OFFPRINTS FROM: MARINE FAUNA AND FLORA OF BERMUDA
Edited by Dr. Wolfgang Sterrer

sucker) on the exumbrella. Color variable, mostly greenish gray-blue, the greenish color due to zooxanthellae embedded in the mesoglea. Polyp slender; strobilation of the monodisc type. Medusae are found, upside-down and usually in large congregations, on the muddy bottoms of inshore bays and ponds.

W. Sterrer

Class Anthozoa (Corals, anemones)

Characteristics: *Exclusively polypoid, solitary or colonial CNIDARIA. Oral end expanded into oral disc which bears the mouth and one or more rings of hollow tentacles. Stomodeum well developed, often with 1 or 2 siphonoglyphs. Gastrovascular cavity compartmentalized by radially arranged mesenteries. Mesoglea a mesenchymal or fibrous connective tissue.* Adult body sizes range from Scleractinia of 2 mm diameter to whip-like Antipatharia 7 m long. Colonies of Scleractinia may also reach several meters in diameter and weigh several tons. Most anthozoans, however, measure between 3 and 50 cm. Most orders possess some kind of inorganic supporting structure, such as a calcareous or horny axis or microscopic calcareous sclerites distributed throughout the tissue. Some gorgonians and pennatulids have both supporting axes and sclerites, whereas the Actiniaria, Corallimorpharia, Zoanthidea and Ceriantharia have no such supporting structure. Anthozoans are among the most colorful animals in the reef environment. Unfortunately the pigments are rarely retained in preserved specimens and, although distinctive in some species, color is not usually a reliable taxonomic character. Anthozoans are predominantly sedentary animals, often firmly attached to the substrate. The only locomotion involved in most life cycles is in the planktonic larval stage. However, many Actiniaria and Ceriantharia can move if exposed to unfavorable conditions. Actiniaria can creep along on their pedal discs at 8-10 cm/hr, pull themselves by their tentacles, move by peristalsis through loose sediment, float in currents, and even swim by coordinated tentacular motion.

Both subclasses are represented in Bermuda. Because the orders are so diverse morphologically, they are often discussed separately. In some classifications the anthozoan orders are grouped into 3 (not the 2 considered here) subclasses, splitting off the Ceriantharia and Antipatharia into a separate subclass, the Ceriantipatharia. Corallimorpharia are sometimes considered a suborder of Scleractinia. Approximately 6,500 species of Anthozoa are known. Of 93 species reported from Bermuda, 76 are included here; the remaining 17 are deep-water or rare shallow-water species.

Occurrence: Throughout the world oceans from the Arctic to the Antarctic, from the intertidal to hadal depths (10,700 m), and in temperatures of −1° to 30°C. In general, more species occur in the shallow-water tropical and subtropical regions associated with coral reefs, but virtually all benthic marine habitats are exploited. Full oceanic salinity is usually required, but some scleractinians and gorgonians can tolerate brackish water of 1.7% salinity. Some zoanthids and actinians thrive in polluted areas. Substrate type is an important factor governing distribution; some species require mud, others sand or hard substrates, and others are epizoic or epiphytic. Anthozoans are usually patchy in distribution, often abundant in coral reef habitats where conditions of substrate, light and current combine to create highly productive areas. Densities of 27-30 colonies of Scleractinia or Gorgonacea per square meter are not unusual in reef environments, whereas antipatharians rarely exceed 2-3 colonies/m^2.

Most intertidal and shallow-water Anthozoa can be collected with the aid of a hammer and chisel while snorkeling or SCUBA diving. A wooden spatula or flat bivalve shell is good for detaching anemones. Burrowing actinians, cerianthids and pennatulids may be obtained by sieving of sand and mud, preferably after the animals have been spotted in the expanded condition. It is best to collect cerianthids at night or at dusk, when most species expand. If kept moist, and the temperature is controlled, anemones may live for several days and even survive shipment by mail. Deep-water (over 70 m) species are usually collected fortuitously by trawling and dredging, or selectively by submersible.

Some anthozoans are commercially or pharmacologically important. Some gorgonians and zoanthids contain compounds (prostaglandins and palytoxin, respectively) that are biologically very active and of pharmaceutical value. Care must be taken when collecting the zoanthid *Palythoa* in late summer because it contains a highly toxic substance (palytoxin) which is very irritating to the skin and open cuts, causing severe pain and long-lasting blisters. Actinians, some scleractinians and cerianthids are popular aquarium animals. Finally, because anthozoans constitute most of the mass of coral and patch reefs, they contribute to storm protection, tourist recreation and sand production, not to mention the habitats provided for innumerable other animals, many of which are eaten by humans. The taking of corals for souvenirs is strongly discouraged, and prohibited by law in certain areas (Coral Reef Preserves).

IDENTIFICATION: Because of the morphological diversity within the class, identification relies on a great number of characters and methods.

The basic structural unit of anthozoans is the polyp, which may exist alone or in a colonial arrangement, all contiguous polyps tracing their ancestry through asexual budding to a single founder polyp. The polyp usually has a short, squat, cylindrical body (column) with a flattened oral end (oral disc). The mouth occupies the center of the oral disc and is surrounded by several rings (cycles) of hollow tentacles. The mouth leads through a short, longitudinally ridged tube (stomodeum) into the gastrovascular cavity (coelenteron). The hollow tentacles are continuous with this cavity. Sometimes the stomodeum is flattened, with one or both of the narrow edges modified into flagellated grooves (siphonoglyphs) that propel water into the polyp. The gastrovascular cavity is radially partitioned by thin lamellae (mesenteries, septa) on which the gonads develop. The inner, free edges of the mesenteries bear distinct, thickened rims, the (mesenterial) filaments, which perform the functions of digestion, absorption and excretion. These filaments generally have the form of a simple cord, often very sinuous in the lower part of the polyp. In Ceriantharia the filaments in the upper part of the polyp are bilobed, in Actiniaria and Zoanthidea trilobed. Mesenteries (except in Ceriantharia) are arranged in cycles of different order. They are termed perfect or complete if they are attached to the column, oral disc, base and stomodeum; imperfect or incomplete if they do not reach the stomodeum. The inner, free edges of the imperfect mesenteries (mesenterial filaments) are sometimes very sinuous and trilobed. Most anthozoan polyps are bilaterally symmetrical, the axis being determined by the siphonoglyphs or the flattened stomodeum. Two mesenteries may occur symmetrically on both sides of the axis (coupled) and/or directly adjacent (in pairs). The space between the mesenteries of a pair is called an endocoel, the space between 2 pairs an exocoel. A directive mesentery pair flanks a siphonoglyph. In some elongate actinians there may be 8 well-developed, fertile macromesenteries alternating with 8 smaller sterile micromesenteries. Nematocysts, the characteristic "stinging capsules" of Coelenterata, are found on the tentacles, stomodeum, column and mesenterial filaments of all Anthozoa. The fine structure of nematocysts as well as the cnidom (types of nematocysts in a species or higher taxon) are important criteria for classification. The body wall of an anthozoan is composed of 3 layers: an outer ectoderm (epidermis), an inner endoderm (gastrodermis) and an intermediate mesoglea, composed of a mesenchymal or fibrous connective tissue. The mesoglea of a colonial anthozoan is collectively termed coenenchyme. Many species contain symbiotic zooxanthellae (dinoflagellates) that enable many Scleractinia to be reef-building (hermatypic) in shallow, well-lit waters; the other, non-reef-building (ahermatypic) Scleractinia, i.e., without zooxanthellae, are able to live in dark, cold deeper waters.

The following terms pertain to features of individual orders rather than the entire class.

All gorgonaceans have a central supporting structure, usually called the axis in Scleraxonia and the central core in Holaxonia. The axis is composed of horny material and usually fused sclerites; the central core has a horny outer layer (cortex) surrounding a chambered core but sclerites are not present. Surrounding the cortex the inner and outer rinds, concentric layers of mesoglea (coenenchyme), make up most of the colony. Within the coenenchyme numerous tiny calcareous skeletal elements (sclerites) lend support to the coenenchyme. Sclerites occur in many different sizes and shapes. One of the simplest kinds is the spindle, a straight, monaxial structure pointed at both ends. Scales are thin, flat sclerites and plates are thicker scales. Monaxial, elongate sclerites that are enlarged at one end (the head) are called clubs. Leaf-clubs have heads ornamented with foliate processes whereas wart-clubs have only low, blunt protuberances on their heads. Capstans are monaxial spicules with 2 whorls of tubercles at either end and terminal tufts. Quadriradiates, also called "butterfly spicules", have 4 terminal processes, usually radiating in the same plane. The portion of the expanded polyp that projects above the surface of the branch is called the anthocodium; it can be retracted into a tubular basal neck zone (calyx), which may support a transverse ring of sclerites (collaret). Directly above the collaret are groups of vertically arranged sclerites, peaking at each tentacle. The peaks are called points and the collaret and points are collectively termed the crown and points. Above the points are the 8 tentacles.

Pennatulaceans are composed of 1 large, axial primary polyp that consists of an anchoring peduncle and a distal rachis, from which the secondary polyps arise. Secondary polyps consist of siphonozooids, controlling water circulation, and autozooids, the typical food-gathering polyps.

Many species of Actiniaria have a muscle band (marginal sphincter) that encircles the upper part of the column. Each mesentery bears a longitudinal muscular band, the retractor. Basilar muscles are present in species with a broadly attached pedal disc. The column can usually be divided into the scapus (column proper) and the scapulus, a histologically differentiated region at the level of the sphincter. Sometimes there is a capitular region above the scapulus, separated by a fold of tissue (collar or parapet), and a groove (fossa) that occurs between the collar and the base of the capitulum. The scapulus and capitulum are invariably smooth, but the scapus may bear a variety of special structures, such as vesicles, hollow, nematocyst-bearing outgrowths of the gastrovascular cavity; acrorhagi, vesicle-like nematocyst batteries occurring on the parapet or in the fossa; pseudotentacles, large, branched, inflated, vesicle-like structures bearing acrorhagus-like nematocyst batteries; warts, adhesive, generally brightly colored, button-shaped structures similar to vesicles; and tenaculi, adhesive, solid mesogleal papillae also used to attach foreign particles to the column. The column may also be pierced by tiny, regularly arranged pores (cinclides) that provide for rapid water expulsion during a sudden contraction and for the emission of acontia. Acontia are long, spirally coiled threads generally below the mesenterial filaments, thought to function in defense.

The calcareous skeleton of scleractinian coral colonies (corallum) is made up of individual units (corallites) produced by individual polyps. The calice is the oral surface of a corallite. Some of the growth forms of colonial Scleractinia include cerioid—closely appressed prismatic corallites, which usually share fused walls; plocoid—slightly more widely spaced, cylindrical corallites with separate walls; phaceloid—parallel or nearly parallel, laterally free corallites; and meandroid—meandering rows of confluent corallites with walls only between rows. In meandroid coralla, rows of corallites (valleys) alternate with slightly elevated walls (collines); the colline may be grooved on top by an ambulacrum. Between each pair of mesenteries is a thin calcareous septum (sometimes called scleroseptum to distinguish it from a mesentery). Each septum is composed of numerous radiating rods (trabeculae) arranged in a plane. The trabeculae of each septum are usually grouped into one or more fan-shaped patterns (fan systems). Usually the trabeculae are parallel and closely adjacent (solid septum), or there is space between the trabeculae (fenestrate septum). Small rods or bars (synapticulae) may connect opposed faces of adjacent septa. If the upper margin of a septum projects above the calicular edge it is termed an exsert septum. Small vertical lobes or pillars on the lower inner edges of the septa are termed pali or paliform lobes. The columella is a calcareous axial structure found in the calices of many species. It is quite variable in shape, including twisted or straight rods, straight or labyrinthiform lamellae, and spongy or solid masses. In colonial Scleractinia the calcium carbonate deposited between corallites is called coenosteum. It may be solid or vesicular; in the latter case, small thin plates called dissepiments form perpendicular to the growth gradient, forming small cavities in the coenosteum. Dissepiments may also occur within the corallites of both colonial and solitary corals.

In the Corallimorpharia, the tentacles on the oral disc are sometimes segregated into peripheral marginal tentacles and more central discal tentacles; the latter are often branched. Some of the unbranched tentacles have knob-like tips (acrospheres) heavily laden with nematocysts.

The mesenteries in Zoanthidea are both paired and coupled, with alternating complete and incomplete mesenteries, except for the 4th through 6th mesenteries on either side of the dorsal directive. Most zoanthids have 2 consecutive imcomplete mesenteries in the 5th and 6th positions (the brachycnemic arrangement), but some have 2 adjacent, complete mesenteries in the 4th and 5th positions (the macrocnemic arrangement).

Ceriantharia also have tentacles of 2 kinds: short labial tentacles surrounding the mouth, and larger peripherally arranged marginal tentacles. Mesenteries are arranged in couples, not pairs, which one after another develop in the multiplication chamber situated opposite the single siphonoglyph. Successive couples are arranged in a regular bilateral pattern of repeating duplets (suborder Penicillaria) or quartets (suborder Spirularia) of mesenteries. Mesenterial filaments may bear both craspedonemes, thread-like, branched, and often bunched processes, or a single aboral acontioid, a short, thick, acontium-like thread.

The horny skeleton (axis) of Antipatharia is often covered by numerous small spines. If a colony consists primarily of a single main stem it is called monopodial but even monopodial colonies may bear pinnules (symmetrically arranged, simple or branched ramifications of smaller branch diameter). If the pinnule branches dichotomously once or twice, secondary and tertiary pinnules, respectively, result. There are no calcareous elements in the mesoglea.

Characters used in the classification of the Alcyonaria include nature of the skeleton if any, arrangement of polyps, branching pattern, terminal branch diameter, sometimes color and, most importantly, the shape and distribution of sclerites. The sclerites can be easily separated from the tissue by dropping a small amount of sodium hypochlorite (full-strength commercial bleach) onto a small piece of tissue on a glass slide. Within minutes the organic tissue dissolves and the sclerites may be rinsed, covered with a cover slip, and examined. For more permanent mounts the sclerites should be repeatedly rinsed with water in a small vial, after which an alcoholic suspension of spicules should be pipetted onto a slide, allowed to dry, and mounted in balsam or a synthetic resin.

