septa in 2 or 3 crowns; columella papillose. No endotheca.

Type Species: *Turbinolia mitrata* Goldfuss, 1827, by subsequent designation (MILNE EDWARDS & HAIME 1850a: xiv).

Trochocyathus rawsonii Pourtalès, 1874

Trochocyathus rawsonii Pourtalès, v*1874: 35, pl. 6, figs. 7-10. –Cairns, 1979: 77-79, pl. 13, figs. 5-7, pl. 14, figs. 1-6, Map 17 (description and synonymy). –Cairns et al., 1991: 47 (listed). –Cairns et al., 1994: 4 (listed).

Diagnosis: Corallum usually bowl-shaped, with a rounded, often slightly twisted, base that is attached to a solid substrate or a smaller object. In the former case the PD:GCD is up to 0.33, in the latter case the pedicel or scar of attachment may have a PD:GCD as small as 0.09. Largest known corallum (G-1036) 25.9 x 22.5 mm in CD; the tallest corallum 33 mm. Costae usually masked with thin, wrinkled bands of epitheca to within 2-3 mm of calicular edge, above which costae are well defined, separated by deep intercostal furrows. Septa hexamerally arranged in 5 cycles, the fifth never complete: S1>S2>S3>S4>S5. The fourth cycle may be complete at a GCD as small as 9 mm and persist at this complement until a GCD of 16 mm, but larger coralla have additional pairs of S5 up to approximately 72 septa. Large coralla often have 2 pairs of S5 in each system, one pair flanking the S4 adjacent to each S1. Pali occur before all but the last cycle of septa in 3 crowns. Innermost crown composed of 6 P1 and 6 P2, the P2 about twice the width of the P1 but axial edges of all 12 P1-2 extend the same distance into fossa. Intermediate crown of 12 P3 slightly recessed from columella and rise higher in fossa than P1-2 crown, the P3 about the same width as the P2. Development of P4 crown incomplete, when present P4 more recessed from columella and project higher in fossa than P3, are of equal width, and their axial edges usually fuse to the axial edge of the

adjacent P3. Columella papillose, composed of numerous robust granulated pillars.

Discussion: The records reported herein extend the known distribution of this species to Jamaica; Quintana Roo, Mexico; and slightly farther north in the Gulf of Mexico off Cedar Keys, as well as including the shallowest record of the species (55 m, off Cedar Keys) and the deepest (700 m, Gosnold 112/78). Approximately half of the known records of *T. rawsonii* occur shallower than 200 m, the majority of these between 100 and 200 m.

New Records: O-22084, 1, IRCZM 12:130; B-A DS10, 1, USNM 93185; Gos-112/78, 1, USNM 80912; BLM, SOFLA-32, 10, USNM 71990-94; BLM, SOFLA-35, 2, USNM 71995; 25°16'N, 84°15'W, 159-166 m, 8, USNM 83452; 26°16'N, 84°04'W, 139-148 m, 1, USNM 83446; west of Cedar Keys, FL, 55 m, 3, USNM 46094; Isla Contoy, Quintana Roo, Yucatan Peninsula, 100-200 m, 1, USNM 98467.

Types: See CAIRNS (1979).

Distribution: Southeastern US from off South Carolina (32°01'N, 79°24'W) throughout Bahamas and Antilles to off Maranhão, northeastern coast of Brazil (0°18'N, 44°17'W); southeastern Gulf of Mexico; off Jamaica, Nicaragua, and Venezuela (CAIRNS 1979: map 17); 55-700 m. –Elsewhere: ?southwest Indian Ocean (CAIRNS & KELLER 1993).

Trochocyathus laboreli, new species

(Figs. 17, 87-88)

?*Trochocyathus* sp. –Laborel, 1970: 155 (listed). –Tommasi, 1970: 56 (in part: fig. 5f).
?*Trochocyathus* n. sp. –Laborel, 1971: 175 (listed).
?*Trochocyathus rawsonii*. –Zibrowius, 1988: 135 (listed).

Description: Corallum ceratoid, usually cornute, having an elongate, slender pedicel 0.85-2.4 mm in diameter (PD:GCD = 0.09-0.20). Base monocyclic, containing 6 septa. Corallum usually free but occasionally

weakly attached to substrate. Largest corallum 15.9 mm in CD and 20.6 mm in height (WB-5148). Costae equal in width, low, faintly granular, and separated by shallow intercostal furrows. Lower ⅓ of theca often encrusted with various calcareous epizoa; corallum uniformly white.

Septa hexamerally arranged in 4 cycles (S1>S2>S3>S4), even the largest coralla having no more than 48 septa. S1 only moderately exsert (about 1.8 mm); have vertical to slightly concave, sinuous axial edges; and bear a small palus of approximately 1 mm width. S2 equally exsert and only slightly narrower than S1, each bearing a palus about twice the width of the P1; however, P2 often missing from some or all systems within a corallum. P1-2 form the innermost palar crown, their axial edges extending the same distance into the fossa. S3 less exsert (about 1.1 mm) but only slightly narrower than S2, also having sinuous axial edges. Each S3 bears a palus about the same width of the P1, but recessed from the columella and rising higher in fossa than P1-2, the 12 P3 forming outermost of 2 palar crowns. S4 equally as exsert as S3 but only about half the width, rudimentary lower in fossa. Fossa of moderate depth, containing a papillose columella composed of 6-10 irregularly shaped, crispate elements that are often loosely fused to one another.

Discussion: Although similar to *T. rawsonii*, *T. laboreli* differs in having a smaller, cornute, often free corallum with a slender, elongate pedicel. Because of its smaller size it has fewer septa and pali. *T. laboreli* is known only from the state of São Paulo, Brazil, whereas *T. rawsonii* has a more northerly distribution, known from throughout the Caribbean and southeastern US, with a southern limit of off Maranhão, Brazil (0°18'N, 44°17'W).

Etymology: This species is named for JACQUES LABOREL, who first implied that this species was undescribed, and who did much of the early work on Brazilian deep-water corals (LABOREL 1967, 1970, 1971).

Types: IOSP stn 1, 2 specimens: holotype (USNM 99193), paratype (USNM 99194); WB-2, 4 paratypes, USNM 99197; WB-318, 3 paratypes, USNM 99196; WB-5148, 10 paratypes, MNRJ 2443; WB-5192, 3 paratypes, MNRJ 2451; WB-5366, 60. Paratypes: 40 (MNRJ 2439), 20 (USNM 99195). Type Locality: 24°20'S, 44°40'W (off Ilha de São Sebastião, Brazil), 130 m.

Distribution: Known from a relatively small region just south of Rio de Janeiro (Fig. 17); 130-240 m.

Genus **Paracyathus Milne Edwards & Haime, 1848**

Diagnosis: Corallum solitary; conical; fixed or free. Septotheca costate. Three to 5 cycles of septa; paliform lobes before all but last cycle of septa, the lobes often bi- or tri-lobed. Columella papillose, sometimes indistinguishable from lower, axial paliform lobes.

Type Species: *Paracyathus procumbens* Milne Edwards & Haime, 1848a, by subsequent designation (MILNE EDWARDS & HAIME 1850a: xv).

Paracyathus pulchellus (Philippi, 1842)

(Figs. 89-91)

Cyathina pulchellus Philippi, *1842: 42.
Paracyathus pulchellus. –Cairns, 1979: 88-90, pl. 16, figs. 1-4, 6, Map 20 (synonymy of western Atlantic records and description). –Zibrowius, v.1980: 90-93, pl. 44, figs. A-K, pl. 45, figs. A-L (synonymy of eastern Atlantic records and description). –Rezak et al., v.1985: 225 (listed: stn 113, Coffee Lump; stn 115, 128, Geyer Bank; stn 118, Diaphus Bank; stn 120, Sidner Bank; stn 122, Alderice Bank). –Not Hubbard & Wells, v.1986: 133 (*=Polycyathus senegalensis*). –?Estalella, 1987: 8, 13, figs. 3A-B. –Prahl & Erhardt, 1989: 545. –Cairns et al., 1991: 47. –Fenner, v.1993a: 12, 14 (listed). –Cairns et al. 1994: 4 (listed).
Paracyathus defilippi Duchassaing & Michelotti, v*1860: 60, pl. 9, figs. 2-3. –Cerame-Vivas & Gray, 1966: 263 (listed). –Avent, King & Gore, 1977: 200, fig. 111. –Castañares & Soto, 1982: Table 1 (listed).
Paracyathus confertus Pourtalès, v*1868: 134.

Diagnosis: Corallum variable in shape, ranging from cylindrical (with a polycyclic base) to trochoid; always attached. Largest known corallum (O-1493) 16.2 x 13.6 mm in CD, 16.3 mm in height, and 5.7 mm in PD. Costae well developed and granular. Upper theca and calicular elements usually pigmented light brown. Septa hexamerally arranged in 5 cycles, the fifth cycle never complete. Number of septa roughly a function of GCD, the largest corallum having 92 septa. Septal formula: S1-2>S3>S4>S5; however, there is little difference in width among the S3-S5, all septa being about equally exsert. Paliform lobes occur before all but last cycle of septa, and in some specimens occur before septa of the last cycle as well (Fig. 91). P1-

2 narrowest and lowest paliform lobes; P3-4 about twice as wide and rise progressively higher in fossa. All classes of paliform lobes (*i.e.*, P1-4) may occur in the single or multilobate condition, the latter state consisting of a septum bearing 2-5 small paliform lobes, the lowermost lobe merging with the columella. Columella consists of up to 60 close-set, slender (0.20-0.25 mm diameter) elements often arranged in an elliptical, slightly convex field.

Discussion: *Paracyathus pulchellus* is a very common and variable species found throughout the western Atlantic. It is more fully described and illustrated by CAIRNS (1979) and ZIBROWIUS (1980). It may be confused with *Polycyathus senegalensis*, as discussed in the account of that species. To reiterate, *P. pulchellus* differs in having a solitary corallum and in having approximately equally exsert septa, the pairs of septa adjacent to the S1-2 (*i.e.*, S4-5) of *P. senegalensis* forming exsert lancets. The species is known by the common name of the papillose cup coral (CAIRNS *et al.* 1991).

New Records: P-705, 2, USNM 99390; SB-1956, 1, USNM 99200; SB-1959, 8, USNM 99201; SB-2009, 1, USNM 99389; SB-2405, 1, USNM 61906; SB-2425, 2, USNM 61894; O-1493 (labelling error?), 1, USNM 61915; O-1494, 5, USNM 99391; Alb-2320, 2, USNM 16125; Alb-2322, 3, USNM 16129; Alb-2330, 1, USNM 16127; Alb-2331, 2, USNM 16126; Alb-2394, 1, USNM 10423; Alb-2651, 1, USNM 14605; Combat-90, 1, USNM 99392; GS (Geology)-5, 1, USNM 46166; GS (Geology)-44, 36, USNM 46165; GS (Geology)-71-5, 16, USNM 46167; GS (Geology)-71-6, 2, USNM 46169; JSL-I-2582, 6, USNM 87784; JSL-I-2586, 2, USNM 89351; Circé 28-2, 1, USNM 75658; Circé 30-1, 1, USNM 75663; Circé 81-3, 3, USNM 75667; Circé 83-1-F, 5, USNM 75674; BLM, LMRS, O-S01, 1, USNM 67851; BLM, LMRS, O-S03, 3, USNM 67852; BLM, LMRS, O-S05, 2, USNM 71666; BLM, LMRS, 1-579, 2, USNM 72395; BLM, SOFLA-32, 2+, USNM 72643; BLM, SOFLA-35, 1, USNM 72647; BLM, SOFLA-36, 10+, USNM 72652; BLM, SOFLA-38, 10+, USNM 72656; BLM, SOFLA-39, 8, USNM 72657; BLM James Island Area Block 198-2, 5+, USNM 75696; BLM James Island Area Block 380-3, 7, USNM 75727; BLM James Island Area Block 380-11, 10+, USNM 75698; Combat-457, 4, USNM 61906; Triton 553-56, 1, USNM 95498; CSA Pinnacle site 2, 1, CSA; CSA Pinnacle site 4, 1, CSA; CSA Pinnacle site 7, 1, CSA; CSA Pinnacle site 9, 4, CSA; Dry Tortugas, FL, 59-71 m, 1, USNM 81300; off Key West, FL, 150 m, 100+, USNM 61918; 25°16'23"N, 84°15'17"W, 159-166 m, 20, USNM 83449; Palancar

Reef, Cozumel, Mexico, 1, USNM 75167; Santa Marta, Colombia, 55 m, 3, USNM 80890; South of Castle Roads, Bermuda, 60-90 m, 1, USNM 61899; Mississippi Mud Lump 90 (TU 977), 15,500 BP, 1 May 1969, 8, USNM 99387.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: widespread throughout Caribbean and Gulf of Mexico, ranging from Cape Lookout, NC (34°37'N, 75°44.4'W) to off Maranhão, Brazil (0°18'N, 44°23'W). Although the western Atlantic depth range for this species was stated to be 17-838 m (CAIRNS 1979: map 20), the deepest record of 838 m (based on BL-271) is probably an error, since almost all subsequent records of this species occur at depths of 50-250 m. Elsewhere: eastern Atlantic from Mediterranean and area bounded by Portugal, the Azores, and the Gulf of Guinea; 40-1260 m, but rare below 200 m (ZIBROWIUS 1980).

Genus **Polycyathus Duncan, 1876**

Diagnosis: Corallum colonial, cylindrical to slightly conical corallites budded from a common coenosteum or from stolons. Septotheca costate. Three to 4 cycles of septa; pali present before all but last cycle of septa; columella papillose.

Type Species: *Polycyathus atlanticus* Duncan, 1876, by monotypy.

Polycyathus senegalensis Chevalier, 1966

(Figs. 17, 92-95)

Polycyathus senegalensis Chevalier, v*1966a: 971-974, pl. 4, figs. 7-8, text-fig. 21. –Best, 1968: 72 (listed). –Patriti, 1970: 124. –Wijsman-Best, 1970: 83-84. –Zibrowius, 1980: 94. –Hubbard & Wells, v.1986: 133-134, figs. 21-22. –Cairns et al., 1994: 7.
Polycyathus mullerae. –Hubbard & Wells, v.1986: 134, figs. 23-24. [Not *Polycyathus muellerae* (Abel, 1959)]
Paracyathus pulchellus. –Cairns, 1979: 88-90, pl. 16, fig. 5 (in part: P-650, 705, 707, 708, 709, 769). –Hubbard & Wells, v.1986: 133. [Not *Cyathina pulchellus* Philippi, 1842]

Description: Corallites bud from a common, continuous, thick (up to

1.5 mm) coenosteum as well as perpendicularly from lower half of theca of various corallites, the latter buds often deformed or stunted in growth because of proximity to other corallites. Coralla often encrust cylindrical objects such as antipatharian and gorgonian axes, or attach to rocks and shells. Corallites increase in diameter with height, the largest corallite up to 10.5 mm in GCD and 19 mm in height. Costae variable, often low and only slightly convex, covered with 3-5 small granules across their width and separated by narrow, shallow intercostal striae, but may also be ridged with intercostal regions equal in width to costae. Costae rarely extend to intercorallite coenosteum but granules usually present in this region. Basal coenosteum white, this colour gradually changing to light brown towards calicular edge; septa also light brown, but pali and columella white.

