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Illustrated Key to the Shallow-Water Gorgonians and Pennatulaceans of the Verde Island Passage, Northern Philippines, Including Synopses of the Taxa and a Glossary of Terms (Cnidaria: Anthozoa: Octocorallia)

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A guide is here presented to twenty-six genera of gorgonian and pennatulacean octocorals that are commonly seen by divers on the coral reefs of the Verde Island Passage region of the northern Philippines, between southern Luzon and northern Mindoro. Ten of these are identified to species level. Each taxon is illustrated with color photographs either *in situ* or of preserved specimens, as well as with scanning electron micrographs or drawings of sclerites that are crucial for identification purposes. All material used in the study was collected during eighteen years of field work by Academy scientists, including the Hearst Biodiversity Expedition of 2011, and is housed in the marine invertebrate collections of the California Academy of Sciences. A glossary of technical terms used in the key is appended to the end of the main body of text.

KEYWORDS: Illustrated Key, Gorgonians, Pennatulaceans, Sea Fans, Sea Whips, Sea Pens, Shallow Water, Verde Island Passage, Philippines, Glossary of Terms

Between 1993 and 2012, field researchers from the California Academy of Sciences made extensive collections of octocorallian cnidarians (soft corals, gorgonians, and sea pens) that are frequently encountered from the shallow water (0–40 meters in depth) coral reefs and adjacent habitats of the Philippine archipelago.

This paper provides an illustrated identification key to common taxa of the gorgonian and pennatulacean faunas that are known to inhabit the coral reef region between southern Luzon and northern Mindoro — the area known as the Verde Island Passage, which comprises an oceanic link between The South China Sea on the east, the Sibuyan Sea in the central Philippines, and the Philippine Sea to the west. Such updated identification guides have proved valuable as guides to local or global faunal composition and biodiversity assessments, as shown by the examples of such guides to soft corals and sea fans (Fabricius and Alderslade 2001), sea pens (Williams 1995), and azooxanthellate hard corals (Cairns and Kitahara 2012).

BIOGEOGRAPHIC SETTING.— The Philippine archipelago comprises over 7100 islands (Dr. Cathy Lagunzad, Ateneo de Manila University and University of the Philippines, pers. comm.) and occupies the northern part of the Coral Triangle in the tropical western Pacific Ocean, between approximately 5 and 20 degrees north latitude (Fig. 1A).

The Coral Triangle is the region of the tropical western Pacific Ocean that has been recognized as having the world's highest shallow-water marine species diversity with regard to scleractinian corals (Hoeksema 2007; Veron et al. 2009), and similarly for fishes (Carpenter and Springer 2005; Gaither and Rocha 2013).

This region as here recognized includes eastern Indonesia, The Philippines, northern New Guinea, the Bismarck Archipelago, and the Solomon Islands (Fig. 2A).

FIGURE 1. Maps of the Philippines. A. The Philippine Archipelago. B. The study area in the Verde Island Passage. C. Dive sites in the regions of the Calumpan Peninsula and Maricaban Island.

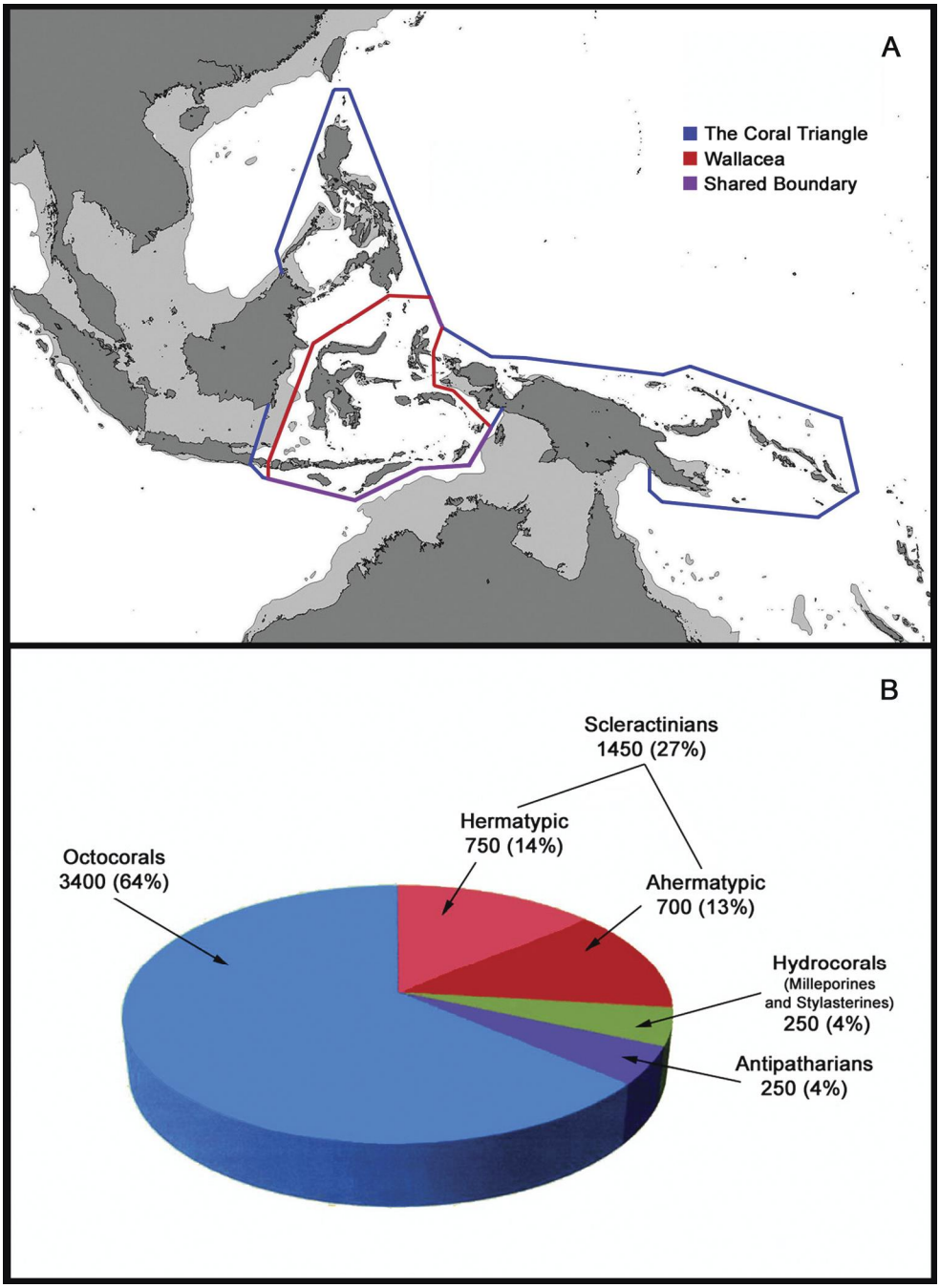

FIGURE 2. A. Map of the tropical western Pacific showing delineation of Wallacea and the Coral Triangle. Boundaries adapted from Conservation International (2010), Hoeksema (2007), and Veron et al. (2009). B. Pie chart showing comparative species diversity of extant corals, estimated 5350 total species of corals worldwide. Adapted from Williams and Cairns, 2013

During his travels in the Malay Archipelago and based largely on his careful observations of bird and mammal distributions, Alfred Russel Wallace (1860) first postulated a biogeographic line defining a faunal discontinuity that "abruptly separates two of the great Zoological regions of the globe." Subsequently, Wallace (1880) perceptively deduced that varying degrees of isolation resulted from profound geological changes in the past. Subsequent biogeographers showed that the nature of ocean depths in the region and former deviations from the present sea levels, were responsible for Wallace's striking demarcation (Quammen 1996). The line which separates Bali from adjacent Lombok in Indonesia, and Sulawesi (The Celebes) from Borneo to its west, was later called "Wallace's Line" by Thomas Henry Huxley (Raby 2001). In the same paragraph Huxley (1868:313) not only names the line after Wallace, but also modifies Wallace's boundary to include the Philippines, "…the boundary in question would coincide with what may be called 'Wallace's line,' between the Indian and the Papuan divisions of the Malay archipelago. But it would run northward as far as the Philippines, and passing between them and Formosa, would trend southward and eastward to the Samoan archipelago" Huxley (1868:294) provides a map to illustrate his alteration.

Our modern concept of the biogeographic region known as "Wallacea" (Conservation International 2010; Beccaloni 2012) does not recognize Huxley's modification, but rather agrees with Wallace's original boundary delineation. Wallacea encompasses a group of islands in "the heart of Indonesia" that are separated by areas of deep water from the Asian and Australian continental shelves (Beccaloni 2012). These islands were thus never connected to either of these continental regions, and are entirely included within the boundary of the coral triangle (Fig. 2A). In 1860, Wallace viewed the zoogeography of the Philippines as somewhat problematic since the archipelago at the same time resembled and differed from either the Asian or Australian regions, but nevertheless, he aligned them as a whole with the Asian region. By 1880, significant additions to the Philippine's fauna had been recorded by various researchers.

Wallace (1880) then reasoned that the peculiarities of isolation of the islands can be explained by the deep seas surrounding the archipelago, but that the archipelago was connected with Borneo by shallow arms of the Asian continental shelf, referred to by him as *two narrow submarine banks*. These represent southwestern extensions of Palawan and the Zamboanga Peninsula of Mindanao. He further deduced that as a consequence, the Philippines were once part of what he called "the great Malayan extension of Asia." He maintained that the Philippines have experienced prolonged isolation in the past and were later fragmented by extensive volcanic activity, which produced his observed faunal peculiarities. Although his observations and conclusions were for the most part based on terrestrial vertebrate distributions, our contemporary tectonic knowledge of ocean floor bathymetry and topography largely verifies his writings of the latter half of the nineteenth century.

CORAL BIODIVERSITY.— An additional consideration to be noted when studying aspects of the world's coral faunas, is the widely varying perception of comparative coral diversity. Contrary to a popular belief assumed by many individuals that all corals are inhabitants and builders of coral reefs, it is currently estimated that hermatypic corals (reef-building corals) represent only about 15% of total coral species diversity, as the majority of corals are non-hermatypic (Fig. 2B). This small percentage is comprised of approximately 14% by hard corals (scleractinians) and perhaps 1% by others including several species of the hydrocoral genus *Millepora*, and two monotypic octocoral genera — *Heliopora* and *Tubipora* (Williams and Cairns 2013).

OCTOCORAL BIOLOGY.— Gorgonians and pennatulaceans are octocorals that have a central axis in the interior of the colony — composed of consolidated sclerites, or hard proteinaceous and/or calcareous material. In addition, unconsolidated skeletal components composed of calcium carbonate in the form of numerous minute sclerites are present in the thin tissues surrounding the

axis (Williams 1992). Sclerites are highly diverse in shape, size, and ornamentation. The comparative microscopic examination of sclerites is necessary for the identification of octocoral taxa.

Zooxanthellae are single-celled dinoflagellates (*Symbiodinium microadriaticum* plus an undetermined number of similar species) that act as the photosynthetic endosymbionts in numerous organisms from various invertebrate groups including corals, sea anemones, sponges, flatworms, mollusks, foraminiferans, and ciliates.

Gorgonians are divided into three groups based on axial structure and composition: scleraxonians (in which the axial structure, the medulla, is composed of sclerites), holaxonians (internal axis composed of scleroproteinacous concentric layers around a hollow core), and calcaxonians (with a solid, largely calcareous axis) (Grasshoff 1999). Pennatulaceans, on the other hand, are a specialized and morphologically distinct group of octocorals with a muscular peduncle for anchoring in unconsolidated benthic substrata (Williams 2011).

Notes On The Current Status of Knowledge.— Bayer (1981:7–9) reviewed the status of knowledge of octocorals in major geographic regions of the world. He proposed four levels of taxonomic knowledge: essentially complete, moderately well-known, poorly known, and minimally known. He assigned the Philippines to the third category, poorly known, "where the literature is sparse and incomplete. Here the major part of the fauna remains to be described and a large number of species will inevitably be new to science. The major faunal relationships can be deduced, but distributional patterns are not clearly understood."

Bayer's assessment is still considered a valid evaluation of the regional situation at present (more than thirty years later). The abbreviation "cf." used between the words of some binomens stands for the Latin word *conferre* (to compare or compare with). It is used for provisional or tentative identifications at the species level, as opposed to definitive or conclusive ones.

Throughout the text of this paper, an unidentified species of a particular genus is denoted by "sp." whereas "spp." refers to more than one species of the genus. Species level identifications in Indo-Pacific octocorals remains largely problematic for several reasons. Many genera require thorough taxonomic revisions before an identification can be made with confidence, a particular species can be considered valid, or the number of valid species can be accurately ascertained. In many genera, a large number of species have been described, some of which may have been described in other genera or are conspecific with other named species, while others have been described in the wrong genus. Confusion in a good deal of the relevant literature persists. Many taxa have been described or illustrated insufficiently or inadequately for positive identification purposes. Also, the type specimens that represent a particular taxon may be unknown or not designated, unobtainable, damaged, lost, or otherwise not suitable for comparative purposes.

The relatively few taxonomic papers treating Philippine octocorals include Light (1913, 1914, 1915a, 1915b, 1915c, 1921), Mai-Bao-Thu and Domantay (1970, 1971), Roxas (1932, 1933a, 1933b), Stiasny (1940, 1941), and Williams and Alderslade (1999).

Materials And Methods

All material used in this study was collected via SCUBA during field operations between 1994 and 2012. The Philippine Archipelago and the Verde Island Passage region are shown in Figs. 1A and 1B. Collecting stations (SCUBA diving sites) of material used in this study from the region of the Calumpan Peninsula and Maricaban Island are shown in Fig. 1C. All material is catalogued and housed in the marine invertebrate collections of the California Academy of Sciences, San Francisco.

Octocoral sclerites were isolated and prepared following standard protocols (Williams and Mattison, 2013). SEM images of sclerites were taken on a LEO 1450VP scanning electron micro-

scope with Everhart-Thornley detector (SE1) under 10kV accelerating voltage and 30 μm aperture size at Optibeam mode. All specimens were sputter-coated with gold/palladium using a Denton Vacuum Desk II sputter coater prior to imaging.

Other abbreviations used in the text are: CASIZ (California Academy of Sciences, Invertebrate Zoology), and WoRMS (World Register of Marine Species). Photographs are by the first author (GCW) unless otherwise indicated. Scanning electron micrographs are by the second author (J-YC).

Key to the shallow-water genera of Gorgonians and Pennatulaceans of the Verde Island Passage

(An asterisk indicates genera that contain some or all zooxanthellate species)

1a. Unbranched octocorals composed of a sterile stalk and a polyp-bearing rachis, imbedded in unconsolidated sediment by a muscular peduncle. Calcified central axis of variable length or absent with varying amounts of proteinaceous material. Sclerites are smooth three-flanged rods, ovals, plates, or needles (pennatulaceans) 2

1b. Mostly branching octocorals, sometimes whiplike, encrusting, or lobate, attached to hard substrata by basal holdfast. Axial material highly variable, composed of a purple medullar zone, consolidated sclerites, hard protein, or predominantly calcareous material. Sclerites are mostly conspicuously tubercated, highly variable in shape (gorgonians). 6

2a. Polyps arise directly from the surface of the rachis 3

2b. Polyps arise from polyp leaves that emanate laterally from the rachis 4

3a. Sclerites are smooth spindles, rods, or ovals, sometimes with bilobed ends . . . . . **Cavernulina*, Figs. 36A, 40A

3b. Sclerites are truncated plates either with smooth, uneven, or denticulated ends . . . . . *Veretillum*, Fig. 37

4a. Polyps united basally to form thin polyp leaves, peduncle slender 5

4b. Polyps are contained on large thick polyp leaves, peduncle thick . . . *Pteroeides*, Figs. 39, 40C

5a. Sclerites absent in rachis and polyp leaves . . . . . **Virgularia*, Fig. 38

5b. Sclerites present in rachis and polyp leaves . . . . . *Scytalium*, Figs. 36B, 40B

6a. Colony form highly variable — membranous and encrusting, knobby to tall lobate, or form masses of tangled hollow branches. Axis not highly developed — composed of two layers, an outer cortex and inner medulla. Medullar sclerites often deep magenta in color . . . . . **Briareum*, Figs. 3, 4

6b. Colony form arborescent, upright and branching, rarely filiform. Axial material composed of consolidated sclerites, hard proteinaceous and/or calcareous material 7

7a. Axial material composed of consolidated sclerites 8

7b. Axial material composed of hard proteinaceous and/or calcareous material 12

8a. Axis segmented, composed of alternating swollen, rounded nodes and straight, elongate internodes. Branching occurs at the nodes. Axial sclerites smooth 9

8b. Axial material uniform throughout, non-segmented 10

9a. Sclerites include capstans often modified as birotulates (double discs) and club-like forms . . . . . *Melithaea*, Figs. 10A, B, 12

9b. Sclerites are mostly spindles, often modified or curved . . . . . *Acabaria*, Figs. 10C, 11

10a. Most branches are hollow, tubular, or openly channeled (interior open to the outside) . . . . . *Solenocaulon*, Figs. 5C, 6

10b. Branches are solid, not hollow 11

11a. Branching is densely reticulated (netlike), forming closed cells . . . . . *Annella*, Figs. 7, 8

11b. Branching is open, dichotomous to lateral . . . . . *Subergorgia*, Figs. 5A, B, 9
12a. Polyps non-retractile, forming hemispherical to cylindrical projections when contracted. Sclerites mostly spindles, often curved, bent, or hockeystick-shaped, arranged en chevron along polyp walls 13
12b. Polyps fully retractile into permanent calyces or form small mounds or short lobes, or retract flush with branch surfaces. Polyp wall sclerites not arranged en chevron 14
13a. Polyps tall cylindrical, perpendicular to branches. Sclerites always colorless. . . . . *Acanthogorgia*, Figs. 13, 14
13b. Polyps low, rounded, hemi-spherical to moundlike. Sclerites often colored . . . . . *Muricella*, Figs. 13, 15
14a. Calyx and surface sclerites are rooted leaves (also called leaf-scales) with broad terminal blades . . . . . *Menella*, Figs. 23, 24, 25B
14b. Rooted leaf (leaf scales) absent. 15
15a. Thornscales present in calyx and/or surface 16
15b. Thornscales absent altogether 19
16a. Thornscales with rootlike or finely tubercated bases 17
16b. Thornscales with deltoid, wing-like extensions on the bases, which are smooth or sparsely tubercated. . . . . *Villogorgia*, Figs. 28, 29
17a. Thornscales with a single long, central spine emanating from a broad rootlike base . . . . . *Echinomuricea*, Figs. 18A, 20
17b. Thornscales with more than one terminal spine 18
18a. Thornscales somewhat thick with broad terminal spines, present in both calyx and colonial surface . . . . . *Echinogorgia*, Figs. 18B, 19
18b. Thornscales are variable in shape, surface sclerites include somewhat robust globular forms that are differentiated between finely tuberculated basal portions, and cobblestone-like or variously thorny upper portions. . . . . *Paraplexaura*, Figs. 25A, 26, 27
19a. Surface sclerites include conspicuous tuberculate spheroids, often ovoid to subspherical in shape . . . . . *Euplexaura*, Figs. 21, 22
19b. Surface sclerites do not include tuberculate spheroids 20
20a. Sclerites are spindles, many long and narrow with pointed ends . . . *Astrogorgia*, Figs. 16, 17
20b. Sclerites are clubs, double heads, or radiates 21
21a. Colonial growth form usually abundantly branched. Contracted polyps retract flush with branch surfaces or less often appear as bumps or low mounds. Surface sclerites are clubs, subsurface sclerites are capstans and/or partly tubercated spindles. Sclerites always colorless. Colony color grey, tan, or brown 22
21b. Colonial growth form variable — copiously branched to sparsely branched or filiform and whiplike. Contracted polyps form mounds or short lobe-like projections. Surface sclerites are double heads or clubs, subsurface sclerites are capstans or waisted spindles. Sclerites often colored. Colony color red, orange, yellow, pink, or white 23
22a. Axis dark brown to black, composed mostly of concentric layers of proteinaceous material (gorgonin), with a narrow hollow core. . . . . **Rumphella*, Figs. 30A, 31A
22b. Axis segmented; elongated, white calcareous internodes with ring-like, dark, proteinaceous nodes; solid, without hollow core . . . . . **Isis*, Figs. 30B, C, 31B
23a. Surface sclerites include clubs 24
23b. Surface sclerites are double heads and waisted spindles 25
24a. Unbranched and whiplike . . . . . **Junceella*, Figs. 34, 35C
24b. Branching dichotomous . . . . . *Dichotella*, Figs. 32B, 35D

25a. Unbranched and whiplike, rarely with two or three terminal branches . . . . . *Viminella*, Figs. 32A, C, 35B
25b. Sparsely to abundantly branched . . . . . *Ellisella*, Figs. 33, 35A

Synopses of the Genera of Pennatulaceans and Gorgonians from the Verde Island Passage

Alcyonacea Lamouroux, 1816
(Gorgonians)
Family Briareidae Gray, 1859

Genus *Briareum* Blainville, 1834

***Briareum* spp.**
Figures 3–4

Material Examined.— CASIZ 180158, Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Point; < 15 m depth, 23 April 2008, coll. G. C. Williams, one specimen wet-preserved 75% ethanol; CASIZ 180159, Philippines, Luzon, Batangas Province, Maricaban Island, Aphol's Rock, 18.3 m depth, 23 Apr 2008, coll. G. C. Williams, 6 colonies wet-preserved 75% ethanol; CASIZ 104004, Philippines, Luzon, Batangas Province, Maricaban Island, Culebra (Bonito), 27 February 1995, coll. G. C. Williams, one wet-preserved specimen 75% ethanol.

Remarks.— Often seen as large mat-like, encrusting masses covering dead coral heads, sometimes knoblike or with finger-like projections (Fig. 3A). The tentacles are usually green to gray in color, narrow and elongate, with significantly-reduced pinnules that are mostly unseen underwater, making the tentacles appear smooth, not pinnate (Fig. 3B).

The basal layer of encrusting colonies is usually a distinct deep purple or magenta in color. Some of the more robust, spindle-like sclerites have more-or-less parallel, transverse rings of conspicuous tubercles (Fig. 4). The outer surface of colonies with retracted polyps may be tan, grey, pink-brown, or most commonly red-purple. In the Indo-West Pacific, *Briareum* is fed upon by the aeolid nudibranch *Phyllodesmium briareum*.

Species.— Eight species are recognized (Appeltans et al. 2013).

The name *Pachyclavularia* is junior synonym of *Briareum* and was previously used in some literature sources for mostly red-purple species of the genus.

Distribution.— Indo-Pacific (East Africa, Red Sea, Northwestern Australia, Great Barrier Reef, New Guinea, Solomon Islands, Indonesia, Malaysia, Philippines, Taiwan, Palau, Palmyra Atoll); Tropical Western Atlantic (Florida, Caribbean Sea).

References.— Fabricius et al. (2007:90); Fabricius and Alderslade (2001); Gosliner, Behrens, and Williams (1996:50); Grasshoff and Bargibant (2001:110–113).

Family Anthothelidae Broch, 1916

Genus *Solenocaulon* Gray, 1862

***Solenocaulon* cf. *rubra* (Kölliker, 1870)**
Figures 5C, 6

Material Examined.— CASIZ 95361; Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Point; <26 m depth; 14 March 1994; coll. G. C. Williams; one specimen wet pre-

served 75% ethanol; CASIZ 103904, Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Point, 36.6 m depth, 24 Feb 1995, coll. G. C. Williams, 1 whole colony wet-preserved 75% ethanol.

Remarks.— In this species that is frequently found on coral reefs of the Batangas region, branching is in one plane. The terminal parts of the branches are spatulate and fistulose, whereas the main stem and basal parts of the branches are mostly solid.

The exterior surface of the colonies is usually red-orange to red-brown, while the colony interior is pure white.

Species.— Eleven species are recognized (Appeltans et al. 2013).

Distribution.— Indo-West Pacific (East Africa, Persian Gulf, Madagascar, Maldives, Taiwan, Philippines, Indonesia, New Guinea, Solomon Islands, Northwestern Australia, Great Barrier Reef, Palau).

References.— Fabricius et al. (2007:91); Fabricius and Alderslade (2001); Gosliner, Behrens, and Williams (1996:50, as *Semperina*); Grasshoff and Bargibant (2001:106–109).

Family Subergorgiidae Gray, 1859

Genus *Annella* Gray, 1858

***Annella reticulata* (Ellis and Solander, 1786) and *Annella mollis* (Nutting, 1910)**
Figures 7–8

Material Examined.— CASIZ 185458; Philippines, Luzon Island: Batangas Province, Murals (GPS coordinates 13.69927°N, 120.8824°E); <31 m depth; 13 May 2011; coll. G. C. Williams; one whole colony wet-preserved 95% ethanol.

Remarks.— Species in the genus *Annella* are unlike other Indo-Pacific gorgonians in that the colonies have a net-like appearance — they are conspicuously reticulated due to numerous anastomosing branches.

At least two species of a pygmy sea horse (family Syngnathidae), which are generally < 20 mm in height, are known to inhabit the branches of two genera of gorgonians found in the Coral Triangle — *Hippocampus denise* Lourie and Randall, 2003, has been encountered on *Annella mollis* and *A. reticulata*, while *H. bargibanti* is associated with *Muricella* spp. (family Acanthogorgiidae) (Reijnen et al. 2011:5).