To identify the non-skeleton-bearing Zoantharia (Actiniaria, Corallimorpharia, Ceriantharia, Zoanthidea), both the internal and external anatomy must be examined. This is generally done on the basis of preserved specimens. Menthol or magnesium chloride may be used to relax specimens prior to preservation. The general internal anatomy is best studied on the basis of a transverse cut of the column. To determine the character of the (marginal) sphincter a longitudinal cut is required in addition. To study the general anatomy of Ceriantharia it is enough to make a longitudinal cut of the body. It may also be important to examine the types and distribution of nematocysts, though this is not necessary for identifying Bermuda species. The nematocysts are prepared by making a squash preparation of a tiny piece of (preferably living) tissue in a drop of seawater. Examine with a microscope (preferably with interference contrast) under oil immersion (1,000×).

The classification of the Scleractinia relies entirely on characteristics of the corallum. The tissue should be removed by soaking the specimen in sodium hypochlorite, followed by thorough rinsing. It may be necessary to cut through or break a corallum to examine its internal structure.

Identification of the Antipatharia requires examination of the colony form, axis spination, and external characteristics of the polyp.

Haematoxylin and eosin and Gomori Trichrome Stain are usually good histological stains for anthozoan tissue.

Fixation and Preservation: In general, all anthozoans can be fixed in 6-10% formalin (mixed with seawater) and preserved in 70% ethanol. Exceptions are Actiniaria and Zoanthidea, which retain their colors better in formalin. It is usually desirable to fix the specimen in the expanded condition. For gorgonians and zoanthids a 7.5-8.0% solution of magnesium chloride in fresh water is effective for narcotization. The magnesium chloride is repeatedly substituted for half of the water in the container until most of the seawater has been replaced. The animal is then killed with concentrated formalin. Menthol crystals dropped on the water surface are effective in relaxing many Actiniaria and Ceriantharia. Scleractinia are usually preserved dry, as are some gorgonians and antipatharians. Bouin's fixative may be used for histology; however, neither Bouin's nor formalin should be used in cases where calcareous structures are to be preserved.

BIOLOGY: Sexual reproduction is either dioecious or hermaphroditic; protandrous hermaphroditism is usual in monoecious forms. Gonads are often limited to certain mesenteries. Fertilization is either internal or external. Periods of sexual activity for most species are unknown. The gorgonian *Plexaura homomalla* is sexually active in June and July; however, some tropical Scleractinia are fertile year round, but on a lunar periodicity. All orders except Actiniaria and Ceriantharia include species that produce colonies by asexual reproduction. The original founder polyp, a product of sexual reproduction, may produce colonies consisting of millions of asexually budded polyps. When budding occurs the original polyp usually remains intact and one additional polyp is produced, either within the original tentacular ring (intratentacular budding) or outside of it (extratentacular budding). In the case of parricidal budding, however, the original polyp is destroyed, giving rise to numerous daughter polyps. Although the Actiniaria do not produce colonies, they are capable of asexual reproduction by pedal laceration and longitudinal and transverse fission. Transverse fission is also known to occur in Ceriantharia. Growth rates and longevity of anthozoans are also poorly known. One tropical shallow-water gorgonian has an annual growth rate of 0.1-4.0 cm, whereas a deep-water species is known to average 0.9 cm/yr. Branching reef Scleractinia may grow 4.5-27 cm/yr, massive species 0.3-1.9 cm/yr, and deep-water ahermatypes about 0.6 cm/yr. Antipatharians can grow 2-10 cm/yr. Some deep-water gorgonians and antipatharians reach sexual maturity at 12-13 yr and may live for over 70 yr. Actinians have been kept in aquaria for over 70 yr, and it is not unreasonable to surmise that some massive colonial corals are centuries old.

Anthozoans obtain nourishment by a variety of methods. Most are suspension feeders, preying on zooplankton and small crustaceans, fish, jellyfish, etc., by using their tentacles and extruded mesenterial filaments. Both structures have abundant nematocysts that, when discharged, are capable of immobilizing and adhering to small animals. Cilia and mucus aid in the capture and transport of food to the mouth. In this manner many anthozoans are also known to ingest particulate organic matter (detritus), including bacteria, in the same manner. Dissolved organics are quickly assimilated, but their role in nutrition is not fully understood. Some anthozoans may also receive nourishment from a symbiotic relationship. All orders except the Pennatulacea, Ceriantharia and Antipatharia include species that possess symbiotic dinoflagellate algae (zooxanthellae) in their endodermal tissue. These symbiotic species are especially abundant in tropical reef habitats. The zooxanthellae receive protection and waste products from the anthozoan, whereas the advantages to the anthozoan are variable and not fully understood. Zooxanthellae undoubtedly promote calcification in Scleractinia; in general, zooxanthellae probably provide some nourishment for the anthozoan in the form of dissolved organics, e.g., vitamins, glucose and amino acids. Some gorgonians seem to depend entirely on nutrition from the zooxanthellae; they die if placed in darkness, even if provided with food.

Although formidably armed with nematocysts for protection, Anthozoa are not immune to predation. Some of the most common predators are gastropods, polychaetes, echinoids, asteroids, pycnogonids and fishes.

There are numerous associations, both parasitic and symbiotic, of Anthozoa with other animals, e. g., parasitic copepods in most gorgonian gastrovascular cavities; pycnogonid cysts on gorgonians; and *Millepora* encrustation of branching corals. Other less destructive examples include associations of Actiniaria with ciliate protozoans, amphipods, shrimps, crabs and fishes; Zoanthidea with sponges; gorgonians with ophiuroids and crinoids; and gorgonians and scleractinians with polychaetes, which alter the coral branches to form their tubes.

Plate 36

DEVELOPMENT: The fertilized anthozoan zygote undergoes cleavage, resulting in a stereo- or coeloblastula. Gastrulation proceeds by delamination and invagination, or ingression, producing a ciliated planula, the common planktonic larva. The planula may drift in the plankton for weeks, during which time it forms its first mesenteries. A ring of tentacles is formed, usually after the planula has settled. The pelagic larvae of zoanthids are called zoanthella (or Semper's larva) and zoanthina. The former usually develop into species of *Palythoa*, the latter into *Zoanthus*. The planulae of Ceriantharia float on the surface and are therefore often collected in surface plankton tows. These larvae pass through a cerinula stage of 6 mesenteries.

REFERENCES: For general information see HYMAN (1940) and BAYER & OWRE (1968). General references to the following orders include: Alcyonacea, Gorgonacea, and Pennatulacea (BAYER 1956; BAYER & WEINHEIMER 1974; CAIRNS 1976); Actiniaria and Corallimorpharia (CARLGREN 1949; DEN HARTOG 1980); Scleractinia (WELLS 1956); Zoanthidea (HADDON & SHACKLETON 1891, CARLGREN 1923); Ceriantharia (CARLGREN 1912; DEN HARTOG 1977); and Antipatharia (OPRESKO 1972).

For a general reference to Bermuda's Anthozoa see VERRILL (1900a, 1901a, 1907b). Specific references to the Bermudian fauna include Alcyonaria (BAYER 1961; VERRILL 1900a, 1907b); Actiniaria (VERRILL 1899, 1900a, 1907b); Scleractinia (VERRILL 1900a, 1901b, c, 1907b; LABOREL 1966; WELLS 1972); Corallimorpharia (VERRILL 1907b, DEN HARTOG 1980); Zoanthidea (VERRILL 1900a, 1907b); Ceriantharia (VERRILL 1901a). Antipatharia are previously unreported from Bermuda.

S.CL. **ALCYONARIA** (=OCTOCORALLIA): Colonial Anthozoa with 8 pinnate (feathered) tentacles and 8 unpaired mesenteries. (All orders but the Stolonifera, Telestacea and Coenothecalia are represented in Bda.)

Plate 46

O. **ALCYONACEA** (Soft corals): Alcyonaria with thick and encrusting, lobate, or erect and arborescent attached colonies consisting of very long polyps that usually extend from the base of the colony to the uppermost branches. (Of approximately 1,000 species only 14 are known from the western Atlantic; 1 has been collected from Bda.)

F. **NIDALIIDAE:** Alcyonacea with simple or divided, stiff, cylindrical branches. Coenenchyme rigid, densely packed with tuberculate spindles. Anthocodial armature in form of crown and points.

Nidalia occidentalis Gray (Dandelion coral): Clavate colonies with polyps containing flat scales with scalloped edges. Granulated platelets abundant in pharyngeal walls. Spindles have diameters of about 1/6 their lengths. Colonies white, pale orange or yellowish brown. Lower shelf and upper slope depths. (Color Plate 5.12.)

O. **GORGONACEA** (Sea fans, Sea whips): Alcyonaria with arborescent (rarely lobate or encrusting), attached colonies consisting of polyps with uniformly short gastrovascular cavities. Specialized axial structures usually present. (Of approximately 1,200 species, 23 are known from Bda; 20 are included here.)

S.O. **SCLERAXONIA:** Gorgonacea with axial structure composed of free or fused spicules.

F. **BRIAREIDAE:** Scleraxonia with axis of separate spicules; axis perforated by gastrodermal canals throughout the branches and not separated from cortex by boundary canals. (1 sp. from Bda.)

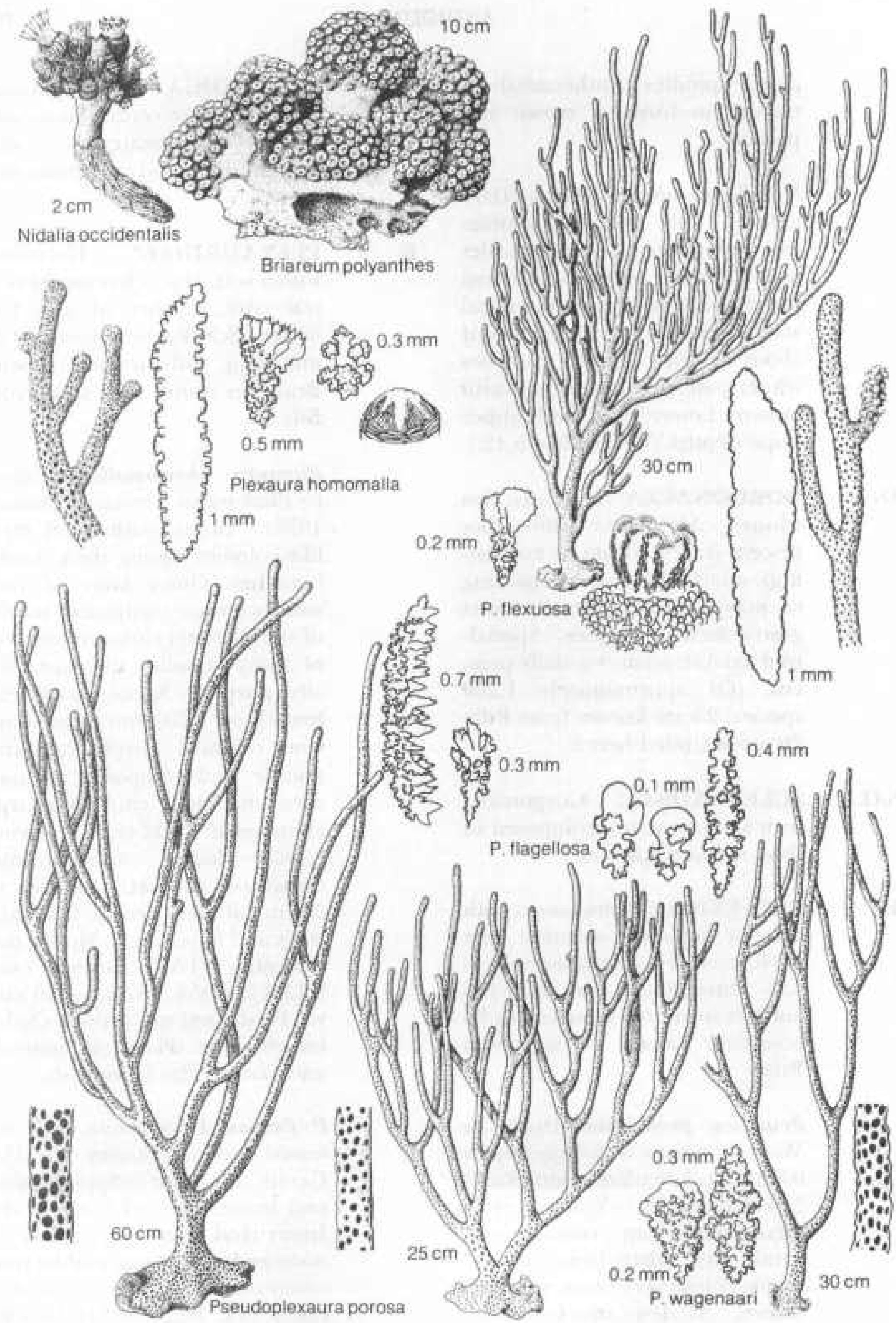
Briareum polyanthes (Duch. & Mich.): Genus with large (up to 0.8 mm) tuberculate spindles and 3-armed bodies.—Species forms incrustations on rocks, dead coral, and other living gorgonians. Polyps very large, purplish brown. At few nearshore localities.

S.O. **HOLAXONIA:** Gorgonacea with a distinct central axis composed of horny material or a mixture of horny and calcareous substances.

F. **PLEXAURIDAE:** Holaxonia with a soft, cross-chambered central core. Cortex of axis loculated. Sclerites often over 0.20 mm long; clubs usually present. Branches stout. (14 spp. from Bda.)

Plexaura homomalla (Esper) (=*Plexauropsis tricolor* Stiasny, 1935): Genus with stout treelike colonies having thick, bushy branches. Outer layer of rind with sclerites composed mostly of spindles and clubs; inner layer of spiny spindles that are usually purple.—Species with end branches 2.5-5.0 mm wide. Inner rind contains purple capstans, middle rind composed of spindles, and outer rind with large asymmetric leaf-clubs having serrate leaves with distinct transverse collaret. Colonies to 35 cm tall; dark brown. On patch reefs and outer reefs. Most active spawning VI-VII. Growth rate: 0.13-4.2 cm/yr, average 2.0 cm/yr. Predators: gastropods *Cyphoma gibbosum* (Flamingo tongue) and *Simnia*; also labrid fish.

P. flexuosa Lamouroux (=*P. edwardsi* sensu Stiasny, 1935): Genus as above.—Species with end branches 2.5-4.5 mm wide. Inner rind contains purple capstans and short rods, middle rind composed of short spindles, outer rind large leaf-clubs with serrate folia. Anthocodia without



46 ALCYONACEA, GORGONACEA 1 (Soft corals 1)

collaret. Colonies to 40 cm tall. Color variable: yellow, brown, purple and reddish purple; commonly purple in Bermuda. Primarily a clear-water (patch reef and outer reef) species. Spawning VI-VII. The dominant octocoral species in shallow water (to 3 m). (Color Plate 5.8-10.)