Septa hexamerally arranged in 4 to 5 cycles, a full fifth cycle never attained: corallites having a GCD of 2-3 mm have 24 septa, whereas 48 septa are present by a GCD of 6 mm, and the largest corallites have as many as 66 septa. S1 about 1.2 mm exsert, with straight, vertical axial edges that are slightly concave near the columella, in order to accommodate a thick, slender (0.40-0.45 mm wide), vertically oriented palus. S2 equally exsert but only about ¾ width of S1, each S2 also having a straight, thickened axial edge that bears a wider (0.60 mm), thick palus, the P2 rising slightly higher and being slightly more recessed farther from the fossa than the P1. S3 about 1 mm exsert and ¾ width of S2, each bearing a wide (0.6-0.7 mm), thick palus that rises even higher and is recessed from columella than the P2. P3 bear obliquely oriented ridges making them appear quite thick; their axial edges are often dissected into 2 or 3 additional lobes. S4 equally exsert as S3, each pair of S4 fused with their adjacent S1 or S2 at calicular edge, forming a lancetted calicular margin. Those S4 adjacent to S1 slightly wider than S3, whereas S4 adjacent to S2 slightly less wide than S3. When present, pairs of S5 usually confer an irregular outline to calicular perimeter, the S5 adjacent to the S1 or S2 being slightly more wide than an S4, the other S5 adjacent to the S3 being slightly narrower than an S4. Pairs of S5 within a half-system accompanied by presence of P4. Fossa deep and steep-sided, the vertical axial edges of the palar crown forming an inner fossa within which the papillose columella sits. Columellar elements large (0.4-0.5 mm in diameter), irregularly shaped, and finely granular. Columella usually consists of 12-18 elements, which are often laterally fused.

Discussion: HUBBARD & WELLS (1986:134) characterized *Polycyathus senegalensis* as a "quasicolonial *Paracyathus pulchellus* with smaller corallites". It is true that these species are very similar, and both HUBBARD & WELLS (1986) and I (CAIRNS 1979) have confused *P. senegalensis* with *P. pulchellus*. The main difference between the two species is that *P. senegalensis* forms a true colony (not a quasicolony) by budding from a common basal coenosteum, whereas *Paracyathus pulchellus* is solitary. Even closely settled *Paracyathus pulchellus*, which may resemble a bushy colony, can be distinguished because each individual has a discrete basal attachment. However, there are several other characters that serve to distinguish specimens that may have been broken from the substrate. *P. senegalensis* has larger and fewer columellar elements than *Paracyathus pulchellus*: 15-20 elements 0.4-0.5 mm in diameter vs a field of up to 50 elements 0.1-0.5 mm in diameter in *Paracyathus pulchellus*. Also the columellar elements of *P. senegalensis* are often fused laterally to other elements, have a more irregular shape, and are very finely dentate. Furthermore, the calicular edge of *P. senegalensis* is lancetted, that of *Paracyathus pulchellus* not; and the fossa of *P. senegalensis* is deeper and more steep-sided, that of *Paracyathus pulchellus* more open. Finally, as HUBBARD & WELLS (1986) implied, *Paracyathus pulchellus* may attain a larger size and thus contain more septa.

HUBBARD & WELLS (1986) also reported the Mediterranean species *Polycyathus mullerae (sic)* (ABEL 1959) from the same Trinidad localities as *P. senegalensis*, which they distinguished from *P. senegalensis* by having smaller, white corallites. However, it is not unusual for small corallites of *P. senegalensis* to be white (even large corallites from Alb-2120 are white), and the small corallites of their *P. muellerae* are very similar to juvenile corallites growing from the base of their figured specimen of *P. senegalensis*. I have therefore reidentified their specimens of *P. muellerae* as *P. senegalensis*. They are nonetheless very similar to the Mediterranean *P. muellerae*, but may be distinguished by their lancetted calicular margin, larger columellar elements, and more robust pali.

Two colonies from off Guyana (P-691 and Chain 35-39) contain several lenticular-shaped acrothoracican cirripede borings (Fig. 95).

New Records: P-650, 18 corallites, USNM 46156; P-691, 3 colonies, USNM 80241; P-705, 1 colony, USNM 80242; P-707, 3 colonies, USNM 46159; P-708, 1 colony, USNM 46129; P-709, 3 corallites, USNM 46128; P-769, 1 corallite,

USNM 46160; SB-2008, 1 colony, USNM 77718; Alb-2120, 4 corallites, USNM 7598; Eastward-10868, 2 colonies, USNM 85439; Eastward-10881, 1 colony, USNM 85438; Chain 35-20, 20 colony fragments, USNM 99205; Chain 35-35, 1 colony, USNM 80415; Chain 35-36, 10 colony fragments, USNM 80416; Albatross III, 29 km off Cape Lookout, NC, 54 m, 1 colony, USNM 99204; Combat-90, 1 colony, USNM 99206; BLM, James Island Area Block 380-4, 4 colonies, USNM 75697; BLM, James Island Area Block 380-11, 4 colonies, USNM 99207; BLM, James Island Area Block 463-19, 1 corallite, USNM 97328; CSA 1347-1, 1, CSA; CSA 1347-2, 1, CSA; off Cape Canaveral, FL, 74-78 m, 1 colony, USNM 85440; 7°17.8'N, 54°04.0'W, 90-100 m, 1 colony, NNM Coel. 16248.

Types: The holotype and paratypes of *P. senegalensis* are deposited at the MNHN, Paris. Type Locality: 'region of Dakar', Senegal.

Distribution: Western Atlantic: Disjunct distribution, most records from Gulf of Paria, Venezuela to French Guiana (also Península de la Guajira, Colombia), but isolated records from off Mobile, AL; Cape Canaveral, FL; off James I., SC/GA; and Cape Lookout, NC (Fig. 17); 12-143 m. The Floridian record mentioned by Hubbard & Wells (1986) are documented above as USNM 85438-40. Eastern Atlantic: Senegal, Morocco; 46-100 m.

Polycyathus mayae, new species

(Figs. 4, 96-101)

Description: Corallum consists of up to a dozen slender, subcylindrical to ceratoid corallites united basally by a thin continuous sheet of coenosteum (if corallites are closely spaced) or united by broad, thin stolons (if corallites are more widely spaced). Holotypic colony consists of three corallites, the tallest 8.5 mm, the smallest just a bud 0.5 mm in height. Corallites usually 8-10 mm in height, but some may be quite elongate (*e.g.*, Alb-2354), reaching up to 27 mm in height. Calice elliptical, most less than 4.0 mm in GCD but largest corallite (part of holotypic colony) 4.6 mm in GCD. Corallites gradually increase in diameter with height, often somewhat flared at calicular end. C1-2 prominent, often slightly ridged, ex-

tending ½ to ⅔ distance to basal coenosteum; C3 convex. Theca often glisteny and relatively smooth, bearing very low, polished granules; basal coenosteum smooth. Upper half of corallites usually a very light brown, whereas lower theca and coenosteum white.

Septa hexamerally arranged in 3 cycles (S1>S-3), larger corallites (*i.e.*, those over 4.0 mm GCD) also having 1 or 2 pairs of S4 (26-28 septa). Disposition of septa within elliptical calice somewhat unusual, in that the greater axis of the calicular ellipse passes through two opposing S2, not S1, as is typical in most Scleractinia, resulting in an apparent 30° rotation of the septa from the normal position. The elongate columella, however, is aligned with opposing S1, which places it 30° off-line from the greater calicular axis. S1 highly exsert (up to 1.4 mm) in relation to calicular diameter and relatively thick (about 0.4 mm) at calicular edge. Axial edges of S1 vertical and sinuous, in larger corallites bearing short carinae on their faces bordering the axial edge. S2 similar to S1 but less exsert (1.0-1.2 mm) and ¾ width of an S1, having a peripheral edge that projects slightly outside calicular margin. S3 also similar in shape to other septa, slightly less exsert (about 0.6 mm) but equally as wide as S2. When present, S4 less exsert than S3 but of equal width. Slender (0.20-0.25 mm), sinuous, ridged P1 border the 6 S1; broader (0.50 mm), also slender and ridged P2 border the 6 S2. These 12 pali form a single crown, positioned such that their axial edges are all at the same distance from the corallite centre, but the distal edges of the P2 rise slightly higher in the fossa than the P1. Fossa deep and narrow, containing an elongate, papillose columella composed of 2-10 irregularly shaped elements 0.15 mm in diameter.

Discussion: Of the 17 valid species of *Polycyathus*, *P. mayae* is most similar to *P. norfolkensis* Cairns, 1995 (Norfolk Island, 10-20 m), one of 3 species having only, or predominantly, 3 cycles of septa. Both species also have a single crown of dimorphic pali, the same relative septal sizes, and approximately the same size corallites. *P. mayae* differs in having more exsert S1 with more sinuous axial edges, thicker and more columellar elements, and an off-centre alignment of septa and columella in relation to its calicular ellipse.

Etymology: This species is named for MAYA BOREL BEST (NNM), in recognition of her work with the species of the genus *Polycyathus*.

Types: Holotype: P-1143, colony of 3 corallites, USNM 99214. Paratypes: P-1303, 1 corallite, USNM 99215; P-1411, 1 corallite, USNM 99210; G-984, 1 corallite, USNM 99213; Alb-2161, 2 colonies, USNM 16131; Alb-2331, 1 corallite, USNM 99236; Alb-2354, 1 colony and 4 corallites, USNM 16116; Gos-39, 1 corallite, USNM 83467; Nekton (gamma) 232, 9 corallites, USNM 99212; Nekton (gamma) 244, 2 corallites, USNM 99216; JSL-I-3659, 1 colony, USNM 94763; JSL-II-3005, 18 corallites, USNM 99209; Endeavor-1, 10 corallites, USNM 77431; B-A DS9, 1 colony, NNM Coel. 23394; Bahia de Cochinos, Cuba, 182-274 m, 10 corallites, USNM 99208; Discovery Bay, 183 m, corallum with 11 corallites, USNM 99237; Barbados, 137 m, 2 colonies, USNM 99211. Type Locality: 20°54.5'N, 73°28.2'W (south of Great Inagua, Bahamas), 110-220 m.

Distribution: Antillean distribution from Arrowsmith Bank and Bahamas through the Antilles to Barbados (Fig. 4); 137-309 m.

Genus **Cladocora Ehrenberg, 1834**

Diagnosis: Bushy to irregularly-shaped coralla formed by extratentacular budding. Septotheca costate. Septa in 3-4 cycles; small paliform lobes before septa of all but last cycle. Columella papillose.

Type species: *Madrepora caespitosa* Linnaeus, 1767, *by subsequent* designation (MILNE EDWARDS & HAIME 1850a: xxxviii).

Discussion: The genus *Cladocora* is herein transferred from the family Faviidae to Caryophylliidae based on its morphological resemblance to genera such as *Polycyathus* and *Paracyathus*, a clade that is strongly supported by molecular analysis of the mitochondrial 16S and nuclear 28S ribosomal genes (ROMANO, *pers. comm.* 1997-8).

Cladocora debilis Milne Edwards & Haime, 1849

(Figs. 18, 102-107)

Cladocora debilis Milne Edwards & Haime, v*1849b: 308. –Pourtalès, v.1871: 30; v.1878: 205. –Moseley, v.1881: 184-185. –Not Vaughan, v.1901: 298 (=*Oculina* sp.). –Not Durham & Barnard, v.1952: 58 (=*C. pacifica* Cairns, 1991a). –Tommasi, 1970: 56, figs. 5d, 6a. –Leite & *Tommasi*, 1976: 101, fig. 2.BAvent, King & Gore, 1977: 200, fig. 11m. –Cairns, 1978a: 10

(listed); 1979: 207 (listed). –Zibrowius, v.1980: 31-33, pl. 11, figs. A-L (description, synonym of eastern Atlantic records). –Zlatarski, 1982: 116. –Hubbard & Wells, v.1986: 125-126, figs. 4-5 (see Discussion: sympodial form). –Cairns, 1991: 6-7. –Cairns et al., 1991: 46 (common name). –Not Humann, v.1993: 96-97, colour fig. (=*C. arbuscula*). –Cairns et al., 1994: 6. –Pires, 1997: 182.
Cladocora patriarca Pourtalès, v*1874: 42, pl. 7, fig. 7.
Cladocora paulmayeri Döderlein, *1913: 137, pl. 9, figs. 66-69b.
Cladocora coespidosa (sic). –Cerame-Vivas, 1966: 263 (listed).
Cladocora arbuscula. –Tommasi, 1970: 56, figs. 5-6. [Not *Cladocora arbuscula* (Lesueur, 1821]
Cladora (sic) debilis. –Zibrowius, 1988: 135 (listed).

Description: Corallum usually composed of 1 or 2 axial corallites, from which secondary corallites branch at right angle, and occasionally tertiary corallites from the secondaries. Secondary corallites often occur in pairs on opposite sides of primary corallite, sometimes resulting in a uniplanar colony with the longer secondary corallites progressively farther away from the calice of the primary corallite (Fig. 103; see also TOMMASI 1970: fig. 6a). However, beyond about 2-3 cm from the calice of the primary corallite, secondary corallites are often broken, resulting in short calicular nubs on the proximal parts of the primary corallite. Detached secondary corallites probably form new coralla, sometimes growing from both the calicular end and the broken proximal end, thus becoming a bipolar branch. Bipolar coralla are rare, however, because the broken ends of corallites and the proximal branches of intact colonies are usually quickly and completely encrusted with calcareous algae, bryozoans, barnacles, and serpulids. Primary and secondary corallites straight to slightly curved or bent; tertiary corallites usually short and straight. Branching not crowded and thus there is no branch anastomosis. Coralla recumbent, rarely collected attached to substrate. Coralla delicate and relatively small (usually less then 4 cm in height); however, some robust coralla from St. Peter and St. Paul Rocks (Chain 36-16) up to 7 cm in length and 5.4 mm in GCD. Corallites small, usually 2.8-3.8 mm in GCD, except for the robust colonies from St. Peter and St. Paul Rocks; branches cylindrical and of same diameter as calices, decreasing in diameter away from calice. C1-3 slightly convex or rarely ridged, and finely granular. Coenosteum light brown or white.

Septa hexamerally arranged usually in 3 cycles (S1>S2>S3), larger corallites with additional pairs of S4 up to 36 septa. S1 only slightly exsert (0.4-0.5 mm), having straight smooth axial edges, each bearing a discrete, narrow paliform lobe. S2 only slightly narrower and less exsert than S1, each

bearing a paliform lobe of equal width but taller than the P1, all 12 forming a single palar crown. S3 slightly narrower and less exsert than S2. Fossa of moderate depth, containing a columella consisting of 5-8 discrete papillose elements.