Species.— Two species of *Annella*, *A. mollis* and *A. reticulata*, are known to occur in the Philippines — *A. reticulata* has finer, more gracile branches, larger closed cells or spaces between the surrounding branches, and colonies usually less than 0.3 m in height. *Annella mollis*, on the other hand, has thicker, more robust, branches, narrower spaces between the surrounding branches, and colonies up to 1.5 m tall (Figs. 7A and 7B).

Distribution.— The genus has an Indo-West Pacific distribution — East Africa to the Eastern Indian Ocean (Keeling Island); Western and Central Pacific (Okinawa, Great Barrier Reef, Indonesia, Philippines, New Guinea, Solomon Islands, New Caledonia, Palau, Marshall Islands).

References.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:51, as *Subergorgia mollis*); Grasshoff and Bargibant (2001:72–79); Appeltans et al. (2013).

Genus *Subergorgia* Gray, 1857

***Subergorgia suberosa* (Pallas, 1766)**
Figures 5A, 5B, 9

Material Examined.— CASIZ 104074, Philippines, Luzon, Batangas Province, Maricaban

Island, Devil's Point, 6–21 m depth, 23 Feb 1995, coll. G. C. Williams, 1 whole colony wet-preserved 75% ethanol; CASIZ 103912; Philippines, Luzon, Nasugbu, Pinnacle Rock; 7 m depth; 04 March 1995; coll. G. C. Williams; two specimens wet-preserved 75% ethanol.

REMARKS.— Branches are often somewhat flattened with a longitudinal line or furrow running along both sides of the branches. *Subergorgia appressa* (Nutting, 1911) and *S. pulchra* (Nutting, 1911) are junior synonyms of *S. suberosa*.

SPECIES.— Ten species of the genus *Subergorgia* are recognized and listed (Appeltans et al. 2013).

DISTRIBUTION.— The genus has an Indo-West Pacific distribution (Zanzibar, Madagascar, Mauritius, Sri Lanka, Great Barrier Reef, Malaysia, Indonesia, Philippines, China, Taiwan, Japan, Palau, New Guinea, Solomon Islands, New Caledonia).

REFERENCES.— Fabricius et al. (2007:91); Gosliner, Behrens and Williams (1996:51); Grasshoff and Bargibant (2001:68–72).

Family Melithaeidae Gray, 1870

Genus *Acabaria* Gray, 1859

***Acabaria* spp.**
Figures 10C, 11

MATERIAL EXAMINED.— CASIZ 186644, Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Point, 29.6 m depth, 20 May 2011, coll. G. C. Williams, one whole colony wet-preserved 95% ethanol.

REMARKS.— The family Melithaeidae contains five currently recognized genera (*Acabaria*, *Clathraria*, *Melithaea*, *Mopsella*, and *Wrightella*), which are not easily distinguished morphologically (Fabricius and Alderslade 2001). If a future revision shows that only one genus in the family is valid, then *Melithaea* would have priority as the first described genus (Reijnen et al. 2013). Currently, the species that have been assigned to *Acabaria* are highly variable with regard to sclerite form. Included here are spindles, as well as various foliate forms such as leafy spindles, clubs, and spheroids. A remarkable amount of color variation can also be seen in species of *Acabaria*, including those found in the Philippines. Many are brightly colored — yellow, red, violet, white, or tan-brown are commonly encountered colors that are observed in the various species. Individual colonies may even be bicolored.

SPECIES.— Forty-seven species are recognized (Appeltans et al. 2013).

DISTRIBUTION.— The genus is broadly distributed in the Indo-Pacific (East Africa to Hawaii).

REFERENCES.— Fabricius et al. (2007:91); Fabricius and Alderslade (2001); Gosliner, Behrens and Williams (1996:52). Grasshoff and Bargibant (2001:90–97); Williams (1993:50–51).

Genus *Melithaea* Milne Edwards and Haime, 1857

Melithaea sp.
Figures 10A, 12

MATERIAL EXAMINED.— CASIZ 103805, Philippines, Luzon, Batangas Province, Maricaban Island, Bonito Island, 16.8 m depth, 27 February 1995, coll. G. C. Williams, one whole colony wet-preserved 75% ethanol.

REMARKS.— Species of *Melithaea* can form large fans and often attain a height of over one meter in localities with strong currents where abundant food is available. The nodes often produce

exaggerated swollen areas along the thicker branches. Sclerite complements include clubs with rounded or knbby heads, spindles, foliate spheroids, and birotulates. Color most commonly includes red, orange, or yellow.

SPECIES.— Thirty-one recognized species (Appeltans et al. 2013).

DISTRIBUTION.— Many parts of the Indo-Pacific from East Africa to Japan, Palau, Fiji, and New Caledonia.

REFERENCES.— Fabricius et al. (2007:91); Fabricius and Alderslade (2001:172); Gosliner, Behrens and Williams (1996:53); Grasshoff and Bargibant (2001:82–89).

Family Acanthogorgiidae Gray, 1859

Genus *Acanthogorgia* Gray, 1857

***Acanthogorgia* sp.**

Figures 13–14

MATERIAL EXAMINED.— CASIZ 180180, Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Wall, 21.3 m depth, 19 Apr 2008, coll. G. C. Williams, 1 whole colony wet-preserved 75% ethanol.

REMARKS.— The polyps are contractile but not retractile and are covered with elongate often curved spindles with numerous small tubercles. The polyps are tubular or cylindrical in shape and are situated perpendicular to the branches. Colonies are often brightly-colored, commonly yellow, orange, or red to pink or purple.

SPECIES.— Sixty-four nominal species (Appeltans et al. 2013).

DISTRIBUTION.— Many species are known from colder or deeper regions of all world seas except the Arctic Ocean. In addition, shallow-water species of the tropical Indo-Pacific are known from the Red Sea, Malaysia, Australian Great Barrier Reef, Philippines, Taiwan, Palau, Japan, Indonesia, Papua New Guinea, Solomon Islands, and New Caledonia.

Whether these two groups belong to the same genus or not is yet to be determined.

REFERENCES.— Fabricius et al. (2007:91); Fabricius and Alderslade (2001:184); Gosliner, Behrens, and Williams (1996:53, as *Acalycigorgia*); Grasshoff and Bargibant (2001:131–144); Williams (1992:208).

Genus *Muricella* Verrill, 1869

***Muricella* sp.**

Figures 13, 15

MATERIAL EXAMINED.— CASIZ 109526, Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Wall, 9–25 m depth, 20 April 1997, coll. G. C. Williams, 1 whole colony wet-preserved 75% ethanol.

REMARKS.— The polyps are contractile but not retractile and are covered with robust or blunt spindles with prominent tubercles. The polyps are usually rounded or hemispherical and appear as numerous bumps along the branches. Colonies are commonly pink to magenta, but brown, yellow or white have also been recorded. The pygmy sea horse *Hippocampus bargibanti*, is reported to be associated with perhaps three species of *Muricella* in the Indo-West Pacific (Reijnen et al. 2011:5), including at least one species in the Philippines (Fig. 13B).

SPECIES.— Thirty-five species recorded (Appeltans et al. 2013).

DISTRIBUTION.— Indo-West Pacific, Indian Ocean to throughout much the western Pacific.

REFERENCES.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:54); Grasshoff and Bargibant (2001:148–153).

Family Plexauridae Gray, 1859

Genus *Astrogorgia* Verrill, 1868

***Astrogorgia* spp.**
Figures 16–17

MATERIAL EXAMINED.— CASIZ 168899, Philippines, Calamian Group, Busuanga Island, Coral Gardens Reef (11.98550°N, 120.07668°E), 14 m depth, 24 February 2010, coll. G. C. Williams, several partial colonies wet-preserved 95% ethanol; CASIZ 185465, Philippines, Luzon, Batangas Province, Maricaban Island, Bonito Island, 31.1 m depth, 16 May 2011, coll. G. C. Williams, 1 whole colony wet-preserved 95% ethanol; CASIZ 190428, Philippines, Kuzon, Batangas Province, Maricaban Isalnd, Devil's Point, 15 m depth, 18 November 2012, coll. G. C. Williams, one partial colony wet-preserved 95% ethanol.

REMARKS.— The branches are somewhat flattened with polyps usually placed oppositely in two longitudinal rows.

The polyps are retractile into mound-like or cylindrical calyces. The prominent sclerites are robust spindles ornamented sparsely with mostly small tubercles. The color of the colonies is often red, magenta or purple, but orange, yellow, cream or tan are also recorded.

SPECIES.— Fifteen species are recognized (Appeltans et al. 2013). However, confusion in the literature regarding the definition of the genus has led to many taxa described in different genera, thereby making an actual determination difficult regarding the total number of species in the genus.

DISTRIBUTION.— Widely distributed in the Indo-Pacific: the Red Sea and western Indian Ocean to as far to the east as Tuvalu in the central Pacific.

REFERENCES.— Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:164–175).

Genus *Echinogorgia* Kölliker, 1865

***Echinogorgia* sp.**
Figures 18B, 19

MATERIAL EXAMINED.— CASIZ 109537; Philippines, Luzon, Batangas Province, Caban Island, Kirby's Rock; < 31 depth; 22 April 1997; coll. G. C. Williams.

REMARKS.— Branching is planar and mostly lateral. Some branches may anastomose, but colonies only rarely form net-like fans. Branches are often thick and rounded at the terminal ends. The colonies do not harbor zooxanthellae. The color of colonies is often vivid red or orange, but can vary from brown to white or yellow; or they can also be bicolored. The polyps are completely retractile and often form conspicuous, mound-like or spiny calyces. This often gives the surface of the colonies a somewhat rough-to-the-touch texture. Characteristic sclerites of the calyces are thornscales with tuberculated root-like bases and usually three (or sometimes more) thorn-like projections at the opposite end.

SPECIES.— Thirty-six species are recognized (Appeltans et al. 2013), although a substantial amount of confusion appears in the literature regarding the differentiation of this genus with others such as *Menella*, *Paraplexaura*, and *Echinomuricea*.

DISTRIBUTION.— Widespread in the Indo-West Pacific: Madagascar, Red Sea, India, Sri Lanka, Thailand, Singapore, Taiwan, Australia, Indonesia, Philippines, New Guinea, New Caledonia, and Palau.

REFERENCES.— Fabricius and Alderslade (2001:202–205); Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:187–190).

Genus *Echinomuricea* Verrill, 1869

***Echinomuricea* sp.**
Figures 18A, 20

Material Examined.— CASIZ 185452, Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Point; < 29 m depth; 17 May 2011; coll. G. C. Williams; one partial specimen wet-preserved 95% ethanol.

Remarks.— Terminal branches are elongate and curved. Colonies have a rough or coarse surface texture to the touch.

The calyces contain easily distinguishable sclerites known as thornscales or thornstars. Many of these have a broad, root-like base that gives rise to a single, projecting, strong spine that is straight and sharply tapered, smooth to slightly toothed on the margins.

The colonies do not harbor zooxanthellae. Overall color is often dark red or orange, but can vary from dark purplish brown to white or yellow; some colonies can also be bicolored.

Species.— Twenty-seven species are recognized (Appeltans et al. 2013).

Distribution.— Indo-West Pacific: South Africa, Madagascar, Red Sea, India, Sri Lanka, Thailand, Singapore, Taiwan, Australia, Indonesia, Philippines, New Guinea, New Caledonia, and Palau.

References.— Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:178–181); Williams (1992:209).

Genus *Euplexaura* Verrill, 1869

***Euplexaura* sp.**
Figures 21–22

Material Examined.— CASIZ 109598; Philippines, Luzon, Batangas Province, Ligpo Island, north end at wall; 27–29 m depth; 23 April 1997; coll. G. C. Williams; CASIZ 180166, Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Point, 15.2 m depth, 23 Apr 2008, coll. G. C. Williams, 2 whole colonies wet-preserved 75% ethanol.

Remarks.— Colonies grow as fans that branch in one plane. The main branches are relatively thick. The terminal branches are short and rounded to slightly swollen at the ends. The diagnostic sclerites are robust ovoid to elliptical or spheroidal spindles, highly ornamented with large knob-shaped tubercles.

Species.— Thirty-six species are currently recognized (Appeltans et al. 2013).

Distribution.— Indo-West Pacific: South Africa to the western Pacific.

References.— Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:158–163); Williams (1992:209).

Genus *Menella* Gray, 1870

***Menella* spp.**
Figures 23–24

Material Examined.— CASIZ 109578; Philippines, Luzon, Batangas Province, Caban Island, Kirby's Rock; 6–33 m depth; 22 April 1997; coll. G. C. Williams, two colonies wet-preserved 75% ethanol; CASIZ 180197; Philippines, Luzon, Maricaban Island, Devil's Point; 24 m depth; 19 April 2008; coll. G. C. Williams, one partial colony; CASIZ 185448, Philippines, Luzon; Batangas Province, Calumpan Peninsula, Murals; 31 m depth;13 May 2011; coll. G. C. Williams, one partial colony wet preserved 95% ethanol; CASIZ 187764, Philippines, Luzon, Batangas Province, Balayan Bay, Ligpo Island, north of Ligpo Dive Site; depth not recorded; 02 May 2011; coll. R. Van Syoc, one partial colony wet-preserved 95% ethanol.

REMARKS.— Branching of the colonies is mostly lateral. Some colonies may have overlapping branches that anastomose to a limited degree, but the colonies are not netlike, and do not form intricate networks. The characteristic sclerite of the calyces is a rooted leaf. Colonies do not harbor zooxanthellae and can vary in color from yellow, orange to dull brown, red, or purple.

SPECIES.— Several other gorgonian genera may have a similar growth form and share a superficial resemblance to species of *Menella*. Included here are *Bebryce*, *Euplexaura*, *Echinogorgia*, *Echinomuricea*, and *Paraplexaura*. Only by the determination of sclerites that are shield-like rooted leaves (often shaped like table tennis rackets), can specimens be positively identified as belonging to the genus *Menella*. Twenty-four species are recognized and listed (Appeltans et al. 2013).

DISTRIBUTION.— Indo-West Pacific: South Africa , Red Sea, Madagascar, Mauritius, Bay of Bengal, Singapore, Malaysia, Indonesia, the Philippines, Papua New Guinea, Australia, and New Caledonia.

REFERENCES.— Fabricius and Alderslade (2001:206–207); Fabricius et al. (2007:91); Gosliner, Behrens and Williams (1996:54, as *Echinogorgia*, *Menella*); Grasshoff and Bargibant (2001: 191–194); Williams (1992:210); Williams (1993:51–53, as *Echinogorgia*).

Genus *Paraplexaura* Kükenthal, 1909

***Paraplexaura* sp.**
Figures 25A, 26–27

MATERIAL EXAMINED.— CASIZ 103947; Philippines, Luzon, Batangas Province, Nasugbu, Pinnacle Rock; 7.6 m depth; 01 April 1995; coll. G. C. Williams; CAS 190431; Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Point; 15 m depth; 18 November 2012; coll. G. C. Williams; CAS 185451; Philippines, Luzon, Batangas Province, Calumpan Peninsula, Murals; < 31 m depth; 13 May 2011; coll. G. C. Williams.

REMARKS.— Lateral branches curve upward strongly and often appear mostly parallel to the main branches.

The branches are often thick with conspicuously-rounded ends. The polyps are completely retractile and often appear flush with the surface of the branches. Many of the characteristic sclerites have a complex structure that are intricately and finely-tuberculated on one end with several elongate thorn-like projections on the opposite end. Color of the colonies is usually red or rust-orange to tan-brown.

SPECIES.— Two species are currently recognized (Appeltans et al. 2013), but due to uncertainly regarding the definition of the species as evident in some literature sources, it is uncertain as to the actual number of valid species.

DISTRIBUTION.— Indo-West Pacific: from the Red Sea to islands of the western Pacific.

REFERENCES.— Fabricius and Alderslade (2001:208–209).

Genus *Villogorgia* Duchassaing and Michelotti, 1860

***Villogorgia* sp.**
Figures 28–29

MATERIAL EXAMINED.— CASIZ 111773, Philippines, Luzon, Batangas Province, Balayan Bay, Ligpo Island, 27–29 m depth, 23 Apr 1997, coll. G. C. Williams, three whole colonies wet-preserved 75% ethanol.

REMARKS.— The colonies are copiously-branched sea fans with numerous, relatively thin, closely adjacent branches. The polyps retract into small mound-like or cylindrical calyces. The diagnostic sclerites are thornscales with usually two prominent wing-like lateral projections that

are usually deltoid or narrowly triangular in shape. Colony color is variable: deep red, orange to brown, or yellow.

SPECIES.— Thirty-nine species are recognized (Appeltans et al. 2013), two of these have been described from the western Atlantic.

DISTRIBUTION.— Widespread in the Indo-West Pacific: western Indian Ocean to New Caledonia.

REFERENCES.— Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:198–204).

Family Gorgoniidae Lamouroux, 1812

Genus *Rumphella* Bayer, 1955

***Rumphella* cf. *aggregata* (Nutting, 1910)**
Figures 30A, 31A

MATERIAL EXAMINED.— CASIZ 180896, Philippines, Sibuyan Sea, Romblon Province, Cobrador Island, 21.9 m depth, 20 Feb 2010, coll. G. C. Williams, 1 whole colony wet-preserved 95% ethanol; CASIZ 186635, Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Point, 15 May 2011, coll. G. C. Williams, two partial colonies wet-preserved 95% ethanol.

REMARKS.— Zooxanthellate coral reef gorgonians, usually grey to tan or yellow-brown in color, with alcohol-soluble chlorophyll pigments in wet-preserved material. Branches are thick with rounded ends. Retracted polyps leave conspicuous polyp openings on the branches. Characteristic sclerites are broadly-flaring clubs with a terminal appendage and a sub-terminal whorl of three large tuberculated appendages. *Rumphella aggregata* is known from the Moluccas and other parts of Indonesia and the Philippines, while *Rumphella antipathes* (Linnaeus, 1758) was originally described from the Malaysian Peninsula. Colonies of *Rumphella* are known to harbor four species of parasitic copepods in three genera, *Acanthomolgus*, *Doridicola*, and *Enalcyonium* (Ofwegen 2013).

SPECIES.— Three species of the genus are recognized (Appeltans et al. 2013).

DISTRIBUTION.— The genus has an Indo-West Pacific distribution: South Africa, the Red Sea, Malaysia, Indonesia, Philippines, Palau, New Guinea, Solomon Islands, New Caledonia.

REFERENCES.— Fabricius and Alderslade (2001:214–215); Fabricius et al. (2007:91); Goslliner, Behrens, and Williams (1996:54); Grasshoff and Bargibant (2001:120–122); Williams (1992:250); Williams (1993:55–57).

Family Ellisellidae Gray, 1859

Genus *Dichotella* Gray, 1870

***Dichotella gemmacea* (Milne Edwards and Haime, 1857)**
Figures 32B, 35D

MATERIAL EXAMINED.— CASIZ 186642, Philippines, Luzon, Batangas Province, Calumpan Peninsula, Murals (13.69927°N, 120.88244°E), 13 May 2011, coll. G. C. Williams, one partial colony wet-preserved 95% ethanol; CASIZ 103948, Philippines, Luzon, Batangas Province, Maricaban Island, Bethlehem, 20.7 m depth, 26 Feb 1995, coll. G. C. Williams, two whole colonies wet-preserved 75% ethanol.

REMARKS.— Conspicuously dichotomously-branched gorgonians, usually less than 0.5 m in height, rarely up to a one meter tall. Some sclerites are clubs with congested clustered of smooth rounded tubercles at the widest end, while other sclerites are waisted spindles. Colonies are usually bright red or orange in color, but sometimes yellow, yellow-brown, or white.

SPECIES.— Only one species is considered valid.

DISTRIBUTION.— Eastern Indian Ocean and western Pacific to New Caledonia.

REFERENCES.— Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:232–233).

Genus *Ellisella* Gray, 1858

***Ellisella* ssp.**

Figures 33, 35

MATERIAL EXAMINED.— CASIZ 185472, Philippines, Luzon, Batangas Province, Calumpan Peninsula, Dead Palm dive site (13.69569°N, 120.88472°E), 25 May 2011, coll. G. C. Williams, several partial specimens wet-preserved 95% ethanol; CASIZ 095385, Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Point, 26.5 m depth, 14 Mar 1994, coll. G. C. Williams, 1 whole colony wet-preserved 75% ethanol.

REMARKS.— Colonies under one meter in height. Branching is dichotomous and the end branches are often long, slender, and whip-like. Polyps are contractile but not retractile. Polyps form numerous mounds or lobe-like projections along the branches. Sclerites are waisted spindles and double heads with large rounded knob-like tubercles. Color of colonies mostly red to orange, but also can be pink, white, or bicolored.

SPECIES.— Forty-one species are recognized but actual number of species that are considered valid is not known (Appeltans et al. 2013).

DISTRIBUTION.— Circumglobal distribution in both tropical and warm temperate waters: Indo-West Pacific and Atlantic as well as the Mediterranean Sea.

REFERENCES.— Fabricius et al. (2007:91); Fabricius and Alderslade (2001:224–225); Gosliner, Behrens and Williams (1996:55, as *Ctenocella*, *Ellisella*), Grasshoff and Bargibant (2001:240–255).

Genus *Junceella* Valenciennes, 1855

***Junceella fragilis* (Ridley, 1884)**

Figures 34, 35C

MATERIAL EXAMINED.— CASIZ 180160, Philippines, Luzon, Batangas Province, Maricaban Island, Aphol's Rock, 23 April 2008, coll. G. C. Williams, one whole specimen wet-preserved 75% ethanol; CASIZ 103838, Philippines, Mindoro, Medio Island, NW Passage of Puerta Galera, 6–19 m depth, 28 Feb 1995, coll. G. C. Williams, one whole colony wet-preserved 75% ethanol.

REMARKS.— Colonies unbranched, whiplike, filiform, and threadlike, or sometimes thicker and more robust, up to two meters in height. The polyps of this species contain numerous brown cells of zooxanthllae, unlike other species of the genus which apparently are azooxanthellate (Williams et al. 2010). Numerous colonies that are in close proximity sometimes form undersea clusters or fields of sea whips, appearing like aggregations of garden eels (Fig. 34C).

SPECIES.— Nine recognized species (Appeltans et al. 2013).

DISTRIBUTION.— Widespread Indo-Pacific distribution: the Red Sea and South Africa to Micronesia and New Caledonia.

REFERENCES.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:55); Grasshoff and Bargibant (2001:226–231); Williams (1992:251); Williams (1993:57–58); Williams, et al. (2010).

Genus *Viminella* Gray, 1870

***Viminella* sp.**
Figures 32A, C, 35B

Material Examined.— CASIZ 103820, Philippines, Luzon, Batangas Province, Maricaban Island, Devil's Rock, 6 m depth, 23 February 1995, coll. G. C. Williams, one whole colony wet-preserved 75% ethanol; CASIZ 104027, Philippines, Luzon, Batangas Province, Maricaban Island, Gamao Point, 22 m depth, 27 February 1995, coll. G. C. Williams, one whole colony wet-preserved 75% ethanol; CASIZ 185478, Philippines, Luzon, Batangas Province, Murals, 31.1 m depth, 13 May 2011, coll. G. C. Williams, 1 whole colony wet-preserved 95% ethanol.

Remarks.— Sea whips up to two meters tall. Colonies are mostly unbranched, but colonies with two or three terminal branches are occasionally encountered. Sclerites are either double heads or waisted spindles. Colony color is variable: red, orange, yellow, white, pink, or bicolored.

Species.— Fifteen species are listed (Appeltans et al. 2013).

Distribution.— Widespread with a circumglobal distribution: Indo-Pacific, Atlantic, and Mediterranean Sea.

References.— Fabricius et al. (2007:91); Grasshoff and Bargibant (2001:236–240).

Family Isididae Lamouroux, 1812

Genus *Isis* Linneaus, 1758

***Isis hippuris* Linnaeus, 1758**
Figures 30B–C, 31B

Material Examined.— CASIZ 192749, Philippines, Sibuyan Sea, Romblon Province, Cobrador Island, 21.9 m depth, 20 Feb 2010, coll. G. C. Williams, 1 whole colony wet-preserved 95% ethanol.

Remarks.— Zooxanthellate coral reef gorgonians, yellow to green or brown in color, with alcohol-soluble chlorophyll pigments in wet-preserved material. The axis is conspicuously segmented with alternating dark proteinaceous nodes and white calcareous internodes. Characteristic sclerites are broadly-flaring clubs without a terminal medial appendage, but with a terminal whorl or crown composed of large tuberculated appendages. Living colonies superficially resemble those of the genus *Rumphella* as well as some species of *Euplexaura*.This species is often encountered in areas of quiet water such as lagoons that are protected from high energy wave action.

Species.— Eight species are described, but only one is currently recognized as valid (Appeltans et al. 2013).

Distribution.— Indo-West Pacific: western Indian Ocean to Taiwan and Palau.

References.— Fabricius et al. (2007:91); Fabricius and Alderslade (2001:248–249).

Pennatulacea Verrill, 1865

Family Veretillidae Herklots, 1858

Genus *Veretillum* Cuvier, 1798

***Veretillum* spp.**
Figure 37

Material Examined.— CASIZ 186636, Philippines, Luzon, Batangas Province, Calumpan Peninsula, Dead Palm South (13.694°N, 120.884°E), 13 May 2011, coll. G. C. Williams, one whole colony wet-preserved 95% ethanol.