Pseudoplexaura porosa (Houttuyn) (=*Plexauropsis bicolor* Verrill, 1907; *P. crassa* sensu Verrill, 1907): Genus with outer rind of smooth leaf-clubs or smooth-headed wart-clubs, spiny spindles, and capstans, all colorless. Middle rind with white or purple spindles. Polyps lacking sclerites and fully retractile, resulting in gaping, elliptical pores on branch.—Species with calycular apertures separated by distances smaller than their own diameters (hence the porous appearance of dry specimens!). Apertures 1.0-1.5 mm wide. Leaf-clubs of outer rind large (to 0.4 mm long) and coarsely sculptured; spindles also large (to 1 mm long), often unilaterally spinose. Colonies to 225 cm tall (!), yellow, brownish or reddish purple. Extremely common. Near shore, patch and outer reefs, 1-15 m. (Color Plate 5.3, 4.)

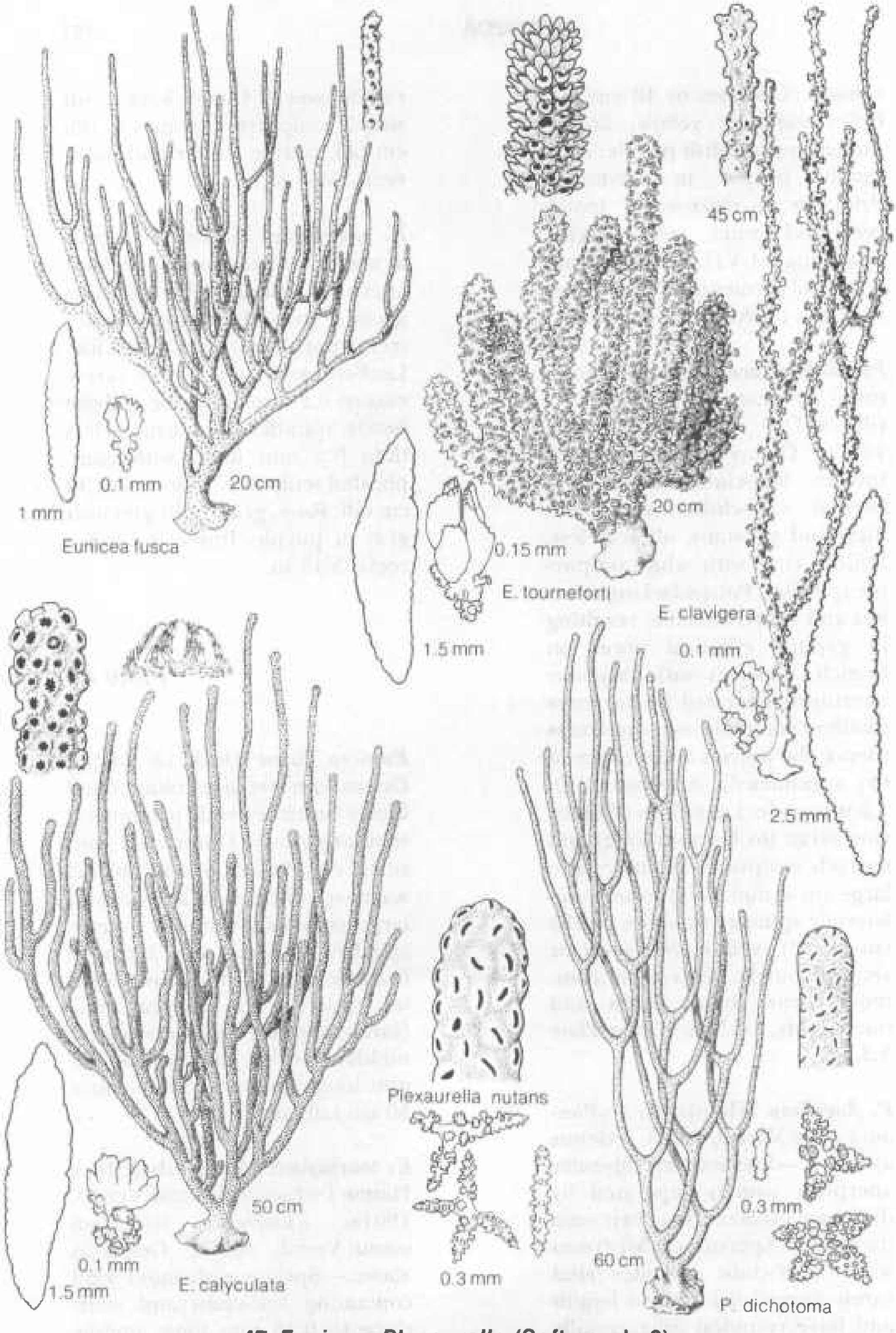
P. flagellosa (Houttuyn) (=*Plexaura esperi* Verrill, 1907): Genus as above.—Species with calycular apertures usually separated by distances greater than their own diameters. Apertures 0.5-1.0 mm wide. Leaf-clubs of outer rind rarely exceed 0.1 mm in length and have rounded folia, usually not globose; spindles slender, rarely over 0.4 mm long, with simple sculpture. Colonies to 100 cm tall; purple. Inner and outer reefs, 5-15 m.

P. wagenaari (Stiasny): Genus as above.—Species with calycular aperture separated by distances greater than their own diameters. Apertures 0.5-1.0 mm wide. Leaf-clubs of outer rind rarely exceed 0.2 mm and have globose heads; spindles stout, usually less than 0.5 mm long, with complicated sculpture. Colonies to 30 cm tall. Rose, gray, light greenish gray or purple. Inner and outer reefs, 5-15 m.

Plate 47

Eunicea fusca Duch. & Mich.: Genus with tree-like colonies and bushy branches with prominent, tubular calyces. Outer rind with small, colorless clubs and purple, warty spindles; middle rind with large colorless, white or purple spindles.—Species with terminal branches 3 mm or less in diameter. Outer rind contains small (rarely over 0.1 mm) wart-clubs; middle rind has spindles about 1 mm long. Colonies rarely above 50 cm tall; gray.

E. tourneforti Milne Edwards & Haime (=*Euniceopsis atra* Verrill, 1901a; *Euniceopsis tourneforti* sensu Verrill, 1907): Genus as above.—Species with outer rind containing leaf-clubs and wart-clubs to 0.15 mm long; middle rind with stout, long (to 1.5 mm)



47 *Eunicea, Plexaurella* (Soft corals 2)

spindles. Colonies broad, candelabrum-shaped. The typical form has terminal branches 10-15 mm in diameter and well-developed lower calycular lips. *E. tourneforti* f. *atra* Verrill, 1901a, has terminal branch diameters of 6-10 mm and poorly developed lower calycular lips. Colonies to 61 cm tall; dark gray, blackish brown, or black. Most common on outer reefs and reef slope. (Color Plate 5.15, 16.)

E. clavigera Bayer: Genus as above.—Species with outer rind containing small leaf-clubs about 0.1 mm long; middle rind with very long (to 3 mm) spindles. Colonies straggly, not candelabrum-shaped. No collaret. Colonies rarely larger than 50 cm; brown.

E. calyculata s. s. (Ellis & Solander) (=*E. grandis* Verrill, 1900a; *Euniceopsis grandis* sensu Verrill, 1907): Genus as above.—Species with outer rind containing small wart-clubs, rarely longer than 0.15 mm; middle rind with large (to 2 mm) white spindles resembling rice grains. Colonies not candelabrum-shaped. Distinct collaret present. Branches long and stout, 8-16 mm in diameter. To 1 m tall; yellowish brown. On patch reefs and nearshore; never abundant.

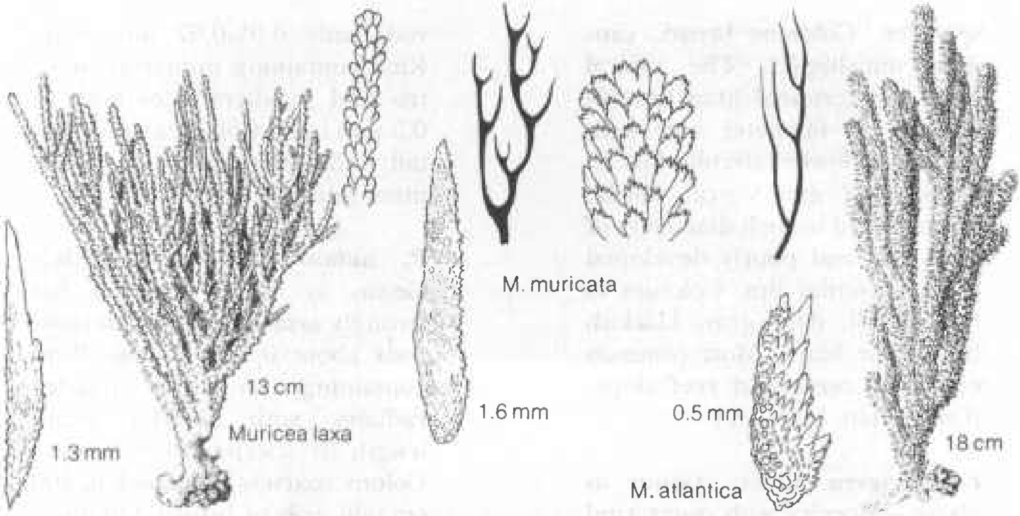
Plexaurella dichotoma (Esper): Genus with rind containing numerous quadriradiates ("butterfly spicules"). Erect, dichotomously branched colonies of thick, furry appearance. Calycular apertures slit-like.—Species with weakly armed polyps, the rods only 0.05-0.07 mm long. Rind containing numerous stout tri- and quadriradiates both to 0.5 mm long. Colonies to 100 cm tall; yellowish brown. On outer, inner and patch reefs.

P. nutans (Duch. & Mich.): Genus as above.—Species has strongly armed polyps with stout rods about 0.3 mm long. Rind containing tri- and quadriradiates with slender arms, length of sclerites to 0.45 mm. Colony sparsely branched, to 100 cm tall; gray or brown. On inner and outer reefs.

Plate 48

Muricea laxa Verrill: Genus with arborescent, densely branched colonies. Branches hard and prickly, with numerous, close-set, tubular or shelf-like, lower calycular rims (edges).—Species with calyces having long spindles that are spiny proximally and smooth distally, forming prominent terminal spikes in the calyx. Branching lateral; end branches long, thin (2-3 mm in diameter) and flexible. Colonies 25-30 cm tall; gray, bluish white or yellow. Usually found in deeper water of outer reef, but sometimes as shallow as 2 m. (Color Plate 5.5-7.)

M. muricata (Pallas): Genus as above.—Species with tuberculate outer rind spindles lacking smooth terminal spikes. Branching lateral in 1 plane; end branches short and thick (4.5-6.0



48 *Muricea* (Soft corals 3)

mm in diameter). Axis conspicuously flattened at points of branching. Rarely over 30 cm tall; white, beige or yellow. Common on patch and outer reefs.

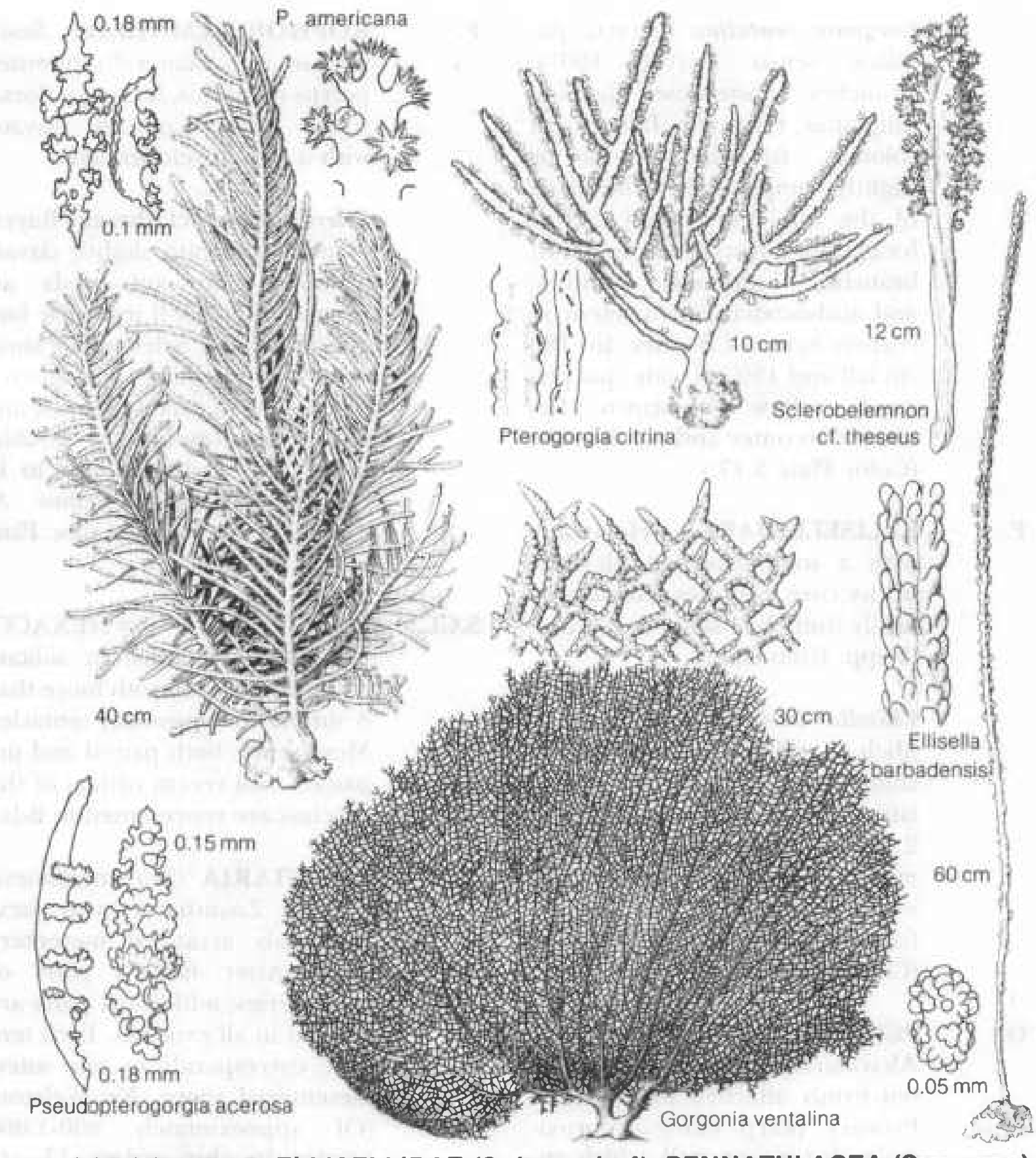
M. atlantica (Kükenthal) (=*M. muricata* sensu Verrill, 1907): Genus as above.—Similar to above species, except that axis is not flattened at points of branching. Also, outer rind spindles sometimes have strong spines on one side. Rarely over 50 cm tall; white or yellow. Outer reefs. (Color Plate 5.13, 14.)