Discussion: Although ZLATARSKI (1982) synonymised *C. debilis* with the more commonly collected, shallow-water *C. arbuscula*, there seem to be numerous differences between these two species aside from their bathymetric ranges. Most significantly, *C. debilis* has well-formed, discrete paliform lobes (P1-2) that form a single palar crown, whereas the S1-2 axial edges of *C. arbuscula* bear a series of small paliform teeth, not formed into a crown. The columellar elements of *C. debilis* are also much better formed and discrete. Furthermore, the colonies of *C. debilis* are small, sparsely branched, and irregular in shape (often uniplanar), whereas those of *C. arbuscula* are larger, densely branched in three dimensions, often resulting in a small bush. Also, there are usually 36 or less septa in a corallites of *C. debilis*, 36 or more in those of *C. arbuscula*. The corallites and branch diameters of *C. debilis* are usually smaller than those of *C. arbuscula*; however, equally robust colonies of *C. debilis* are known from St. Paul Rocks. Finally, *C. debilis* is considered to be an azooxanthellate species (ZIBROWIUS 1980) with a depth range of 32-480 m, whereas *C. arbuscula* is a zooxanthellate species having a shallower bathymetric range of 0.5-27 m (Cairns, 1982b). HUMANN's (1993) colour illustration of a *C. debilis* (USNM 92283, Jupiter Inlet, FL, 27 m) with the typical brown zooxanthellae pigmentation, is considered to be a deep water form of *C. arbuscula*.

Indeed, *C. debilis* is more similar to *C. pacifica* Cairns, 1991, a species described from the Galápagos and Cocos Islands (45-274 m), specimens of the Pacific species being almost indistinguishable from the robust form of *C. debilis* from St. Paul Rocks.

The specimens reported as *C. debilis* from Trinidad by HUBBARD & WELLS (1986) differ strikingly in growth form, each newly budded corallite curving 90°-180° downward before budding the next generation corallite(s) from its upper, convex thecal edge, sometimes forming up to 6 successive generations in this manner. This branching pattern not only produces a differently shaped corallum from *C. debilis* but one that lacks axial corallites, which distinguishes it from both *C. debilis* and *C. arbuscula*. Furthermore, its S3 bend toward and often fuse to their adjacent S2, a trait not

seen in the other Caribbean *Cladocora*. On the other hand, the morphology of its septa, pali, and columella are more typical of *C. arbuscula*. Additional specimens of this phenotype, herein termed the 'sympodial form' of *C. debilis*, are known from P-705 (UMML 8.588), P-710 (USNM 62358), P-721 (UMML 8.1428), P-761 (USNM 62362), and P-778 (UMML 8.590), making its range the southern Caribbean from Península de Guajira, Colombia to the Gulf of Paria, Venezuela at depths of 9-81 m, a range that bridges the depth ranges of *C. debilis* and *C. arbuscula*. This peculiar, sympodially branched *Cladocora* is yet another example of the unique nature of the coral fauna of the southeastern Caribbean and may even represent an undescribed species.

The common name of *C. debilis* is the 'thin tube coral' (CAIRNS *et al.* 1991).

New Records: Alb-2316, 1 branch, USNM 36543; Alb-2317, 10 branches, USNM 16123-24; Alb-2336, 1 branch, USNM 80171; Alb-2405, 100+ branches, USNM 10452; Alb-2406, 4 branches, USNM 10462; O-3603, 1 branch, USNM 88856; O-3704, 10+ fragments, USNM 62344; O-4459, 3 branches, USNM 99219; O-5699, 1 branch, USNM 99378; SB-48, 6 fragments, USNM 99379; SB-1515, 2 branches, USNM 88853; SB-2368, 1 branch, USNM 88854; SB-4122, 2 branches, USNM 88855; P-112, 1 branch, USNM 62342; P-392, 1 branch, USNM 62349; P-624, 11 branches, UMML 8.593; P-707, 10 branches, USNM 62347; P-708, 10+ branches, USNM 62359; P-709, 10+ branches, USNM 62367; P-718, 5 branches, USNM 62343; P-727, 1 branch, USNM 62341; P-728, 4 branches, USNM 62350; P-734, 5 branches, USNM 62369; P-737, 5 branches, UMML 8.226; P-749, 2 branches, USNM 62351; P-759, 2 branches, USNM 62353; P-768, 20+ branches: USNM 62363 and UMML 8.342; P-772, 4 branches, USNM 62368; P-773, 9 branches, USNM 62352; P-775, 3 branches, USNM 62356; P-1369, 1 branch, UMML 8.604; G-602, 1 branch, USNM 62360; G-613, 1 branch, UMML 8.601; G-1086, 1 branch, UMML 8.581; Gos-1533, 3 branches, USNM 62346; Gos-1575, 1 branch, USNM 62367; Gos-1738, 1 branch, USNM 62354; Gos-1774, 8 branches, USNM 62364; Gos-1857, 4 branches, USNM 62366; Gos-1860, 7 branches, USNM 62355, 62365; BLM, SOFLA-7, 3 branches, USNM 86737; BLM, James Island Area Block 380-4, 4 fragments, USNM 75722; BLM, James Island Area Block 380-7, 7 fragments, USNM 75725; BLM, James Island Area Block 463-21, 1 branch, USNM 75723; BLM, LMRS O-S03, 20+ branches, USNM 67846-48, 68415; BLM, O-S06, 1 branch, USNM 88111; BLM,

LMRS, 1-580, 1 branch, USNM 72389; Chain 35-15, 50+ branches, USNM 80813; Chain 35-16, 50+ branches, USNM 80814; WB-2, 1 branch, USNM 62360; WB-379, 10+ fragments, USNM 62370; BL-2, 2 fragments, USNM 5866; Delaware II-131, 10 branches, USNM 84404; Atlantis, 12°14'N, 70°20'W, 73 m, 10 XI 1958, 3 branches, USNM 80199; CSA 1347-1, 1, CSA; CSA 1347-2, 2, CSA; off Fowey Rocks, Biscayne Bay, FL, 25 branches, USNM 80431, 80456, 80458, 80460; Sand Key, FL, 73 m, 13 branches, USNM 80429; off Alligator Light, FL, 182-213 m, 8 branches, USNM 83080; Mississippi Mud Lump 90, 10+ fragments, USNM 83081; Mississippi Mud Lump 90 (TU 977), 15,500 BP, 1 May 1969, 50 fragments, USNM 99385.

Types: Four syntype branches of *C. debilis* are deposited at the BM (1974.6.15.2) (see ZIBROWIUS 1980). Type Locality: Madeira.

Syntypes of *C. patriarca* are deposited at the MCZ: 6 branch fragments (MCZ 5448) and 3 branch fragments (MCZ 2779). Type Locality: Cabo Frio, Brazil; 64 m.

Some syntypes of *C. paulmayeri* are deposited at the Stazione Zoologica Naples (#799) (see ZIBROWIUS 1980). Type Locality: Gulf of Naples.

Distribution: Western Atlantic: a disjunct distribution in four ranges: 1) off Cape Hatteras, NC (35°08'N, 75°08'W) to the Mississippi Delta; 2) southern Caribbean coast from south of Roatán, Honduras to Gulf of Paria, Venezuela; 3) southern coast of Brazil from Cabo Frio (23°S) to Rio Grande do Sul (34°35'S) (LEITE & TOMMASI 1976); and 4) St. Paul Rocks (Fig. 18); 32-480 m, but most records reported herein from 50-100 m. MOSELEY's (1881) record of *C. debilis* from off Rio de la Plata at 1097 m (Challenger-310) is probably a station error, as he implied. Likewise, his record of *C. arbuscula* from 795 m off Bermuda (Challenger-33) is probably also a station error. *C. debilis* has never been collected subsequently from those great depths. Elsewhere: eastern Atlantic from Mediterranean, off Morocco, Gulf of Guinea, Madeira, Canary Islands, Cape Verde, Ascension, and St. Helena; 28-100 m (ZIBROWIUS 1980).

The westernmost record in the Gulf of Mexico is from Mississippi Mud Lump 90, which occurs at 28°58'30"N, 89°09'40"W and was dated at approximately 15,500 yrs BP, or near the Holocene-Pleistocene boundary (HAMAN 1981). Other organisms collected from this lump indicated its origin to be the outer shelf at depths of 30-110 m, which is consistent with the depth range of Recent *C. debilis*.

Deltocyathus Milne Edwards & Haime, 1848

Diagnosis: Solitary, discoidal to patellate, usually free. Septotheca costate. Septa in 4-5 cycles, only the S1 being independent. Pali before septa of all but last cycle, the axial edges of higher cycle pali joining to faces of adjacent septa. Columella papillose.

Type Species: *Turbinolia italica* Michelotti, 1838, by monotypy.

Deltocyathus calcar Pourtalès, 1874

Deltocyathus agassizii variety *calcar* Pourtalès, v*1874: 35-36, pl. 6, fig. 11. [Not *D. agassizii* Pourtalès, 1867]

Deltocyathus calcar. –Cairns, 1979: 93-95, pl. 17, figs. 7-10, pl. 18, fig. 7, Map 22 (description and synonymy). –Viada & Cairns, 1987: 132. –Zibrowius, 1988: 135 (listed). –Prahl & Erhardt, 1989: 545. –Cairns et al., 1991: 47 (common name). –Cairns et al., 1994: 4 (listed). –Pires, 1997: 182.

Diagnosis: Corallum free, having no basal scar; corallum discoidal (flat base) to patellate (conical base); largest known corallum (O-4832) 16.1 mm in diameter, exclusive of costal spines. C1 twice as broad as other costae, usually bearing a prominent spine that may project up to the length of the calicular radius beyond calicular edge, the 6 C1 spines producing a distinctive stellate pattern. Costal spines of some specimens lacking or vestigially present only as small spurs on base of corallum, but invariably C1 are thicker than other costae. Costae well-delineated; costae and costal spines finely granular. Corallum white, but all or part of S2 and C2 usually dark brown. Septa hexamerally arranged in 4 cycles: S1-2>S3-4, S1 being the only independent septa. Axial edges of S4 join to S3 through several thin processes below the S3-P3 notch. Although all pali are about the same width, each successive crown is more recessed from the columella and rises higher in the fossa. Palar faces bear tall granules. Columella papillose, the papillae sometimes spatulate and aligned in series with each S2.

Discussion: The only substantive records of this species since 1979 are

those of VIADA & CAIRNS (1987) and PIRES (1997). Those reports, as well as the records listed below, do not appreciably add to our knowledge of this species except to extend the known range of the species to southeastern Louisiana (VIADA & CAIRNS 1987) and the Netherlands Antilles (Alpha Helix-16). Most records of *D. calcar* are from depths greater than 200 m, but about 20% of collections are from shallower depths, the shallowest record being 81 m (SB-50).

The common name of *D. calcar* is the 'deep-sea star coral' (CAIRNS *et al.* 1991).

New Records: Endeavor-1, 19, USNM 77435; R/V Alpha Helix-16, 1, USNM 79507; Gos-39, 1, USNM 81023; EJ81-9, 4, FSBC I; EJ81-20, 1, FSBC I; EJ81-22, about 100: 93 (FSBC I) and 7 (USNM 88392); BLM, SOFLA-32, 5, USNM 72011-12; R/V Cape Florida, 27°31'N, 79°15'W, 350-400 m, 6, USNM 73918.

Types: See CAIRNS (1979).

Distribution: Common throughout tropical and warm temperate western Atlantic, from off Onslow Bay, NC (33°39'N, 76°44'W) to off São Sebastião Island, Brazil (25°15'S, 44°00'W), including Bermuda, the Bahamas, eastern Gulf of Mexico, and the Caribbean (CAIRNS 1979: map 22); 81-675 m.

Deltocyathus halianthus (Lindström, 1877), new combination

(Figs. 20, 108-112)

Leptocyathus ? halianthus Lindström, v*1877: 9-10, pl. 1, fig. 9. –Duncan, 1883: 364. –Lindström, 1884: 104.
Trochocyathus sp. Tommasi, 1969: 56 (in part: fig. 3).
Trochocyathus halianthus. –Cairns, 1979: 207 (listed).

Description: Corallum tympanoid, having a HT:GCD ratio of 0.3-0.5, and firmly attached by a polycyclic base of up to 5 cycles. Initial thecal wall only 1 mm in diameter, containing the first 2 cycles of septa; second ring formed at a diameter of about 3 mm, containing the third and sometimes fourth septal cycles; fourth thecal ring added at about 6 mm and contains

all 4 cycles; a fifth ring is sometimes found in larger coralla. These successive thecal rings appear to serve the same interseptal strengthening function as synapticulae do in other corals. Coralla attach primarily to bivalve shells, but are also known to attach to gastropod shells and small bryozoan colonies. When the substrate is large, the corallum expands equally in all directions resulting in a cylindrical corallum, but if the substrate is small, the coral may completely envelope it and then expand outward, resulting in a trochoid-shaped corallum. Largest known corallum (illustrated syntype; Figs. 108-109) 10.7 mm in CD and 4.7 mm in height. Costae well defined, separated by deep intercostal furrows, each costa ornamented with a single row of small teeth, not unlike the costae of some turbinoliids; corallum uniformly white.

Septa hexamerally arranged in 4 complete cycles: S1>S2>S3>S4, S1 being the only independent septa. S1 1.5 mm exsert and quite broad, the tallest region of the S1 being its upper, axial edge. Upper and peripheral edges of S1 finely serrate; axial edge smooth, straight, and vertical, bordered internally by a small palus 0.2-0.4 mm in width, often indistinguishable from columellar elements. S2 similar to S1 but only about ¾ as wide, each bearing a palus about twice the width of a P1. Axial edges of both P1 and P2 contiguous with columella. S3 about ⅓ width of S2, each S3 usually having a small P3 about the same size of a P1, the axial edges of which are fused to the peripheral edges of its adjacent P2. S4 half width of S3, the axial edges of each pair of S4 fusing to its adjacent S3 through 2 or 3 digitiform processes far below the S3-P3 notch. Fossa shallow; columella papillose, consisting of 7-25 well-formed, granular pillars.

Discussion: In an acrimonious exchange between DUNCAN (1883) and LINDSTRÖM (1884), DUNCAN queried the generic placement of *L. halianthus*, as well as questioned aspects of LINDSTRÖM's (1877) original description. LINDSTRÖM (1877: 9) reported this species to have columellar elements with a "semblance of paluli". According to DUNCAN, if this species had pali it should be classified as a *Trochocyathus*, and if lacking pali, as *Sabinotrochus* (=*Stephanotrochus*). Apparently DUNCAN did not examine LINDSTRÖM's material. Ironically, LINDSTRÖM (1884) responded that *L. halianthus* had no pali, but that it resembled a variety of *Deltocyathus agassizi*. Having examined the syntype series and additional material, I conclude that *L. halianthus* does have pali (P1-3), although the P1 and P3 are

sometimes not well developed and may resemble columellar rods instead of the more typical palar lamellae. These pali are well illustrated by TOMMASI (1969: fig. 3). *Trochocyathus* and *Deltocyathus* are similar genera, both having pali before all but the last cycle of septa, but *Deltocyathus* always has P3 fused (in chevrons) to P2, S4 fused to P3 or S3, and a low (tympanoid/discoidal), unattached corallum. In these characters, *L. halianthus* resembles *Deltocyathus*, except that it has an attached, polycyclic base, which would make it unique in the genus. Also unique is its serrate upper margin of the S1. Both of these characters, as well as its shallow depth range, suggest an affinity with the rhizangiids. This species is one that would benefit from molecular analysis for correct familial placement and a final conclusion of the old argument between DUNCAN and LINDSTRÖM, but at present, I tend to agree with LINDSTRÖM (1884) that this species is a polycyclic *Deltocyathus*.

