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**A revision of the genus *Leptogorgia* Milne Edwards & Haime, 1857
(Coelenterata: Octocorallia: Gorgoniidae)
in the eastern Pacific**

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A revision of the genus *Leptogorgia* Milne Edwards & Haime, 1857 (Coelenterata: Octocorallia: Gorgoniidae) in the eastern Pacific

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Abstract

The species of the widespread gorgoniid genus *Leptogorgia*, which occur along the eastern Pacific, are taxonomically revised based on original type material of all species described until now and reference specimens from recent surveys and expeditions along the Pacific coast of Panama, and Costa Rica. As a result, 21 species are recognized as valid and one as dubious. Lectotypes are assigned for eight species in order to establish their taxonomic status. All the species are

described and illustrated. The fauna herein reported does not represent overall diversity or geographical range of each species but adds new reports. The present count is 16 species for Panama, 11 for Costa Rica, 7 for Mexico, 6 for El Salvador, 4 for Peru, 4 for Ecuador, 3 for Colombia, 2 for California, 2 for Nicaragua, and 2 for Chile.

Key words: Cnidaria, Coelenterata, Costa Rica, eastern Pacific, gorgonian, octocoral, *Leptogorgia*, sea fans, Panama, soft corals, taxonomy

Introduction

The genus *Leptogorgia* Milne Edwards & Haime, 1857, (Gorgoniidae) comprises approximately 54 valid species. It is distributed throughout most of the Panamic Province, the Atlantic Ocean, the Caribbean, the Mediterranean seas, around southern Africa, and one species is found in the subantarctic (Williams & Lindo 1997). Bayer (2000) described one species from deeper waters (> 1900 m) of the East Pacific Rise. Regarding the Indo-Pacific species, Williams & Vennam (2001) consider them in the genus *Pseudopterogorgia* Kükenthal, 1919.

A number of authors from the last two centuries dealt with the shallow water octocoral fauna of the eastern Pacific including Valenciennes (1846, 1855), Milne Edwards and Haime (1857), Horn (1860), Duchassaing and Michelotti (1864), Verrill (1864, 1865, 1868a,b, 1869a,b, 1870), Hickson (1928), Bielschowsky (1918, 1929), Kükenthal (1919, 1924), Stiasny (1941, 1943), Prah *et al.* (1986), Breedy (2001), Breedy & Guzman (2002, 2003a,b, 2004, 2005a,b), and Williams & Breedy (2004). Verrill made the most significant contributions to the knowledge of the eastern Pacific octocoral fauna (Breedy & Guzman 2002).

Leptogorgia is one of the most abundant genera of the shallow water octocoral fauna in the eastern Pacific. About 30 nominal species were described in this genus, for the region, but not without problems. Most of the authors failed to provide detailed illustrations with the species descriptions, delineations are not clear and in most cases holotypes were not designated or were subsequently lost. In some cases, the type material is represented just by one specimen, or by a small fragment, or it has been lost. Consequently, a complete evaluation of the genus with the available type material as well as recent collections is needed to establish the taxonomic status of the species (Prah *et al.* 1986; Williams & Lindo 1997; Breedy & Guzman 2002). Several of the species treated in this paper occur frequently and have a wide geographical distribution while for others only a few specimens are known, and some species have been found just in one locality. We record the distribution of species known at the present, which will probably expand if more extensive surveys are conducted.

This study represents the second contribution in a series proposed to reevaluate the genera of gorgonians reported for the shallow eastern Pacific waters. The first contribution (Breedy & Guzman 2002) revised the genus *Pacificorgia*. Herein, we revise the genus *Leptogorgia*.