Plate 49

F. **GORGONIIDAE:** Holaxonia with a soft, cross-chambered central core. Sclerites rarely over 0.15 mm long; no clubs. Cortex of axis slightly loculated. (3 spp. from Bda.)

Pseudopterogorgia americana (Gmelin) (=*Gorgonia americana* sensu Verrill, 1907): Genus with pinnate branching, twigs round or slightly flattened; branches do not anastomose. Two types of sclerites predominate: straight spindles and C-shaped scaphoids.—Species very slimy to the touch when alive (when dead, the mucus usually causes the branches to stick together). Scaphoid sclerites tuberculate on the concave side and echinulate on the convex side. Colonies to 100 cm tall; pale yellow or light purple. Common on inner and outer reefs.

P. acerosa (Pallas) (Sea plume): Genus as above.—Species not slimy in life. Scaphoids weakly curved, more or less smooth on the convex side. Colonies to 180 cm tall. Color of live colony light purple, purple-red or light yellow becoming white upon drying.



49 GORGONIIDAE, ELLISELLIDAE (Soft corals 4), PENNATULACEA (Sea pens)

Mostly nearshore; often host to snails (*Cyphoma*), the shrimp *Tozeuma* and brittle stars.

Pterogorgia citrina (Esper) (=*Gorgonia citrina* sensu Verrill, 1900a, 1907): Branching lateral; end branches slender, stiff, and strongly flattened. Branches do not anastomose. Slit-like calyces arranged along the 2 narrow edges of the branches. Scaphoids, spindles, and anthocodial rods present in coenenchyme. Colonies to 45 cm tall; yellow, sometimes with purple edges. Primarily inshore. (Color Plate 5.1, 2.)

Gorgonia ventalina L. (=*G. flabellum* sensu Verrill, 1907): Branches anastomose, forming uniplanar, reticulate, fan-shaped colonies. Branches round or slightly compressed in the plane of the fan. Very small calyces located in 2 rows along edges of branches. Scaphoids, spindles, and anthocodial rods present in coenenchyme. Colonies to 180 cm tall and 150 cm wide; purple, rarely yellow or brown. Restricted to outer and patch reefs. (Color Plate 5.17.)

F. **ELLISELLIDAE:** Holaxonia with a solid, calcified, flexible, horny core. Spicules characteristically dumbbell-shaped or clubs. (3 spp. from Bda.)

Ellisella barbadensis (Duch. & Mich.): Whip-like, unbranched colonies with biserial or multiple lateral bands of calyces. Whips to 2 m long and usually less than 8 mm in diameter; vermilion red when alive. Most common on the fore-reef slope (50 m and more). (Color Plate 14.5.)

O. **PENNATULACEA** (Sea pens): Alcyonaria without branches and not firmly attached to substrate. Primary polyp elongate proximally, forming a stalk which anchors the colony in mud. Secondary polyps originate from distal rachis. (Of approximately 300 described species, only 1 is known from Bda.)

S.O. **SESSILIFLORAE:** Pennatulacea with secondary polyps arising directly from rachis, not united near their bases by ridge-like or leaf-like structures.

F. **KOPHOBELEMNIDAE:** Sessiliflorae with bilaterally oriented polyps on rachis, leaving a dorsal streak bare. Colonies clavate, with a well-developed axis.

Sclerobelemnon cf. **theseus** Bayer: Slender, elongate, slightly clavate colonies with autozooids arranged in about 9 irregular longitudinal rows. Sclerites are small oval or slightly constricted platelets with serrated ends, and flat scales resembling double-bitted axe heads. Colonies to 15 cm tall; orange or yellow. At depths of 50-60 m. (Color Plate 5.11.)

S.CL. **ZOANTHARIA** (=HEXACORALLIA): Colonial or solitary Anthozoa usually with more than 8 simple (not pinnate) tentacles. Mesenteries both paired and unpaired. (All recent orders of this subclass are represented in Bda.)

O. **ACTINIARIA** (Sea anemones): Solitary Zoantharia with hexamerously arranged mesentery pairs. After first 6 pairs of mesenteries, additional pairs are formed in all exocoels. Each tentacle corresponds to one intermesenterial space. No skeleton. (Of approximately 800-1,000 species in this order, 17 are known from Bda, 15 are included here. Of the 5 superfamilies, the Abasilaria and Mesomyaria are not represented in Bda.)

Plate 50

SUP.F. **BOLOCEROIDARIA:** Actiniaria without marginal sphincter muscle. Column divided into scapus (often bearing vesicles) and scapulus. Acontia absent.

F. **BOLOCEROIDIDAE:** Boloceroidaria with tentacles separated from the coelenteron by a thin, centrally perforated diaphragm and a sphincter, which cause the tentacles to break off easily at this partition. Basilar muscles absent. (2 spp. from Bda.)

Bunodeopsis antilliensis Duerden (=*B. globulifera* Verrill, 1900a): Scapus provided with sessile or stalked vesicles of variable shape and development (small and simple to large and highly compound), and variegated in color, usually green, brown or white. Scapulus, oral disc, and tentacles smooth and transparent. Mouth occasionally surrounded by a blue ring. With 20-40 tentacles, variable in length and densely speckled with fine white dots (nematocyst batteries); usually expanded only at night. Diameter of base rarely exceeds 15 mm. Common on dead coral, living sponges, mangrove roots, and *Thalassia* leaves. With zooxanthellae. Asexual reproduction by pedal laceration common. A strong stinger. (Color Plate 6.1.)

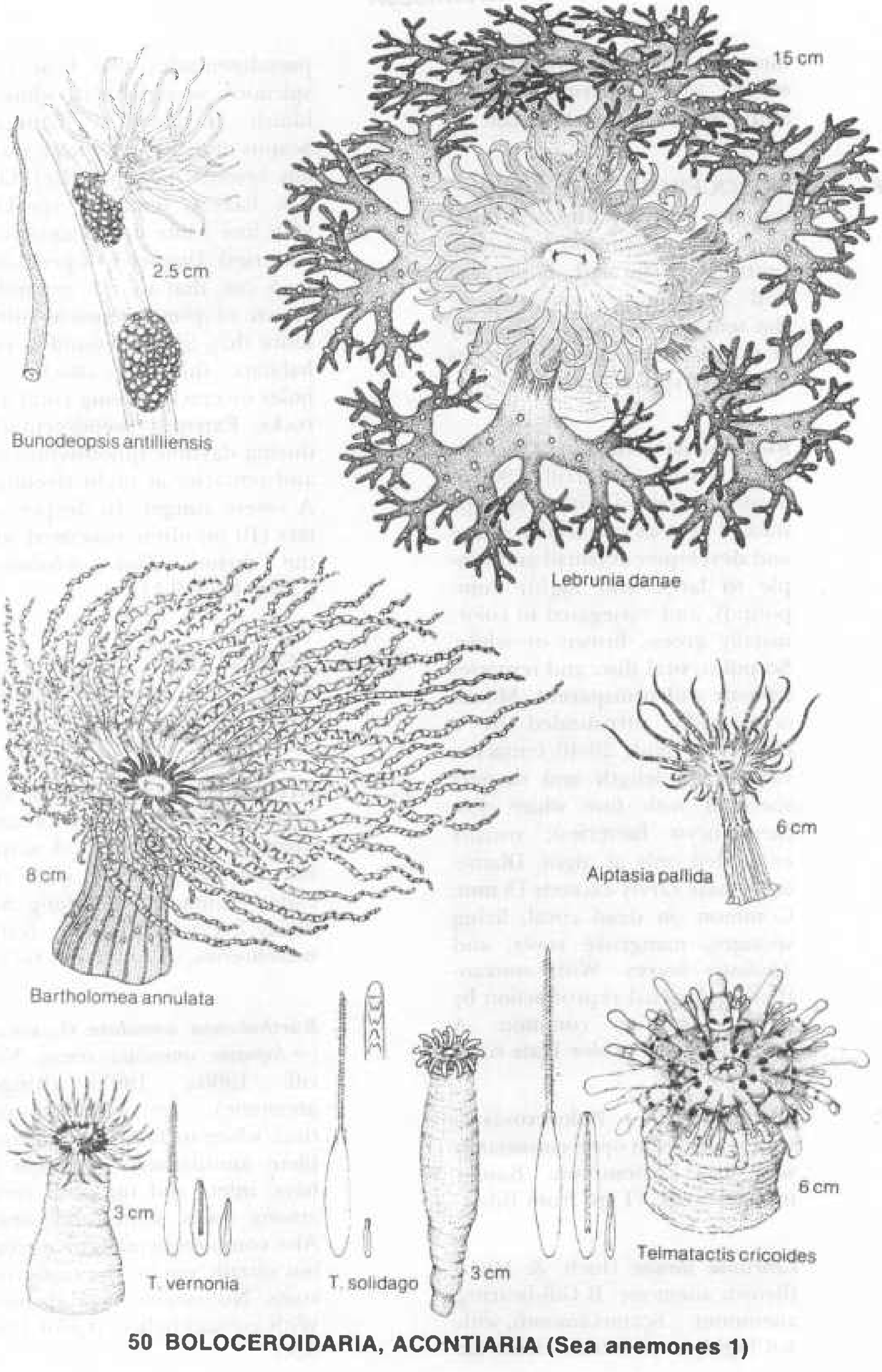
F. **ALICIIDAE:** Boloceroidaria with tentacles in open connection with the coelenteron. Basilar muscles weak. (1 sp. from Bda.)

Lebrunia danae Duch. & Mich. (Brown anemone; B Gill-bearing anemone): Scapus smooth, with 4-8 highly expandable, dendritic pseudotentacles that bear conspicuous, semiglobular, white to bluish nematocyst batteries. Scapus and pseudotentacles usually brown (zooxanthellae). Oral disc has 96 tentacles, speckled with fine white dots (nematocyst batteries). Diameter of pedal disc to 5 cm, that of the expanded crown of pseudotentacles often more than 25 cm. Found in reef habitats, the base attached in holes or cracks among coral and rocks. Expands pseudotentacles during daytime (photosynthesis), and tentacles at night (feeding). A severe stinger. In deeper waters (10 m) often associated with the shrimp *Thor amboinensis*. (Color Plate 9.11.)

SUP.F. **ACONTIARIA:** Actiniaria with a mesogleal sphincter. Acontia always present.

F. **AIPTASIIDAE:** Acontiaria with a very weak sphincter. Column divided into scapus and scapulus. Scapus smooth, with cinclides. Tentacles often long. Six, rarely 8 pairs of perfect, fertile mesenteries. (2 spp. from Bda.)

Bartholomea annulata (Lesueur) (=*Aiptasia annulata* sensu Verrill, 1900a, 1907) (Ringed anemone): Tentacles with distinct white to faint blue, incomplete annulations. Common in bays, inlets and on coral reefs, among rocks, stones and corals. Also common in mangrove areas, but usually not on the mangrove roots. No asexual reproduction. With zooxanthellae. (Color Plate 6.5.)



50 BOLOCEROIDARIA, ACONTIARIA (Sea anemones 1)

Aiptasia pallida (Verrill) (=*A. tagetes* sensu Verrill, 1900a, 1907) (Pale anemone; B White-speckled anemone): Tentacles long and smooth. Upper part of scapus with 1 or 2 (rarely 3) cycles of slightly elevated cinclides. Scapus pale brown, semi-transparent. Scapulus, tentacles and oral disc often speckled with pale, cream-colored or bluish dots. Pedal disc irregular in outline, about 0.5-3.0 cm in diameter. Common, found predominantly in protected bays and inlets among stones and algae, on sponges and often on mangrove roots. Pedal laceration common, often resulting in the formation of large, unisexual clones. With zooxanthellae. (Color Plate 6.4.)

F. **ISOPHELLIIDAE:** Acontiaria with a distinct sphincter. Column divided into long scapus, often with an investment, and a narrow, smooth scapulus. With or without tenaculi and cinclides. Mesenteries divided into macro- and micromesenteries. Without zooxanthellae. (4 spp. from Bda.)

Telmatactis cricoides (Duch.) (=*Phellia americana* Verrill; *Phellia rufa* sensu Verrill, 1901a, 1907; not *Phellia rufa* Verrill, 1900a; *T. clavata* Duch. & Mich): Genus with elongate cylindrical column. Scapus without tenaculi and cinclides but with a distinct investment. More than 1 acontium per mesentery.—Species with column to 10 cm long. Scapus orange-red with a brown or reddish brown investment. Oral disc with up to 80 tentacles; those of the 2 innermost cycles are relatively large and distinctly clavate, whereas those of the outer cycles are smaller and less distinctly clavate or blunt. Pedal disc to 3 cm in diameter. Retractor muscles of mesenteries never kidney-shaped in cross section. Many acontia. Common on reefs and in bays, usually under stones and corals, hanging upside down.

T. solidago (Duch. & Mich.) (=*Phellia simplex* Verrill, 1901a): Genus as above.—Species with elongate to vermiform column to 6 cm long, but generally smaller. Scapus and investment sand colored to dirty yellow ochre. Oral disc with 24-48 short, blunt tentacles that are never capitate. Tentacles white, with conspicuous, dark W-shaped marks. Pedal disc to 8 mm in diameter. Retractor muscles of mesenteries distinctly kidney-shaped in cross section. Few acontia. Found on reefs and in bays, usually under stones dug in sand, the base loosely attached to solid substrate.

T. vernonia (Duch. & Mich.) (=*Phellia rufa* Verrill, 1900a): Genus as above.—Species with a slightly conical column to 5 cm tall. Scapus orange-red with a brown to reddish brown investment. Scapulus often brightly colored (yellow, soft green or lilac). Oral disc with 36-80 acute tentacles, often dark or with 1 or 2 dark sectors. Base to 2 cm in diameter. Retractor muscles of the mesenteries distinctly kidney-shaped in cross section. Many acontia. Common on reefs and in bays, in both sandy and rocky bottoms. Usually found in crevices or under stones. (Color Plate 6.11.)