New Records: Alb-2762, 11, USNM 36473; WB-6, 6, USNM 62303; WB-302, 16: 15 (USNM 62302) and 1 (UMML 8.245).

Types: Seven coralla (syntypes) attached to 6 bivalve shells are deposited at the Swedish Museum of Natural History (#134). Type Locality: 22°47'S, 41°41'W (off Cabo Frio, Brazil), 55 m.

Distribution: Known only from off São Paulo, Brazil from off Cabo Frio to off Ilha de São Sebastião (Fig. 20); 46-130 m.

Genus **Desmophyllum Ehrenberg, 1834**

Diagnosis: Corallum solitary, trochoid, attached. Septothecate. Septa in 3-5 cycles. Pali absent; columella absent or quite reduced. Sparse endothecal dissepiments.

Type Species: *Madrepora dianthus* Esper, 1794, by subsequent designation (CAIRNS 1994).

Desmophyllum dianthus (Esper, 1794)

Madrepora dianthus Esper, *1794: pl. 69, figs. 1-3.
Desmophyllum cristagalli Milne Edwards & Haime, v*1848a: 253, pl. 7, figs. 10, 10a. –Jourdan, v.1895; 22. –Cairns, 1979: 117-119, pl. 21, figs. 7-8, pl. 22, fig. 8, Map 32 (description and synonymy). –Zibrowius, v.1980: 117-121, pl. 61, figs. A-O, pl. 62, figs. A-M (description and synonymy). –Cairns, 1981: 10. –Not Hubbard & Wells, 1986: v.136 (=*Javania cailleti*). –Messing, 1987: 12, fig. –Zibrowius, 1988: 136 (listed). –Cairns et al., 1991: 47 (listed).
Desmophyllum dianthus. –Cairns, 1994: 26-27, pl. 9, figs. a-d; 1995a: 77, pl. 21, figs. d-f.

Discussion: Although *D. dianthus* has been reported as shallow as 25 m in New Zealand fjords (Cairns 1995a) and at a range of 155-1939 m in the western Atlantic (Cairns 1979), the shallowest western Atlantic record is based on a specimen reported by Jourdan (1895) from off Nova Scotia, all other records from the western Atlantic being much deeper than 200 m. The species is therefore not considered to be a true shallow-water azooxanthellate; nonetheless several additional records are reported below that extend the range of the species to Bermuda, and increase the western Atlantic bathymetric range to 2200 m. For a description of this commonly collected deep-water species see: Cairns (1979, 1982a, 1994, 1995a) and Zibrowius (1980).

The other western Atlantic *Desmophyllum, D. striatum* Cairns, 1979, was listed in its original description to occur at 130-823 m. However, a reanalysis of the two records shallower than 200 m (Nekton-563 and P-1411) show the former to be *Thalamophyllia riisei* and the latter to be too small to confidently identify. Thus the revised depth range of *D. striatum* is 277-823 m, and is therefore not treated in this account.

New Records: Eastward-35948, 1, USNM 62311; Eastward-35985, 1, USNM 83001; Eastward-35992, 2, USNM 62312; Eastward-36023, 1, USNM 62309; Eastward-36259, 1, UCSC; Gos-2349, 1, USNM 77022; ASLAR, Oceanus-1, 2, USNM 78402; ASLAR, Oceanus (38°29'N, 73°01'W, 1990-2175 m), 1, USNM 78461; ASLAR, Gyre-4, 2, USNM 81407; ASLAR, Gyre-15, 1, USNM 81408; ASLAR, Gyre (34°13'N, 75°38'W, 1790-1880 m), 6, USNM 78463; Arctic Discoverer, 32°N, 77°W, 2200 m, 1, USNM 91933; 50°33'N, 46°11'36"W (Orphan Knoll, off Newfoundland, 29,270 yr BP), 1628 m, 3, USNM 86555; 44°52'N, 55°40'W, 162 m, 1, ROM; 44°52'N, 55°37'W, 458 m, 1, BM; off Bermuda, 457-609 m, 1, USNM 99383; off Bermuda, 1200 m, 1, USNM 83000; south of Dry Tortugas, FL, 1065 m, 3, USNM 80987.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: common on seamounts and canyons off northeastern North America from east of Newfoundland to the Straits of Florida; Martinique; southeastern Brazil; not known from Gulf of Mexico and very few reports from Caribbean (CAIRNS 1979: map 32); 155-2200 m. Elsewhere: cosmopolitan, except off continental Antarctica; 25-2460 m (CAIRNS 1995a).

Genus **Thalamophyllia Duchassaing, 1870**

Diagnosis: Corallum colonial, forming reptoid colonies by extratentacular budding from stolons and occasionally from theca of parent corallites. Corallites ceratoid to cylindrical. Septothecate. Pali and columella absent.

Type Species: *Desmophyllum rusei* Duchassaing, 1860, by monotypy.

Thalamophyllia riisei (Duchassaing & Michelotti, 1860)

(Fig. 113)

Desmophyllum Rusei Duchassaing & Michelotti, *1860: 61, pl. 9, fig. 5.
Thalamophyllia riisei. –Duchassaing, 1870: 28. –Cairns, 1979: 121-123, Map 33 (description and synonymy; but not G-103, =*L. prolifera*). –Wood, 1983: 63, 120 (colour. fig.). –Hubbard & Wells, v.1986: 136-138, figs. 27-28. –Viada & Cairns, 1987: 132. –Messing, 1987: 12, 2 figs. –Humann, v.1993: 160-161, colour fig. –Fenner, v.1993a: 14 (listed). –Cairns et al., 1994: 9. –Bayer & Grasshoff, 1997: 11-12 (nomenclature comment).
Desmophyllum rusei. –Keith & Weber, v.1970: 271.
Desmophyllum riisei. –Colin, 1978: 289 (colour fig.), 290-291. –Castañares & Soto, 1982: Table 1 (listed).
Desmophyllum striatum Cairns, *1979: 121 (in part: Nekton-563).
Desmophyllum reesei (sic). –Bouchon & Laborel, 1986: 204 (listed).

Diagnosis: Corallum consists of up to 25 corallites usually connected basally by thin, delicate stolons; less frequently united by a contiguous basal coenosteum; and in rare cases corallites are budded from theca of parent corallites up to a fourth generation (see HUBBARD & WELLS 1986: fig. 27). Corallites ceratoid to cylindrical, with a narrow pedicel and flared calice. Largest corallite 13 x 11 mm in CD and 19.2 mm in height. C1-2

highly ridged; C3-4 usually broader and not ridged. Corallum white. Septa hexamerally arranged in 4 cycles (S1>S2>S3>S4), but fourth cycle never complete, 42 septa being the highest septal complement observed. S1 highly exsert, with straight, vertical axial edges that almost meet in centre of fossa. In the *'solidum'* form of the species, highest cycle septa (*i.e.*, S3 or S4) are least exsert but thickest septa, with corresponding wide costae, as much as twice the thickness of other septa. In the typical form, the highest cycle septa are the same thickness as all others and rather rudimentary. Fossa deep and narrow; no columella.

Discussion: *Thalamophyllia riisei* differs from *T. gombergi* by its highly exsert septa, thinner theca, ceratoid coralla, and ridged costae. Although CAIRNS (1979) listed 155-220 m as the depth range for *T. gombergi*, the confirmed depth range (a conservative adjustment for bathymetrically wide ranging trawls) is actually 188-220 m, and therefore *T. gombergi* is not treated in this paper. Individual corallites of *T. riisei* are similar in size and shape to *Desmophyllum striatum*, as noted by CAIRNS (1979), both species sometimes collected at the same station. *T. riisei* is distinguished by its vertical axial septal edges (no paliform lobes), more highly exsert septa, costate (not transversely ridged) theca, narrower pedicel, and stoloniferous growth form.

The unusual growth form of *T. riisei* illustrated by HUBBARD & WELLS (1986) (see also Fig. 113), characterized by several generations of buds originating from parent corallites instead of a basal stolon, produces an irregularly bushy corallum instead of a stoloniferous mat. This is but one example of the unusual fauna reported by HUBBARD & WELLS (1986) from Trinidad (see Historical Resume).

The bathymetric range of 18-1317 m reported by CAIRNS (1979) is herein modified to 4-914 m. The deepest record of 1317 m (CI-158) was based on a long-dead specimen and is therefore not reliable as a bathymetric record, and another deep record of 824 m (G-103) is reidentified as *L. prolifera*. However, there remain several deep records of the species (*i.e.*, 914 m off Golding Cay and 640 m from O-4297), although most records of this species are known from shallower than 200 m. The shallowest record of 4 m from Chankanaab Caves is, however, 27 m from a cave entrance. In fact, this species is most commonly found on the ceilings of caves and on the undersides of dead, platy corals. The geographic range of the species is not significantly extended by these new records.

The polyps of this species are reported to be lavender, white, pink, pale green, and purple; its common name is the 'baroque cave coral' (HUMAN 1993).

New Records: BL-296, 1 colony, USNM 6417; SB-437, 10 corallites, UMML; O-3494, 2, USNM 99220; Eastward-19497, 1, USNM 99225; Endeavor-1, 2, USNM 77433; JSL-I-1332, 3, IRCZM; JSL-I-1495, 1, IRCZM; JSL-I-2585, 1, USNM 89361; JSL-I-3618, 3, USNM 93949; JSL-I-3659, 1, USNM 94747; JSL-I-3660, 4, USNM 94743; Chankanaab Caves, Cozumel, Mexico, 4 m, 2 colonies, USNM 73915; Palancar Reef, Cozumel, Mexico, 1, USNM 77655; 16°48'N, 88°04'W, 128 m, 10, USNM 99223; Bahia Cochinos, Cuba, 183-274 m, 15, USNM 61797; DBL-1312, Discovery Bay, Jamaica, depth unknown, 1, USNM 80980; Discovery Bay, Jamaica, 183 m, 1 large colony, USNM 93183.

Types: See CAIRNS (1979).

Distribution: Antillean Distribution: throughout Bahamas and Caribbean, but not northern coast of South America; Panama; Gulf of Mexico (off LA, MS; Campeche Bank); northeastern South America from Trinidad to Suriname; 4-914 m (CAIRNS 1979: map 33);

Genus **Lophelia Milne Edwards & Haime, 1849**

Diagnosis: Colonial, forming large dendroid colonies by intratentacular budding. Coenosteum dense; costae poorly developed. Pali absent; columella absent or rudimentary. Sparse endothecal dissepiments.

Type Species: *Madrepora prolifera* Pallas, 1766 (=*L. pertusa* L., 1758), by subsequent designation (MILNE EDWARDS & HAIME 1850a: xx).

Lophelia pertusa (Linnaeus, 1758)

Madrepora pertusa Linnaeus, *1758: 797.
Madrepora prolifera Pallas, *1766: 307.
Lophohelia oculifera Whiteaves, 1901: 42 (*nomen nudum*).
Lophelia prolifera. –Cairns, 1979: 125-127, pl. 24, figs. 1-5, Map 34 (description and synonymy); 1981: 10. –Viada & Cairns, 1987: 132. –Zibrowius, 1988: 136 (listed). –Prahl & Erhardt, 1989: 547. –Cairns et al., 1991: 47 (listed). –Cairns et al., 1994: 4 (listed).

Lophelia pertusa. –Zibrowius, v.1980: 126-130, pl. 66, figs. A-L (description and synonymy). –Cairns, 1994: 27-28, pl. 9, figs. e-i.

Diagnosis: Corallum forms a bushy colony up to a meter in height, often with anastomosing branches. Corallites on distal branches sympodially arranged; those on proximal branches less regularly arranged. Great variation in branching pattern and corallite size, ranging from delicate branches with small, widely-spaced corallites to robust branches, with large, closely-spaced, thick-walled corallites. GCD range from 5-20 mm. Coenosteum bears fine granules producing a smooth texture; corallum white. Septa arranged in 3 cycles of non-hexamerally arranged septa: usually 7-9 primary septa, 7-9 secondaries, and 14-18 tertiary septa, although a full complement of tertiary septa is rarely achieved. Septa of each cycle progressively less exsert. Fossa deep and often curved. Columella usually absent, but may be present as 1-3 small rods.

Discussion: *Lophelia pertusa* is rarely reported in waters shallower than 300 m in the western Atlantic, most specimens having been collected from 500-800 m. The shallowest western Atlantic record of 95 m reported by Cairns (1979) was based on material from P-112, which is probably a labelling error for Gerda-112, which was made at 641-686 m. This correction is based on the circumstantial evidence that those specimens were collected with *Enallopsammia profunda*, which is not known from less than 400 m. Although the species is known from as shallow as 60 m in other regions of the world, the only legitimate record of *L pertusa* shallower than 200 in the western Atlantic is from *Delaware* II-137 (reported herein) at 146 m; all other new records listed below are from considerably deeper water. A western Atlantic depth record of 1200 m is reported herein from Bermuda. Geographic extensions of the species based on specimens reported herein include Bermuda, the western coast of Florida, and off southwestern Louisiana.

New Records: O-11705, 1 branch, USNM 99229; Gos-2366, 3, USNM 77010; Gos-2439, many branches, USNM 77028; Gos-2452, many branches, USNM 77025; Delaware II-137, 2 branches, USNM 99226; Alvin-761 (F27, 30), many branches, USNM 49117-19, -21; Alvin-762 (F13), many branches, USNM 49120; Alvin-1335, 1 branch, USNM 99228; Eastward-34957, 10 branches,

USNM 80809; Anton Dorhn-6392, 3 branches, USNM 73766; Aleutian Bounty 83-165, 2 branches, USNM 84355; ASLAR, R/V Cape Hatteras, 31°50'N, 78°19'W, 625 m, 1 branch, USNM 81415; ASLAR, Grye, 40°21'N, 67°41'W, 800 m, 1 branch, USNM 99232; ASLAR, Gyre 87-G-2, 27°43'N, 91°16'W, depth unknown, 1 branch, USNM 78511; C-Hawk, 29°10'N, 88°20'W, 519 m, 2 branches, USNM 88393; Sea Probe, Eluethera, Bahamas, 671 m, 8 corallites, USNM 99230; Bermuda, 1200 m, 1 branch, USNM 99233.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: from Nova Scotia (43°09'N, 60°13'W; VERRILL 1883) to southeastern Brazil (25°18'S, 44°45'W; CAIRNS 1979), including Bermuda, but absent from western Gulf of Mexico and western Caribbean, and most of northeastern South America from the Antilles to Rio de Janeiro; 146-1200 m (CAIRNS 1979: map 34). Elsewhere: cosmopolitan in tropical and temperate waters; 60-2170 m (CAIRNS 1995a).