Abbreviations

BM: The Natural History Museum (former British Museum), London, UK; CASIZ: California Academy of Science, Invertebrate Zoology, San Francisco, USA; CIMAR: Centro de Investigación en Ciencias del Mar y Limnología, Universidad de Costa Rica, San Jose, Costa Rica; CIEMIC: Centro de Investigación en Estructuras Microscópicas, Universidad de Costa Rica; CDRS: Charles Darwin Research Station, Galapagos, Ecuador; ICZN: International Code of Zoological Nomenclature; MZUT: Museo Regionale di Scienze Naturali, Torino, Italy; MZUF: Museo Zoologico dell'Università di Firenze, Firenze, Italy; MNHN: Muséum National d'Histoire Naturelle, Paris, France; MCZ: Museum of Comparative Zoology, Harvard University, Boston, USA; SEM: Scanning Electron Microscopy; STRI: Smithsonian Tropical Research Institute, Panama; UCR: Museo de Zoología, Escuela de Biología, Universidad de Costa Rica; USNM: National Museum of Natural History (former United States National Museum), Smithsonian Institution, Washington, USA; YPM: Yale

Peabody Museum of Natural History, New Haven, USA; ZMHC: Zoologisches Institut und Zoologisches Museum, Hamburg, Germany; ZMUC: Zoologisk Museum Kobenhavn, Copenhagen, Denmark; ZSM: Zoologische Staatssammlung München, Munich, Germany.

Materials and Methods

Type specimens and comparative reference material used in this study were analyzed during visits to museums or acquired on loan from the BM, CASIZ, MCZ, MNHN, MZUT, MZUF, USNM, YPM, ZMHC, ZMUC, and ZSM. In addition, specimens recently collected from along the Pacific coast of Costa Rica and Panama, deposited in the UCR and STRI, were examined. This material was collected by scuba diving down to a depth of 40 m.

Specimens were prepared for SEM following the protocol described in Breedy and Guzman (2002). For light microscope photography, sclerites were mounted in water or glycerine. Abundance of sclerites, forms and colours are given in terms of occurrences in unsorted sclerite samples observed under the light microscope. Measurements of the sclerites were obtained from pictures or directly using a light microscope with an optical micrometer. Length and maximum width of the sclerites were measured and the longest measurements are reported here. The type specimens were mostly dry, only a few were preserved in ethanol; for this reason, measurements of the diameter of stems and branches included the polyp-mounds (wet or dry). According to Hickson (1928), presence of longitudinal grooves along the branches of the colonies is an artefact of the drying process of the colony. We, however, believe this is a valid character since it is also observed in living animals.

Data on geographical distribution provided here are from collections, museum catalogues, published monographs and our personal observations. Lectotypes have been designated to establish the identity of some species to avoid future confusions.

Terminology

Taxonomy of *Leptogorgia*, as in most gorgonians, is based on the combination of the morphology and colour of both the colony and the sclerites. In this study, for the description of the species we followed the terminology proposed by Bayer, Grasshoff and Verseveldt (1983). However, in some cases, the introduction of new terms or modifications of older ones applied to the genus *Leptogorgia* were considered appropriate, and are given here.

Longitudinal grooves. Narrow, sinuous furrow extending along two sides of the main stems which correspond to the primary stem canals (Bayer *et al.* 1983). In dry specimens they are conspicuous grooves, and in wet specimens they are like a bare longitudinal row, which in some species is slightly raised, as in a quill.

Main branches. Thick branches in which the stem immediately divides or individual branches that sprout close together directly from the holdfast.

Points. A chevron or inverted “V” arrangement of the anthocodial sclerites below the polyp tentacles.

Polyp-mounds. Protuberances resulting from polyps retracting into the coenenchyme. These are accentuated during the preservation process, but the general characteristic (prominent, flat, and slightly raised) proved to be consistent through specimens of the same species preserved or dry.

Stem. Basal part of the colony attached to the holdfast, from which branches subdivide.

Unbranched terminal twigs. Final portion of the branches that do not ramify, free ends, or terminal twigs (Grasshoff 1988).

Family Gorgoniidae Lamouroux, 1812

Genus *Leptogorgia* Milne Edwards & Haime, 1857

Gorgonia (pars) Pallas, 1766: 160; Milne Edwards & Haime 1857: 157.