Plate 51

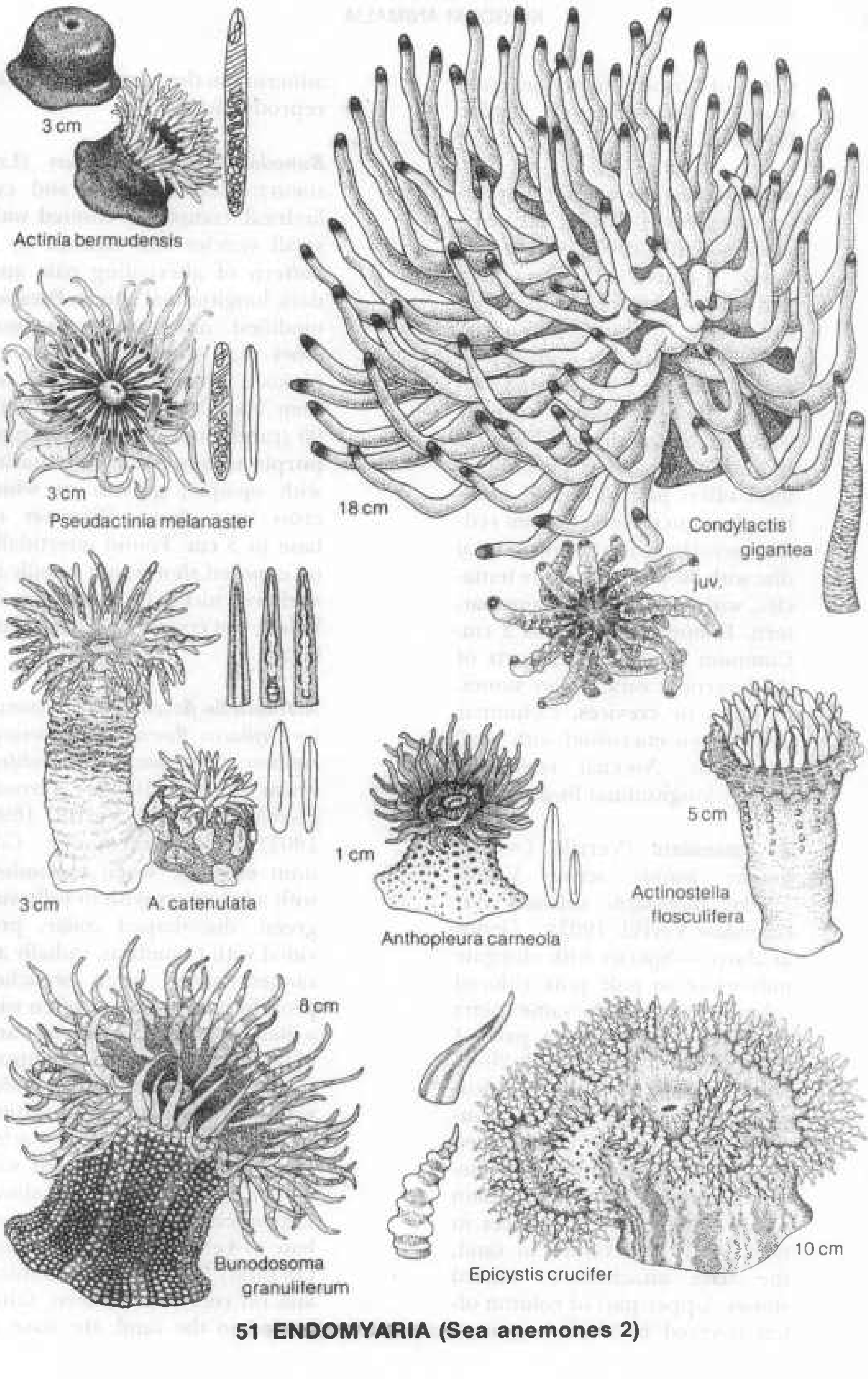
SUP.F. **ENDOMYARIA:** Actiniaria with an endodermal, occasionally reduced sphincter. Acontia absent.

F. **ACTINIIDAE:** Endomyaria with a distinct sphincter (rarely reduced) and with an adherent pedal disc with well-developed basilar muscles. Column divided into scapus and a narrow capitulum. More than 6 pairs of mesenteries are perfect. (8 spp. from Bda.)

Actinia bermudensis (McMurrich) (B Red anemone): Column smooth and low, deep red to brownish. Fossa contains 0-24 blue, globular acrorhagi. Oral disc with 96-140 rather short, acute tentacles. Tentacles without pattern and often more brightly colored than the rest of the body. Two pairs of directive mesenteries and 2 distinct siphonoglyphs. Diameter of base to 4 cm. Intertidally in holes and under stones, often in rather exposed localities. Viviparous; asexual reproduction by longitudinal fission has occasionally been reported. (Color Plate 6.2.)

Pseudactinia melanaster (Verrill) (=*Anemonia elegans* Verrill, 1901a, 1907; *Actinia melanaster* sensu Verrill, 1901a, 1907; *Anemonia sargassensis*; *Anemonia antilliensis*) (B Dark-star anemone): Column smooth, low, fawn colored to reddish brown. Variable number (sometimes none) of cream colored acrorhagi on parapet. Oral disc with 30-200 tapering tentacles, usually with acute tips. Oral disc with a distinct, stellate pattern of alternating pale and dark stripes. No directive mesenteries or siphonoglyphs. Diameter of base varies from 0.5 to 4.0 cm. Subtidally and intertidally on exposed shores, in pools, on and under stones and in holes. A small form of this species occurs on floating *Sargassum*. Asexual reproduction by longitudinal fission common. (Color Plate 6.3.)

Condylactis gigantea (Weinland) (=*C. passiflora* sensu Verrill, 1901a; *Ilyanthopsis longifilis* sensu Verrill, 1907) (B Purple-tipped anemone): Column smooth, short-cylindrical to trumpet-shaped; color bluish gray, yellowish or brick-red. Acrorhagi absent. Up to 150 long, tapering, greenish or brownish tentacles with a conspicuous design of pale, densely arranged, ruffle-like striae. Tentacle tips blunt or slightly swollen, often rose or purple (less frequently blue or bright green). Diameter of expanded oral disc and tentacles to 30 cm; of base to 8 cm. Juveniles often with knobby tentacles. Common in shallow water (less than 10 m) usually on coral reefs, rubble flats and *Thalassia* fields. With zooxanthellae. Often associated with shrimp (e.g., *Periclimenes anthophilus*, *Thor amboinensis*), crabs (e.g., *Stenorhynchus seticornis*, *Mithrax* spp.), and a va-



51 ENDOMYARIA (Sea anemones 2)

riety of fishes (e.g., juvenile wrasses, *Apogon* spp.). (Color Plate 9.12.)

Anthopleura carneola (Verrill) (=*Bunodactis stelloides* var. *carneola* Verrill, 1907; *A. variоarmata*): Genus with acrorhagi and scapus covered with adhesive warts. Sphincter often circumscript.—Species with dirty-green, pink or wine-colored column, which is entirely covered with bright green, yellowish or reddish warts. Lower part of column often pale. Variable number of cream colored to faint reddish acrorhagi in the fossa. Oral disc with 30-60 short, acute tentacles, with or without a faint pattern. Diameter of base to 2 cm. Common in the upper parts of the intertidal zone under stones, in holes or crevices. Columnar warts often encrusted with shell fragments. Asexual reproduction by longitudinal fission.

A. catenulata (Verrill) (= *Actinoides pallida* sensu Verrill 1900a; *Bunodactis stelloides* var. *catenulata* Verrill, 1907): Genus as above.—Species with elongate milk-white to pale pink colored column. Warts of the same colors restricted to the upper part of the column. Oral disc with 20-43 tentacles, which have a conspicuous color pattern. Oral disc usually with a conspicuous green ring around the mouth. Diameter of base to 1.5 cm. Common under stones and in crevices in tide pools; also found in sand, the base attached to buried stones. Upper part of column often covered by shell fragments adhering to the warts. No asexual reproduction.

Bunodosoma granuliferum (Lesueur): Column short and cylindrical, completely covered with small vesicles and marked by a pattern of alternating pale and dark longitudinal bands. Parapet modified into small, marginal lobes that often bear cream or pinkish, globular acrorhagi on their aboral face. Oral disc with 96 (rarely more) brown, orange, purple to almost black tentacles with opaque, grayish or white cross bars above. Diameter of base to 5 cm. Found intertidally on exposed shores, but usually in sheltered niches (under stones, in holes); not common. (Color Plate 6.12.)

Actinostella flosculifera (Lesueur) (=*Phyllactis flosculifera*; *Asteractis expansa*; *Actinactis flosculifera* sensu Verrill 1900a; *Asteractis flosculifera* sensu Verrill 1899, 1907) (Sand anemone): Column elongate when expanded, with a broad, grayish to yellowish green, disc-shaped collar, provided with numerous, radially arranged, short, often branched protuberances. Scapus often with a flamed pattern of cream and bluish gray or red; the upper scapus is darker and provided with longitudinal rows of distinct warts. Oral disc with 48 tentacles, often green, yellow or red with cream colored crossbars above. Expanded collar to 10 cm across; base to 4 cm. With zooxanthellae. On sandy flats, in bays and inlets, and on reefs; rarely seen. Often buried in the sand, the base attached to a solid substrate, the expanded collar resting on the sand. Viviparous.

F. **PHYMANTHIDAE:** Endomyaria with or without a weak sphincter and with an adherent pedal disc with well-developed basilar muscles. Column not divided into regions. Oral disc wide; divided into a distinct, peripheral, tentaculate region and a central region with radial rows of wart-like protuberances (discal tentacles). (1 sp. from Bda.)

Epicystis crucifer (Lesueur) (=*Phymanthus crucifer*) (B Cross-barred anemone): Column short and trumpet-shaped, with a flamed pattern of cream and red. Numerous longitudinal rows of 3-6 conspicuous purple warts in the marginal region, each row ending in a conical marginal wart. Tentacles short, up to 384 in number. Oral disc to 15 cm across; base to 8 cm in diameter. Two varieties occur in Bermuda: a form with elevated crossbars on the tentacles and with predominantly gray (sometimes yellow, green or dark purple) oral disc and tentacles (Color Plate 6.9); and a form with smooth tentacles, a brown oral disc, and tentacles with yellow to faint orange, radial-longitudinal stripes. (Color Plate 6.10.) Intermediates also occur. With zooxanthellae. In shallow water on reefs, rocky shores and stony-sandy flats. Often in sand, the base attached to stones; uncommon.

O. **SCLERACTINIA** (=MADREPORARIA) (Stony corals): Solitary or colonial Zoantharia very similar to the Actiniaria but with a calcareous skeleton. (Of approximately 2,500 living species, 34 are known from Bda; 25 are included here. All 5 suborders are represented in Bda.)

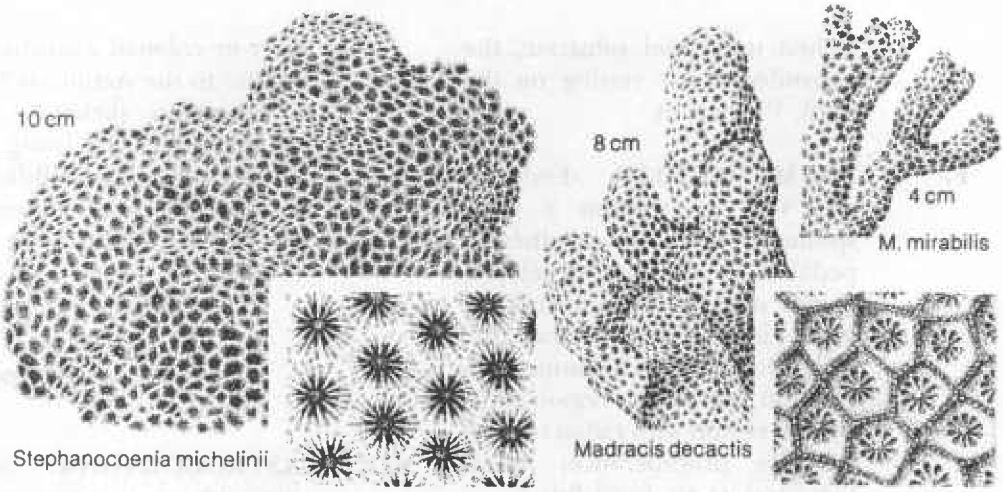
Plate 52

S.O. **ASTROCOENIINA:** Scleractinia with septa composed of a few simple trabeculae. Corallites small (less than 3 mm in diameter); polyps rarely with more than 12 tentacles. Colonial.

F. **ASTROCOENIIDAE:** Astrocoeniina with beaded septal margins and poorly developed coenosteum. Phaceloid to cerioid colonies formed by extratentacular budding. (1 sp. from Bda.)

Stephanocoenia michelinii Milne Edwards & Haime (=*Plesiastrea goodei* Verrill, 1900a, 1901b, 1907) (B Small-eyed star coral): Corallum massive, cerioid to plocoid, often encrusting. Calices 2-3 mm in diameter, containing 24 septa. Twelve paliform lobes arranged before the 1st and 2nd cycles of septa. Columella styliform. Brown. Rare on outer reefs; more common in open, inshore waters; 2-5 m.

F. **POCILLOPORIDAE:** Astrocoeniina having septa with smooth inner margins or reduced to spines. Well-developed, solid coenosteum. Plocoid and usually



52 ASTROCOENIINA (Stony corals 1)

Plate 53

ramose colonies formed by extratentacular budding. (3 spp. from Bda.)