Genus **Dasmosmilia Pourtalès, 1880**

Diagnosis: Corallum solitary; turbinate or trochoid in shape. Parricidal budding common, resulting in unattached coralla with open/fractured bases or bases still attached to inner theca of parent fragment. Theca very thin. Multiple paliform lobes on septa of all but last cycle. Trabecular columella formed from axial paliform lobes. Endothecal dissepiments present.

Type Species: *Parasmilia lymani* Pourtalès, 1871, by subsequent designation (WELLS 1933a).

Dasmosmilia lymani (Pourtalès, 1871)

(Figs. 114-116)

Parasmilia lymani Pourtalès, v*1871: 20, pl. 6, figs. 8-10.
Dasmosmilia lymani. –Wells, 1933a: 220-221, pl. 12, fig. 10. –Cerame-Vivas & Gray, 1966: 263 (listed). –Cairns, 1979: 132-134, pl. 25, figs. 1-3, 8-9, Map 37 (synonymy and description). –Zibrowius, v.1980: 70-71, pl. 28, figs. A-L, pl. 29, figs. A-L (synonymy and description).

–Cairns, 1981: 10 (figs. on p. 4). –Cairns et al., 1991: 47 (common name). –Cairns, 1994: 63. –Cairns et al., 1994: 4 (listed). –Zibrowius, 1988: 136 (listed). –Cairns, 1995a: 76, pl. 20, figs. g-i, pl. 21, fig. a. –Pires, v.1997: 182.

Diagnosis: Corallum ceratoid, often curved, and usually having a broken, open basal end or one that is still attached to inner theca of parent corallum. Coralla up to 28 mm in GCD and 30 mm in height, but most populations considerably smaller. Calices circular, elliptical, triangular, or rectangular in outline; calicular edge moderately lancetted. Costae usually equal in width and slightly ridged. Theca and septa quite thin (0.3-0.5 mm), resulting in a brittle corallum, easily fractured; corallum white to light brown. Septa hexamerally arranged in 5 cycles, larger coralla with some pairs of S6 (up to 106 septa): S1-3>S4>S5>S6. S1-3 often bear small paliform lobes, but S4 always bear a prominent lobe, which is sometimes divided into 2-5 smaller lobes. Fossa deep, containing a columella composed of the crinkled lower axial edges of the P1-4. Endothecal dissepiments present, especially noticeable in larger coralla.

Discussion: Despite numerous additional records of this species, specimens from only one station (Vema 16-65) extend the known distributional range of the species north from Massachusetts to Newfoundland, as well as slightly decreasing the known minimum bathymetric range from 48 to 42 m. *D. lymani* is usually found in relatively shallow water, most records being from 100-200 m, and is one of the few shelf-depth corals known off the northeastern US. In the western Atlantic, its distribution is essentially temperate to subtropical in both hemispheres, with one disjunct tropical record off Venezuela (P-722). Its common name is the 'splitting cup coral' (Cairns *et al.* 1991).

New Records: O-23271, 1, IRCZM 12:123; BLM-OCS A1, over 100, USNM 62636, 62646, 83422, 83430; BLM-OCS A2, 2, USNM 83426; BLM-OCS F1, 1, USNM 61686; BLM-OCS F2, 4, USNM 83425; BLM-OCS K4, 4, USNM 83419, 83423; BLM-OCS K5, 1, USNM 83428; BLM-OCS L4, 4, USNM 61677, 83421, 83429; BLM-OCS L5, 3, USNM 83418; FH-7282, 1, USNM 62238; FH-7516, 6, USNM 82997; Gos-1588, 6, USNM 99240; GS 74-04-94, 1, USNM 99239; GS 75-08-95, 2, USNM 82995; E-35941, 1, USNM 82996; Pelican 182-6, 2, USNM 99234; BLM, NEEB 24, 1, USNM 89167; BLM NEEB 27, 3, USNM 89168-69; Vema 16-65, 7,

USNM 61816; off Ajax Reef, Florida Keys, 128-164 m, 10, USNM 62234; CSA Pinnacle site 2, 1, CSA; off Ajax Reef, Florida Keys, 146-183 m, 14, USNM 62233; Mississippi Mud Lump 90 (TU 977), 15,500 years BP, 1 May 1969, 78, USNM 80888; Mississippi Mud Lump 93, 6, Holocene, USNM 84295.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: continental shelf of eastern US from St. Pierre Bank, Newfoundland (46°45'N, 56°22'W) to the Mississippi Delta (Holocene); one isolated record off Isla de Margarita, Venezuela; off Maranhão, Brazil; southeastern Brazil from Cabo de São Tomé to São Francisco do Sul (27°05'S, 46°53'W); 37-366 m (CAIRNS 1979: map 37). Eastern Atlantic: area bounded by Portugal, the Azores, and Spanish Sahara; 85-316 m (ZIBROWIUS 1980). Elsewhere: Japan; northern New Zealand; 168-1002 m (CAIRNS 1995a).

Dasmosmilia variegata (Pourtalès, 1871)

Parasmilia variegata Pourtalès, v*1871: 21, pl. 1, fig. 13.
Dasmosmilia variegata. –Cairns, 1979: 134-136, pl. 25, figs. 4-7, 10, pl. 26, fig. 1, Map 38 (synonymy and description). –Zibrowius, v.1980: 71-72, pl. 30, figs. A-K (synonymy and description); 1988: 136 (listed). –Cairns et al., 1991: 47 (listed). –Cairns & Keller, 1993: 247, 249, fig. 6C. –Cairns et al., 1994: 4 (listed). –Pires, 1997: 182.

Diagnosis: Corallum ceratoid to trochoid, usually straight, and invariably attached to fragment of parent corallum. Coralla up to 20.2 mm in GCD and 21 mm in height. Calices elliptical to irregular in shape; calicular edge highly lancetted. Costae well defined, separated by deep, thin intercostal striae. Theca quite thin (0.2-0.4 mm). Corallum white, but S1-2, C1-2, and P1-2 pigmented black. Septa hexamerally arranged 5 cycles, the fifth cycle only partially developed even in large coralla: S1-2>S4>S3 or S1-2>S3>S5>S4, the highest cycle of septa within a half-system always more highly exsert (lancetted) and wider than those of the penultimate cycle. S1-2 quite thick, as though swollen or inflated. Large, ornately sculptured and ridged paliform lobes occur on S1-2; smaller, more elongate paliform lobes occur on axial edges of S3-4. Columella composed of a central mass of axial paliform lobes. Endothecal dissepiments present in large coralla.

Discussion: Although *D. variegata* and *D. lymani* are similar in corallum fragility, tendency toward asexual reproduction through fragmentation, and distribution range, *D. variegata* differs in having thicker S1-2; thicker, more ornately sculptured paliform lobes; darkly pigmented S1-2, C1-2 and P1-2; and S4 (or S5) that are wider than S3 (or S4). *Dasmosmilia variegata* is collected much less frequently than *D. lymani*, but displays a similar geographic and bathymetric range, except that *D. lymani* is known from much farther north along the eastern coast of North America. The records reported below do not add much to the known distribution of the species, but the report of PIRES (1997) considerably extended the known distribution of *D. variegata* to southern Brazil.

New Records: O-22084, 2, IRCZM 12:116; southeast of Fowey Light, Florida, depth unknown, 1 fragment, USNM 82999.

Types: See CAIRNS (1979).

Distribution: Western Atlantic: Florida Keys; off Tampa, FL; off Península de Paria, Venezuela; off Maranhão, northeastern Brazil; off Ilha de São Sebastião, southeastern Brazil (CAIRNS 1979: map 38); 110-421 m. Eastern Atlantic: Cape Verde Islands; Azores; 185-600 m (ZIBROWIUS 1980). Elsewhere: off southwestern Madagascar; 330-335 m (CAIRNS & KELLER 1993).

Genus **Oxysmilia Duchassaing, 1870**

Diagnosis: Corallum solitary, attached through a broad base that increases in diameter by repeatedly adding exothecal dissepiments over raised costae, resulting in several concentric, chambered rings that encircle the base. Endothecal dissepiments also present in large specimens. Septotheca costate. Septa hexamerally arranged in 4-5 cycles. Paliform lobes often present before S3. Columella papillose.

Type Species: *Lophosmilia rotundifolia* Milne Edwards & Haime, 1848, by monotypy.

Oxysmilia rotundifolia (Milne Edwards & Haime, 1848)

(Figs. 117-120)

Lophosmilia rotundifolia Milne Edwards & Haime, v.1848c: 247, pl. 5, figs. 3, 3a.
Oxysmilia rotundifolia. –Duchassaing, 1870: 27. –Cairns, 1979: 73-75, pl. 10, figs. 7-9, pl. 11, figs. 1-4, Map 16 (description and synonymy). –Fricke & Meischner, 1985: 183, fig. 11b. –Rezak et al., v.1985: 225 (listed: stn 115, Geyer Bank; stn 119, Diaphus Bank). –Prahl & Erhardt, 1989: 544-545. –Cairns et al., 1991: 47 (listed). –Cairns et al., 1994: 6-7.

Diagnosis: Corallum variable in shape, including trochoid, ceratoid, and subcylindrical, but usually straight; firmly attached by a broad pedicel and a base composed of up to 6 concentric rings of raised costae covered with exothecal dissepiments (Figs. 117-118), often resulting in a base as wide or wider than the CD. Although solitary, several smaller coralla often settle on the theca of an older corallum, and thus may resemble a colony. Largest corallum (P-707) 35 x 27 mm in CD and 48 mm in height. C1-5 usually ridged; corallum uniformly white. Septa hexamerally arranged in 5 cycles (S1>S2>S3>S4>S5), the fifth cycle attained at a GCD of 18-20 mm, with additional pairs of S6 in largest coralla, the largest corallum having 26 S6, or 124 septa. Axial edges of S1-2 straight and vertical, reaching the columella; axial edges of S3-4 slightly sinuous; axial edges of S5 serrate. Small paliform lobes sometimes present on axial edges of S3 (antepenultimate cycle), but may be absent. Columella deep, containing a papillose columella consisting of 3-12 thick, finely granular elements that, in large specimens, are fused into a massive central structure. Large or elongate coralla contain endothecal dissepiments (Fig. 120).

Discussion: Although placed in the Caryophylliinae by VAUGHAN & WELLS (1943) and most subsequent authors, the presence of endothecal dissepiments in *O. rotundifolia* suggests a subfamilial placement in the Parasmiliinae, as originally placed by MILNE EDWARDS & HAIME (1848c). In fact, it is quite similar to *Rhizosmilia*, but differs in the consistent placement of paliform lobes before the S3 (even when S5 are present) and in being solitary. Species subsequently assigned to *Oxysmilia* should be re-evaluated for the presence of endothecal dissepiments.

The only significant new records of this species since 1979 are those from off Bermuda (FRICKE & MEISCHNER 1985) and several reports from the northern Gulf of Mexico (REZAK *et al.* 1985; CAIRNS *et al.* 1994). Although

the species is known from as deep as 640 m (O-4297), most specimens were collected shallower than 200 m.

New Records: O-24237, 3, IRCZM 12:118; O-24238, 1, IRCZM 12:113; JSL-I-1334, 3, IRCZM; JSL-II-1724, 3, USNM 94730; BLM, SOFLA-36, 1, USNM; Barbados, 402-457 m, coll. LEWIS 1961, 1, USNM 80990.

Types: See CAIRNS (1979).

Distribution: From off Onslow Bay, NC (33°52'N, 76°29'W) to Suriname (CAIRNS 1979: map 16), including the Caribbean and northern Gulf of Mexico to Geyer Bank, Texas; Bermuda; 46-640 m.

Genus **Colangia Pourtalès, 1871**

Diagnosis: Colonies reptoid, producing buds extratentacularly via discrete stolons. Cylindrical corallites polycyclic and epithecate; theca smooth but often encrusted. Axial edges of S1-2 smooth; those of S3-4 finely dentate. Paliform lobes before penultimate cycle (P3) and occasionally retained before antepenultimate (P2) cycle. Columella lamellar or papillose. Endotheca absent.

Type Species: *Colangia immersa* Pourtalès, 1871, by monotypy.

Colangia immersa Pourtalès, 1871

(Figs. 6, 121-123)

Colangia immersa Pourtalès, v*1871: 31-32. –Pourtalès in Agassiz, 1880b: pl. 12, figs. 13-15. –Goreau & Wells, 1967: 448 (listed). –Porter, 1972: 112 (listed). –Wells & Lang, 1973: 57 (listed). –Land, Lang & Barnes, 1977: 170 (isotopic analysis). –Cairns, 1979: 207 (listed); 1982b: 290, fig. 128f. –Castañares & Soto, 1982: Table 1 (listed). –Hubbard & Wells, 1986: 129-130, figs. 13-16 (see Discussion). –Cairns et. al., 1986: 184, 186, pl. 55, fig. –Humann, 1993: 168-171, 3 colour figs. –Fenner, v.1993b: 12, 14 (listed).
Colangia sp. 1 Porter, 1972: 112.
Rhizosmilia maculata. –Cortés, 1992: 243, fig. 1; 1996: 331. [Not *Bathycyathus maculatus* Pourtalès, 1874]

Description: Corallum reptoid, composed of widely-spaced (1-20

mm), cylindrical corallites united by wide (6-7 mm) paper-thin stolons. Greater diameter of corallites usually ranges from 6-9 mm and corallite height usually less than 10 mm; however, height of corallum often difficult to determine due to encrustation of corallite base by adjacent encrusting organisms, such as calcareous algae, bryozoans, serpulids, sponges, and foraminifera, which also often obscure the connecting stolons. Corallites polycyclic, the first low wall established at a CD of about 2.5 mm, the second and usually outer epithecal wall formed outside and usually eccentric to the first. Epitheca originally smooth and often 'rimmed' but often later encrusted. Most corallites pigmented with black-brown granules 0.1-0.2 mm in diameter that cover the septal faces and stolons, the same pigmentation also occurring on the theca, but having no surface relief. In older corallites pigmentation often more intense, the colour occurring in curved bands that parallel the distal and axial septal edges. Only in rare instances are corallites not pigmented in this fashion (e.g., P-439 and USNM 76311), these coralla being homogeneously white. Paliform lobes and columella always white.