REMARKS.— Sol Felty Light — the author of the first edition of what was later to become known as *Light's Manual* (Light 1941) — as a young professor at the University of the Philippines during the World War I period, published widely on the Octocorallia of the region in six papers (Light, 1913–1921). In one of these papers (Light 1921), he described four new species of the sea pen genus *Lituaria*, which appear to be more correctly placed in the genus *Veretillum*, due to the possession of numerous, minute, otolith-like sclerites in the peduncular interior (Williams, 1995:98).

Light's type material, collected from Puerto Galera on the north coast of Mindoro, is cited as being housed in the "zoological collection, College of Liberal Arts, University of the Philippines." Light (1921:253; in reference to *Lituaria breve*), states, "This species, like the others described in this paper, was described some time ago. Since then, unfortunately, the type specimens have been misplaced. In view of the very distinct characters of the species, however, I have considered it permissible to publish the description, in spite of the loss, temporary it is to be hoped, of the type specimens."

Whether these specimens were ever located is not known, but a subsequent story possibly relates to the disappearance of Light's types. The first author and T. M. Gosliner visited the marine collections of the Marine Science Institute of the University of the Philippines in March of 1994 to look for the types and were told by a collections staff member that they were possibly destroyed in a 1970's student rebellion, when several alcohol-filled jars from the collections were taken from the collection shelves and used as Molotov cocktails in street demonstrations.

Colonies of the genus are cylindrical and sausage-shaped, sometimes slightly club-shaped, up to 200 mm in length. Polyps are distributed all around the rachis and are retractile, not forming calyces. The sclerites of the rachis are either variably-shaped plates or absent altogether. Species of *Veretillum* in the region of the Verde Island Passage have been observed only during night dives.

SPECIES.— Eighteen species have been described, of which perhaps seven may be valid (Williams 1995:105).

DISTRIBUTION.— Indo-West Pacific, eastern Atlantic, and the Mediterranean Sea.

REFERENCES.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:56–58); Williams (2011:3, 6, 9).

Genus *Cavernulina* Kükenthal and Broch, 1911

Cavernulina cf. *cylindrica* Kükenthal and Broch, 1911

Figures 36A, 40A

MATERIAL EXAMINED.— CASIZ 186569; Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Point (13.69°N, 120.83°E); 25 May 2011; coll. Peri Paleracio; one entire specimen wet-preserved 95% ethanol.

REMARKS.— Colonies are cylindrical to somewhat club-shaped. Sclerites of the rachis are rods that commonly have branched or bilobed ends. The polyps do not contain sclerites. The one species of *Cavernulina* that is known in the Verde Island Passage region is diurnal — the polyps are brown due to the presence of zooxanthellae.

SPECIES.— Four species are considered valid (Williams 1995:103).

DISTRIBUTION.— Indo-West Pacific (southeastern Africa to the Ryukyu Islands and New Caledonia) and the eastern Pacific (Baja California to Ecuador and the Galápagos Islands).

REFERENCES.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:56); Williams (1993:59–60); Williams (2011:3, 6, 9).

Family Virgulariidae Verrill, 1868

Genus *Scytalium* Herklots, 1858

***Scytalium* cf. *sarsi* Herklots, 1858**
Figures 36B, 40B

Material Examined.— CASIZ 185443, Philippines, Luzon, Batangas Province, Calumpan Peninsula, Maricaban Strait, Basketball dive site (13.68594°N, 120. 89172°E), 14 May 2011, coll. G. C. Williams, one specimen wet-preserved 95% ethanol.

Remarks.— Colonies in life often take on the appearance of dark red to violet-colored feathers. The sclerites are abundant, oval-shaped plates (< 0.05 mm in length) throughout most of the near-surface tissues of the colonies. Members of two of the fifteen families of pennatulaceans (Virgulariidae and Pennatulidae) give the group its names due to their resemblance to feathers or feather pens.

This appearance is provided by the presence of conspicuous polyp leaves in two longitudinal rows that emanate from the lateral margins of the rachis.

Species.— Six species have been described, of which perhaps only two or three are valid (Williams, 1995:124).

Distribution.— Indo-West Pacific: the Red Sea and southeastern Africa to Indonesia, the Philippines, Taiwan, China, and Japan.

References.— Gosliner, Behrens, and Williams (1996:58); Williams (2011:3, 6, 9).

Genus *Virgularia* Lamarck, 1816

***Virgularia* spp.**
Figure 38

Material Examined.— CASIZ 180146, Philippines, Luzon, Batangas Province, Calumpan Peninsula, Batangas Bay, Mainit Bubbles dive site (13.7615972°N, 121.3834889°E), 19 m depth, 22 April 2018, coll. G. C. Williams, one whole specimen wet-preserved 75% ethanol.

Remarks.— Colonies have a conspicuous feather-like appearance in life. Sclerites are absent throughout the tissues of the colonies except for minute oval bodies (< 0.01 mm in length) that are present in the interior of the peduncles. Color is variable: cream white or milky white with semi-transparent polyp leaves, to brown, red, violet, or multicolored.

Species.— Fifty-six species are described, of which twenty-one are currently recognized (Williams 1995:125); WoRMS 2013).

Distribution.— The distribution of the genus is circumglobal: throughout the Pacific and Indian Oceans, as well as the Atlantic Ocean including the Mediterranean Sea.

References.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:58–59); Williams (2011:3, 6, 9).

Family Pennatulidae Ehrenberg, 1834

Genus *Pteroeides* Herklots, 1858

***Pteroeides* spp.**
Figures 39, 40C

Material Examined.— CASIZ 190421, Philippines, Luzon, Batangas Province, Calumpan Peninsula, Batangas Bay, Mainit Bubbles, 19 m depth, 17 November 2012, coll. G. C. Williams, one whole specimen wet-preserved 95% ethanol; CASIZ 185934, Philippines, Luzon, Batangas Province, Maricaban Island, Sepok Point (13.688°N, 120.827°E), 15 May 2011, coll. G. C.

Williams, one whole specimen wet-preserved 95% ethanol; CASIZ 179462, Philippines, Luzon, Batangas Province, Maricaban Island, Sepoc Point, 25 May 2011, 18 m depth, coll. Joseph Comendador, one whole colony wet-preserved 95% ethanol.

Remarks.— Many species of *Pteroeides* have been described from Indonesia and the Philippines, but unfortunately, many of these are poorly described or insufficiently illustrated, and type material for comparative study is often not obtainable.

The genus is in need of revision before most Indo-Pacific species can be confidently identified or the number of valid species in the genus can be ascertained. More original descriptions of species of *Pteroeides* appear in the literature than any other pennatulacean genus.

Species.— Thirty-one species are currently recognized (Appeltans et al. 2013).

Distribution.— The genus is circumglobal: Indian, Pacific, and Atlantic Oceans, as well as the Mediterranean Sea.

References.— Fabricius et al. (2007:91); Gosliner, Behrens, and Williams (1996:59–60); Williams (1995:130); Williams (2011:3, 6, 9).

Discussion and Conclusion

Somewhat differing species compositions, as encountered in various island groups of the Philippine Archipelago, are evident in a complex geographic region of over 7000 islands spread over approximately 15° of north latitude in the Indo-Pacific tropics. The additive effects of these differing faunal components result in a complex mosaic of overall high diversity in the archipelago, and no doubt is a major contributing factor to the recognition of the region as having certainly one of the highest levels of marine biodiversity in the world.

In the late 1980s and 1990s, the concept of the Coral Triangle of high marine biodiversity came about through the efforts of various scientists working largely independently in Papua New Guinea, Indonesia, and the Philippines. The three points of the Coral Triangle came to be defined as the northern tip of the Philippines, the eastern end of New Guinea, and Indonesia between the islands of Java and Bali. Subsequently, a team of scientists and conservationists declared the Philippine Archipelago to be the center of global marine biodiversity and the Verde Island Passage as the center of the center (or epicenter of marine biodiversity) based on the diversity of shorefishes (Carpenter and Springer 2005). In addition, the Bismarck Archipelago and the Solomon Islands were later included as extensions of the Coral Triangle based on zooxanthellate coral diversity (Veron et al. 2009).

Accumulative field observations since the early 1990s by invertebrate zoologists from the California Academy of Sciences, have revealed that the Verde Island Passage shows remarkably high levels of diversity in both opisthobranch mollusks and octocoral cnidarians (T. M. Gosliner and G. C. Williams, pers. comm.).

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LITERATURE CITED

APPELTANS, WARD, ET AL. 2013. World Register of Marine Organisms, WoRMS Taxon Search. *<http://www.marinespecies.org/aphia.php?p=search>*. Cited 12 November 2013.

BAYER, FREDERICK M. 1981. Status of knowledge of octocorals of the world seas. *Seminários de Biologia Marinha. Academia Brasileira de Ciências* :3–102.

BECCALONI, GEORGE, ED. 2012. Another important Wallace anniversary approaches! *In* The Alfred Russel Wallace Website *<http://wallacefund.info/another-important-wallace-anniversary-approaches>*. Cited 27 March 2013.

CAIRNS, STEPHEN D., AND MARCELO V. KITAHARA. 2012. An illustrated key to the genera and subgenera of the Recent azooxanthellate Scleractinia (Cnidaria, Anthozoa), with an attached glossary. *ZooKeys* (227):1–47.

CARPENTER, KENT E., AND VICTOR G. SPRINGER. 2005. The center of the center of marine shore fish biodiverstiy: the Philippine Islands. *Environmental Biology of Fishes* 72:467–480.

CONSERVATION INTERNATIONAL. 2010. Biological diversity in Wallacea. *In* The Encyclopedia of Earth *<http://www.eoearth.org/article/Biological_diversity_in_Wallacea>*. Cited 12 March 2013.

FABRICIUS, KATHARINA E., AND PHILIP ALDERSLADE. 2001. *Soft Corals and Sea fans — a Comprehensive Guide to the Tropical Shallow-water Genera of the Central-West Pacific, the Indian Ocean and the Red Sea.* Australian Institute of Marine Science, Townsville, Australia. 264 pp.

FABRICIUS, KATHARINA E, PHIL ALDERSLADE, GARY C. WILLIAMS, PATRICK L. COLIN, AND YIMNANG GOLBUU. 2007. Octocorallia in Palau, Micronesia: effects of biogeography and coastal influences on local and regional biodiversity. *In* H. Kayanne, et al., eds., *Coral Reefs of Palau.* Palau International Coral Reef Center (PICRC), Koror, Republic of Palau. 238 pp.

GAITHER, MICHELLE R., AND LUIZ A. ROCHA. 2013. Origins of species richness in the Indo-Malay-Philippine biodiversity hotspot: evidence for the centre of overlap hypothesis. *Journal of Biodiversity* 40:1638–1648.

GOSLINER, TERRENCE M., DAVID W. BEHRENS, AND GARY C. WILLIAMS. 1996. *Coral Reef Animals of the Indo-Pacific — Animal Life from Africa to Hawai'i Exclusive of the Vertebrates.* Sea Challengers, Monterey. California, USA. 314 pp.

GRASSHOFF, MANFRED. 1999. The shallow water gorgonians of New Caledonia and adjacent islands (Coelenterata, Octocorallia). *Senckenbergiana biologica* 78(1/2):1–121.

GRASSHOFF, MANFRED, AND GEORGES BARGIBANT. 2001. *Coral Reef Gorgonians of New Caledonia.* Institut de Recherche pour le Développement, Collection Faune et Flore tropicales 38, Paris. 335 pp.

HOEKSEMA, BERT W. 2007. Delineation of the Indo-Malayan Centre of Maximum Marine Biodiversity: The Coral Triangle. Pages 117–178 *in* W. Renema, ed., *Biogeography, Time and Place: Distributions, Barriers and Islands.* Springer, The Netherlands.

HUXLEY, THOMAS H. 1868. On the classification and distribution of the Alectromorphae and Heteromorphae. *Proceedings of the Zoological Society, London*: 294–319.

LIGHT, SOL FELTY. 1913. Notes on Philippine Alcyonaria, Part 1. The Philippine species of the genus *Capnella*. *Philippine Journal of Science* 8D(6):435–453.

LIGHT, SOL FELTY. 1914. Notes on Philippine Alcyonaria, Part 2. *Lemnalioides kükenthali*, a new genus and species of Alcyonaria from the Philippines and a discussion of the systematic position of the genus. *Philippine Journal of Science* 9D(3):233–246.

LIGHT, SOL FELTY. 1915a. Notes on Philippine Alcyonaria, Part 3. Two new species of *Lithophytum* Forskål from the Philippines. *Philippine Journal of Science* 10D(1):1–10.

LIGHT, SOL FELTY. 1915b. Notes on Philippine Alcyonaria, Part 4. Notes on Philippine Stolonifera and Xeniidae. *Philippine Journal of Science* 10D(2):155–167.

LIGHT, SOL FELTY. 1915c. Notes on Philippine Alcyonaria, Part 5. *Cornularia minuta*, new species. *Philippine Journal of Science* 10D(3):203–213.

LIGHT, SOL FELTY. 1921. Notes on Philippine Alcyonaria, Part 6. New Philippine Pennatularia (sea pens) of the genus *Lituaria*. *Philippine Journal of Science* 19(2):247–255.

LIGHT, SOL FELTY. 1941. *Laboratory and Field Text in Invertebrate Zoology*. Assocatied students of the University of California, Berkeley, Californbia, USA. 232 pp.

MAI-BAO-THU, FRANCIS, AND JOSE S. DOMANTAY. 1970. Taxonomic studies of the Philippine gorgonaceans in the collections of the University of Santo Tomas, Manila. *Acta Manilana* (A) 6(11):25–73.

MAI-BAO-THU, FRANCIS, AND JOSE S. DOMANTAY. 1971. Taxonomic studies of the Philippine Gorgonaceans in the collections of the University of Santo Tomas, Manila (Con't). *Acta Manilana* (A) 7(12):3–77.

OFWEGEN, LEEN P. VAN. 2013. *Rumphella antipathes* (Linnaeus, 1758). Accessed through: World Register of Marine Species (WoRMS) at *<http://www.marinespecies.org/aphia.php?p=taxdetails&id=288448>*. Cited 3 September 2013.

QUAMMEN, DAVID. 1996. *The Song of the Dodo — Island Biogeography in an Age of Extinction.* Touchstone, New York, New York, USA. 702 pp.

RABY, PETER. 2001. *Alfred Russel Wallace — a life*. Princeton University Press, Princeton and Oxford. 340 pp.

REIJNEN, BASTIN T., CATHERINE S. MCFADDEN, YOSELHINE T. HERMANLIMIANTO, AND LEENDERT P. VAN OFWEGEN. 2013. A molecular and morphological exploration of the generic boundaries in the family Melithaeidae (Coelenterata: Octocorallia) and its taxonomic consequences. *Molecular Phylogenetics and Evolution* 2013, pp. 1–38, <doi: *<http://dx.doi.org/10.1016/j.ympev.2013.09.028>*.

REIJNEN, BASTIN T., S. E. T. VAN DER MEIJ, AND LEEN P. VAN OFWEGEN. 2011. Fish, fans and hydroids: host species of pygmy seahorses. *ZooKeys* 103:1–26.

ROXAS, HILARIO A. 1932. Two new species of *Sarcophyton* Less. from the Philippines. *Natural and Applied Science Bulletin* 2(1):73–81.

ROXAS, HILARIO A. 1933a. Philippine Alcyonaria. The families Cornulariidae and Xeniidae. *Philippine Journal of Science* 50(1):49–110.

ROXAS, HILARIO A. 1933b. Philippine Alcyonaria, II. The families Alcyoniidae and Nephthyidae. *Philippine Journal of Science* 50(4):345– 470.

STIASNY, GUSTAV. 1940. Gorgonaria von Tropisch-Westafrika aus dem Zoologischen Museum in Hamburg. *Zoologische Jahrbücher, Abteilung Systematik* 73(4):339–368.

STIASNY, GUSTAV. 1941. Octocorallia from Philippine waters. *Philippine Journal of Science* 76(1):67–72.

VERON, J. E. N., LYNDON M. DEVANTIER, EMRE TURAK, ALISON L. GREEN, STUART KININMONTH, MARY STAFFORD-SMITH, AND NATE PETERSON. 2009. Delineating the Coral Triangle. *Galaxea, Journal of Coral Reef Studies* 11:91–100.

WALLACE, ALFRED RUSSEL. 1860. On the zoological geography of the Malay Archipelago. *The Proceedings of the Linnean Society, Zoology* 4:172–184.

WALLACE, ALFRED RUSSEL. 1880. *Island Life: or, The Phenomenon and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates.* Part 2, *Insular Faunas and Floras*. MacMillan and Company, London, UK. 526 pp.

WILLIAMS, GARY C. 1992. The Alcyonacea of southern Africa. gorgonian octocorals (Coelenterata, Anthozoa) South Africa. *Annals of the South African Museum* 101(8):181–296.

WILLIAMS, GARY C. 1993. *Coral Reef Octocorals, and Illustrated Guide to the Soft Corals, Sea Fans and Sea Pens Inhabiting the Coral Reefs of Northern Natal*. Durban Natural Science Museum, Durban, South Africa. 64 pp.

WILLIAMS, GARY C. 1995. Living genera of sea pens (Coelenterata: Octocorallia: Pennatulacea): illustrated key and synopses. *Zoological Journal of the Linnean Society* 113:93–140.

WILLIAMS, GARY C. 2011. The Global Diversity of Sea Pens (Cnidaria: Octocorallia: Pennatulacea). *PLoS ONE* 6(7):1–11.

WILLIAMS, GARY C. AND PHILIP ALDERSLADE. 1999. Revisionary systematics of the western Pacific soft coral genus *Minabea* (Octocorallia: Alcyonacea), with descriptions of a related new genus and species from the Indo-Pacific. *Proceedings of the California Academy of Sciences*, ser. 4, 51(7):337–364.

WILLIAMS, GARY C. AND STEPHEN D. CAIRNS. 2013. Biodiversity myth busters. Octocoral Research Center Website. *<http://researcharchive.calacademy.org/research/izg/Biodiversity%20Myth%20Busters.html>*. Cited 3 September 2013.

WILLIAMS, GARY C., J. CHARLES DELBEEK, BART SHEPHERD, AND SETH WOLTERS. 2010. Zooxanthellae in

ellisellid gorgonians of the Philippines. *Proceedings of the California Academy of Sciences*, ser. 4, 61(18):647–648.

WILLIAMS, GARY, AND COURTNEY MATTISON. 2013. Microscoope slide or SEM stub preparation for octocoral sclerites or other invertebarate spicules. In: Octocoral Research Center Website, Research Techniques. <*http://researcharchive.calacademy.org/research/izg/Biodiversity%20Myth%20Busters.html*>. Cited 6 September 2013.

Appendix

Glossary

Anastomosis: In gorgonian corals, the union or cross fusion of branches. Sometimes there is only one or a few examples on a colony, but if a colony has common and abundant anastomosing branches the colonial growth form may appear as a network.

Autozooid: The largest kind of polyp in octocorals, with eight pinnate tentacles surrounding the mouth; for feeding, reproduction, and protection.

Axial: Referring to the central axis of a gorgonian, sea pen, or black coral; see **Axis.**

Axis: The rod-like structure in the center of a gorgonian or pennatulacean colony that runs throughout most or all of the length of the colony, composed of sclerites, hard protein, or consolidated calcium carbonate with varying amount of proteinaceous material.

Birotulate: A capstan-like sclerite, with the tubercles of two parallel whorls fused into disks; also called double discs or double wheels (Fig. 8, center and bottom right).

Calcareous: Referring to a structure that is composed of calcium carbonate ($CaCO_3$).

Calyx: The wart-like, rigid base of some polyps that does not retract below the surface of the colony.

Capstan: A capstan-like sclerite; see **Radiate** (Fig. 31, top left and bottom right).

Clubs: Unbranched, club-like sclerites that are enlarged at one end, and tapered to form a thinner handle at the other end.

Contractile: A polyp that may reduce in size but cannot be withdrawn.

Coral Triangle: A biogeographical region of maximum marine biodiversity based primarily on the high species diversity of zooxanthellate corals; encompassing the entire Philippines, eastern Indonesia, and western, northern and eastern New Guinea, to the Bismarck Archipelago and the Solomon Islands (Fig. 2A).

Cortex: The outer layer of a central axis that is composed of consolidated sclerites; as opposed to the medulla — the inner core.

Denticulated: Toothed or serrated.

Dichotomous branching: Branching pattern in which a single branch gives rise to only two branches at each branching point, giving a Y-shaped axil.

Double heads: Sclerites with narrow, smooth waists and terminal clusters of tubercles that are not radially-arranged (See Fig. 35, top row).

***en chevron*:** Sclerites arranged in an inverted V-shape, sometimes found on the walls or calyces of autozooids.

Filiform: Unbranched, threadike, or whiplike, as in *Junceella.*

Fistulose: Hollow with open widened grooves where the white interior is exposed toward the ends of branches, gutter-like, as in *Solenocaulon.*

Holdfast: The basal portion of a colony that adheres a gorgonian to a hard substratum.

Lateral branching: Irregular branching in octocorals — neither dichotomous or pinnate.

Lobate: Growth form with several prominent lobes, as in some colonies of the genus *Briareum.*

Medulla: The inner supporting structure of scleraxonian gorgonians that is composed of consolidated sclerites, as in *Subergorgia* (Fig. 9, bottom row).

Needle: A long, thin, unbranched sclerite.

Oval: A short rodlike sclerite, rounded or ovoid in shape, often somewhat flattened.

Peduncle: The muscular lower (proximal) portion of a sea pen colony that is devoid of polyps and serves to anchor the colony into sediments of the sea bottom.

Planar: Branching pattern that is only in one plane.

Plate: A flattened, relatively thick sclerite of diverse form — ovoid, polygonal, or irregularly-shaped.

Polyp: Any individual of an octocoral colony, but usually refers to an autozooid.

Polyp leaf: In some sea pens, a lateral projection emanating from the rachis that contains multiple numbers of autozooids, often giving the colony a feather-like appearance.

Proteinaceous: Partially or wholly composed of a protein or combination of several proteins, often part of a matrix associated with other substances such as calcium carbonate.

Rachis: The upper portion of a sea pen that contains the polyps; as opposed to the peduncle in the lower portion of the colony that is smooth and does not contain polyps.

Radiate: A spindle-like sclerite with two parallel whorls of tubercles separated by a smooth waist, also called *capstan* in some literature accounts.

Reticulated: Branching pattern that forms a netlike structure; see **Anastomosis.**

Retractile: A polyp that can completely withdraw or retract into the coenenchyme of the coral colony.

Rod: An unbranched sclerite that has blunt edges at both ends.

Rooted leaf: A clublike sclerite with a rootlike base and a broad, flattened, shieldlike blade; also sometimes referred to as a leaf scale (Fig. 24, top row).

Rosette: A sclerite with a funnel-shaped, projecting, often somewhat spiny crown.

Sclerite: Minute skeletal components in octocorals (commonly < 0.25 mm in length), primarily comprised of calcium carbonate; combined with varying amounts of protein that often provides permanent coloration in axooxanthellate gorgonians; also called "spicule."

Spatulate: Widened or spatula-shaped toward the end of branches, as in *Solenocaulon*.

Spheroid: A ball-like or sphere-shaped sclerite.

Spindle: An unbranched sclerite that is pointed at both ends.

Stalk: The proximal part of a gorgonian or pennatulacean colony that is devoid of polyps.

Thornscale: A flattened sclerite with a single spine-like or several thorn-like projecting processes. Derivations of this kind of sclerite have been called thornstars (Figs. 19–20).

Tuberculated: Refers to a sclerite that is ornamented with several or many rounded nodules or pointed knobs or wart-like structures (Fig. 35).

Waisted spindle: A spindle-like sclerite that has a medial, smooth waist that is narrower than the rest of the sclerite, and the tubercles on each end are not radially-arranged (Fig. 35C-D, last three sclerites on the right in each row)

Wallacea: A group of islands in eastern Indonesia that are separated by regions of deep water from the Asian and Australian continental shelves. They were never connected to either of these continental regions, are entirely included within the coral triangle, and share common faunistic characteristics (Figure 2A); named for 19th century naturalist and zoogeographer, Alfred Russel Wallace.

Zooxanthellate: An adjective that is used to describe corals and other organisms that harbor symbiotic, photosynthetic zooxanthellae (single-celled organisms that are dinoflagellates of the genus *Symbiodinium*) in their tissues.