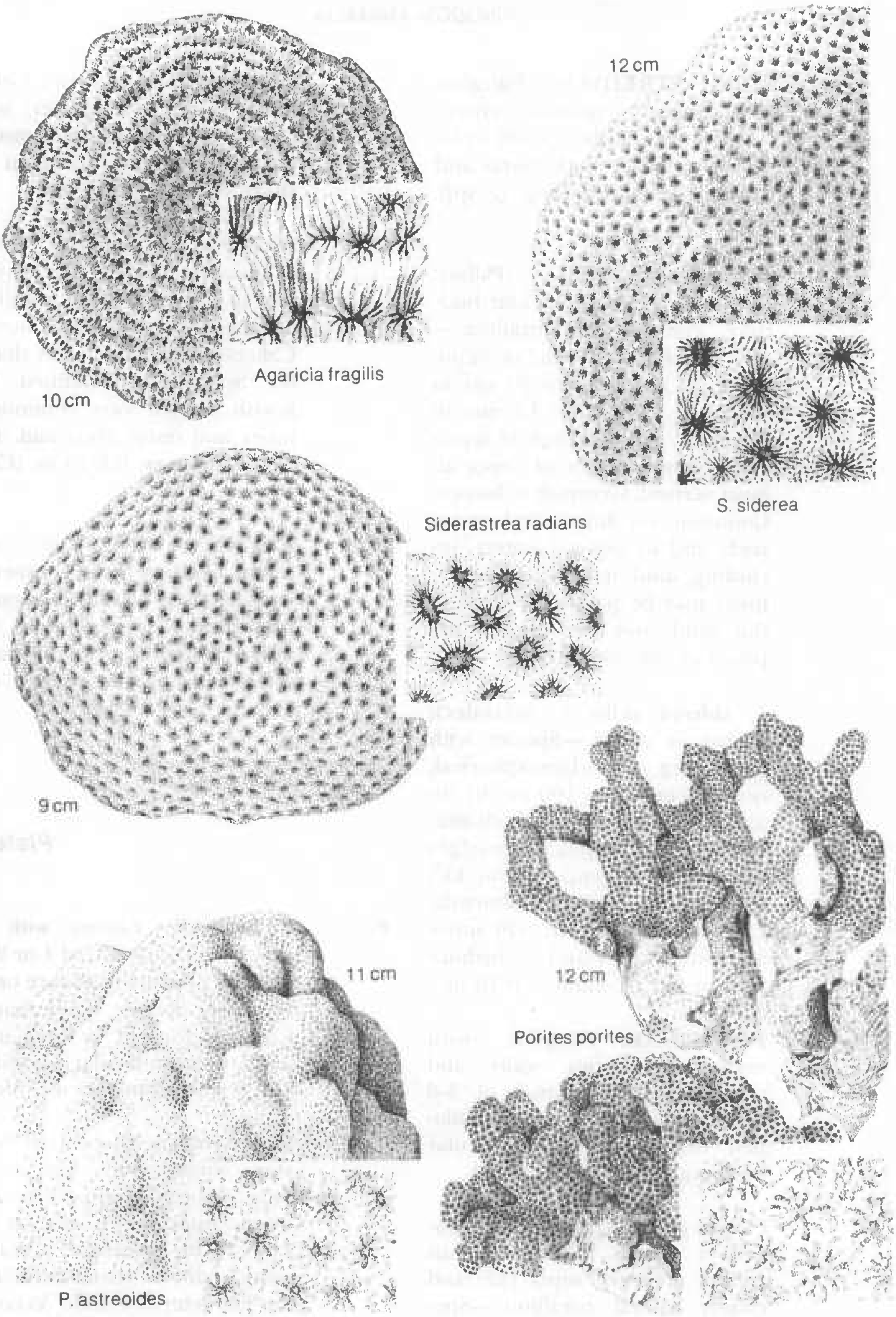
Madracis decactis (Lyman) (B Ten-rayed star coral): Genus with well-developed septa arranged in groups of 6, 8 or 10. Columella styliform and prominent.—Species with encrusting, massive, nodular or clavate corallum. Calices about 2 mm in diameter, with 10 septa each. Pali absent. Green or brown. Common on inner reefs and in inshore waters, especially on vertical reef edges; 1-4 m.

M. mirabilis (Duch. & Mich.): Genus as above.—Species with bushy colonies, to 2 m in diameter. Branches 5-9 mm in diameter, with blunt tips. Calices 1-2 mm in diameter, with 10 septa each. Pali absent. Pale cream to bright yellow. Very common in 0.5-6.0 m, especially on the vertical edges of inshore reefs.

S.O. **FUNGIINA:** Scleractinia with septa composed of numerous trabeculae in fenestrate arrangement. Synapticulae present. Corallites usually larger than 2 mm in diameter; polyps usually with more than 12 tentacles. Colonial and solitary.

F. **AGARICIIDAE:** Fungiina with solid septothecal walls. Solitary or colonial, the latter condition resulting from intratentacular budding. (1 sp. from Bda.)

Agaricia fragilis Dana (B Hat coral, Shade coral): Corallum pedicellated, with broad (rarely over 15 cm in diameter), thin, saucer-shaped fronds. Calices only on upper side of frond. Up to 24 septa per calice. No columella. Chocolate- or purple-brown. Very common in shaded areas such as shallow caves; inner and outer reefs, and inshore waters; 1-15 m.



53 FUNGIINA (Stony corals 2)

F. **SIDERASTREIDAE:** Fungiina with slightly porous, synapticulothecate walls. Usually colonial, formed by both extra- and intratentacular budding. (2 spp. from Bda.)

Siderastrea radians (Pallas): Genus with extratentacular budding and cerioid corallum.—Species with spheroidal or hemispherical corallum to 30 cm in diameter. Calices 2.5-3.5 mm in diameter, with less than 48 septa/calice. Inner edges of septa almost vertical. Greenish to brown. Common on inner and outer reefs and in inshore waters, including mud flats where specimens may be partially buried in the mud and periodically exposed at low tide; 0-10 m.

S. siderea (Ellis & Solander): Genus as above.—Species with encrusting or hemispherical, cerioid coralla to 100 cm in diameter. Calices 4-5 mm in diameter, with 50-60 septa. Inner edges of septa slope gently (about 45°) toward the papillose columella. Light reddish brown. On inner and outer reefs and in inshore waters; fairly common; 0-10 m.

F. **PORITIDAE:** Fungiina with extremely porous walls and septa. Septa composed of 3-8 loosely united trabeculae. Colonial, formed by extratentacular budding. (2 spp. from Bda.)

Porites porites (Pallas) (=*P. polymorpha* Verrill, 1901b): Genus with 2 cycles of septa (12) and closely united corallites.—Species with cerioid, ramose corallum consisting of thick clumps or irregular, stout branches. Calices about 2 mm in diameter; septa poorly defined. Light brown to purple. Common in open inshore waters; 0.5-3.0 m.

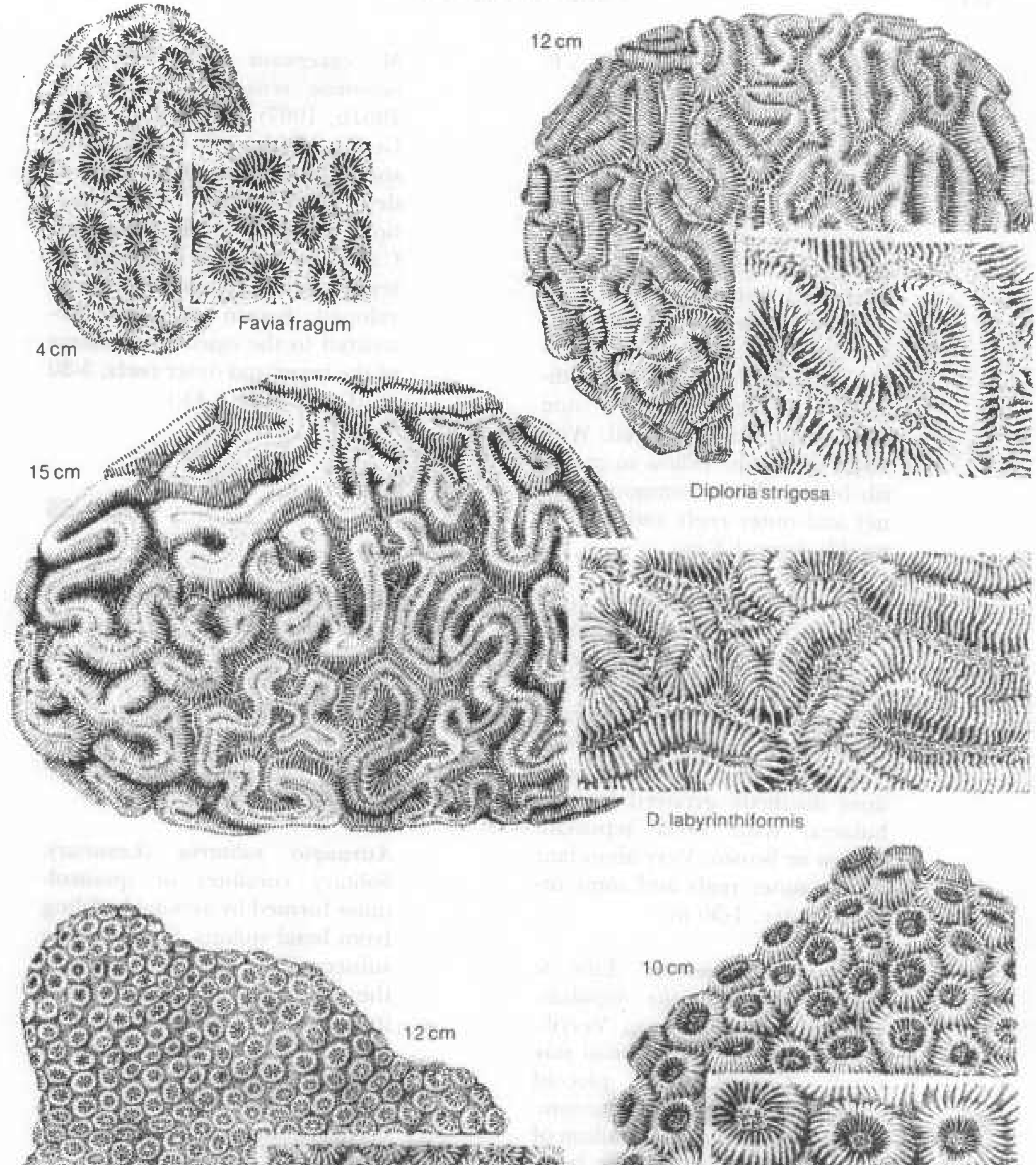
P. astreoides Lamarck: Genus as above.—Species with cerioid, flat to hemispherical corallum, often covered with small bumps. Calices about 1.5 mm in diameter. Septa poorly defined. Yellowish brown. Very common in inner and outer reefs and open inshore waters; 0.5-15 m. (Color Plate 6.14.)

S.O. **FAVIINA:** Scleractinia with septa composed of numerous trabeculae in laminar arrangement; septal edges dentate. Synapticulae absent. Corallite diameter usually greater than 2 mm. Colonial and solitary.

Plate 54

F. **FAVIIDAE:** Faviina with exsert septa composed of 1 or 2 fan systems producing a more or less regularly dentate inner margin. Colonies formed by both intra- and extratentacular budding. (All 5 spp. from Bda included.)

Favia fragum (Esper) (B Small star coral, Golf ball coral): Small, plocoid, pebble-like coralla or encrustations, usually less than 10 cm in diameter. Corallites mono-, di-, or tricentric. Calicular diameter 5-6 mm. Yellowish brown. Common on inner reefs, in open inshore waters, and in



54 FAVIIDAE (Stony corals 3)

tide pools; 1-6 m. Planulation VI-VIII.

Diploria strigosa (Dana) (=*Meandra cerebrum* sensu Verrill, 1901b, 1907) (Brain coral): Genus with meandroid, sinuous series of corallites. Paliform lobes absent. Trabecular linkages between corallite centers.—Species with hemispherical, spheroidal, or encrusting coralla to 200 cm in diameter. Valleys about 6 mm wide; collines not grooved. With 15-20 septa/cm. Yellow to greenish brown. Very common in inner and outer reefs and even in muddy bays; 1-8 m.

D. labyrinthiformis (L.) (=*Meandra labyrinthiformis* sensu Verrill, 1901b, 1907) (Brain coral): Genus as above.—Species with hemispherical coralla reaching 200 cm in diameter. Valleys about 5 mm wide; collines distinctly grooved by ambulacra. With 14-17 septa/cm. Yellow or brown. Very abundant on the outer reefs and some inshore water; 1-30 m.

Montastrea annularis (Ellis & Solander) (=*Orbicella hispidula*; *Orbicella annularis* sensu Verrill, 1900a, 1901b, 1907) (Small star coral): Genus with plocoid coralla and costate coenosteum. Columella spongy.—Corallum of species shaped as massive boulders, upright pillars, or encrustations to 200-300 cm in diameter. Calices 2-4 mm in diameter; 24 septa/calice. No paliform lobes; columella well developed. Yellowish to brown. Very common on inner and outer reefs and in open inshore waters; 1-30 m.

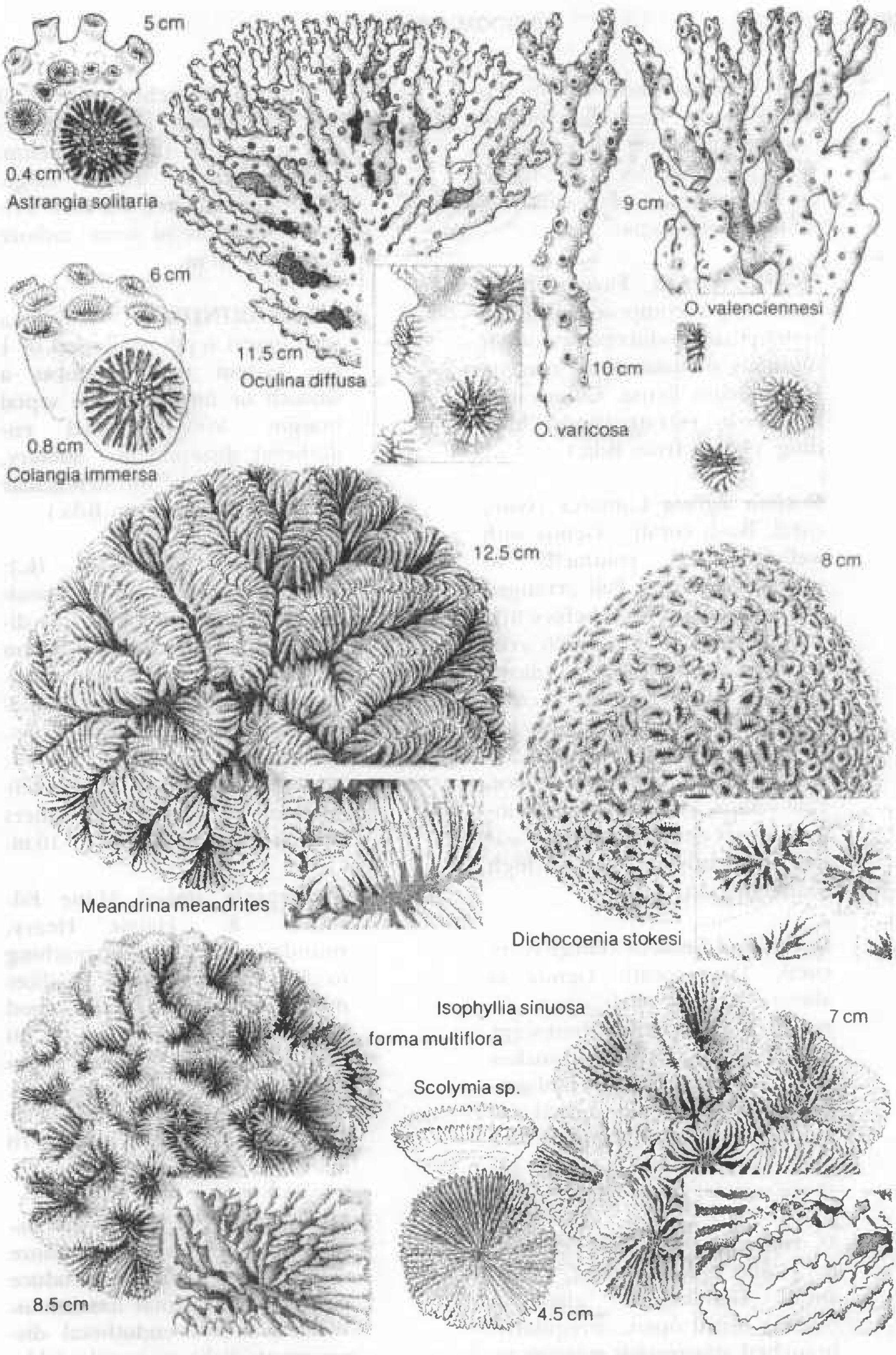
M. cavernosa (L.) (=*Orbicella cavernosa* sensu Verrill, 1900a, 1901b, 1907) (Great star coral): Genus as above.—Corallum of species shaped as massive boulders, platy fronds, or encrustations to 200 cm in diameter. Calices 5-11 mm in diameter; 48 septa/calice. Columella well developed. Brown or green. Restricted to the open clear waters of the inner and outer reefs; 3-30 m. (Color Plate 6.13.)