Septa hexamerally arranged in 4 cycles according to formula: S1>S2>S3>S4. A full fourth cycle (48 septa) is not attained until a GCD of about 7 mm, and larger corallites have some pairs of S5, but corallites less than 7 mm usually have an incomplete fourth cycle and less than 12 paliform lobes. S1 highly exsert (up to 2.6 mm) and relatively narrow, the straight, vertical axial edge reaching only about half distance to columella. S2 also exsert (up to 1.3 mm), about ¾ width of the S1, also having straight continuous axial edges. S3 0.5-0.6 mm exsert, ⅓ – ½ width of an S3, having finely dentate axial edges. S4 equally exsert, fused to their adjacent S1 at the calicular edge contributing to a lancetted margin, but only about half width of an S3, and have dentate axial edges. In small coralla, in which half-systems have not yet formed S4, there is a prominent paliform lobe (P2) before the S2. However, when a pair of S4 form within a half-system, the P2 begins to realign itself with the flanked S3, eventually positioning itself before the S3 and serving as the P3. When the second pair of S4 forms within a system, the enclosed S3 also forms a paliform lobe of equal size. Eventually a crown of 12 wide (up to 1.3 mm, or 4-5 times the width of the S3) P3 are formed, each couple within a system slightly closer to one another than to those in adjacent systems, thus appearing to be paired. Paliform lobes have rounded distal edges and straight axial and peripheral

edges. S2 of larger corallites usually do not have paliform lobes; however, in some corallites 6 independent P2 are formed in addition to the 12 P3, these secondary P2 being smaller (about ½ the width) and lower in fossa than the P3. Fossa of moderate depth, containing a lamellar or papillose columella, the papillae often aligned along the greater axis of the calice.

Discussion: *Colangia immersa* is a fairly common shallow-water species found throughout the Caribbean on the undersides of platy corals, under ledges, and in caves (especially ceilings). These cryptic environments are often highly competitive ones, shared with calcareous algae, bryozoans, serpulids, sponges, and foraminifera, all of which tend to encrust the smooth theca of *Colangia immersa*, often resulting in only the tentacular crown of the cylindrical corallites rising above the background epizoa. Polyps occur in a variety of colours, including: brown, light green, salmon pink, lavender, orange-brown, and white (HUMANN 1993). The common name of this species is the 'lesser speckled cup coral' (CAIRNS *et al.* 1991).

The specimens reported by HUBBARD & WELLS (1986) from Trinidad (USNM 68468 and 86746) were stated to be 'typical' of the species, but differ from all other specimens reported herein by having larger corallites (up to 11 mm in GCD), often having small P1 (paliform lobes) as well as P2 and P3, and in having relatively smaller P3 lobes. Because they are otherwise similar to *C. immersa*, they are considered to be an environmental variation or population difference from other more typical coralla.

New Records: Alb-2321, 1 colony, USNM 16111; P-439, 6 colonies: 5 colonies, USNM 80499 and 1, UMML 8.231; P-584, 2 corallites, USNM 92288; P-595, 2 corallites, USNM 92288; P-1196, 1 colony, USNM 80327; P-1202, 10 corallites, USNM 80328; P-1220, 1 colony, USNM 80329; P-1284, 3 colonies, USNM 99241; G-983, 1 corallite, USNM 92302; G-984, 2 corallites, USNM 92303; G-986, 3 corallites, USNM 80342; G-1246, 2 corallites, USNM 92304; SB-2447, 1 colony, USNM 92307; SB-2462, 1 colony, USNM 80231; SB-3494, 1 corallite, USNM 99245; JS-52, 1 corallite, USNM 80192; Eastward 30178, 3 corallites, USNM 61873; JSL-I-3659, 5 corallites, USNM 94739; CI-158, 2 corallites, USNM 92305; DBL-130, 131, Cardiff Hall, Jamaica, 30 m, 2 corallites, USNM 80883; DBL-624, Jamaica, depth unknown, 1 corallite, USNM 92313; DBL-637, Little Bay, Jamaica, 27 m, 1 colony, USNM 83854; DBL-995, Discovery Bay, Jamaica, depth unknown, 1 colony, USNM 80349; DBL-1424, Discovery Bay, Jamaica, 61-66 m,

1 colony, USNM 80917; DBL-2476, Discovery Bay, Jamaica, depth unknown, 1, USNM 99248; DBL-2485, Discovery Bay, Jamaica, depth unknown, 1, USNM 99252; Urchin Cove, Prosperity, Jamaica, 3 m, 2 corallites, USNM 76311 and 76309; Maria Buena Bay, Jamaica, 40 m, 1 colony, USNM 72369; Runaway Bay, Jamaica, 37 m, 5 corallites, USNM 80919; Cardiff Hall, Jamaica, 1 colony, USNM 80918; Montego Bay, 55 m, 2 corallites, USNM 80884; Punta Cahuita, Costa Rica, 6 m, 2 corallites, USNM 92312 (=Cortés, 1992); Chankanaab Caves, Cozumel, Mexico, 2 colonies, 0.5 and 18 m, USNM 73916 and 73917; Humann stn 2RC-5, Roatán, Honduras, 5 m, 4 corallites, USNM 92086; Humann stn 2RC-4, Roatán, Honduras, 26 m, 1 colony, USNM 92085; Humann stn CBH-4, Conception Island, Bahamas, 22 m, 3 corallites, USNM 91658; Humann stn 2RC-10A, Roatán, Honduras, 2 corallites, USNM 92091; Humann stn off Anguilla, 7 m, 2 corallites, USNM 99380; St. Lucia, 15-27 m, 1 colony, USNM 80345; Portomaribaai, Curaçao, 15 m, 3 colonies, USNM 80347; Palancar Reef, Cozumel, Mexico, 15 m, 8 corallites, USNM 75170 and 77652; La Paguera, Puerto Rico, 21 m, 3 colonies, USNM 80368; Cayman Islands, 4 corallites, USNM 81284; Roatán, Honduras, 15 m, 2 corallites, USNM 78498; John Smith Bay, Bermuda, 6-8 m, 2 colonies, USNM 80209.

Types: The holotype colony, consisting of 12 corallites, is deposited at the MCZ (2787). Type Locality: Double-Headed Shot Cay (Elbow Cays), western side of Cal Sal Bank, Bahamas; 315 fm (=576 m), however, POURTALÈS (1871) implied that the holotypic colony had certainly been transported to this depth after death.

Distribution: Throughout Caribbean; Bahamas; and Bermuda (Fig. 6); 0.5-347 m. Dead coralla of this species have been collected from as deep as 1317 m (USNM 92305), and the holotype was collected from 576 m, but the deepest live-collected colony is from P-584 at 347-353 m.

Colangia jamaicaensis, new species

(Figs. 6, 124-128)

Colangia n. sp. Humann, 1993: 170-171, colour fig.

Description: Corallum reptoid, composed of closely-spaced, cylindri-

cal corallites united by thin stolons; however, interconnections among corallites usually obscured by entrusting organisms. Largest corallite (on holotypic colony) 7.1 x 6.5 mm in CD and 17.1 mm in height. Theca smooth near calice (not costate or granular), but usually encrusted below. Jamaican coralla uniformly white; single specimen from Honduras a light brown, but not speckled.

Septal symmetry variable: 10 of the 12 corallites reported have septa arranged hexamerally in 4 cycles (S1>S2>S3>S4, up to 48 septa); however, two corallites (DBL-2482 and 1 of 4 from DBL-2487) have septa arranged pentamerally in 4 cycles (S1°>S2°>S3°>S4°, up to 40 septa). In the hexameral forms, a full fourth cycle is achieved at a GCD of 5-7 mm, whereas corallites ≤6 mm GCD often lack 1-3 pairs of S4, resulting in corallites with 42-46 septa and 9-11 paliform lobes, respectively. S1 variable in exsertness, ranging from 0.7-2.1 mm, having straight, smooth axial edges that reach about half distance to centre of calice. S2 similar to S1 but slightly less exsert and ¾-⅞ width of the S1. S3 barely exsert, about ⅓ width of the S2, having straight but slightly dentate axial edges. S4 equally exsert, about ½ width of the S3, having highly dentate axial edges. Nine to 12 paliform lobes occur in a single, discrete crown before septa of penultimate cycle, usually the S3 (or before S2 in half-systems lacking a pair of S4). Paliform lobes about 0.9 mm wide, which is equal to or slightly less wide than the septa they border; lobes are thicker than septa, having straight edges and rounded distal edges. Fossa shallow, containing the palar crown and a reduced papillose columella; however, the columella is often lacking.

Discussion: *Colangia jamaicaensis* is distinguished from *C. immersa* by having a white or brown (non-speckled) corallum; narrower and thicker paliform lobes in relation to the septa they border; a reduced or no columella; less exsert S1; and proportionally wider S2 and S3 in relation to the S1. It is quite similar to *C. moseleyi* (FAUSTINO 1927) (see Figs. 133-134), known only from one record at 55 m in the Philippines (see CAIRNS & ZIBROWIUS 1997), but appears to differ in having a reduced or no columella, more robust P3, better developed S4, and in lacking paliform lobes on the S1 and S2.

According to HUMANN (1993), this species is found on the ceilings of caves and has a fairly transparent polyp; however, the species is rarely collected and thus poorly known. Humann named it the 'cryptic cave coral'.

Etymology: Named for the country from which it was first collected.

Records/Types: DBL-2481, holotypic colony of 4 live corallites, USNM 80925; DBL-2479, Rio Bueno, Jamaica, 20 m, 1 paratype, USNM 99246; DBL-2482, Discovery Bay, Jamaica, depth unknown, 1 paratype, USNM 99250; DBL-2483, Discovery Bay, Jamaica, depth unknown, 1 paratype, USNM 99251; DBL-2487, Discovery Bay, Jamaica, depth unknown, 4 paratypes, USNM 86544; Humann stn CQ18, Isla Cayos Cochinos, Bay of Islands, Honduras, 10 m, 1 paratype, USNM 99247. Type Locality: Rio Bueno, Jamaica, 20 m.

Distribution: Known only from the northern coast of Jamaica and Isla Cayos Cochinos, Honduras; 10-20 m (Fig. 6). HUMANN'S (1993) reference to specimens from Roatán is contradicted by the original label with the figured specimens, which indicates "Isla Cayos Cochinos, Bay Islands, Honduras".

Colangia multipalifera, new species

(Figs. 2, 6, 129-132)

Description: Reptoid corallum composed of elongate, widely-spaced, cylindrical corallites united basally by very thin stolons. Stolons often encrusted or obscured, making it appear that corallites are solitary in habit. Largest corallite (on holotypic colony) 9.1 x 8.9 mm in CD and 13.9 mm in height; whereas another corallite from same colony is taller (21.6 mm) but smaller in calicular diameter. Theca smooth, sometimes bearing small, low granules. Corallum white; nature and colour of polyp unknown.

Septa hexamerally arranged in 4 complete cycles in all specimens of type series: S1-2>S3>S4 (48 septa). S1-2 moderately exsert (1.3-1.5 mm), having straight, smooth, vertical axial edges that extend ½ to ⅔ distance to columella. S3 about 0.8 mm exsert, ⅔ width of the S1-2, having slightly dentate axial edges. S4 equally exsert but only about ⅓ width of the S3, having dentate axial edges. A narrow (0.5-0.8 mm wide) paliform lobe (P1-2) often, but not always, occurs before the S1-2, when present measuring only ¼ to ½ width of the septum it borders. Much larger paliform lobes 1.5-1.8 mm wide (2-3 times width of septum they border) and rising higher in the fossa than the P1-2, form an elliptical palar crown encircling the columel-

la. The position of the larger paliform lobes is quite variable within a corallite, occurring before both the S3 and S4 in various half-systems (see Discussion). For instance, in the figured holotypic corallite, 3 half-systems contain only P4, 5 half-systems contain a mixture of 1 P3 and 1 P4, and 3 half systems contain 2 P4, for a total of 20 large paliform lobes. When a half-system has 2 P4 the flanked S3 usually has no paliform lobe. Fossa quite shallow, containing the elliptical palar crown and a papillose columella, the elements of which may be aligned or in an elliptical field.

Discussion: The arrangement of the large paliform lobes in this species is not unlike that for other species of *Colangia* and *Rhizosmilia* (see CAIRNS 1978b: text-fig. 1); however, the unique difference about *C. multipalifera* is that P4 form on S4 without the presence of flanking S5, resulting in paliform lobes often being present on the last cycle of septa, instead of the penultimate cycle of septa as is the case in other species of *Colangia* and *Rhizosmilia*. To reiterate, it would appear that a half-system composed of 1 S3 and a pair of S4 starts with a large P3 paliform lobe (Fig. 2a). Gradually, and without the acquisition of S5 to the half-system, this P3 lobe realigns itself with an adjacent S4, usually the one closest to the S2. At the same time an independent P4 begins to form before the other S4 in the half-system, the axial edges of both lobes often fused into a V-shaped structure (Fig. 2b-c). Eventually the original lobe is completely realigned with an S4 and the other P4 becomes independent and of equal size, forming a pair of P4 lobes within this system and no remaining lobe before the S3 (Fig. 2d).

Colangia multipalifera is distinguished from its congeners by its frequent retention of P1-2 and the acquisition of P4 paliform lobes without the insertion of S5, resulting in paliform lobes before septa of the last, not penultimate, cycle of septa.

Etymology: The species name *multipalifera* (Latin *multi*, many + *paliferus*, stake bearing), alludes to the many paliform lobes present in this species.

Records/Types: DBL-2474, holotypic colony of 3 corallites, USNM 99253; DBL-1471, Discovery Bay, Jamaica, depth unknown, 1 paratype, USNM 99254; DBL-2480, Rio Bueno, Jamaica, 20 m, 1 paratype, USNM 99256; DBL-

2516, Rio Bueno, Jamaica, 20 m, 1 paratype corallite, USNM 99255. Type Locality: Discovery Bay, Jamaica (Fig. 6); depth unknown.

Distribution: Known only from Discovery Bay and Rio Bueno, northern coast of Jamaica; 20 m.

Genus **Phyllangia Milne Edwards & Haime, 1848**

Diagnosis: Colonies form by extratentacular budding from common basal coenosteum. Septotheca costate and granular. Axial edges of septa finely serrate or smooth. Paliform lobes before septa of penultimate cycle, often poorly formed. Columella trabecular. Endotheca present.

Type Species: *Phyllangia americana* Milne Edwards & Haime, 1849, by subsequent designation (MILNE EDWARDS & HAIME 1850a: xliv).