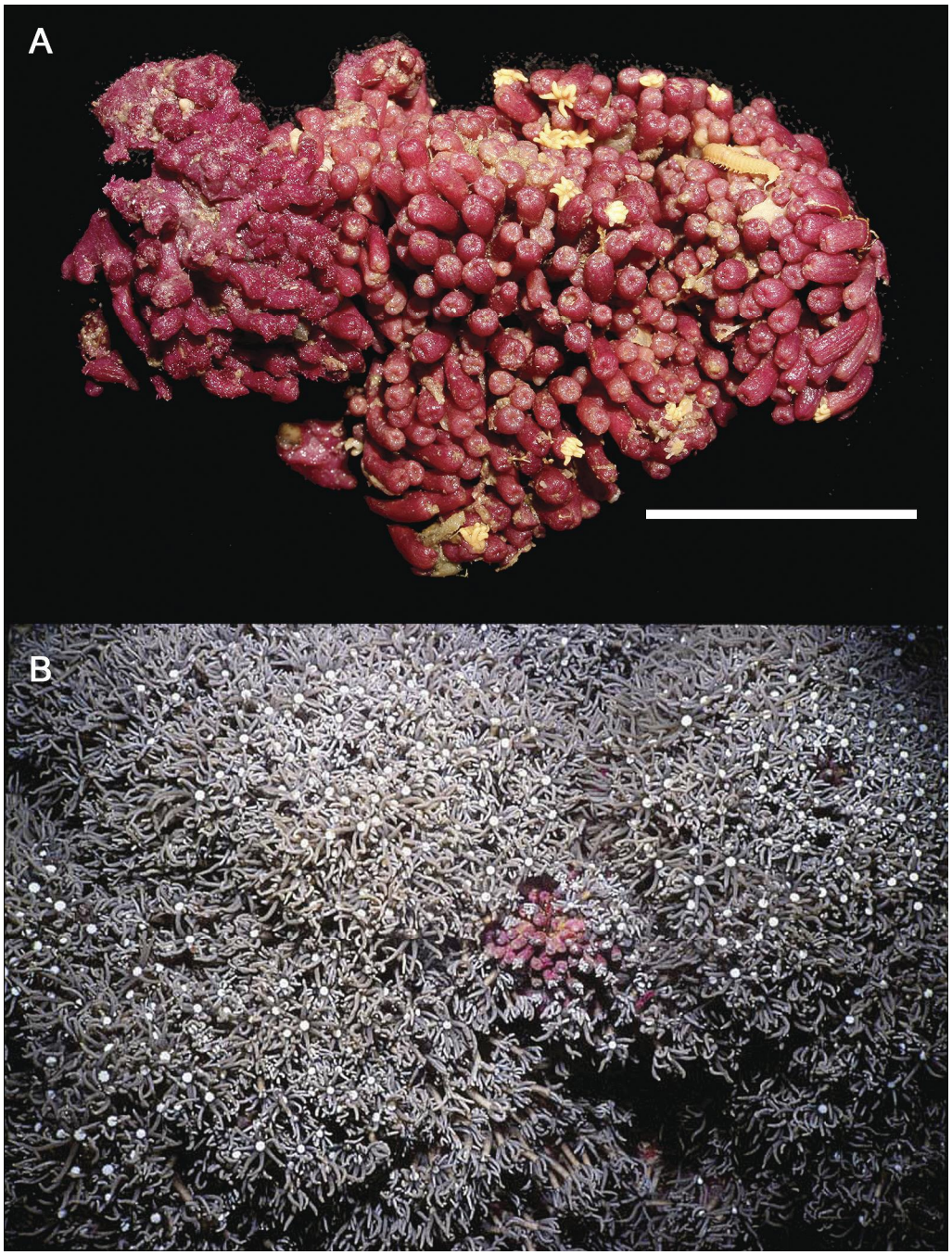

FIGURE 3. *Briareum* sp. A. Wet-preserved specimen (CASIZ 104004); scale bar = 20 mm. B. Underwater photograph of a species of *Briareum* with extended polyps in which the tentacles are gray in color, the oral discs are white, and the mound-like or cylindrical polyp bases are red-purple.

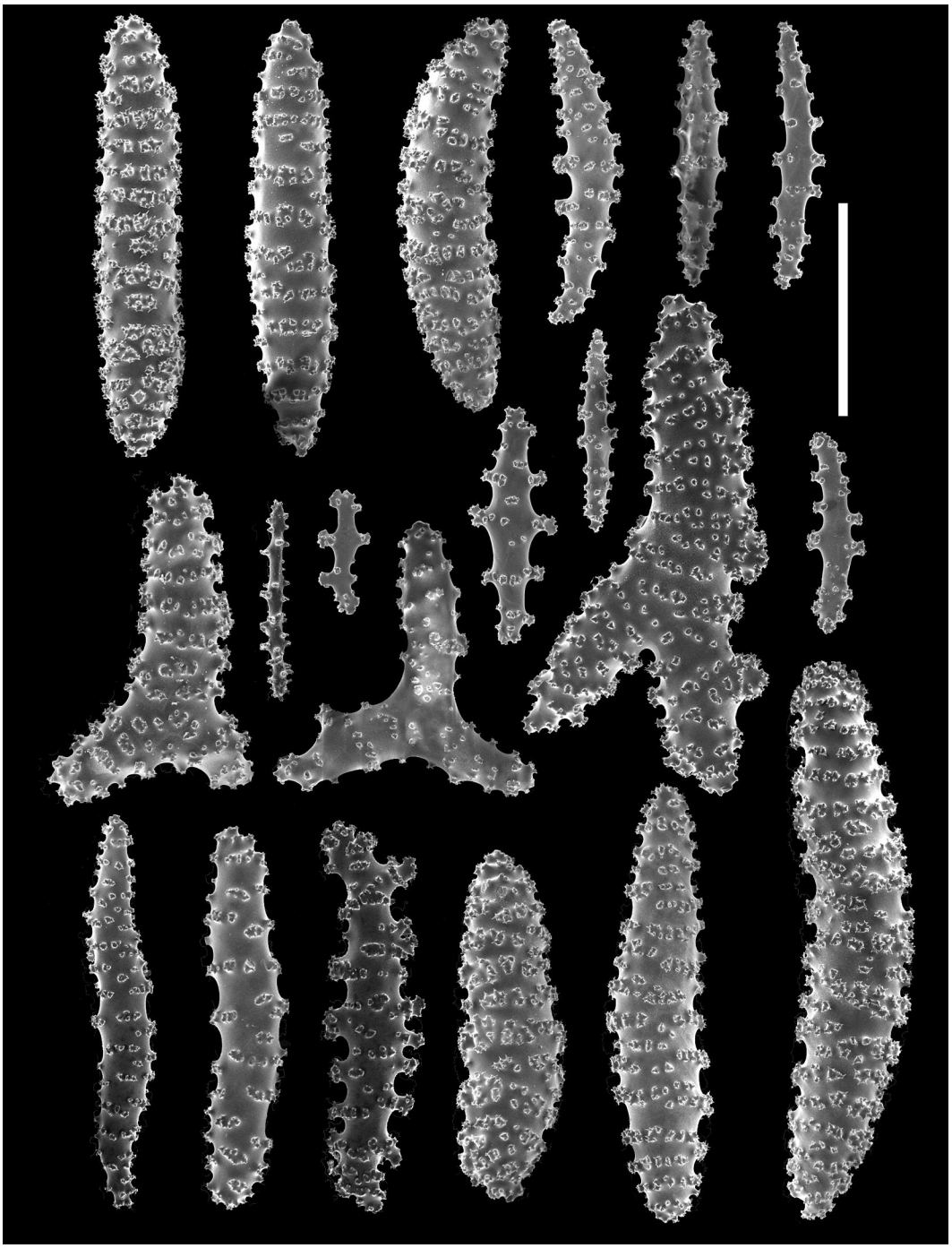

FIGURE 4. *Briareum* sp., scanning electron micrographs of sclerites from the polyp bases of retracted polyps. Scale bar = 0.2 mm.

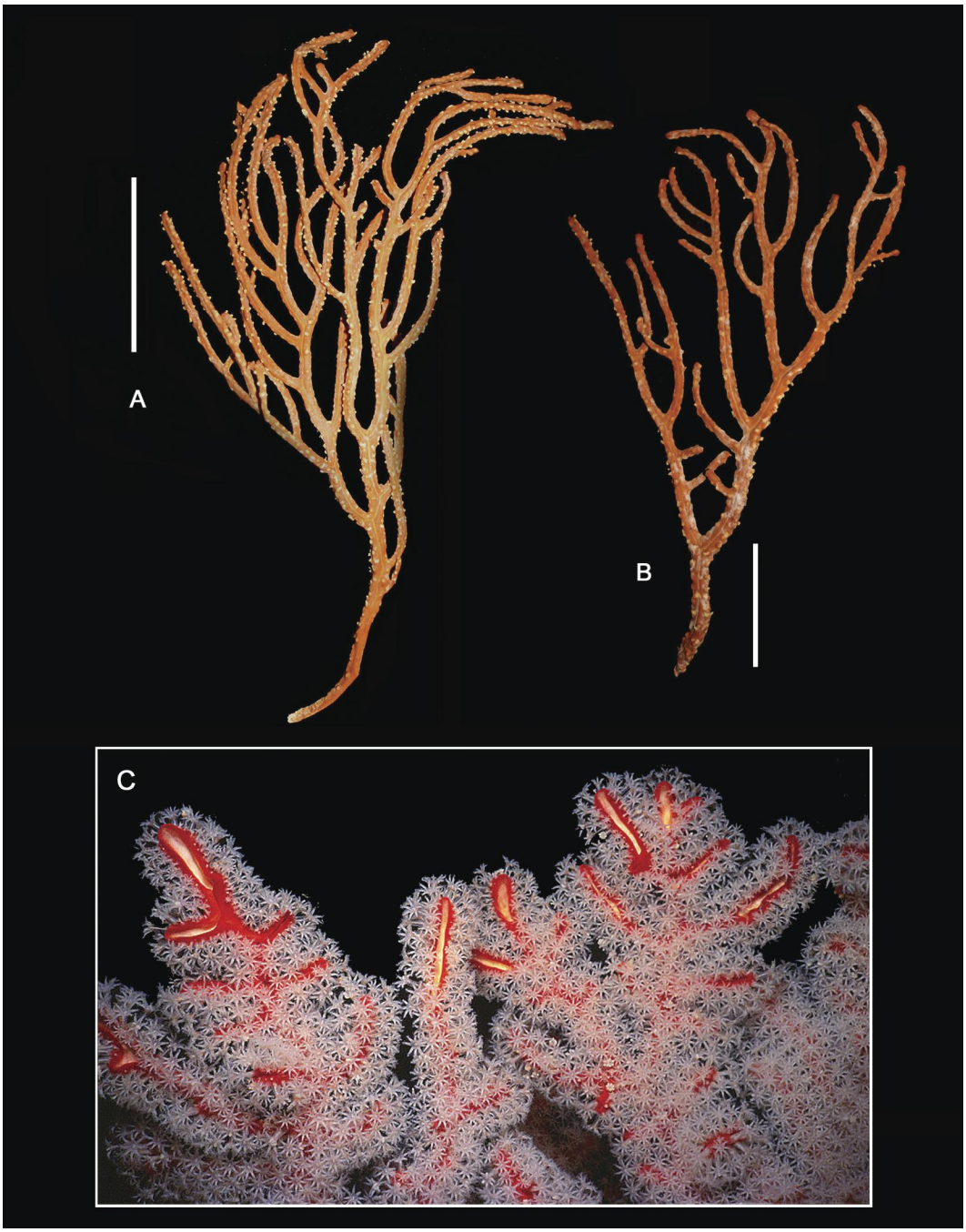

FIGURE 5. A–B. Wet-preserved specimens of *Subergorgia suberosa* (CASIZ 103912), scale bars = 40 mm. C. Underwater photograph of *Solenocaulon* cf. *rubra*, with polyps extended showing fistulose branch ends.

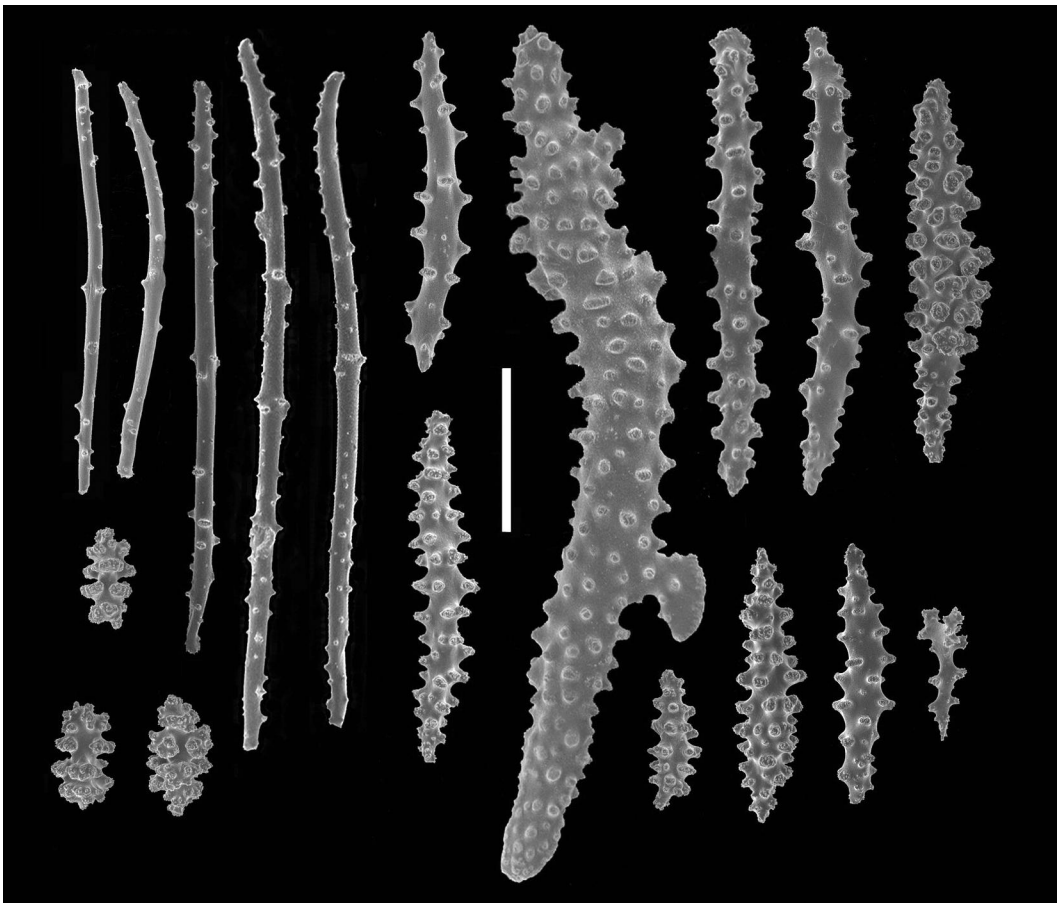

FIGURE 6. *Solenocaulon* cf. *rubra*, scanning electron micrographs of sclerites from CASIZ 103904. Scale bar = 0.10 mm.

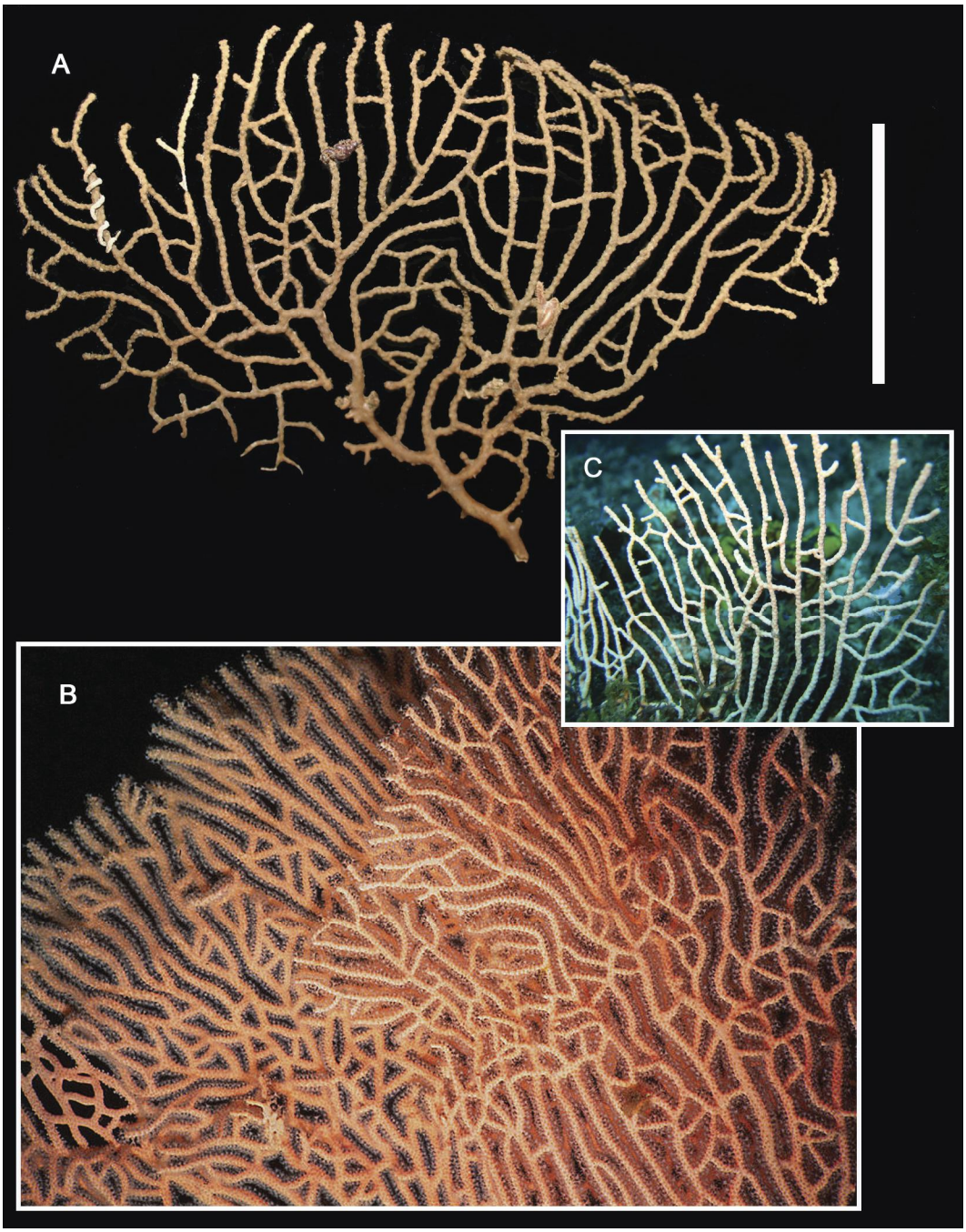

FIGURE 7. A. Wet-preserved specimen of *Annella reticulata* (CASIZ 185458), scale bar = 50 mm. B. Underwater photograph of *Annella mollis*, with minute extended polyps arranged biserially in opposite longitudinal rows. C. Underwater photograph of *Annella* sp. showing reticulated branching pattern.

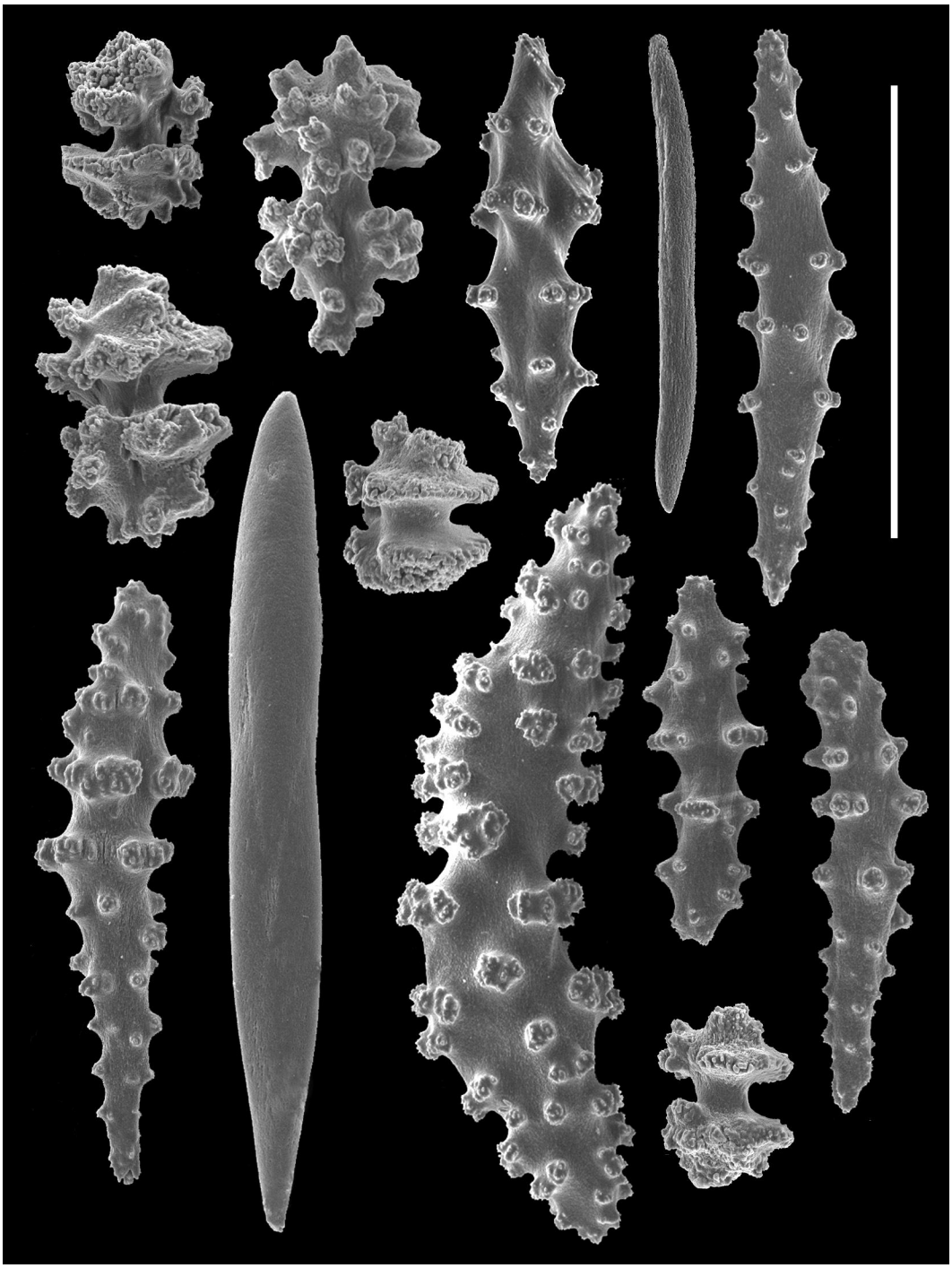

FIGURE 8. *Annella reticulata*, scanning electron micrographs of sclerites from CASIZ 185458. Scale bar = 0.10 mm.

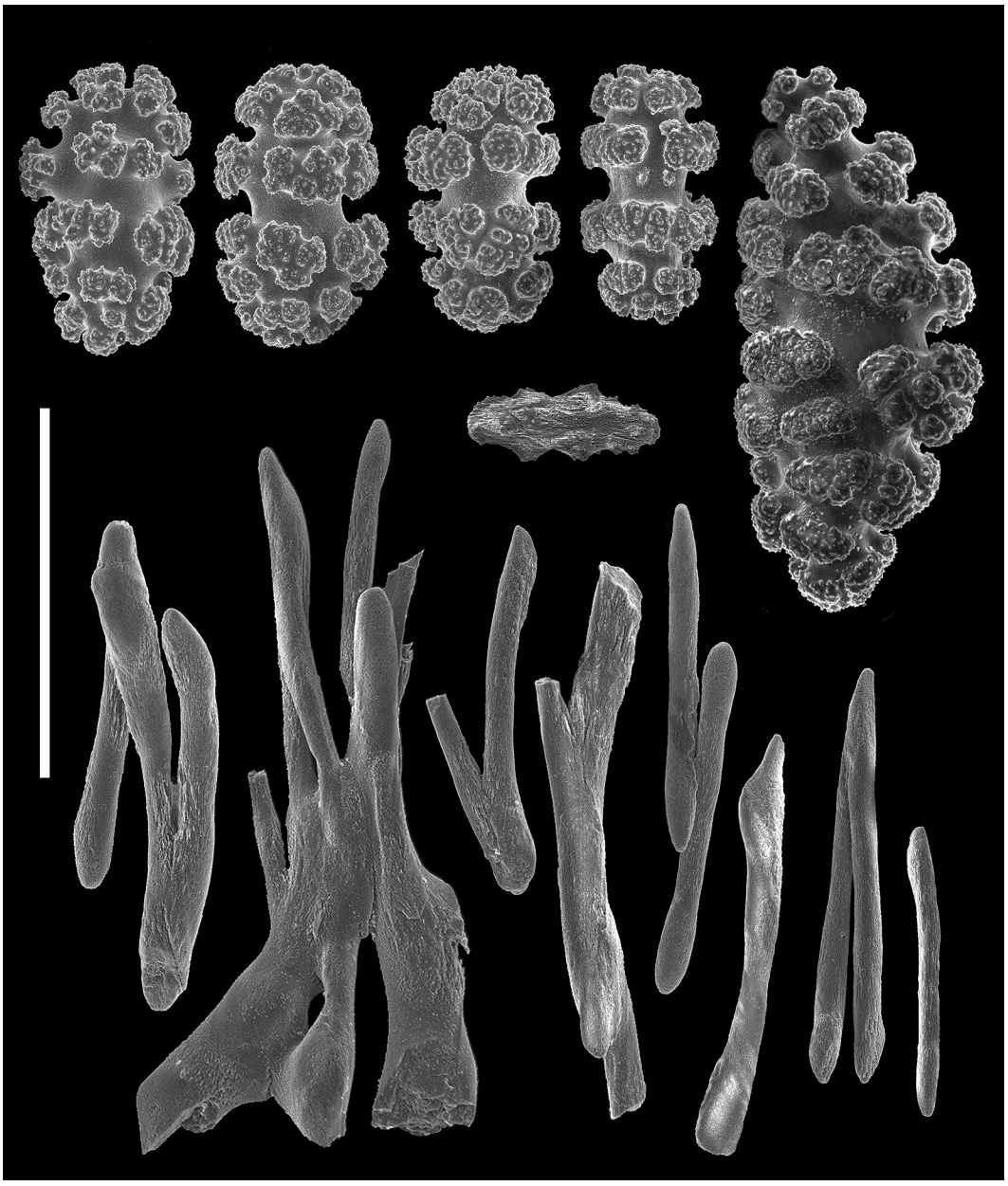

FIGURE 9. *Subergorgia suberosa*, scanning electron micrographs of sclerites from CASIZ 104074. Scale bar = 0.10 mm.