Plate 55

F. **RHIZANGIIDAE:** Faviina with septa composed of 1 fan system that produces an irregular septal margin. Colony formation by extratentacular, stoloniferous budding, with individual polyps often losing their original connections. (3 spp. from Bda.)

Astrangia solitaria (Lesueur): Solitary corallites or quasicolonies formed by asexual budding from basal stolons. Stolons often subsequently disrupted, giving the appearance of exclusively solitary corallites. Corallites cylindrical, 5-20 mm tall, 3-4 mm in diameter. With 36 septa; no paliform lobes. Common but cryptic; found on undersurfaces of rocks or other corals; 1-3 m. Ahermatypic. (Color Plate 6.7.)

Colangia immersa Pourtalès: Solitary corallites or quasicolonies formed by asexual budding from a common basal stolon. Corallites cylindrical, to 10 mm tall, 6-7 mm in diameter.



55 RHIZANGIIDAE-MUSSIDAE (Stony corals 4)

With 48 septa; those of 1st cycle much more exsert than others. Twelve paliform lobes. Green, with clear tentacles. Rare; found on undersides of platy corals; 3-95 m. Ahermatypic.

F. **OCULINIDAE:** Faviina with exsert septa composed of 1 fan system that produces a smooth or minutely dentate septal margin. Coenosteum dense. Colony formation by extratentacular budding. (4 spp. from Bda.)

Oculina diffusa Lamarck (Ivory coral, Bush coral): Genus with well-developed columella of twisted processes. Pali arranged in an irregular crown before first 1 or 2 cycles of septa. No axial corallites.—Species have ramose, compact colonies rarely exceeding 30 cm in diameter. Branches to 10 mm in diameter. Calice 3-4 mm in diameter; 24 septa/calice. Pale yellow. Very common on inshore reefs and some inshore waters, especially in areas of high sedimentation; 1-3 m.

O. varicosa Lesueur (Large ivory coral, Tree coral): Genus as above.—Species with open, irregularly branched, arborescent coralla to 40 cm tall. Branches long, crooked, to 50 mm in diameter. Calices usually raised on mounds. Calicular diameter 3-4 mm. Rare; found in some inshore waters; 12-25 m.

O. valenciennesi Milne Edwards & Haime (Ivory coral, Tree coral): Genus as above.—Species with open, irregularly branched arborescent colonies to 40 cm tall. Branches long, 12-20 mm in diameter. Calices low, often sunken in the coenosteum, surrounded by a low ridge. Calicular diameter 3-5 mm. Yellow. Common in some inshore waters; 2-20 m.

F. **MEANDRINIDAE:** Faviina with exsert septa composed of 1 fan system that produces a smooth or finely dentate septal margin. Well-developed endothecal dissepiments. Solitary, or colonial by intratentacular budding. (2 spp. from Bda.)

Meandrina meandrites (L.): Massive, rounded or flat boulders reaching to 100 cm in diameter (rarely more than 30 cm in Bda); smaller coralla unattached. Meandroid. Septa 6-8/cm, with smooth inner edges. Columella lamellar. Yellow, brown, or white. Moderately common in open, clear waters such as outer patch reefs; 1-10 m.

Dichocoenia stokesi Milne Edwards & Haime: Heavy, rounded or flat coralla reaching to 50 cm in diameter. Calices mono- or polycentric, arranged in a Y-shape or in long (to 50 mm) meandroid valleys. Septa 10/cm, with smooth inner edges. Columella trabecular. Yellow or brown. Rare; on outer reefs; 7-10 m.

F. **MUSSIDAE:** Faviina with exsert septa composed of more than 2 fan systems that produce large, coarse, septal dentations. Well-developed endothecal dissepiments. Solitary, or colonial by

56 CARYOPHYLLIINA, DENDROPHYLLIINA (Stony corals 5)

intratentacular budding. (2 spp. from Bda.)

Isophyllia sinuosa (Ellis & Solander) (=*I. multiflora* Verrill, 1901b; *Mussa anectens* Verrill, 1901c, 1907; *Mussa roseola* Verrill, 1907; *Mussa dipsacea* sensu Verrill, 1907; *Mussa fragilis* sensu Verrill, 1907; *I. fragilis* sensu Verrill, 1901b; *I. dipsacea* sensu Verrill, 1901b) (Rose coral): Small meandroid coralla usually less than 20 cm in diameter. Septa 7-9/cm, with inner edges bearing coarse teeth. Columella spongy. Valleys 20-25 mm wide. Form *multiflora* is smaller, with narrower valleys (12-15 mm wide) and has 11-12 septa/cm. Both forms occur in a variety of colors: green, white, lavender, brown and variegated. Very common on outer reefs and in inshore waters; 0.5-5 m. (Color Plate 6.8.)

Scolymia sp.: Solitary, subcylindrical, firmly attached coralla to 7 cm in diameter. Calice round, with 4 or 5 cycles of septa. Septa and costae coarsely dentate. Columella large and trabecular. (The specimens collected from Bda are too small to identify as to species.) Rare, on outer reefs.

Plate 56

S.O. **CARYOPHYLLIINA:** Scleractinia with septa composed of numerous trabeculae in laminar arrangement; septal edges smooth. Synapticulae absent. Corallite diameter usually greater than 2 mm. Mostly solitary.

F. **CARYOPHYLLIIDAE:** Caryophylliina with solid septothecal walls. Solitary or colonial by intra- or extratentacular budding. (Of 7 spp. known from Bda the only shallow-water species is included here.)

Coenocyathus goreaui Wells: Small bushy colonies of intertwined cylindrical corallities. Corallites to 20 mm long and 4-6 mm in diameter. Usually 32 septa arranged octamerally. Eight pali. Pale pink. Rare, known only from cavities in reef rock. Ahermatypic.

F. **GUYNIIDAE:** Caryophylliina with epithecal wall penetrated by regular rows of pores. Exclusively solitary and ahermatypic. (1 sp. from Bda.)

Guynia annulata Duncan: Corallum cylindrical, attached basally or along its side. Extremely small; calicular diameter 1 mm, lenght to 10 mm. Septa 12 or 16. Columella consists of one twisted lath. Inconspicuous, and extremely rare in shallow water. Known depth range 3-653 m.

S.O. **DENDROPHYLLIINA:** Scleractinia with irregularly perforate septa composed of numerous trabeculae; septal edges smooth. Synapticulae present. Corallite diameter usually greater than 2 mm. (Contains only 1 family, Dendrophylliidae, and only 1 sp. is known from Bda.)

Rhizopsammia bermudensis Wells: Small colonies, formed by budding of corallites from an encrusting base. Corallites cylindrical, 6-8 mm in diameter, 5-10 mm tall. Septa 48/calice. Septa and theca porous. Bright orange. Rare; known only from cavities in reef rock. Ahermatypic (Color Plate 6.6.)

Plate 57

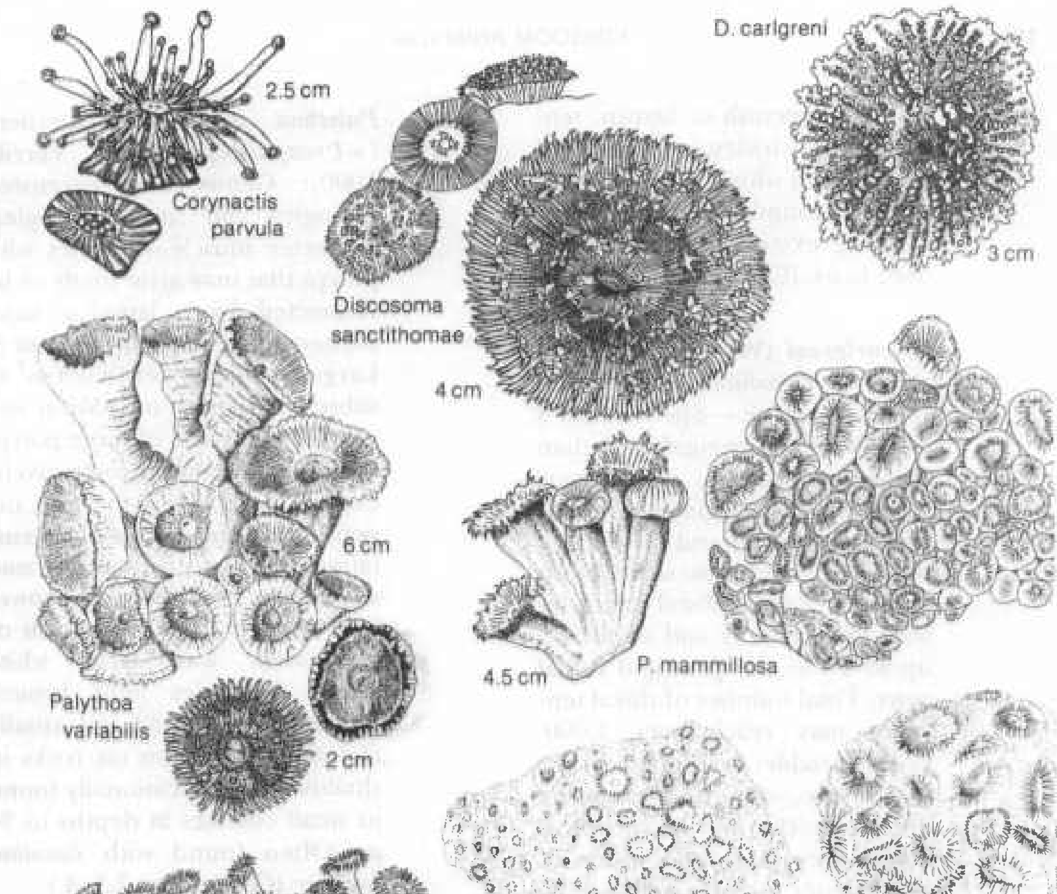
O. **CORALLIMORPHARIA** (=ASCLEROCORALLIA) (Coral anemones, False corals): Solitary or colonial Zoantharia with hexamerously arranged mesentery pairs. More than one tentacle corresponds to each intermesenterial space. No skeleton. (Of approximately 35 spp. worldwide, 3 spp. are known from Bda).

F. **CORALLIMORPHIDAE:** Corallimorpharia with simple, retractile tentacles, bearing conspicuous, globular acrospheres. Spirocysts always present. (1 sp. from Bda.)

Corynactis parvula Duch. & Mich. (Jewel anemone): With 50-100 tentacles arranged in radial rows of 3-7 tentacles each, which increase in size toward the margin. Outer tentacles longest, often exceeding the diameter of the oral disc. Diameter of base and oral disc about 5-8 mm, that of the expanded crown of tentacles to 25 mm. Color variable: body often orange to brown, acrospheres bright orange to red. On reefs, under stones and in holes among dead coral; rare. Often several specimens are clustered as a result of asexual reproduction by pedal laceration. (Color Plate 7.5.)

F. **DISCOSOMATIDAE:** Cup- or disc-shaped, often firm Corallimorpharia with simple or dendritic discal tentacles lacking acrospheres. Tropical shallow-water forms, invariably with zooxanthellae. (2 spp. from Bda.)

Discosoma sanctithomae (Duch. & Mich.) (=*Actinotryx sanctithomae* sensu Verrill, 1900, 1907; *Rhodactis sanctithomae*): Genus as the family.—Species with oral disc to 5 cm in diameter, and with a narrow, naked marginal zone, generally bordered by distinct but tiny marginal tentacles which often have white acrospheres. Discal tentacles usually well developed and distinctly dendritic. No more than 3-7 discal tentacles in the principal radial rows, the total number not exceeding 300.



57 CORALLIMORPHARIA (False corals), ZOANTHIDAE (Sea mats)

Column greenish or brown; tentacles often iridescent; inside of stomodeum white. Very common on and around coral reefs, often forming extensive, brightly colored mats. (Color Plate 7.12, 13.)

D. carlgreni (Watzl) (=*Rhodactis carlgreni*; *Paradiscosoma carlgreni*): Genus as above.—Species with a smaller and more rigid body than *D. sanctithomae*. No naked marginal zone. Marginal tentacles generally smaller and the margin often drawn out into small, blunt or trifid lobes. Discal tentacles wart-like to short and dendritic, up to 20 in the principal radial rows. Total number of discal tentacles may reach over 1,000. Color variable: variegated, green with brown, orange or red; some discal tentacles may be conspicuously white or yellow; inside of stomodeum usually yellow. On and around coral reefs; uncommon. (Color Plate 7.6, 7.)