Phyllangia americana americana Milne Edwards & Haime, 1849

(Figs. 19, 135-140)

Phyllangia americana Milne Edwards & Haime, *v1849c: 182. –Milne Edwards, 1857: 616, pl. D4, fig. 6. –Not Gosse, 1858: 349 (=*Hoplangia durotrix* Gosse, 1860). –Duchassaing & Michelotti, 1864: 92. –Pourtalès, 1871: 30, 79. –Vaughan, 1901: 299. –Duerden, 1902: 555-558, pl. 5, fig. 46, text-fig. 9h (histology and description of living polyps). –Branner, v.1904: 266. –van der Horst, 1927: 59. –Vaughan & Wells, 1943: 178, –Wells, v.1947a: 169, pl. 2, fig. 6. –Goreau, 1959: 70 (listed). –Zans, 1959: 29, 35 (listed). –Almy & Carrión-Torres, 1963: 156, fig. 15b. –Roos, 1964: 48. –Laborel, 1967: 3. –Goreau & Wells, 1967: 448. –Weisbord, 1968: 68-71, pl. 10, fig. 3, pl. 11, fig. 1 (synonymy). –MacIntyre & Pilkey, 1969: 375. –Keith & Weber, v.1970: 270. –MacIntyre, 1970: 178. –Laborel, 1971: 201, pl. 6, fig. 2. –Smith, 1971: 87-88. –Roos, 1971: 74, pl. 36, figs. a-b. –Olivares & Leonard, v.1971: 64, pl. 8, figs. C-D. –Porter, v.1972: 111. –Wells & Lang, 1973: 57 (listed). –Erhardt, 1974: 406 (listed). –Weisbord, 1974: 403-405, pl. 46, figs. 4-5. –Grimm & Hopkins, 1977: 136 (listed). –Land, Lang & Barnes, 1977: 170 (isotopic composition). –Cairns, 1978a: 10 (listed). –Colin, 1978: 262-263, colour fig. (page 257). –Chassaing et al., 1978: 74, fig. 49. –Zibrowius, 1980: 137. –Cairns, 1982b: 290, fig. 128e. –Zlatarski, 1982: 127-129, pl. 41, figs. 1-5, pl. 42, figs. 1-3, pl. 43, figs. 1-6 (description and variation). –Castañares & Soto, 1982: Table 1 (listed). –Wood, 1983: colour fig. (page 109). –Cortés et al., 1984: 59 (listed). –Prahl & Erhardt, 1985: 102, fig. 83. –Cortés & Guzman, 1985: 75, fig. 28b. –Hubbard & Wells, 1986: 129, figs. 10-12 (in part: specimens RH 1, 2, 10, 13, and figured specimens). –Estalella, 1986: 20. –Bouchon & Laborel, 1986: 204 (listed). –Leão, 1986: 38, 2 figs (page 39). –Tunnel, 1989: 307. –Prahl & Erhardt, 1989: 542, fig. 1. –Humann, v.1993: 170-173, 3 colour figs. –Not Cairns et al., 1994:

8 (=*P. pequegnatae*, n. sp.). –Hetzel & Barreira e Castro, 1994: colour fig. (page 61). –Cortés, 1996: 331. –Pires, 1997: 184.
Syndepas Gouldii Lyman, *1857: 274-278.
Stellangia reptans Duchassaing & Michelotti, *1860: 80, pl. 10, figs. 1-2. –Quelch, 1886: 12 (listed).
Astrangia phyllangioides Duchassaing & Michelotti, v*1864: 91-92, pl. 10, figs. 1, 3-4.

Description: Corallum colonial, usually producing additional corallites by extratentacular budding from a thick, common, encrusting coenosteum (not stoloniferous). Occasionally corallites bud from lower theca of a parent corallite, and in several cases intratentacular budding was observed (Fig. 140), the latter in coralla that may have been under stress related to proximity of man-made facilities. Corallites cylindrical to trochoid and often closely spaced, the theca of adjacent corallites sometimes fused to one another. Largest known corallite 15.9 mm in GCD (USNM 8779). Theca costate and granular, in some corallites the costae (C1-3) forming discrete ridges; however, theca of most corallites encrusted with calcareous algae, bryozoans, sponges, and/or serpulids (Fig. 137). Despite encrustation, corallites rarely immersed in epifanua, as in *Colangia immersa*, often rising as much as 1 cm above substrate. All corallites bear a distinctive light brown colouration within the calice and on upper theca within 2-3 mm from the calicular edge. Lower theca and coenosteum white.

Septa hexamerally arranged in 5 cycles (S1>S2>S3>S4>S5), the fifth cycle complete only in corallites budding intratentacularly or otherwise abnormally developed. There is a direct relationship between GCD and number of septa, corallites passing through the 4-cycle stage (48 septa) at a GCD of 7-9 mm, and continuing to add pairs of S5 up to an observed maximum of 80 (USNM 72668) in normal corallites. S1 moderately to highly exsert (up to 2.5 mm), having a finely serrate upper (distal) edge and a smooth, straight axial edge, which is sometimes slightly concave lower in fossa, but fuses to the columella. In well-preserved, intact corallites, the distal exsert edges of S1 bear short granular ridges perpendicularly aligned to them. S2 less exsert (up to 1.5 mm), about ⅓ width of the S1, but otherwise similar to S1. S3 about 0.8 mm exsert and ⅔ width of S2. S4 adjacent to S2 equally exsert to S3, but only half width of S3, whereas S4 adjacent to S1 are about twice as exsert, each pair forming a rectangular lancet with its flanked S1. Small paliform lobes occur before the S3 in developing corallites, these P3 sometimes well formed but usually poorly distinguished

from the septum they border and sometimes even broken into 2 or 3 smaller lobes. When a pair of S5 forms in a half-system, it is invariably adjacent to the S1 (not the S2) and is concurrent with the formation of a small paliform lobe before the flanked S4, the axial edge of which is usually fused to the adjacent P3. If the second pairs of S5 form within a half-system, the P3 realigns with this second flanked S4, leaving the S3 without a paliform lobe. Fossa moderately deep, containing a single, elliptical paliform lobe crown and a trabecular columella composed of poorly-formed, non-descript elements, the columella sometimes being slightly concave. Vesicular endothecal dissepiments present in larger corallites, which, along with a relatively thin theca, produces a light-weight corallum.

Discussion: *Phyllangia americana* is perhaps the most frequently collected and reported azooxanthellate coral in the western Atlantic (see Synonymy). Its commonness may be due to its proclivity to colonize submerged, man-made objects, such as pilings, docks, jetties, submerged wrecks, buoys, and even plastic and wood, which are often inspected by humans. Its natural substrate would appear to be bivalve shells, especially *Spondylus* and calico shells, and small rocks. Colour of polyps clear, brown, yellow-brown, or red-brown (HUMANN 1983). This species is known by the common name of the 'hidden cup coral' (CAIRNS *et al.* 1991).

Specimens from Bermuda and Bahia Mochina, Venezuela (OLIVARES & LEONARD 1971) have unusually small corallites (Fig. 136) and are considered as dwarf populations.

The distinction between the western Atlantic *P. americana* and the eastern Atlantic *P. mouchezii* (LACAZE-DUTHIERS, 1897) has always been difficult to quantify, authors such as BEST (1969) and ZIBROWIUS (1980) stating that the two species were very similar but not offering distinguishing criteria. However, CHEVALIER (1966a) did distinguish an eastern Atlantic population of *Phyllangia* from the western Atlantic *P. americana* at the subspecies level as *P. americana nazensis* (later synonymized as *P. mouchezii* by ZIBROWIUS 1980). According to CHEVALIER, *P. americana nazensis* differed from the nominate subspecies in four criteria: 1) its S1 and S2 were equal in size, 2) it often had more than 48 septa, usually 54-64 (up to 96 according to ZIBROWIUS 1980), 3) its septal face granules were not aligned on the distal septal margins, and 4) its columella was better developed. Having examined numerous specimens of *P. americana* from the western Atlantic (see New Records) and east-

ern Atlantic specimens from the Mediterranean and Madeira, it is clear that criteria 1 and 2 are not valid distinctions, and that criteria 3 and 4 are in general consistent, but trivial differences. To reiterate, the eastern Atlantic populations of *Phyllangia*, customarily called *P. mouchezii*, differ from typical *P. americana* in having a slightly more developed columella, in lacking short sepal face ridges, and, in some specimens, adopting a bushy corallum, unlike any examined in the western Atlantic. Given the geographic separation of the two taxa (see Distribution) and the slight, but consistent differences in morphology, I agree with CHEVALIER's subspecific distinction of the two forms: the western Atlantic *Phyllangia americana americana* and the eastern Atlantic *P. americana mouchezii*, new rank.

New Records: P-625, 3 corallites, USNM 99282; P-629, 5 colonies: 3, USNM 99285 and 2, UMML 8.227 and 344; P-1330, 1 corallite, USNM 99266; P-1335, 1 corallite, USNM 99262; P-1336, 1 colony, USNM 99260; P-1360, 1 colony, USNM 99277; P-1362, 1 colony, USNM 99273; SB-1125, 20 colonies, USNM 87777; SB-1697, 1 colony, USNM 91623; SB-1698, 1 colony, USNM 95491; SB-1710, many corallites, USNM 95489; SB-1952, 1 colony, USNM 95442; SB-2061, 3, USNM 99302; SB-3147, 1 colony, USNM 95490; SB-4195, 4 corallites, USNM 99265; O-933, 1, USNM 99303; O-4216, 2 colonies, USNM 99279; O-5398, 1 colony, USNM 95442; Alb-2617, 1 colony, USNM 19147 and 99275; Alb-2619, 3 colonies, USNM 19158; Gos-1540, 1 corallite, USNM 99269; Pelican 167-5, 1 colony, USNM 99281; Delaware II-008, 1 colony, USNM 99278; BLM, SOFLA-1, many corallites, USNM 72658; BLM, SOFLA-7, many corallites, USNM 87196; BLM, SOFLA-13, many corallites, USNM 72686; BLM, SOFLA-15, many corallites, USNM 72624; BLM, SOFLA-21, many corallites, USNM 72687; BLM, SOFLA-24, many corallites, USNM 72675; BLM, SOFLA-30, many corallites, USNM 72667; BLM, SOFLA-44, many corallites, USNM 84571; BLM, SOFLA-45, many corallites, USNM 84579; BLM, SOFLA-51, many corallites, USNM 84576; BLM, SOFLA-52, many corallites, USNM 84575; BLM, SOFLA-55, many corallites, USNM 87190; BLM, LMRS, MS-03, many corallites, USNM 67849; BLM, LMRS MS-04, many corallites, USNM 71701; BLM, LMRS, MS-06, many corallites, USNM 71740; BLM, LMRS, I-S05, many corallites, USNM 71694; Devonshire Bay, Bermuda, 1 m, 1 colony, USNM 87782; off Beaufort, NC, 34 m, 1 colony, USNM 93281; South Bight, Andros I., Bahamas, 11 m, 2 colonies, USNM 99258; 28°40'N, 90°14'W, 30 m, 1 colony, USNM 62536; off Baldwin County, AL, 30 m, 1 colony, USNM 95492; east of Pulaski Buoy, FL, 27-29 m,

1 colony, USNM 87779; Key West, FL, 1 m, 1 colony, USNM 99283; west of Venice, FL, 14 m, 1 colony, USNM 45302; Alligator Point, FL, 11 m, 1 colony, USNM 99274; Boynton Inlet, FL, 1 colony, USNM 99272; Bear Cut, Miami, FL, 1-3 m, 1 colony, USNM 87778; Bird Key, Tortugas, FL, 1 m, 1 colony, USNM 99276; Longboat Inlet, FL, 11 m, 3 colonies, USNM 45364; Sebastian Inlet, FL, 1 colony, USNM 80869; 27°29.6'N, 80°17.3'W (Pepper State Park, FL), 5 m, 1, IRCZM; Port Royal, Jamaica, 1 fragmented colony, USNM 80881; Negril Point, Jamaica, 3 colonies, USNM 80874; St. Lucia, wreck of "Lesleen M.", 18 m, several corallites, USNM 99280; La Paguera, Puerto Rico, 9 m, 1 colony, USNM 99263; off Egmont Key, FL, 30-46 m, 1 colony; Biscayne Bay (County Causeway), 1 m, 1 colony, USNM 99257.

Types: The holotypic colony of *P. americana* is deposited at the MNHN. Type Locality: Martinique, depth not reported.

Two syntypes of *Syndepas gouldii* are deposited at the YPM (429). Type Locality: Bay of Cumaná, Venezuela; wreck of the "San Pedro" (1814).

The types of *Stellangia reptans* were not traced. Type Locality: St. Thomas, Virgin Islands, depth not recorded.

The type of *Astrangia phyllangioides* is deposited at the MNHN. Type Locality: St. Thomas, Virgin Islands, depth not recorded.

Distribution: Typical subspecies: widespread in western Atlantic from off Beaufort, North Carolina (34°36'N, 76°36'W) to Rio de Janeiro, Brazil, including the Caribbean, Bahamas, the Gulf of Mexico, and Bermuda (Fig. 19); 0-53 m.

P. americana mouchezii: Mediterranean, eastern Atlantic between Portugal and Senegal, including Madeira and the Canary Islands (ZIBROWIUS 1980); 1-55 m (live).

Phyllangia pequegnatae, new species

(Figs. 7, 141-143)

Coenocyathus n. sp. Rezak et al., 1985: 225 (listed).
Phyllangia americana. –Cairns et al., 1994: 8. [Not *Phyllangia americana* Milne Edwards & Haime, 1849c].

Description: Corallum consists of a cluster of closely-spaced, cylindri-

cal corallites that bud from a thick, common basal coenosteum. Largest colony (holotype) 6.6 x 5.3 cm in size, consisting of about 30 contiguous corallites, the largest corallite 9.7 x 8.3 mm in CD and 22 mm in height. C1-2 usually prominently ridged, especially near calicular edge; theca granular, but often encrusted with epifauna toward basal coenosteum. S1 and upper C1-2 often faintly speckled with a light brown pigmentation, although some coralla uniformly white.

Septa hexamerally arranged in 4 complete cycles (S1>S2>S3>S4), attaining the 24 septa stage at a GCD of about 3.5 mm and the 48 septa stage at a GCD of 5-6 mm. Only the largest corallites have pairs of S5, up to 52 total septa. S1 highly exsert in relation to CD, projecting up to 3.7 mm above calicular edge; axial edges straight, vertical, smooth, and often thickened. Faint ridges oriented perpendicular to the septal edge occur on distal margin of S1. S2 less exsert (up to 2.0 mm), ⅔ width of S1. S3 about 0.7 mm exsert, half width of S2, having finely dentate axial edges. S4 polymorphic in size, those adjacent to S1 the same width as S3 and as exsert as S2, each pair fusing with its adjacent S1 at calicular edge to form a tall, slender lancet. S4 adjacent to S2 rudimentary in width and about as exsert as S3, each pair also fusing with its adjacent S2 at calicular edge to form a smaller lancet. Small, often poorly-formed paliform lobes on lower, axial margins of S3. Fossa quite deep; columella trabecular, appearing to be formed from small lamella that border the S2, perhaps former paliform lobes (P2) from an earlier ontogenetic stage.