FIGURE 10. A. *Melithaea* sp., CASIZ 185441, wet-preserved specimen; scale bar = 50 mm. B. *Melithaea* sp., CASIZ 103805, wet-preserved specimen; scale bar = 50 mm. C. *Acabaria* sp., 186644, wet-preserved specimen; scale bar = 25 mm.

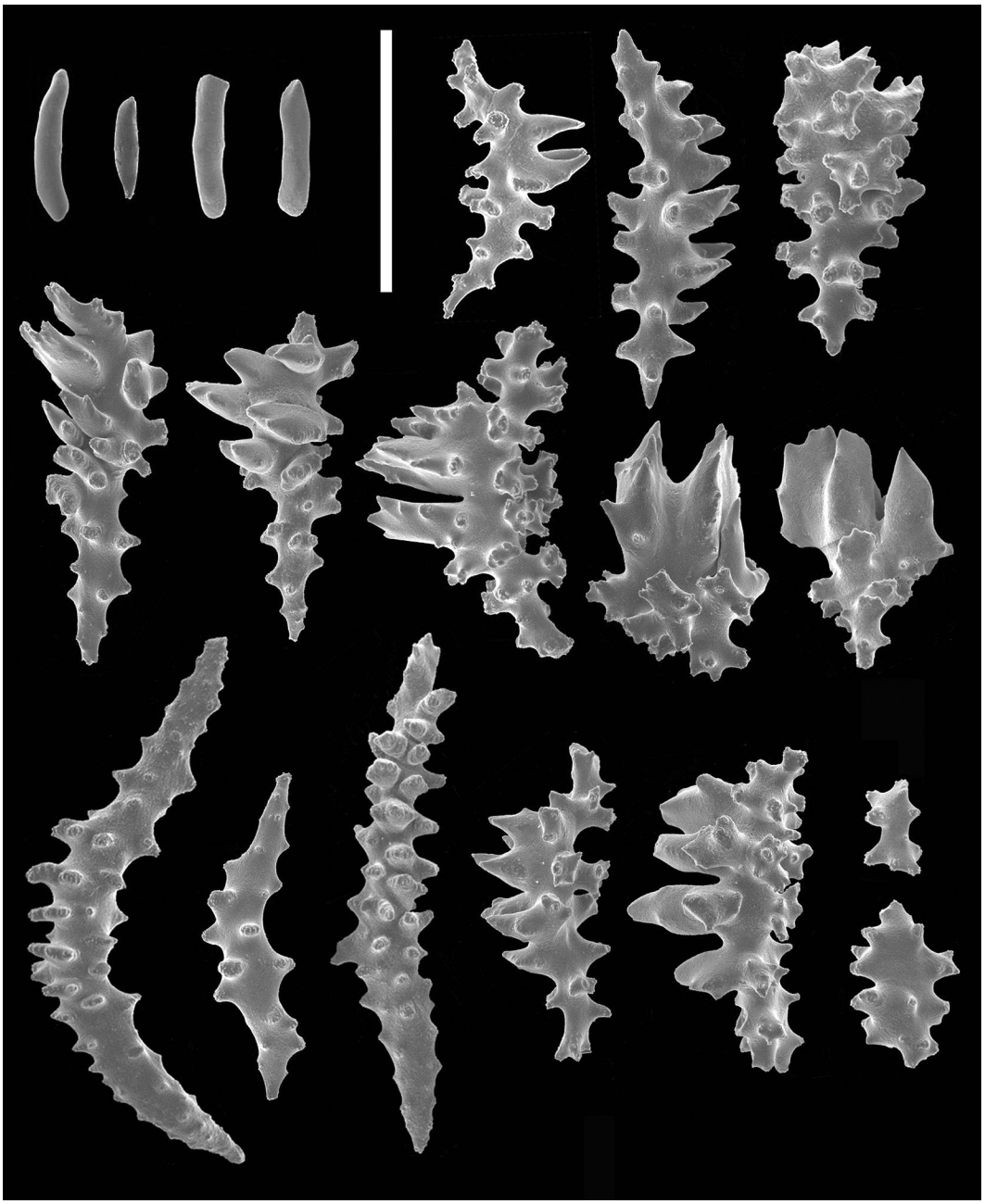

FIGURE 11. *Acabaria* sp., scanning electron micrographs of sclerites from CASIZ 186644. Scale bar = 0.10 mm.

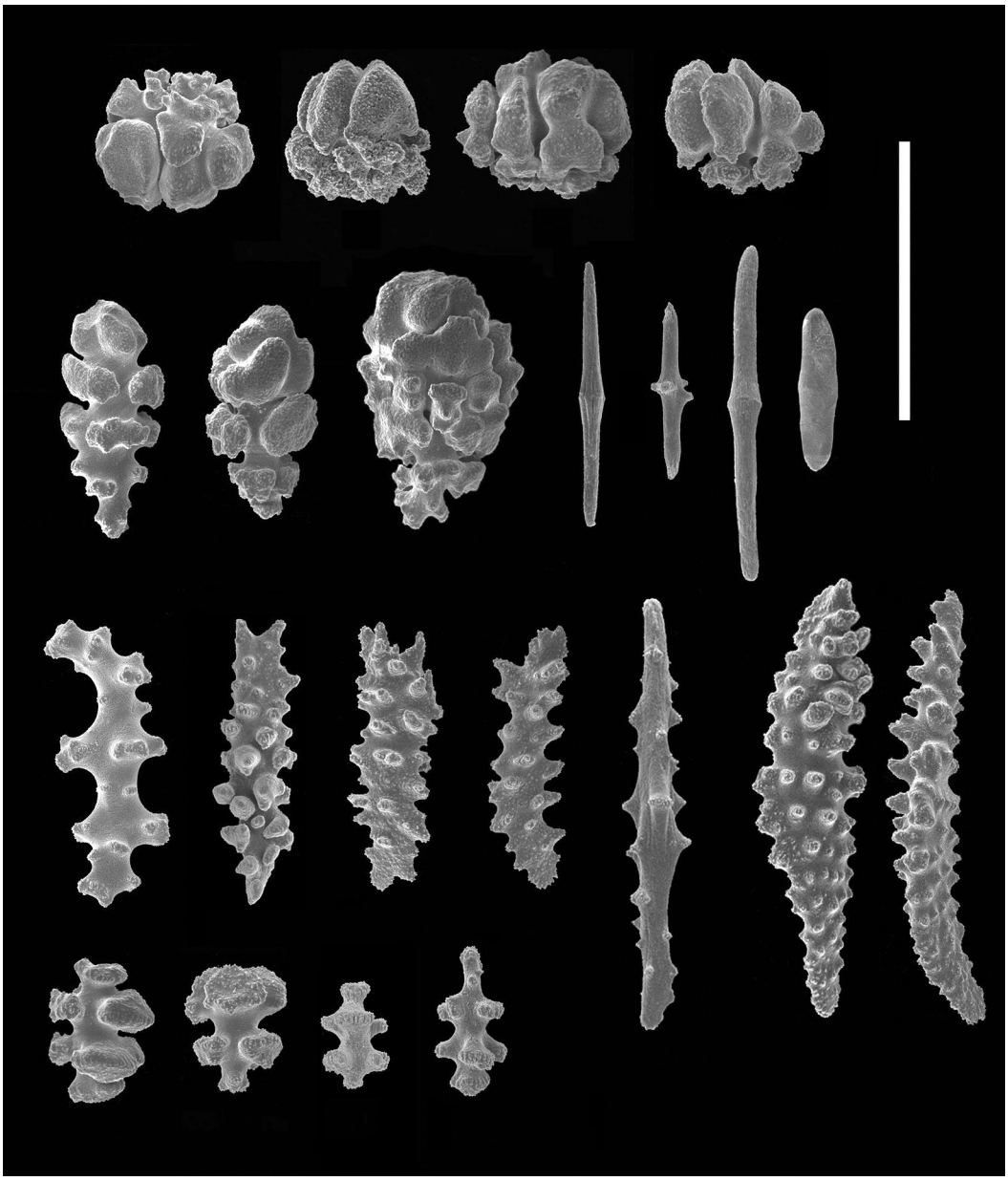

FIGURE 12. *Melithaea* sp., scanning electron micrographs of sclerites from CASIZ 103805. Scale bar = 0.10 mm.

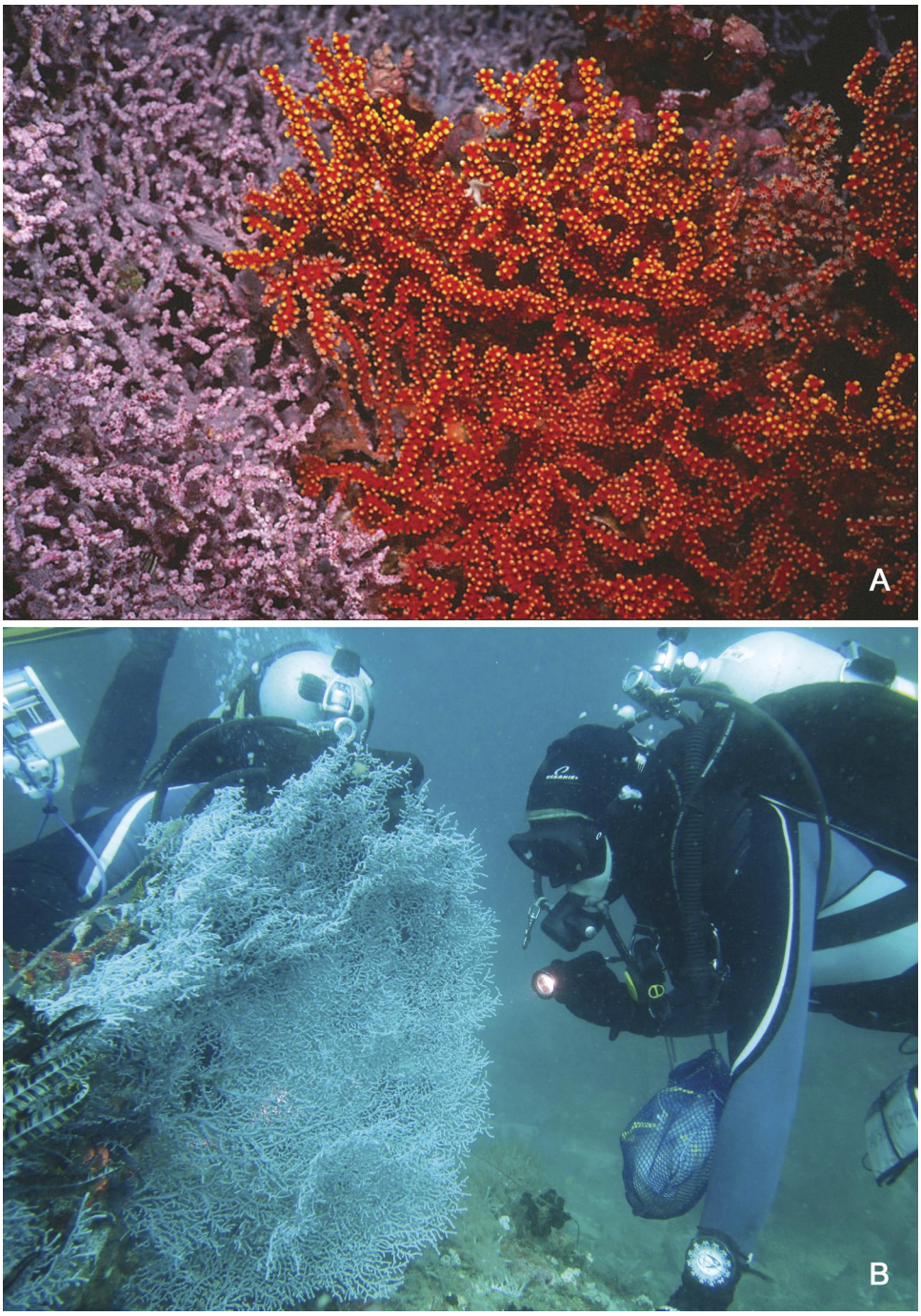

FIGURE 13. A. *Muricella* sp. (left) and *Acanthogorgia* sp. (right). B. Divers inspecting the branches of a large colony of *Muricella* sp. for pygmy sea horses during the Hearst Philippines expedition, Devil's Point, Maricaban Island, ca. 24 m depth, 26 May 2011.

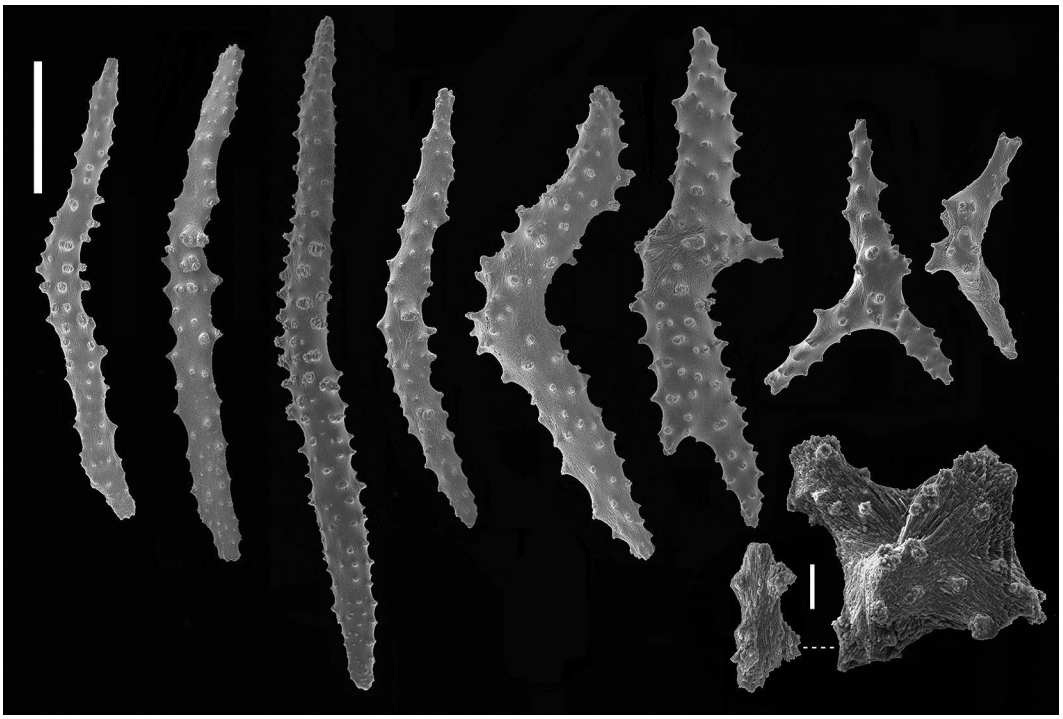

FIGURE 14. *Acanthogorgia* sp., scanning electron micrographs of sclerites from CASIZ 180180. Scale bar on left = 0.10 mm; scale bar on right = 0.01 mm.

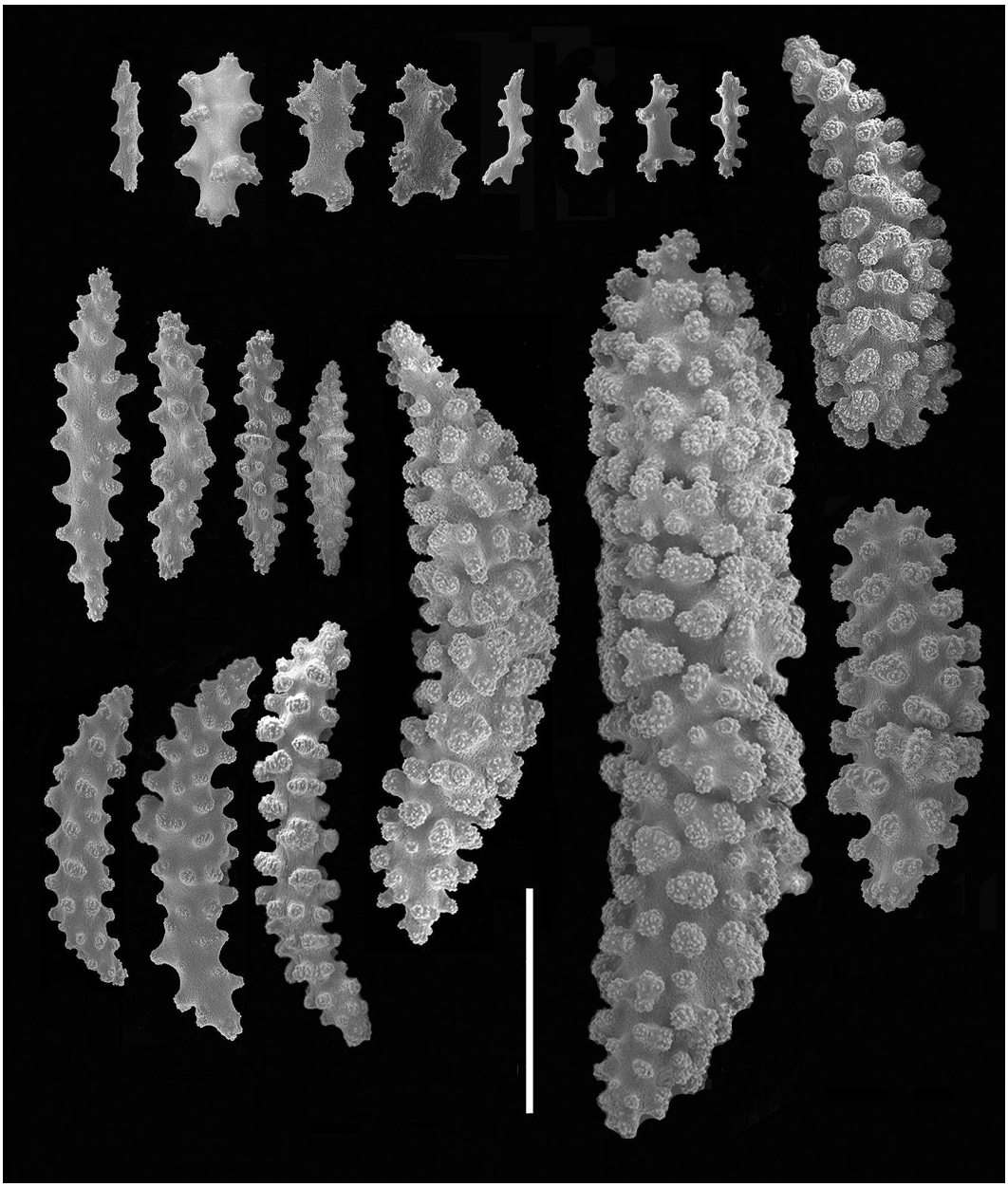

FIGURE 15. *Muricella* sp., scanning electron micrographs of sclerites from CASIZ 109526. Scale bar = 0.10 mm.

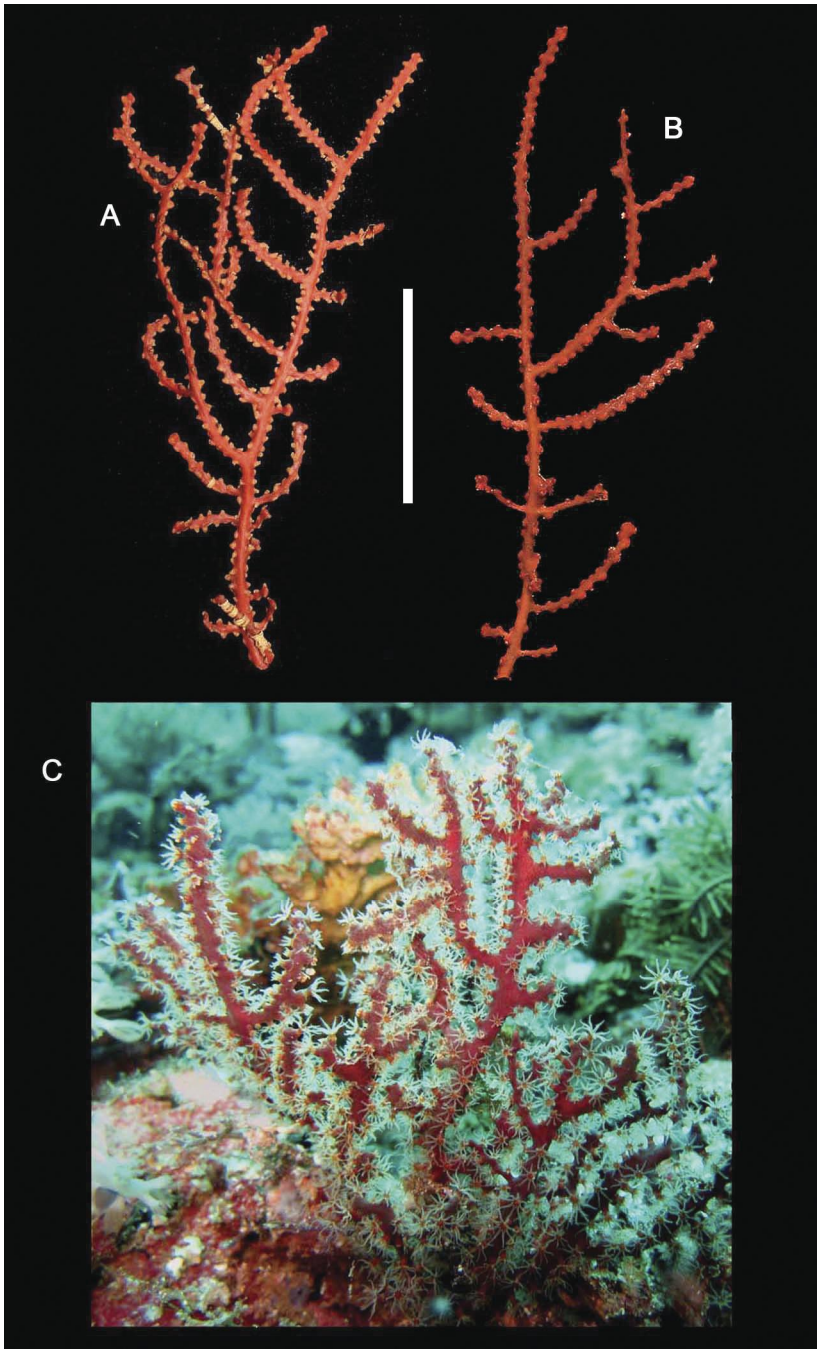

FIGURE 16. *Astrogorgia* sp. A. Wet-preserved specimen (CASIZ 168899). B. Wet-preserved specimen (CASIZ 190428). Scale bar for A and B = 30 mm. C Underwater photograph of a colony with polyps extended.

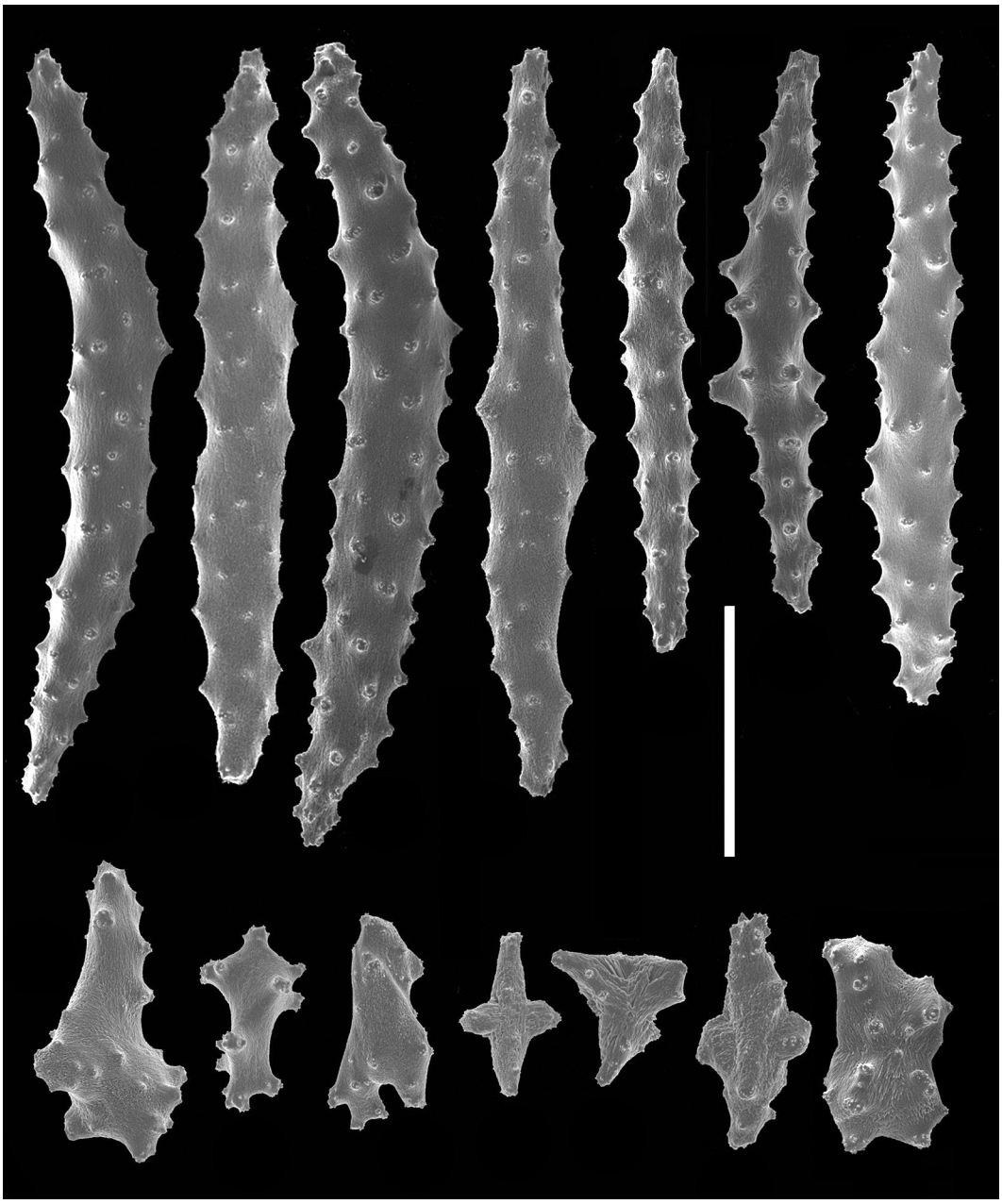

FIGURE 17. *Astrogorgia* sp., scanning electron micrographs of sclerites from CASIZ 185465. Scale bar = 0.10 mm.