O. **ZOANTHIDEA** (Colonial anemones, Sea mats): Solitary and colonial Zoantharia with paired but no hexamerously arranged mesenteries. All mesentery pairs after the first 6 are formed in the ventro-lateral exocoels. No skeleton, but sometimes calcareous encrustation in mesoglea. (Of approximately 300 spp., 9 are known from Bda; 7 are included here.)

F. **ZOANTHIDAE:** Zoanthidea with 1 or 2 mesogleal sphincter muscles and a brachycnemic arrangement of mesenteries. (7 spp. from Bda.)

Palythoa variabilis (Duerden) (=*Protopalythoa grandis* Verrill, 1900): Genus with encrusted mesoglea and single mesogleal sphincter muscle.—Species with polyps that may arise singly or be connected by a lamellar basal coenenchyme in groups of 4 or 5. Large colonies cover to 0.5 m^2 of substrate. Length of column and width of oral disc of large polyps are 5 cm and 4 cm, respectively. Column light brown to white, depending on the degree of encrustation and concentration of zooxanthellae. Oral disc dark brown, light brown, slightly greenish or variegated, with large white areas. Tentacles light brown, numbering up to 82, but usually about 68. Common on rocks in shallow water; occasionally found in small colonies at depths to 30 m. Often found with *Zoanthus sociatus*. (Color Plate 7.3, 4.)

P. mammillosa (Ellis & Solander) (=*P. grandiflora* Verrill, 1900a, 1901a, 1907): Genus as above.—Species with variable colony form depending on habitat. On rocks exposed to wave action, the coenenchyme is about 3 cm thick; colonies are 8-12 cm across, and polyps are separated by channels about 1 cm wide. On sand, the coenenchyme is usually not thicker than 1 cm and the polyps are spaced several centimeters apart, usually with only the oral discs visible. Expanded adult polyp 15 mm long with a 13 mm wide oral disc. Column and disc ocher, never variegated. There are usually 44-48 tentacles in fully grown polyps. Moderately common on rocks in shallow water.

P. caribaea Duch. & Mich. (=*P. mammillosa* sensu Verrill, 1901a): Genus as above.—Species usually forming extensive colonies with numerous closely arranged polyps. Proximal ends of polyps joined in a basal coenosteum about 1 cm thick. When fully expanded, the distal portions of the polyps rise about 4 mm from the basal coenenchyme but when contracted the surface of the colony is almost flat. The colony is light ocher. Number of tentacles increases with body size (from 20 to 44). Common on most patch reefs and nearshore, often found growing on dead areas of coral heads. (Color Plate 7.8.)

Zoanthus sociatus (Ellis & Solander) (=*Z. proteus* Verrill, 1900) (Green sea mat): Polyps squat, elongate, or trumpet-shaped. Basal coenenchyme laminar, covering the surface of the substrate to which the colony is attached, or reticulate, composed of a network of stolons that joins the colony on several separate substrates. A typical colony covers about 10 cm^2. Mesoglea lacks encrustations. Length of column and width of oral disc of expanded polyp are 6 mm and 3 mm, respectively. Color variable, but most polyps have a bluish green or yellowish green oral disc. The pigment of the disc is often arranged in a series of concentric circles and there may be a dark triangular patch at each corner of the slit-shaped mouth. Tentacles light green, usually 46-50. Column smooth, but often polyps at edge of a colony have numerous protuberances on the mid-column. Column light green, often bluish towards the distal end. Common in most of the shallow-water bays, sometimes intertidally. Often found with *Palythoa variabilis*. (Color Plate 7.1.)

Isaurus duchassaingi (Andres): Polyps occur singly or in small clusters. Column usually bent, with tubercles on the convex side and a smooth concave side. During the daytime the oral disc and tentacles are normally infolded, leaving a small aperture at the center of the closed oral disc. Length and width of the column of a large solitary specimen are 7 cm and 1 cm, respectively. Clustered polyps are smaller. Column light brown, orange, white or chartreuse, sometimes translucent because of very thick nonencrusting mesoglea. Oral disc and tentacles light brown. Large polyps generally have 44-46 tentacles. Filamentous green algae and other debris often adhere to the upper warty surface of the column. On reefs and rocks; 0-20 m; very rare. (Color Plate 7.2.)

F. **EPIZOANTHIDAE:** Zoanthidea with a single mesogleal sphincter muscle, macrocnemic arrangement of mesenteries, and encrusted body wall. (1 sp. from Bda.)

Epizoanthus minutus Duerden: Colonies vary in size, but usually 10-20 polyps joined by thin stolons constitute 1 colony. Length of column and width of oral disc of a large, fully expanded polyp are 10 mm and 4 mm, respectively. Color of polyp dependent on the type of mesogleal encrustation, but usually light brown. The oral disc is darker brown with a few radiating white lines. Tentacles are brown with dark brown bands and white tips. Adult polyps have 32-40 tentacles. Sphincter muscle weak, located in several small cavities near the center of the mesoglea. Found attached to the undersurface of rubble in shallow wave-exposed locations; rare. (Color Plate 7.11.)

F. **PARAZOANTHIDAE:** Zoanthidea with a single endodermal sphincter muscle, macrocnemic arrangement of mesenteries, and encrusted body wall. (1 sp. from Bda.)

Parazoanthus parasiticus (Duch. & Mich.): Polyps solitary or colonial, joined in groups of 3 or 4 by thin stolons. Length of column to 4 mm, width of oral disc to 4.5 mm. Column encrusted with fine calcareous and siliceous materials that give it a greenish white color. Oral disc and tentacles light brown. Up to 28 tentacles per polyp. In shallow water on reefs and in enclosed bays; exclusively on sponges, such as *Niphates erecta* and *Callyspongia vaginalis*. (Color Plate 7.9.)

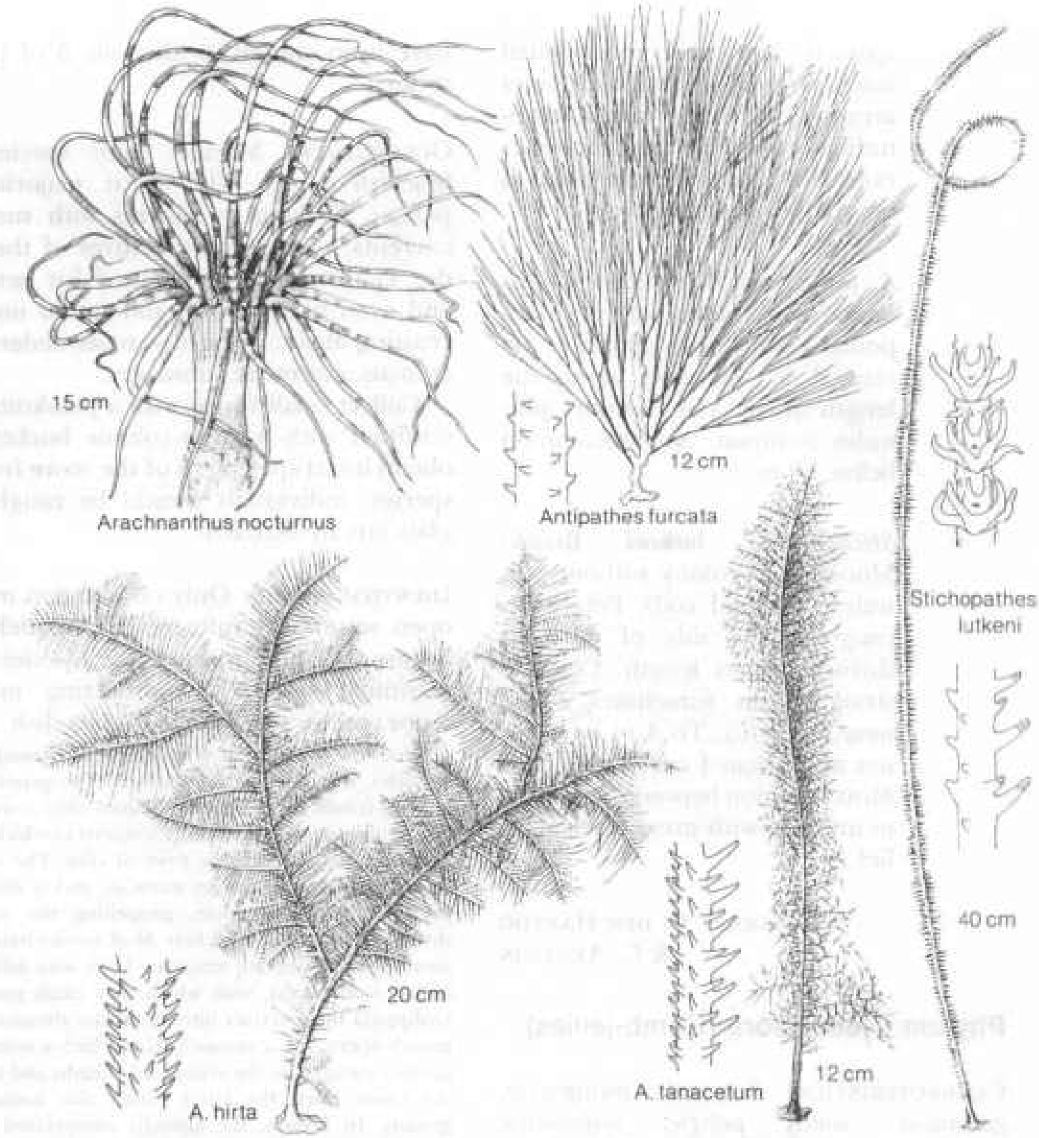
Plate 58

O. **CERIANTHARIA** (Tube anemones): Exclusively solitary Zoantharia with unpaired mesenteries. After first 6 mesenteries, all subsequent mesenteries are formed in multiplication chamber opposite siphonoglyph. Two tentacles correspond to each intermesenterial space. No skeleton; tube dwellers. (Of approximately 100 species, 1 adult sp. is known from Bda.)

S.O. **PENICILLARIA:** Ceriantharia with mesenteries arranged in duplets. Craspedonemes absent. Older, fertile mesenteries bear acontioids. (Only 1 family, Arachnactidae, in the suborder.)

Arachnanthus nocturnus den Hartog (=*Cerianthus natans*? Verrill, 1901a): Tube encrusted with sand or gravel. Body to 30 cm long, yellowish brown (sometimes with dark brown streaks). Upper part of body usually white. Marginal tentacles brown with 3-6 pale crossbars on the upper surface and fine green streaks between their insertions. Labial tentacles pale brown, without crossbars. Siphonoglyph connected with about 1/3 of the total number of mesenteries. In shallow, sandy bays (often just below tide level) where its tubes are attached to stones. Locally common, but easily overlooked because it is usually retracted into its tube during daytime. Juveniles, often without a tube, may be found under stones. (Color Plate 7.10.)

O. **ANTIPATHARIA** (Black corals): Colonial Zoantharia with 6, 10 or 12 unpaired mesenteries and 6 tentacles. Internal axis keratin-like. Colonies firmly attached to substrate. (Of approx-



58 CERIANTHARIA (Tube anemones), ANTIPATHARIA (Black corals)

imately 175 spp., 5 are known from Bda; 4 are included here.)

F. **ANTIPATHIDAE:** Antipatharia with simple (non-pinnate), non-retractile tentacles.

Antipathes furcata Gray: Genus with sparsely to densely branched colonies. Branches simple or pinnulate with simple or bifid spines. Polyps oval.—Species with fan-shaped colonies to 40 cm tall. Branches not pinnulate. At 40-60 m, growing upright on a gently sloping bottom; not uncommon.

A. hirta Gray (=*A. picea*): Genus as above.—Species with sparsely branched, monopodial colonies to 80 cm tall. Pinnules arranged biserially in 4-6 longitudinal rows. Tertiary pinnules rare. Not uncommon at 40-60 m on gently sloping bottom.

A. tanacetum Pourtalès: Genus as above.—Species with a monopodial colony with pinnules arranged in 4-6 rows along the length of the axis. Tertiary pinnules common. Not uncommon below 50 m.

Stichopathes lutkeni Brook: Monopodial colony without pinnules (a naked rod). Polyps arranged on 1 side of the axis throughout its length. Colonies straight, but sometimes coiled near free end. To 4 m long but not more than 1 cm in diameter. Most common between 30 and 60 m in areas with great vertical relief.

S. Cairns, J. C. den Hartog
& C. Arneson

Phylum Ctenophora (Comb-jellies)

Characteristics: *Extremely transparent, gelatinous, mostly pelagic, bisymmetric METAZOA with 8 rows of comb-like ciliary plates; without nematocysts.* Generally 1-10 cm (rarely to 150 cm). Most species are so transparent that only the iridescent flashes emanating from the beating combs reveal their presence.

The phylum is thought to be an early offshoot from the ancestral medusoid cnidarian. Of about 90 species known, many of the pelagic ones are cosmopolitan; 5 species from the Bermuda region have been chosen to illustrate 5 of the 6 orders.

Occurrence: Marine; some species in brackish water. The great majority is pelagic, drifting in swarms with surface currents; some representatives of the order Platyctenida are adapted for benthic and even parasitic life and found on encrusting algae, mangrove roots, sedentary animals and other substrates.

Collect small forms with a plankton net outfitted with a large-volume bucket; to obtain intact specimens of the more fragile species, individuals should be caught in glass jars by SCUBA.

Identification: Only observation in the open water can fully reveal the delicate beauty of these organisms. Species are identified under the dissecting microscope, preferably live, in a glass dish.

Note the 2 planes of symmetry (one through the tentacles, the other perpendicular). The generally 8 rows of combs (plates made of fused cilia) converge, on the aboral pole, toward the statocyst to which they are connected by delicate rows of cilia. The movement of the combs always starts at, and is directed toward, the aboral pole, propelling the animal through the water mouth first. Most species have 1 or more pairs of delicate tentacles, beset with adhesive bodies (colloblasts), with which they catch prey; in Cydippida these retract into tentacular sheaths. The mouth opens into a stomach from which a system of canals extends into the tentacular sheaths and under the comb rows; the latter canals also house the gonads. In Lobata, the laterally compressed body bears 4 short auricles and 2 often extensive lobes that are used in locomotion; in the ribbon-shaped Cestida, 4 comb rows are reduced. The benthic Platyctenida are extremely flattened, and have reduced comb rows.

Fix Cydippida and Beroida, preferably after anesthesia with magnesium chloride, in Flemming or a mixture of mercuric chloride (100 g) and glacial acetic acid (3 ml) in seawater (300 ml). After 15-30 min, carefully replace fixative with fresh water, and transfer to 70% alcohol by stages, starting with 30%. Most Lobata and Ces-