Discussion: Some of the specimens of the type series listed above were reported as an atypical variant of *P. americana* by CAIRNS *et al.* (1994); however, now having a better knowledge of the limits of variation of *P. americana*, this species is described as new. Although similar, *P. pequegnatae* differs from *P. americana* in having taller and more slender corallites, a maculated or white corallum, taller calicular lancets, and a deeper fossa. It also achieves the 48-septa stage at a smaller GCD than *P. americana*, and often has prominent C1-2, whereas the theca of *P. americana* is either smooth or has C1-4. Although their distributions overlap in the western Gulf of Mexico and off South Carolina (Figs. 7, 19), *P. pequegnatae* is more commonly collected in the western Gulf of Mexico, known from only 1 disjunct record off South Carolina, and usually occurs at greater depths than *P. americana*. Other Recent species in the genus include: *P. granulata* Koch, 1886 (Gulf of

Guinea); *P. consagensis* (DURHAM & BARNARD 1952) (tropical eastern Pacific); *P. dispersa* Verrill, 1864 (tropical eastern Pacific); *P. hayamaensis* (Eguchi, 1968) (Japan); and *P. papuensis* Studer, 1878 (South Pacific).

Within the western Atlantic it is more likely that *P. pequegnatae* would be confused with the two other maculated species: *Colangia immersa* and *Rhizosmilia maculata*. The corallites of *Colangia immersa* are approximately the same size as those of *P. pequegnatae* but can be distinguished by having much larger, discrete paliform lobes; noncostate theca, stoloniferous budding, and a polycyclic base. Furthermore, *Colangia immersa* is not yet known from the Gulf of Mexico. *Rhizosmilia maculata* has much larger corallites with more septa, discrete paliform lobes (usually P4), and a polycyclic base. It also is not known from the Gulf of Mexico.

Etymology: This species is named for LINDA H. PEQUEGNAT.

Records/Types: James Island Area Block 463-11, holotype colony, USNM 99286; SB-1125, 12 colonies, paratypes, USNM 99287; Pelican 117-1, 3 colonies, paratypes, USNM 87780; TAMU stn 76-68-II-1, 4 corallites, paratypes, USNM 87781; Circé GS27-1, 1 corallite, paratype, USNM 75656; 27°53'12" N,93°23'54" W, 99 m, 1 paratype, USNM 99268; Mississippi Mud Lump 90 (TU 977), 15,500 yrs BP, 1 May 1969, 1 paratype, USNM 99386. Type Locality: 32°29'52"N, 78°51'23"W (off James Island, SC), 50-54 m.

Distribution: Western Gulf of Mexico from Arcas Cays, Campeche Bay, Mexico to the Mobile Pinnacles, Alabama, with one disjunct record off South Carolina (Fig. 7); 48-112 m.

Genus **Rhizosmilia Cairns, 1978**

Diagnosis: Colonies formed by extratentacular budding from common basal coenosteum. Corallite base increases in diameter by adding exothecal dissepiments over raised costae producing concentric rings of partitioned chambers that resemble polycyclic development. Septotheca costate and granular. Axial edges of septa smooth. Paliform lobes present before penultimate septal cycle (usually P4). Columella papillose or lamellar. Vesicular endotheca present.

Type Species: *R. gerdae* Cairns, 1978, by original designation.

Discussion: In their discussion of the genus *Colangia*, HUBBARD & WELLS (1986: 130) stated that *Colangia* and *Rhizosmilia* are "scarcely distinct", probably because of the similarly of their palar formation, polycyclic base, and speckled pigmentation. Although these two genera have many characters in common, *Rhizosmilia* differs in having: a costate, septotheca (*vs* smooth epitheca); a common basal coenosteum (vs reptoid stolons); vesicular endotheca; smooth septal axial edges (vs dentate S3-4); and a method of basal expansion that resembles, but is not the same as, polycyclic development.

Rhizosmilia maculata (Pourtalès, 1874)

(Figs. 20, 144-147)

Bathycyathus maculatus Pourtalès, v*1874: 34-35, pl. 6, figs. 5-6. –Cerame-Vivas & Gray, 1966: 263 (listed). –Tommasi, 1970: 55 (listed). –Not Keith & Weber, v.1970: 271 (=*Pourtalosmilia conferta*).
Coenocyathus bartschi Wells, v*1947b: 170-171, pl. 11, figs. 1-3. –Werding & Erhardt, 1977: 106. –Zlatarski, 1982: 259-262, pl. 112, figs. 1-5, pl. 113, figs 1, 4-5 (not 2-3, =*Coenocyathus caribbeana*, n. sp.), pl. 114, figs. 1-6. –Prahl, 1985: 174, fig. 106. –Estalella, 1986: 20; 1987: 6-7, figs. 1A-B.
Caryophyllia maculata. –Cairns, 1977b: 9-10, pl. 1, figs. 1-3 (synonymy); 1977c: 86 (colour fig.). –Land, Lang & Barnes, 1977: 170 (isotopic composition). –Cairns, 1978a: 11 (listed). –Castañares & Soto, 1982: Table 1 (listed).
Rhizosmilia maculata. –Cairns, 1978b: 220, pl. 1, fig. 8. –Hubbard & Wells, v.1986: 132, figs. 19-20. –Prahl & Erhardt, 1989: 548, fig. 7. –Not Cortés, v.1992: 243, fig. 1 (=*Colangia immersa*). –Humann, v.1993: 168-169, 4 colour figs. –Cairns, 1995a: 78-79, pl. 21, figs. b-c. –Not Cortés, 1996: 331 (=*Colangia immersa*). –Pires, v.1997: 185.
Rhizosmilia gerdae. –Hubbard & Wells, v.1986: 132, figs. 17-18. [Not *R. gerdae* Cairns, 1978b]

Description: Corallum encrusting, composed of fairly closely spaced, cylindrical corallites united by a thick, common basal coenosteum that usually covers entire substrate between corallites. Corallites usually short and squat, attaining a GCD of 15-20 mm within the first cm of upward growth, corallite bases containing as many as 7 concentric thecal rings. However, some colonies (*e.g.*, those deep within caves, USNM 73913) produce elongate (up to 8 cm in height), yet robust (20 mm in GCD) corallites. Calices circular, elliptical, or irregular in shape, probably dependent

on proximity of other corallites and competing epifauna. Largest known corallite (holotype of *Coenocyathus bartschi*, Fig. 144) 26.5 x 18.9 mm in CD and 21 mm in height. Septotheca covered with finely granular, low costae, the intercostal spaces being thin and shallow. Basal region of corallites and coenosteum between corallites increased in thickness by forming exothecal dissepiments that bridge adjacent raised costae, forming concentric or layered regions of chambered corallum (see Cairns, 1978b). Septal faces of S1-3 and upper theca of most corallites covered with black-brown granules (but see Discussion), producing the characteristic speckling of the corallum, much as in *Colangia immersa*; however, speckling does not occur on basal coenosteum or lower theca, as it does in *Colangia immersa*, and is not found on the paliform lobes or columella.

Septa hexamerally arranged in 5 cycles, the fourth cycle (48 septa) complete at a GCD of about 6-8 mm, the fifth complete at a GCD of 15-18 mm, and additional pairs of S6 often present in corallites over 20 mm in GCD. Corallites between 8-18 mm GCD have a variable number of S5, depending on area available within calice. S1 moderately exsert (about 2.5 mm), having straight, vertical axial edges that join the columella low in fossa. S2 usually equally exsert (at least in larger specimens), but slightly less wide than S1. S3 1.9-2.0 mm exsert, about ¾ width of the S2, having straight, vertical axial edges. S4 about 1.4 mm exsert, ¾ width of the S3, having smooth axial edges. S5 rudimentary, only 0.9 mm exsert and less than half width of an S4, having dentate axial edges. In smaller corallites (e.g. 6-18 mm GCD), in which none or only some of the S4 are flanked by pairs of S5, septa of the penultimate cycle (S3) bear rounded paliform lobes up to 1.7 mm in width, which are invariably less wide than the S3 they border. These P3 lobes have straight axial, upper, and peripheral edges. When a pair of S5 is inserted in a half-system, the P3 lobe realigns itself with the adjacent flanked S4, and eventually another P4 is formed within the half-system before the other flanked S4, the 2 P4 lobes within a half-system forming a closely adjacent pair (see CAIRNS 1978b). Fossa of moderate depth, in large coralla containing a crown of 24 paliform lobes (P4) and the axial columella. Columella composed of several irregularly-shaped papillae, sometimes fused into an elongate lamellar structure. Vesicular endotheca present.

Discussion: HUBBARD & WELLS (1986) identified both *R. maculata* and *R. gerdae* from the same habitat in Trinidad, but commented that "specific

separation of these two forms is doubtful." Having re-examined their material, I conclude that the specimens they identified as *R. gerdae* are actually a non-maculated (white corallum) form of *R. maculata*, which would explain their difficulty in distinguishing the species. Whereas all other specimens of *R. maculata* have a speckled corallum, some of those in Trinidad apparently do not, which requires a re-evaluation of the criteria that separate these species. Although it is somewhat difficult to quantify, the corallites of *R. maculata* are shorter and squatter than those of *R. gerdae*: at a corallite height of 1 cm, the GCD of *R. maculata* may already be 15-17 mm, whereas that of *R. gerdae* would rarely exceed 10 mm, and the corallum would have corresponding fewer septa. In fact, the GCD of *R. gerdae* is not known to exceed 19 mm, whereas that of *R. maculata* grows up to 27 mm. Whereas both species occur as deep as 500 m, only *R. maculata* occurs at SCUBA depth as shallow as 0.5 m, the shallowest record of *R. gerdae* being 123 m. Finally, although it can no longer be used as a definitive difference, most corallites of *R. maculata* have a speckled corallum, whereas the corallum of *R. gerdae* is exclusively white.

Juvenile coralla of *R. maculata* (GCD 6-10 mm) may also be confused with adult coralla of *Colangia immersa*, both species having a speckled corallum, a similar type of paliform lobe formation, and approximately the same number of septa at this size. *R. maculata*, however, differs in having a common basal coenosteum that is not speckled (vs stolons that often are speckled); costae theca (*vs* smooth epitheca); wider S1 (*i.e.*, the S1 axial edges of *Colangia immersa* do not attain the columella); equally exsert S1-2; smooth, non-dentate septal axial edges (S3-4 of *C. immersa* are dentate); and much smaller paliform lobes in relation to the septa they border (the lobes of *Colangia immersa* are much wider than the septa they border).

Rhizosmilia maculata is common throughout the tropical western Atlantic, most often found attached to the ceilings of caves, under ledges, and beneath foliaceous reef corals. The colour of the polyps are orange-brown, brown, pink, lavender, and pale green (HUMANN 1993). The common name of this species is the 'speckled cup coral' (CAIRNS *et al.* 1991).

New Records: P-330, 1, USNM 92286; P-389, 3, USNM 92287; P-736, 1, USNM 92290; P-857, 6, USNM 92292; P-876, 1, USNM 92293; P-924, 1, USNM 99289; P-935, 1, USNM 92295; P-969, 3, USNM 92296; G-701, 1, USNM 92298; G-702, 1 colony, USNM 92299; G-882, 2, USNM 92301; G-985, 3, UMML 8.239;

SB-2446, 1, USNM 92306; O-4227, 6, USNM 99290; Alb-2146, 1, USNM 16113; Alb-2167, 2, USNM 16122; Alb-2319, 1, USNM 16112; B-A DS65, 1, USNM 92315; JS-16, 1, USNM 92317; DBL-83 and -84, Cardiff Hall, Jamaica, 40 m, 3 colonies, USNM 80802; Hummelinck-1443, 1 colony, USNM 92308; Str. Norseman, 12°48'S, 38°W, 49 m, 3 corallites, USNM 5376; Chankanaab Caves, Cozumel, Mexico, 0.5-4 m, 32, 20, and 40 m from cave mouth, numerous colonies, USNM 73912-14, respectively; Green Cay, Bahamas, 130 m, 1, USNM 92316; Middle Bight, Andros, Bahamas, depth unknown, 1, UMML 8.343; 13°52'N, 61°07'W (attached to a telegraph cable), 508 m, 25 corallites, MCZ 5101 and 5588; 'Caribbean', depth unknown, 1, USNM 92309.

Types: The holotype of *Bathycyathus maculatus*, a single corallite measuring 8.9 x 7.8 mm in CD and 8.3 mm in height, is deposited at the MCZ (2783). Type Locality: Abrolhos, Brazil, 55 m.

The holotype of *Coenocyathus bartschi*, a colony consisting of 1 large corallite (GCD = 26.5 mm) and 2 smaller ones, is deposited at the USNM (M547397). Type Locality: Dry Tortugas, Florida, 66-73 m.

Distribution: Southern Florida; Bahamas; Caribbean; Brazil to Abrolhos (Fig. 20); 0.5-508 m, the deepest record from specimens attached to a recovered telegraph cable off St. Lucia (MCZ).

Rhizosmilia gerdae Cairns, 1978

Rhizosmilia gerdae Cairns, *1978b: 219-222, pl. 1, figs. 1-7; 1979: 142-143, pl. 27, figs. 5-8, map 40. –Not Hubbard & Wells, v.1986: 132, figs. 17-18 (=*R. maculata*).

Diagnosis: Colony consists of an assemblage of corallites of different sizes, all united by a common basal coenosteum. Corallites tall and slender, cylindrical to subcylindrical, usually having a slightly larger calice than pedicel. Largest corallite (USNM 46818) 19.1 x 14.6 mm in CD, 10.3 mm in pedicel diameter, and 16.8 mm in height; however, most coralla narrower (e.g., 8-10 mm) and tall in relation to their CD. Corallum exclusively white; colour of polyp unknown. Septa hexamerally arranged in 5 cycles, the last cycle rarely complete. Only 4 cycles of septa (48) present in corallites up to 11 mm in GCD, with a gradually increasing number of S5 occurring in

corallites up to 19 mm GCD. Septal formula: S1-2>S3>S4>S5. Paliform lobes occur before penultimate septal cycle, i.e., 12 P3 in small coralla, and a mixture of P3 and P4 in larger coralla having pairs of S5. Columella papillose or lamellar.

Discussion: Little can be added to the descriptions of this species given by CAIRNS (1978b, 1979); however, the records reported herein extend the known distribution from the Straits of Florida to southeastern Puerto Rico, St. Croix, and the Yucatan Channel. Comparisons to *R. maculata* are made in the account of that species, as well as a discussion of *R. gerdae* reported by HUBBARD & WELLS (1986).

New Records: P-594, 1 colony, UMML; G-704, 1 colony, UMML; O-24237: 8 colonies (IRCZM 12: 109), 2 colonies (USNM 83463); Alb-2331, 1 colony, USNM 10166; JSL-II-816, 1, IRCZM 12:150; St. Croix, Virgin Islands, 549-1280 m, 3 corallites, USNM 61871.

Types: See CAIRNS (1979).

Distribution: Insular Straits of Florida; Bahamas; Yucatan Channel; southeastern Puerto Rico; St. Croix, Virgin Islands (CAIRNS 1979: map 40); 123-549 m.

Genus **Phacelocyathus Cairns, 1979**

Diagnosis: Colonial, new corallites forming by extratentacular budding from common basal coenosteum. Endo- and exothecal dissepiments present. Septotheca costate, but costae often covered with stereome. Pali before septa of all but last cycle. Columella primarily papillose, secondarily lamellar.

Type Species: *Paracyathus flos* Pourtalès, 1878, by original designation.