FIGURE 18. A. Wet-preserved specimen of *Echinomuricea* sp. (CASIZ ******); scale bar = 25 mm. B. Wet-preserved specimen of *Echinogorgia* sp. (CASIZ 109537); scale bar = 40 mm.

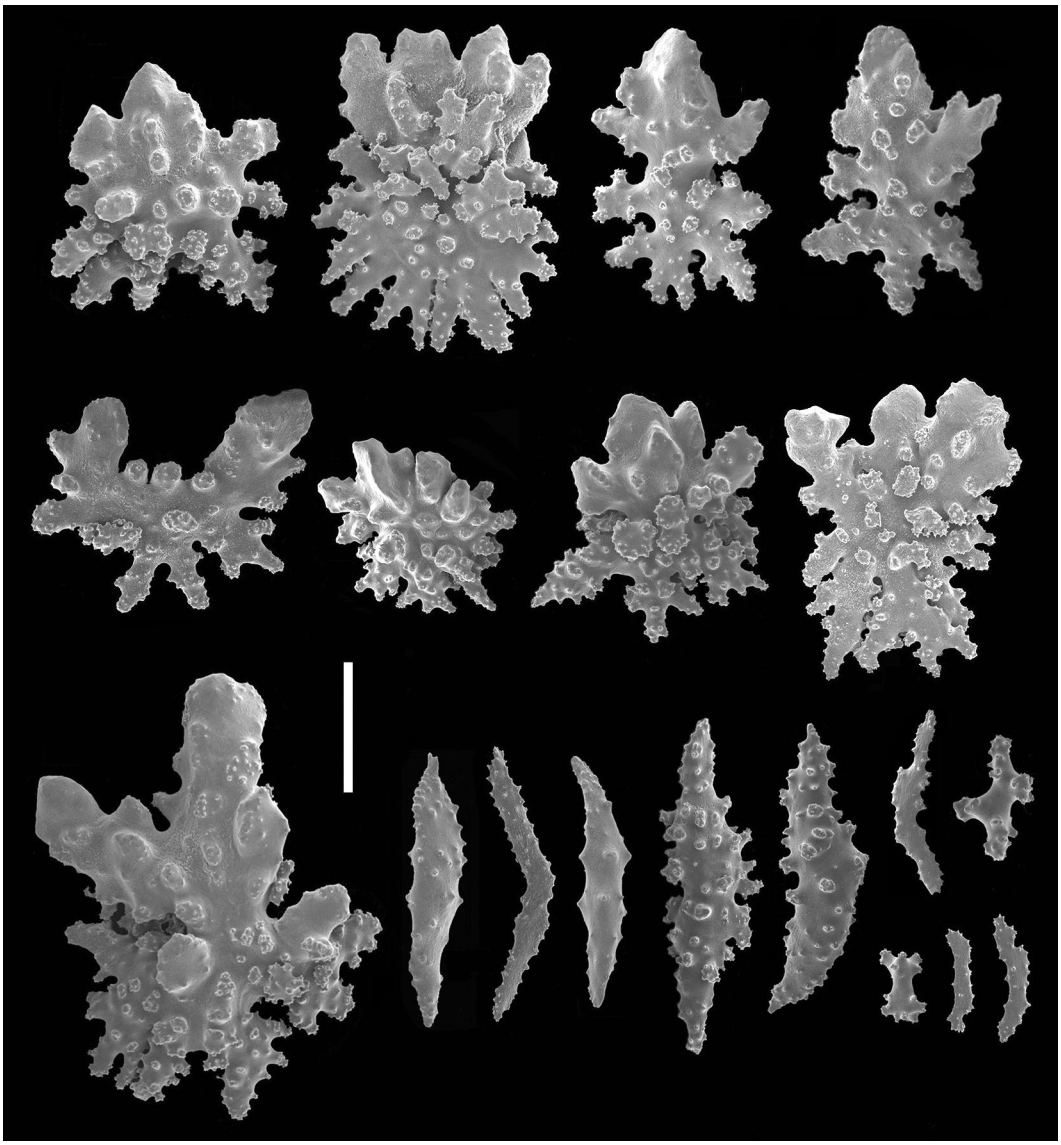

FIGURE 19. *Echinogorgia* sp., scanning electron micrographs of sclerites from CASIZ 109537. Scale bar = 0.10 mm.

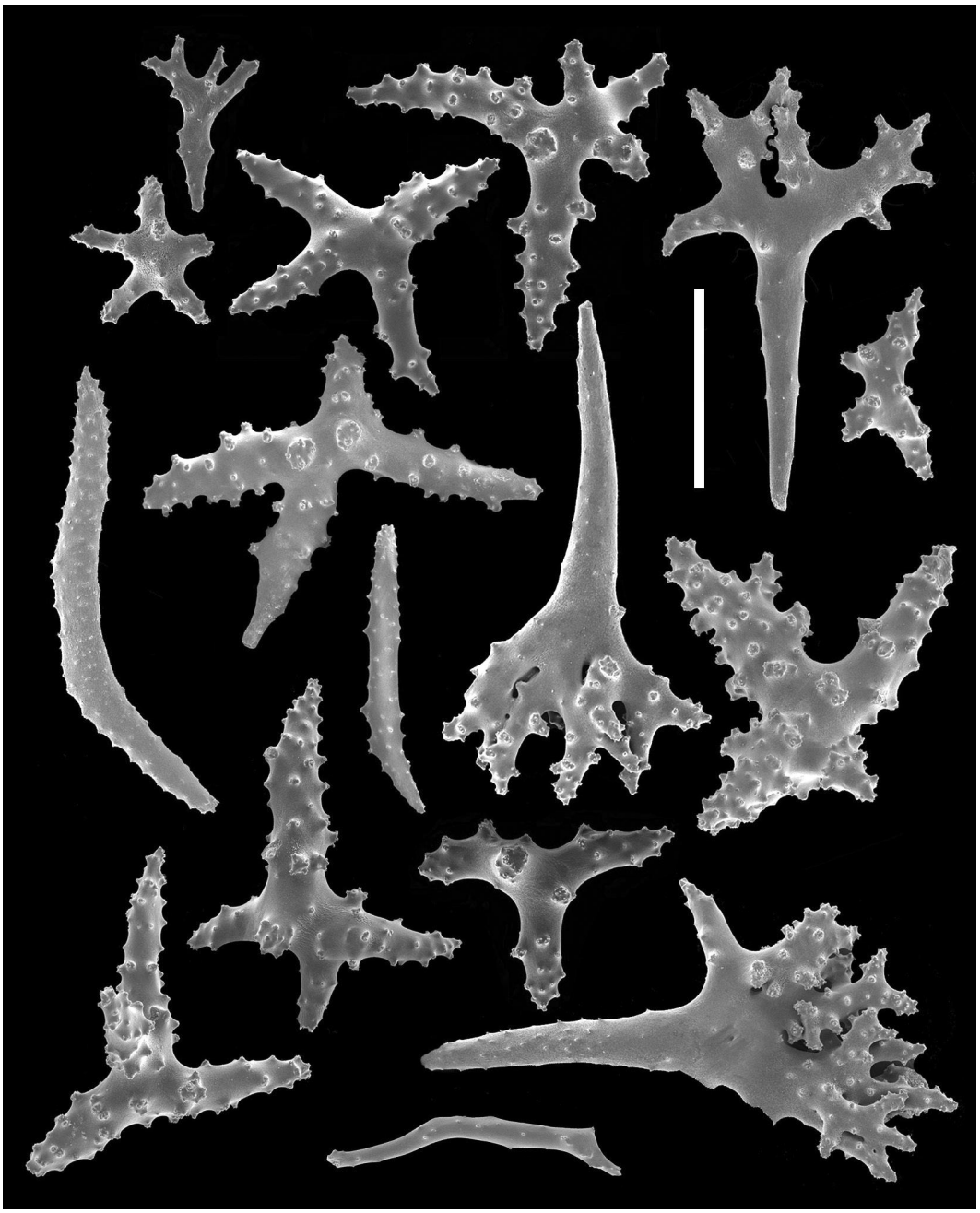

FIGURE 20. *Echinomuricea* sp., scanning electron micrographs of sclerites from CASIZ 185452; scale bar = 0.20 mm.

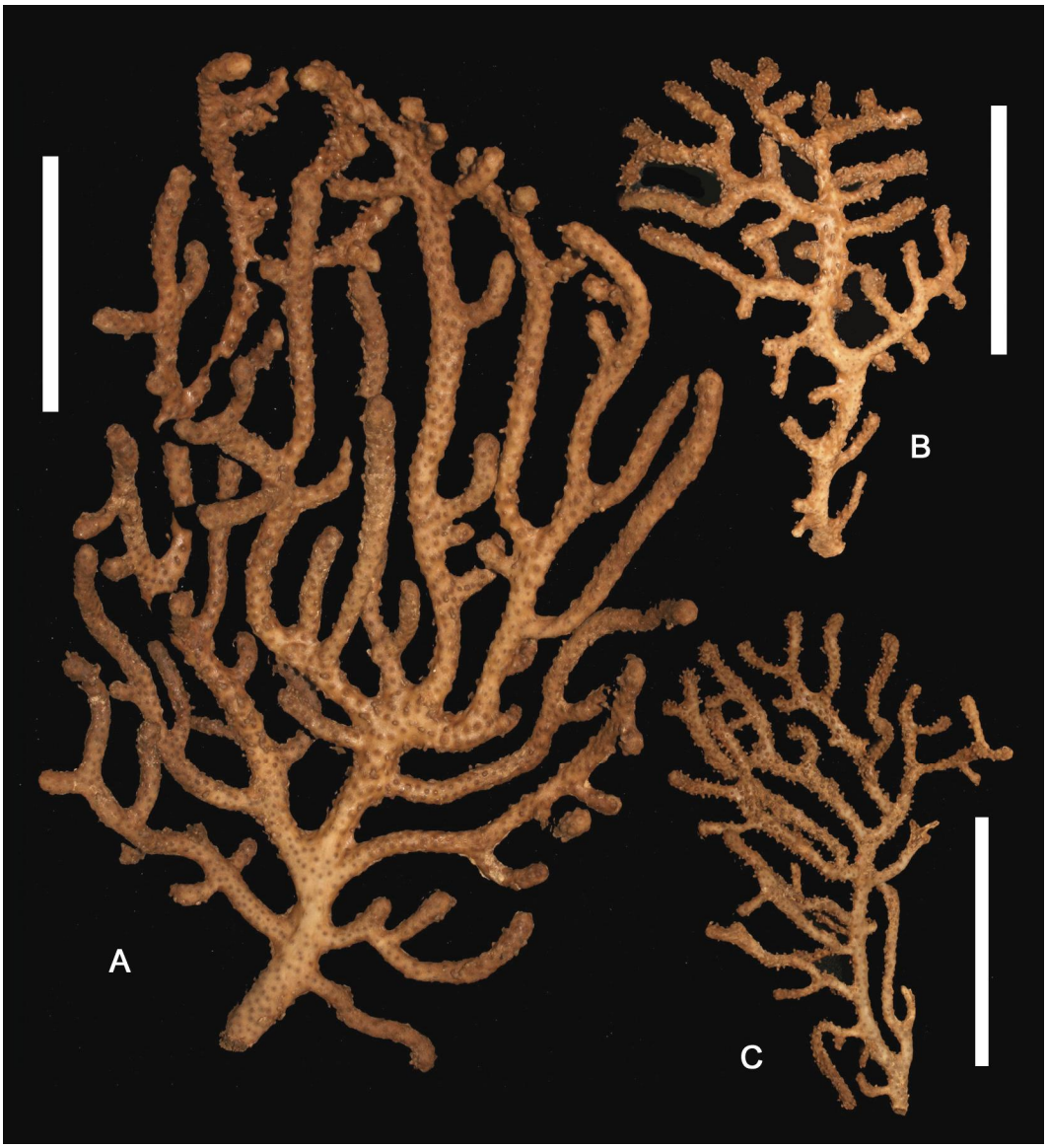

FIGURE 21. *Euplexaura* sp. Wet-preserved specimens (CASIZ 109598); scale bars, A = 40 mm, B = 60 mm, C = 65 mm.

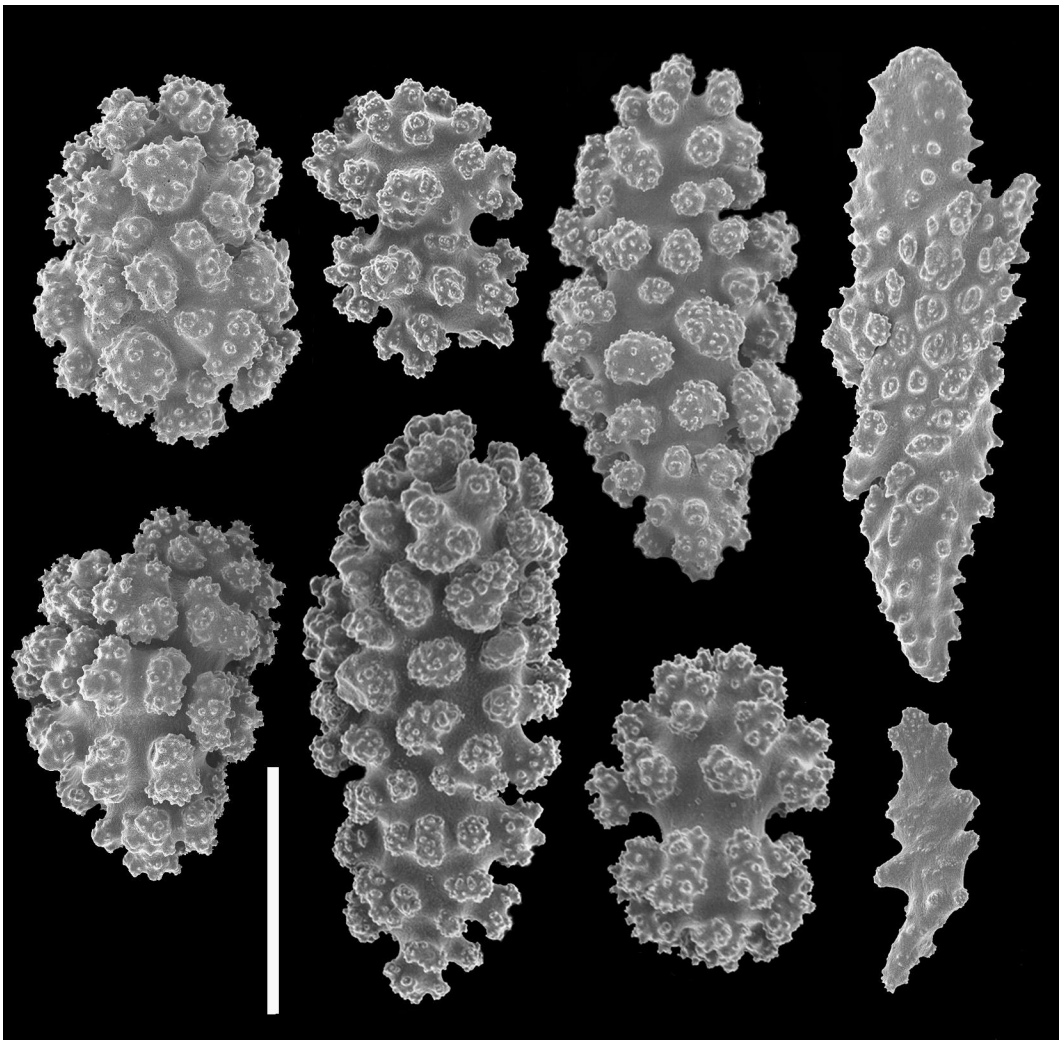

FIGURE 22. *Euplexaura* sp., scanning electron micrographs of sclerites from CASIZ 180166; scale bar = 0.10 mm.

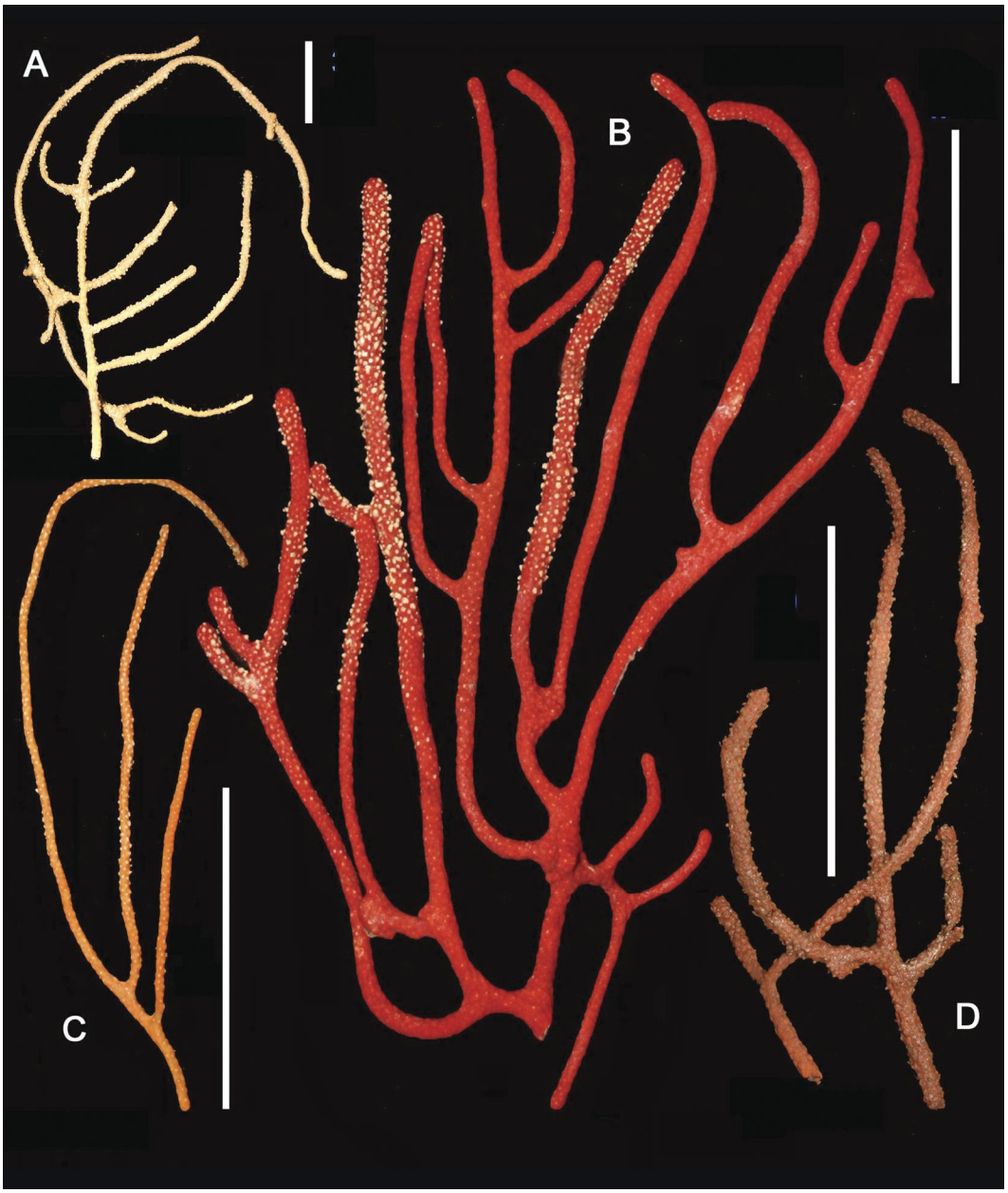

FIGURE 23. *Menella* spp. A. CAS 187764; scale bar = 30 mm. B. CAS 185448; scale bar = 35 mm. C. CAS 180197; scale bar = 60 mm. D. CAS 109578; scale bar = 70 mm.

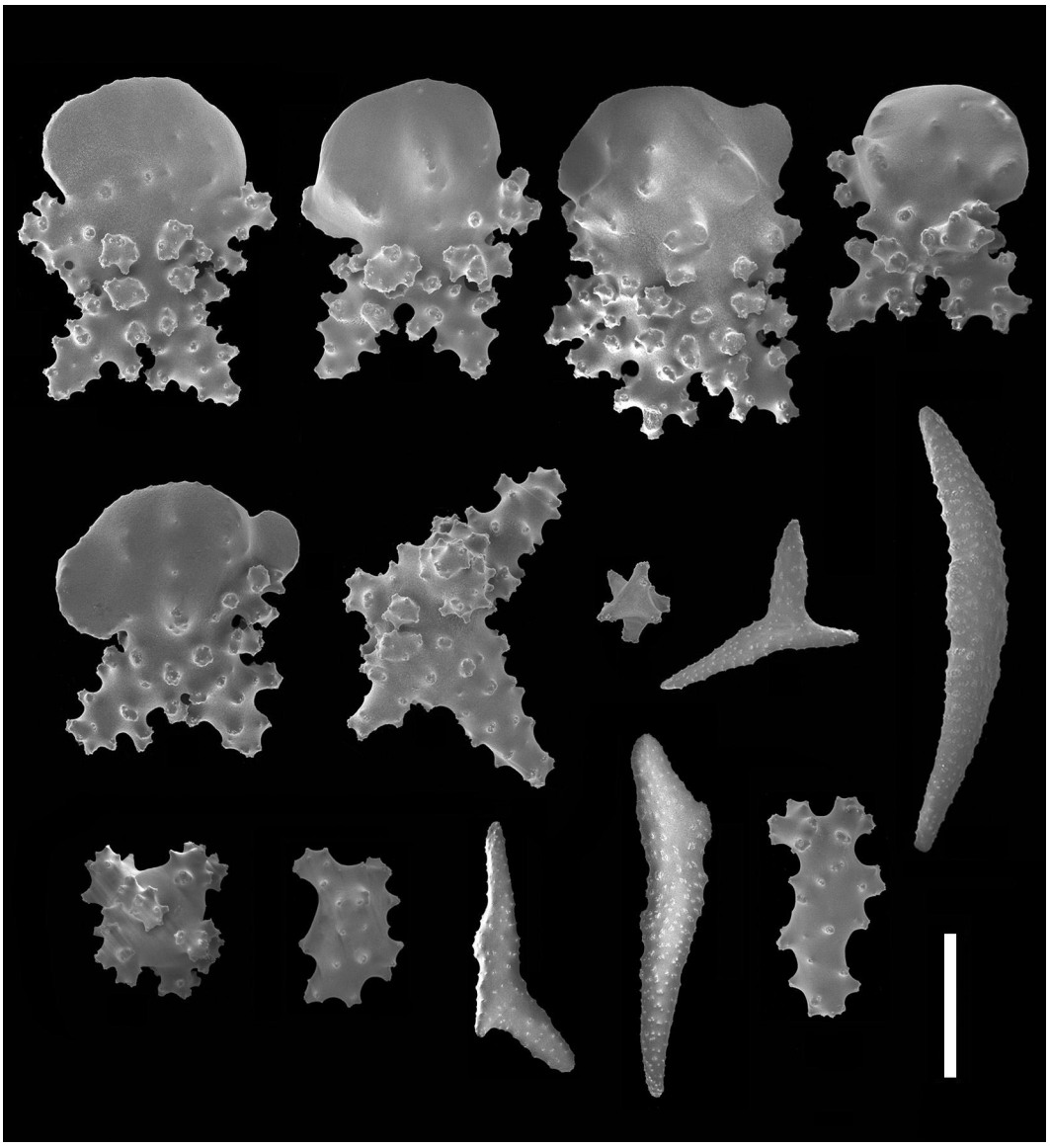

FIGURE 24. *Menella* sp. scanning electron micrographs of sclerites from CASIZ 109578; scale bar = 0.10 mm.

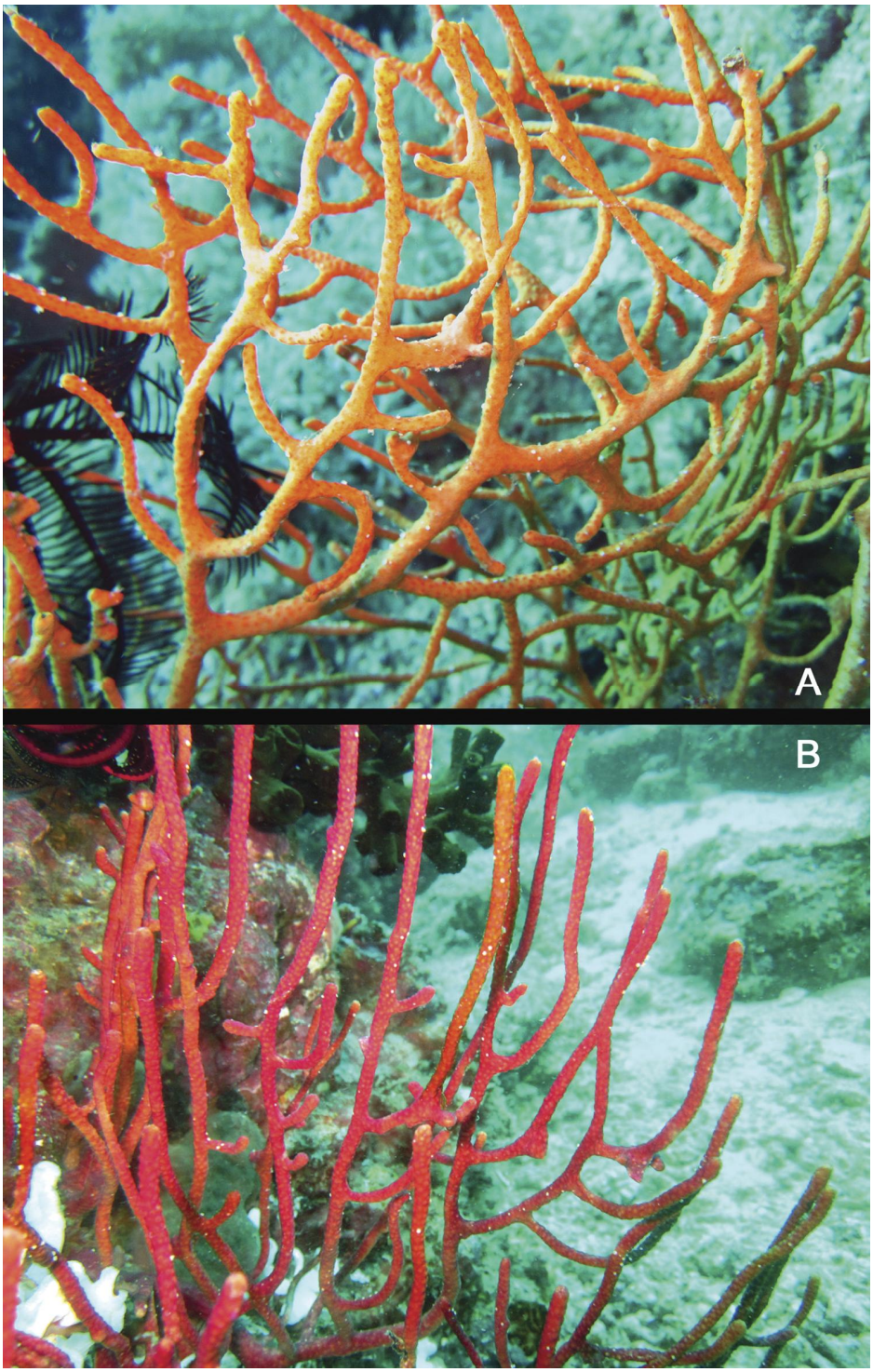

FIGURE 25. Underwater photographs of plexaurid gorgonians. A. *Paraplexaura* sp. B. *Menella* sp.

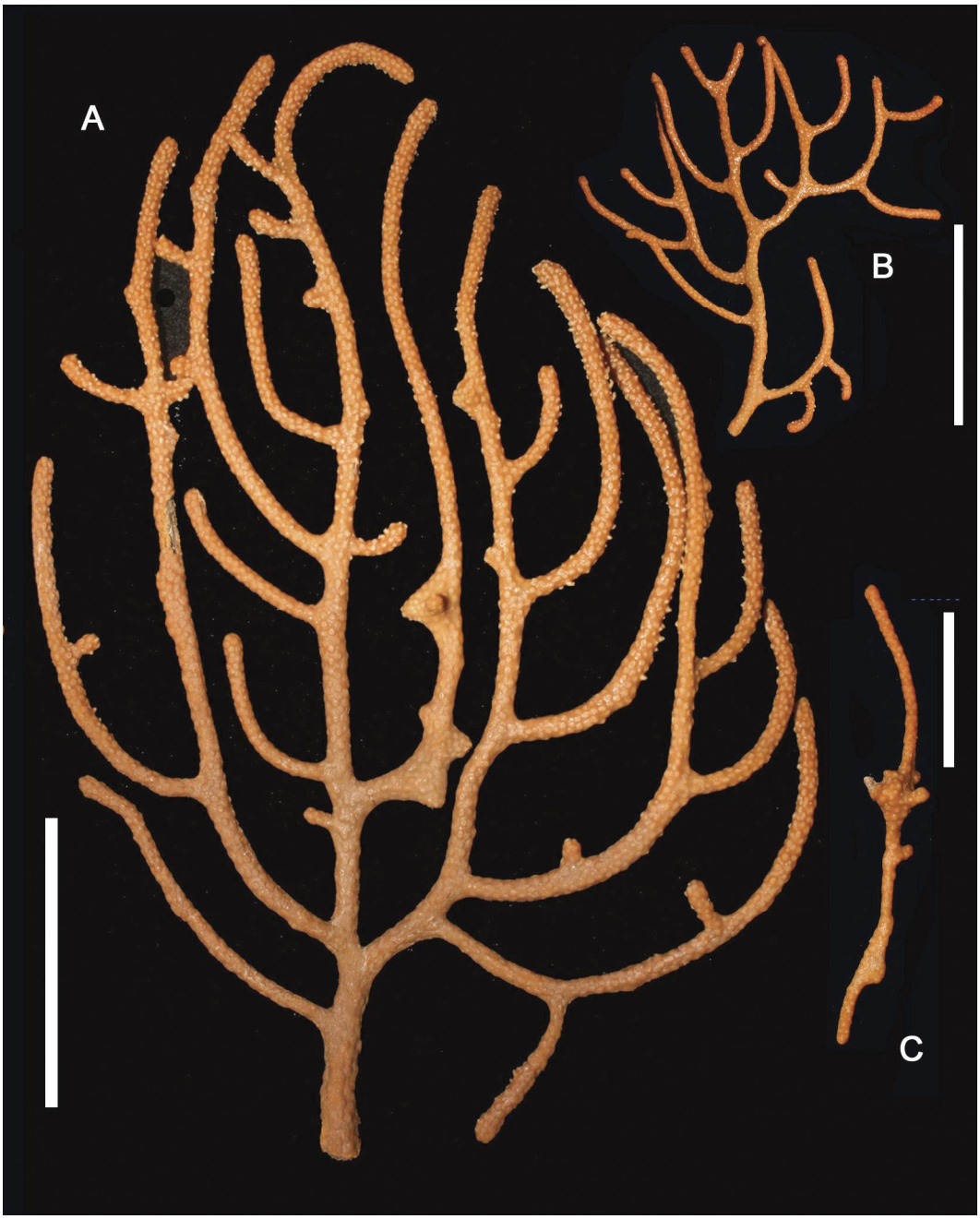

FIGURE 26. *Paraplexaura* sp., wet-preserved specimens. A. CASIZ 185451; scale bar = 40 mm. B. CASIZ 190431; scale bar = 50 mm. C. CASIZ 190431, scale bar = 25 mm

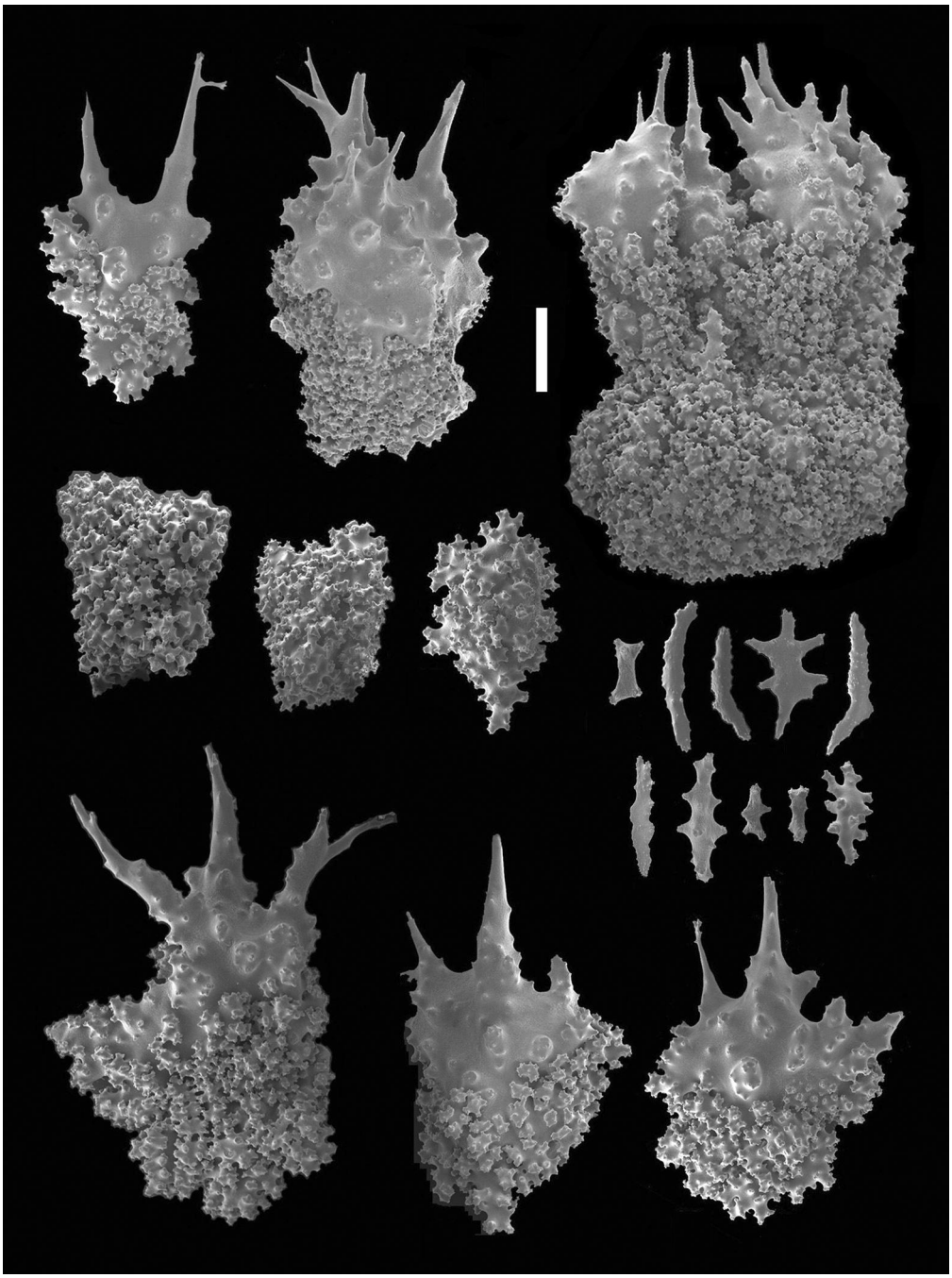

FIGURE 27. *Paraplexaura* sp. scanning electron micrographs of sclerites from CASIZ 103947; scale bar = 0.10 mm.

FIGURE 28. *Villogorgia* sp., CASIZ 111773, wet-preserved specimen; scale bar = 50 mm.

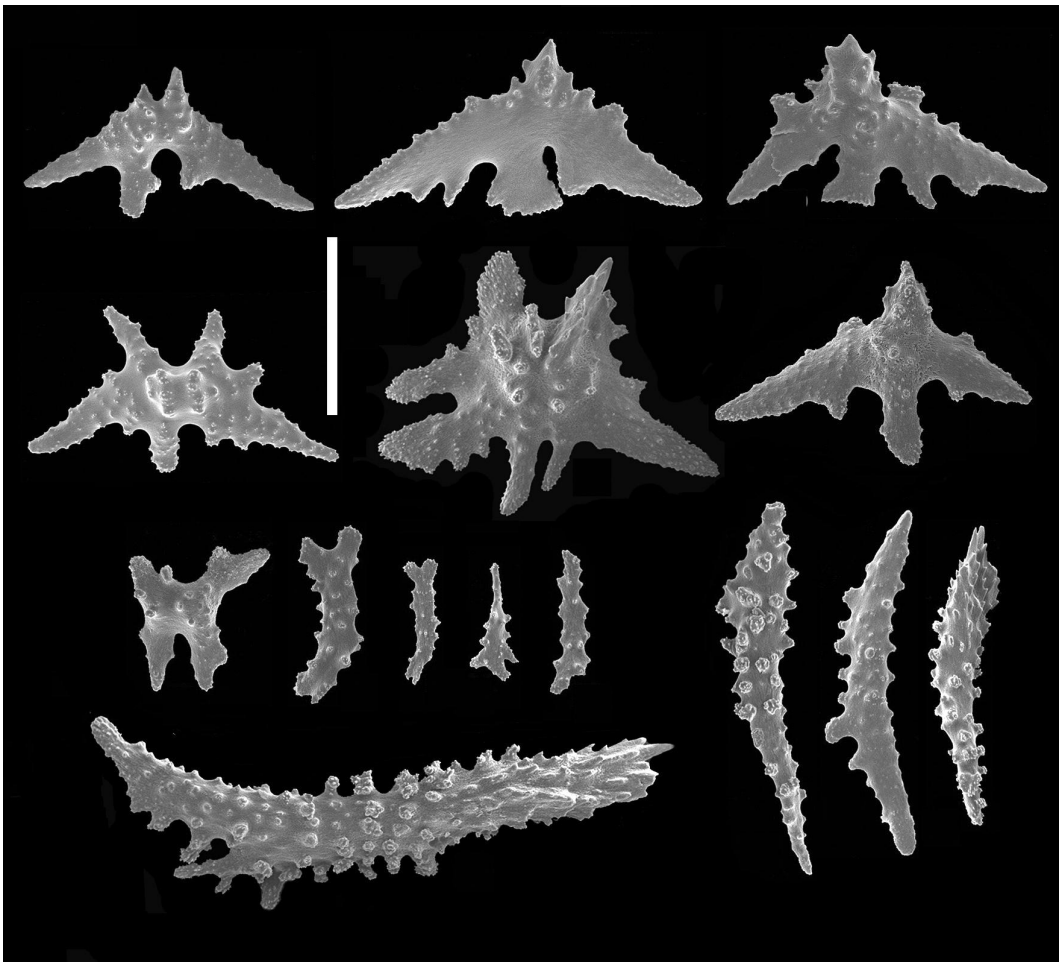

FIGURE 29. *Villogorgia* sp., scanning electron micrographs of sclerites from CASIZ 111773; scale bar = 0.10 mm.

FIGURE 30. *Rumphella* cf. *aggregata* and *Isis hippuris*. *A. Rumphella cf. aggregata*, wet-preserved specimen (CASIZ 186635); scale bar = 35 mm. B. Segmented axis of I*sis hippuris* (dried specimen, not catalogued, no collection data); scale bar = 25 mm. C. *Isis hippuris*, wet-preserved specimen (CAS 192749); scale bar = 55 mm.

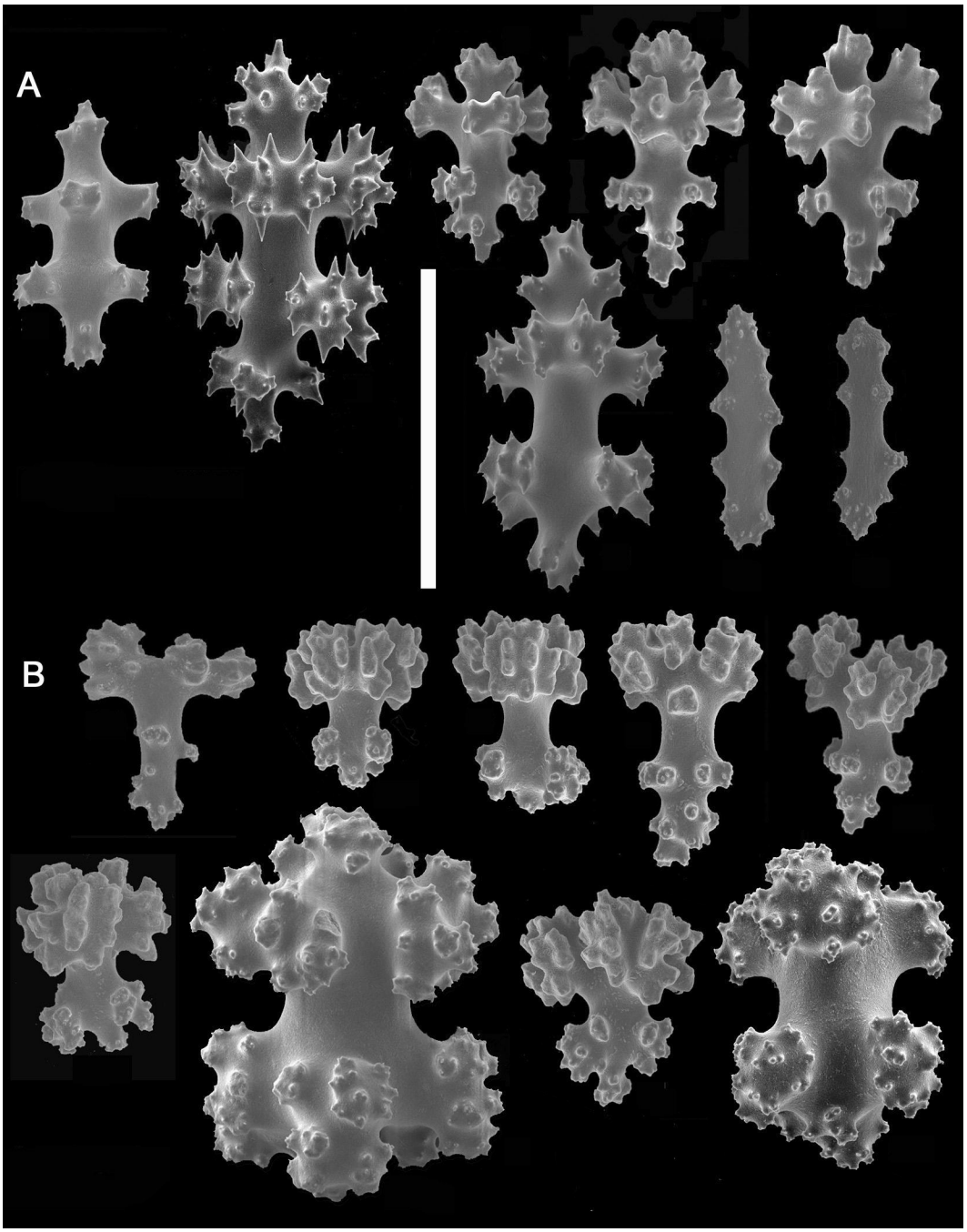

FIGURE 31. *Rumphella* cf. *aggregata* and *Isis hippuris*, scanning electron micrographs of sclerites. A. *Rumphella* cf. *aggregata* (CASIZ 180896). B. *Isis hippuris* (CASIZ 192749). Scale bar for A and B = 0.10 mm.

FIGURE 32. A. *Viminella* sp. unbranched sea whip, CAS 104027; scale bar = 35 mm. B. *Dichotella gemmacea* CASIZ 186642; scale bar = 35 mm. C. *Viminella* sp. with two terminal branches, CASIZ 103820; scale bar = 50 *mm.*

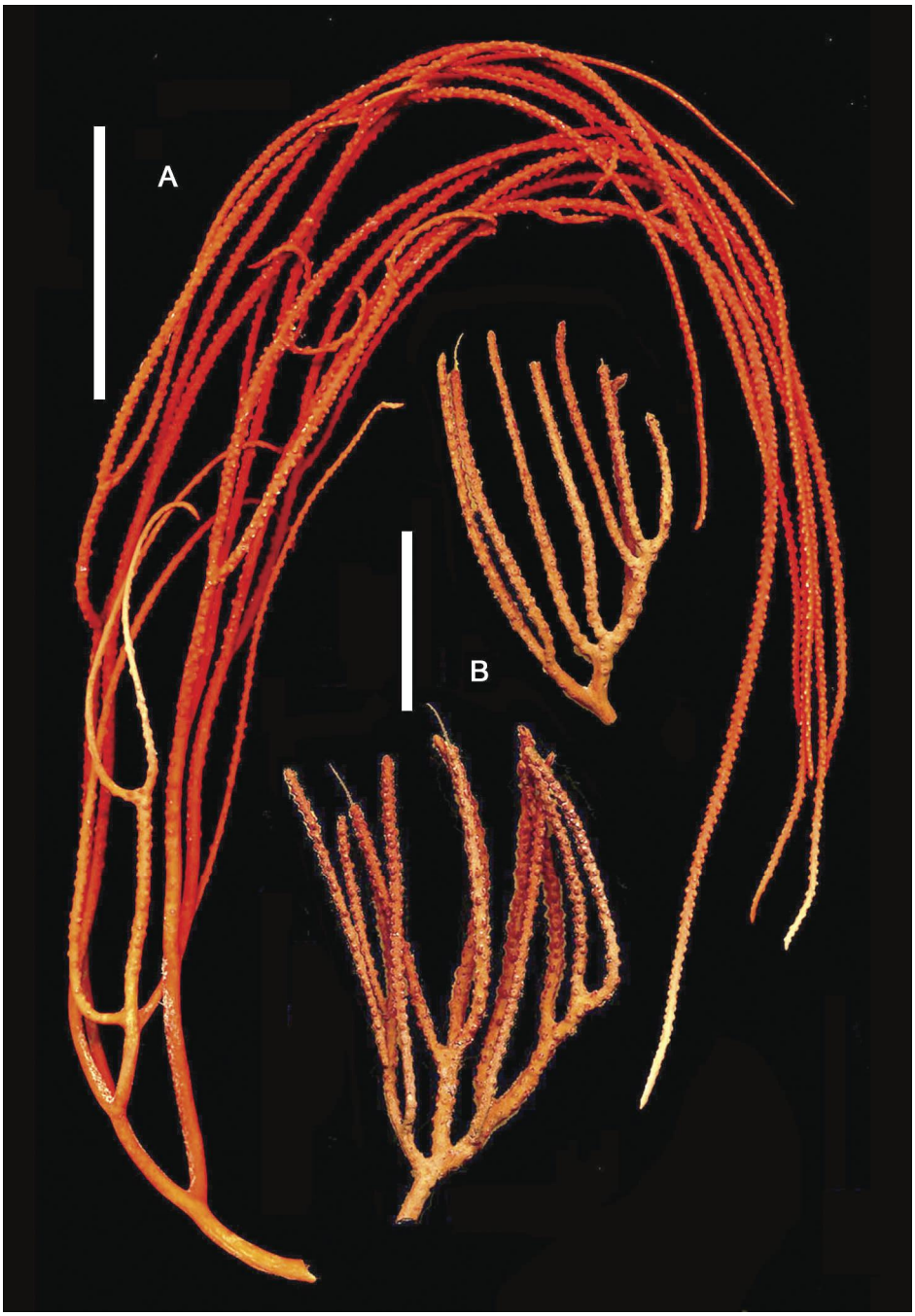

FIGURE 33. *Ellisella* spp. Wet-preserved specimens. A. CASIZ 985385; scale bar = 30 mm. B. CASIZ 185472, two partial specimens; scale bar = 20 mm.

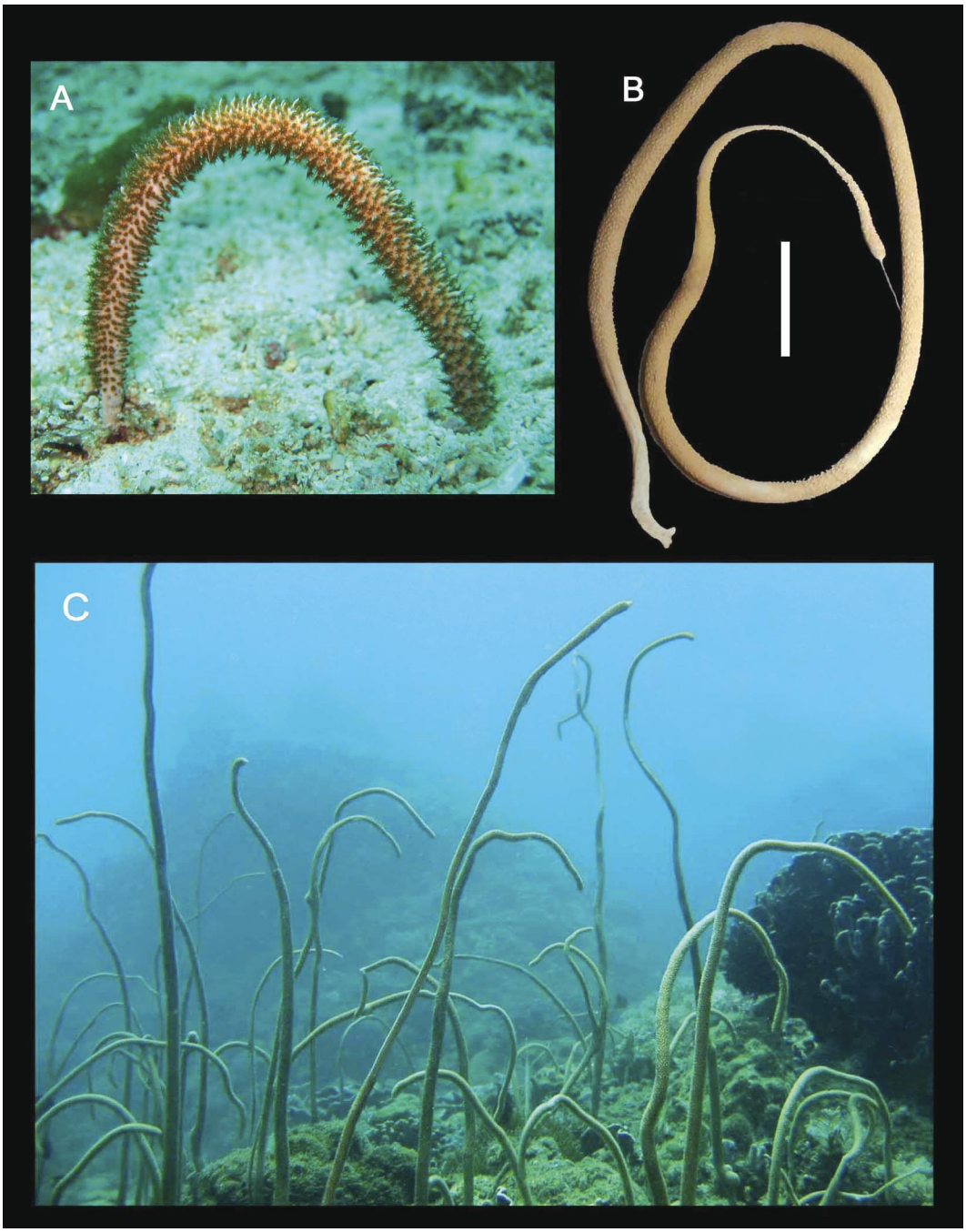

FIGURE 34. *Junceella* cf. *fragilis*: A. Underwater photograph of a single colony showing extended polyps that are brown in color due to the presence of zooxanthellae, Maricaban Island. B. Wet-preserved specimen (CASIZ 180160); scale bar = 40 mm. C. Underwater photograph of many colonies displayed as a dense field of sea whips, Maricaban Island.

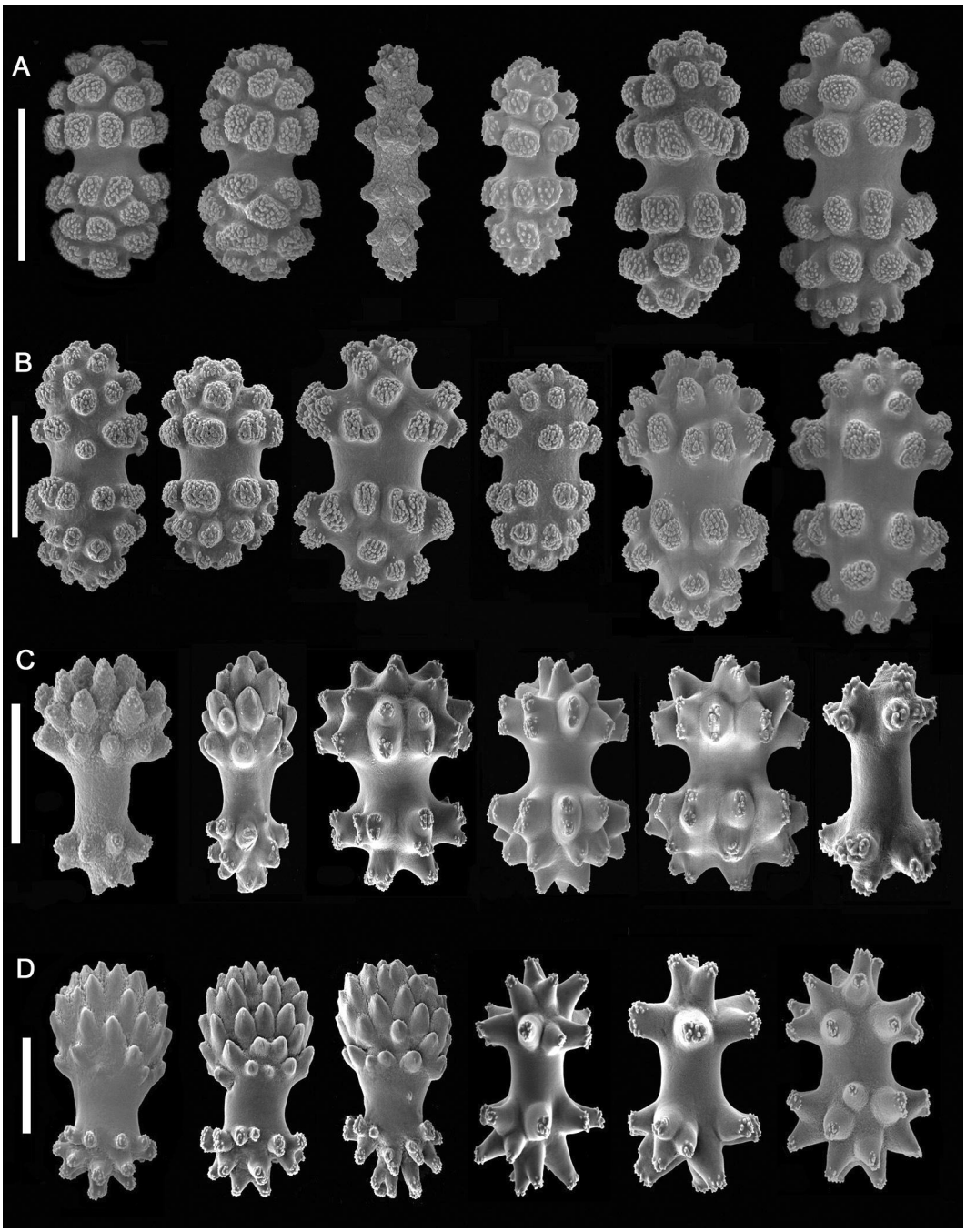

FIGURE 35. Ellisellid gorgonians, scanning electron micrographs of sclerites. A. *Ellisella* sp. (CASIZ 095385). B. *Viminella* sp. (CASIZ 185478). C. *Junceella fragilis* (CASIZ 103838). D. *Dichotella gemmacea* (CASIZ 103948). Scale bars = 0.03 mm.

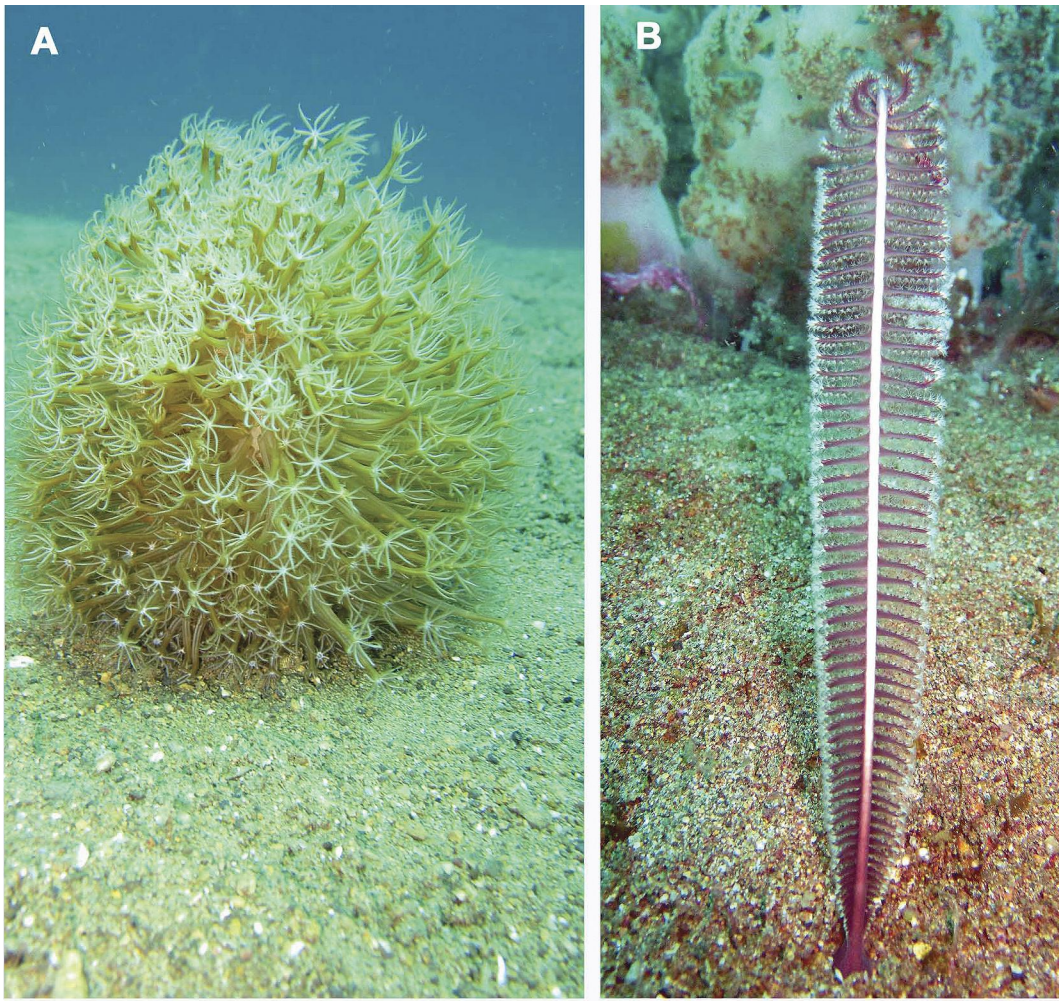

FIGURE 36. Underwater photographs of pennatulaceans, *in situ* during daylight hours. A. *Cavernulina* cf. *cylindrica* showing brown pigmentation in the polyps due to the presence of zooxanthellae; photo by T. M. Gosliner. B. *Scytalium* cf. *sarsi*.

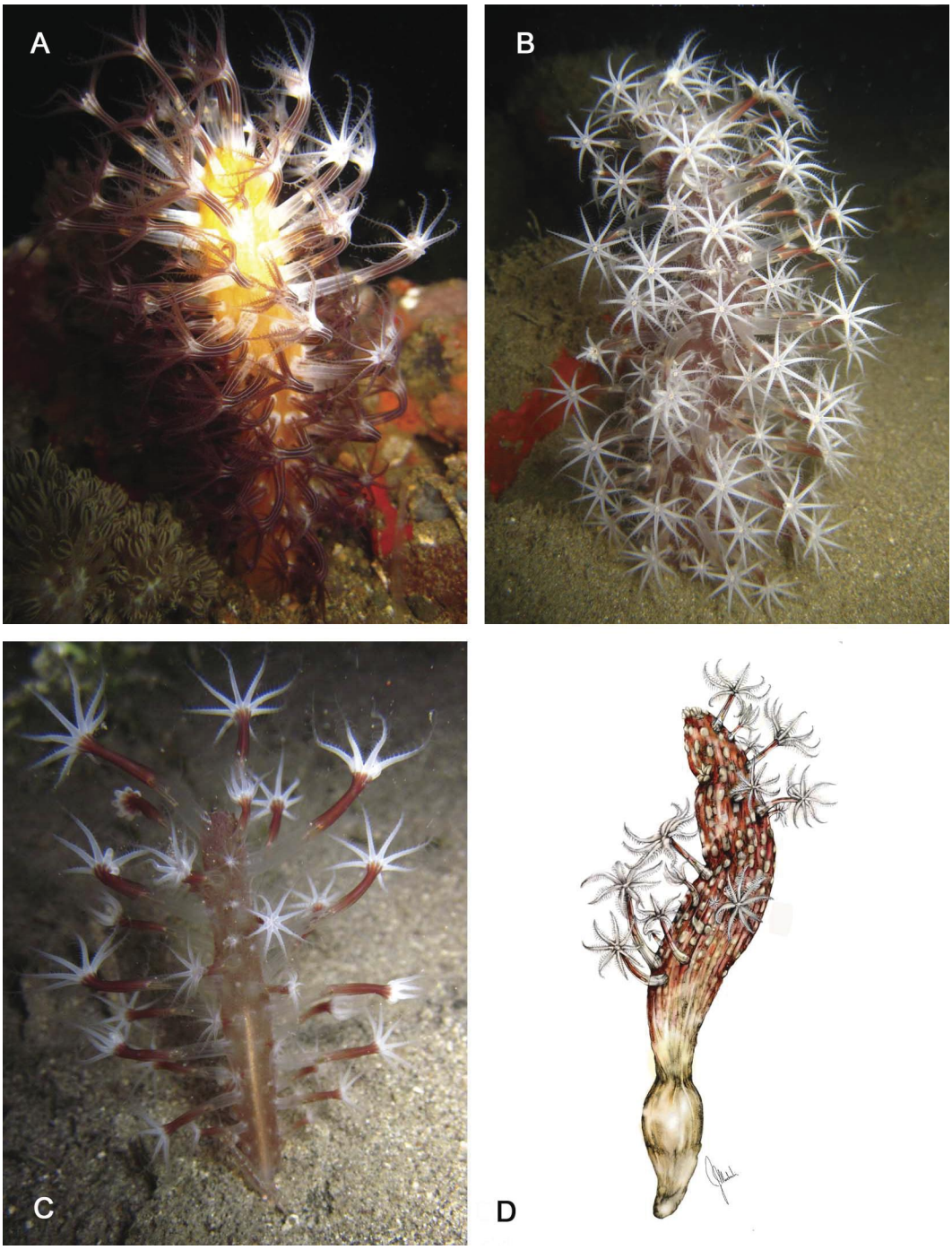

FIGURE 37. *Veretillum* spp. A-C. Underwater photographs of colonies, *in situ* at night; photo in B by T. M. Gosliner. D. Illustration of *Veretillum* sp. from the Batangas region, Luzon, Philippines, by Jessica Machnicki, California Academy of Sciences.

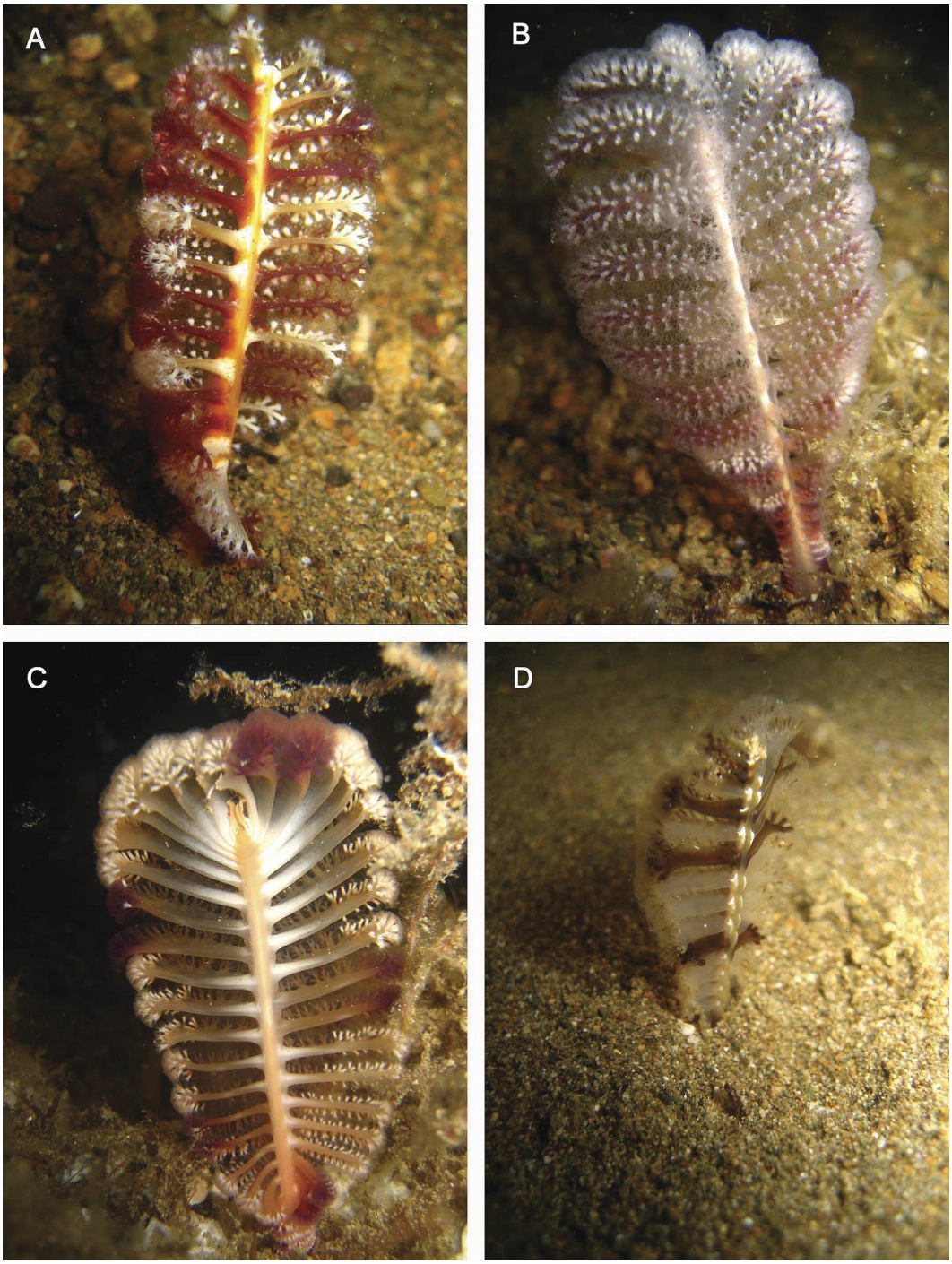

FIGURE 38. Underwater photographs of *Virgularia* spp. (photos in C and D by T. M. Gosliner).

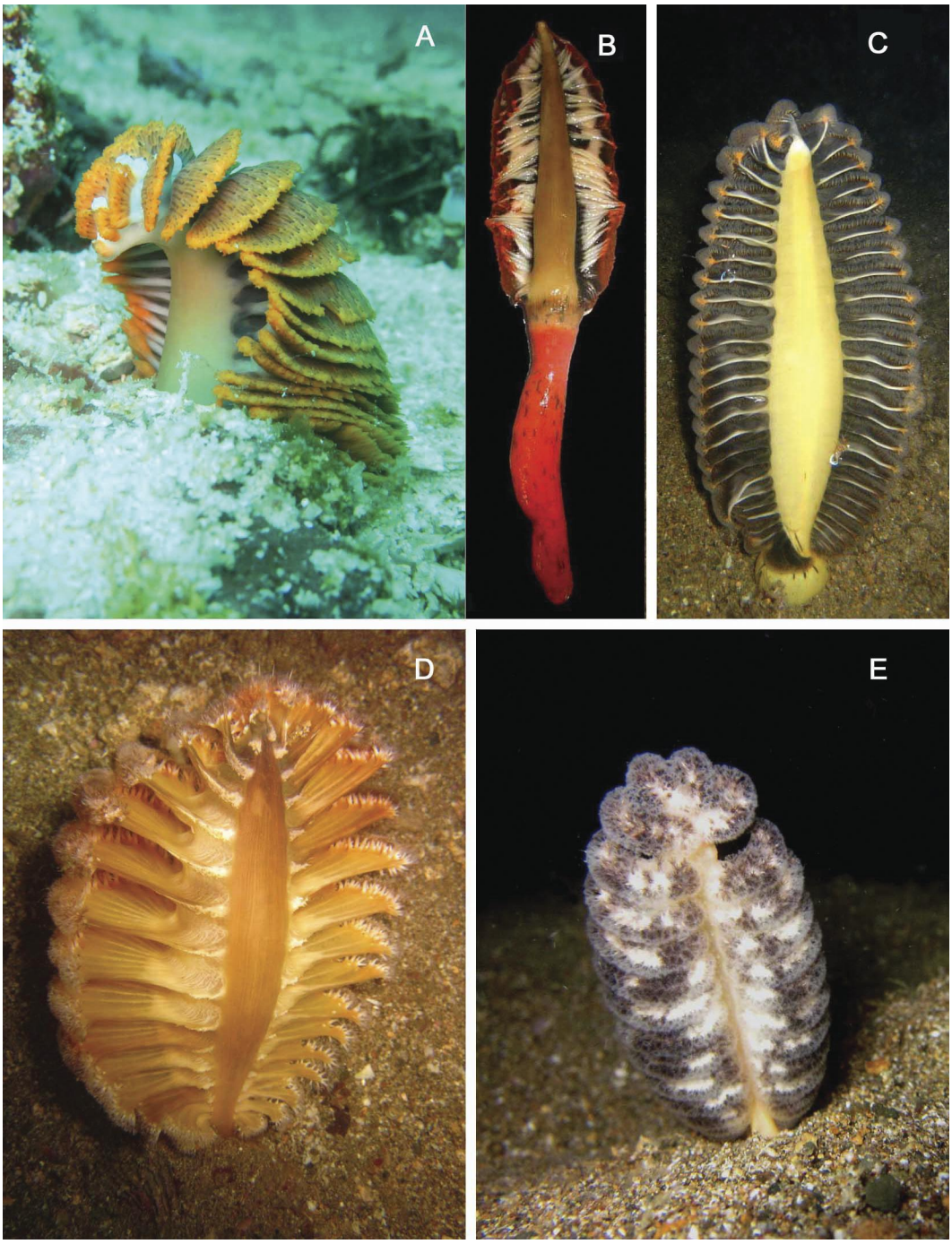

FIGURE 39. *Pteroeides* spp. A, C–E. Underwater photographs of colonies *in situ* (photo in A was taken during daylight hours; those in C–E were taken at night); photo in C by T. M. Gosliner. B. Wet preserved specimen of colony shown in A, CAS 185934, 220 mm in length.

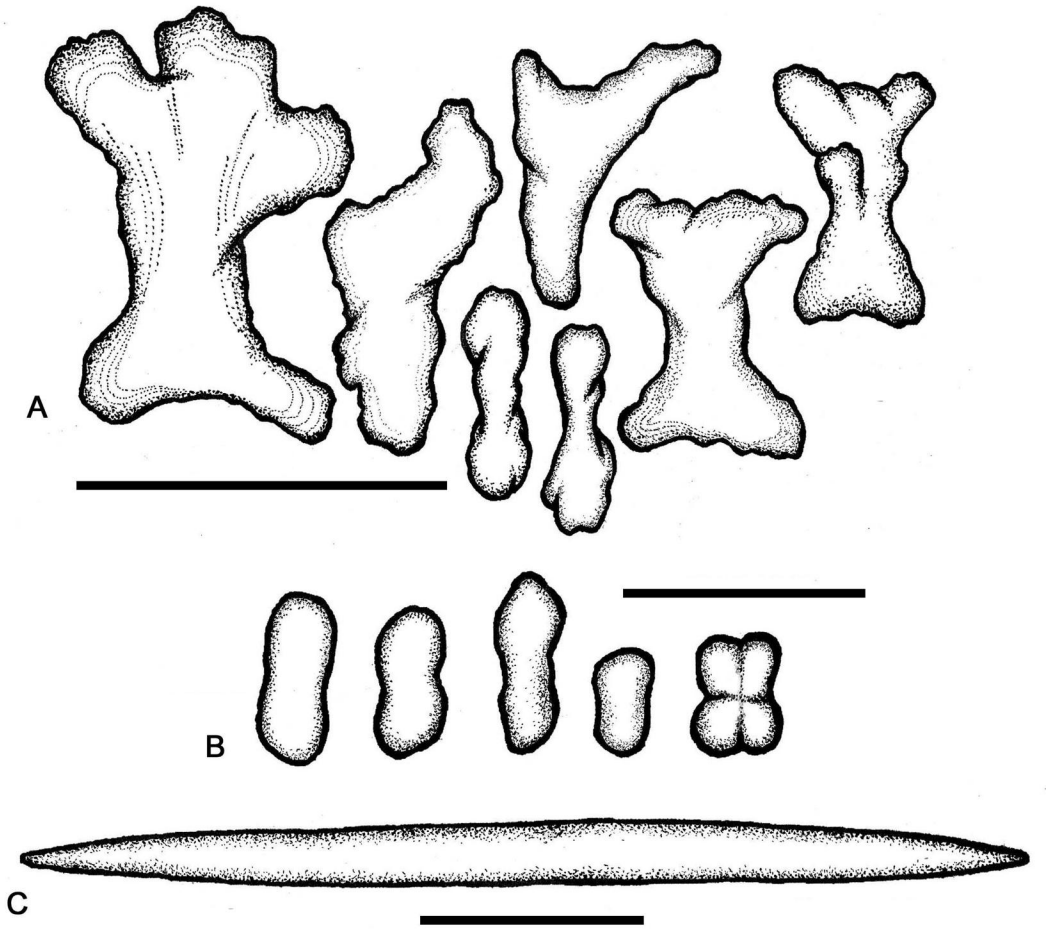

FIGURE 40. Pennatulacean sclerites. A. *Cavernulina* cf. *cylindrica* (CAS 186569); scale bar = 0.1 mm. B. *Scytalium* cf. *sarsi* (CAS 185443); scale bar = 0.05 mm. C. *Pteroeides* sp. (CAS 190421). Scale bar = 2.0 mm.