Leptogorgia Milne Edwards & Haime, 1857: 163; Verrill 1868b: 387; Verrill 1869: 420; Kükenthal 1924: 324; Bielschowsky 1929: 81; Stiasny 1943: 87; Bayer 1961: 214; Grasshoff 1988: 97; Grasshoff 1992: 54; Williams 1992: 231; Williams & Lindo 1997: 500; Breedy & Guzman 2005: 2.

Lophogorgia Milne Edwards & Haime, 1857: 167; Kükenthal 1924: 322; Bielschowsky 1929: 73; Bayer 1956: 212; Bayer 1961: 194.

Filigorgia Stiasny, 1937: 309; 1939: 301; Bayer 1956: 206.

Type species. *Gorgonia viminalis* Pallas, 1766 (from the Mediterranean Sea), by subsequent designation, Verrill 1869: 420.

Diagnosis. Gorgoniids with variable branching patterns: pinnate, dichotomous, or filiform. Branch anastomosis absent in all except two species, *Leptogorgia gilchristi* (Hickson, 1904) and *Leptogorgia bayeri* Williams & Lindo, 1997. Axis horny, with a cross-chambered central core with a network of organic filaments frequently mineralized. Colonies may be found with a holdfast attaching them to hard substrates, or just lying on the substrate. Polyps are fully retractile into the coenenchyme, which may be slightly raised, mound-like, around the apertures. Coenenchymal sclerites are capstans and/or spindles. Capstans have two whorls of tubercles and blunt or elongated ends with various arrangements of complex tubercles. Spindles have several whorls of tubercles; some have bent ends, with symmetrically or asymmetrically complex tuberculation. In some species, the warts are fused into incomplete disks. The ends of the spindles can be acute, blunt, or one of each. Anthocodial sclerites usually flat rods and platelets. Colour variable: white, yellow, orange, red, violet, or brownish, and bicoloured (based on Grasshoff 1988; Grasshoff 1992; Williams & Lindo 1997; Breedy & Guzman 2005).

Distribution. Eastern Pacific (from southern California to Chile), Atlantic Ocean, western and southern Africa, Caribbean Sea, Mediterranean Sea, and one record for the subantarctic (Williams & Lindo 1997).

Remarks. Milne Edwards & Haime (1857) in their “Histoire naturelle des coralliaires” described the genus *Leptogorgia* along with the genus *Lophogorgia*. The genus *Lophogorgia* was established for just one species: *Lophogorgia palma* (from Cape of Good Hope). Milne Edwards & Haime made very short descriptions based only on the external morphology of the colonies. Verrill (1868b) examined the sclerites of several species of *Leptogorgia* and designated *Leptogorgia viminalis* (from Islas Canarias) as the type of *Leptogorgia* and included the monotypic *Lophogorgia* in *Leptogorgia* thus synonymizing the two genera (see Grasshoff 1988). Later the two genera were separated again with uncertainty until Bayer in 1956 and 1961 gave a clear delineation: *Lophogorgia* with symmetrical sclerites and *Leptogorgia* with symmetrical and asymmetrical sclerites, the latter kind with flat tubercles fused into disks. This definition worked well for the West Indies fauna but not for the American Pacific; although the distinction in some species was not clear, suggesting a “continuum” (according to Grasshoff 1988). Grasshoff (1988) in his revision of West African gorgoniid fauna found transitional forms between the two genera, which made the “continuum” more obvious. Consequently, Grasshoff (1988) once more decided to synonymize both genera.

Leptogorgia aequatorialis Bielschowsky, 1929

(Figs. 1–3)

Leptogorgia aequatorialis Bielschowsky, 1918: 31 [Nomen nudum]; Kükenthal 1919: 914; Kükenthal 1924: 331. Bielschowsky 1929: 118–119

Lophogorgia aequatorialis Harden 1976: 67.

Material examined. Holotype: ZMHC 4872, preserved, Bahia de Caraguez, Ecuador, 4–5 m, no more data available.

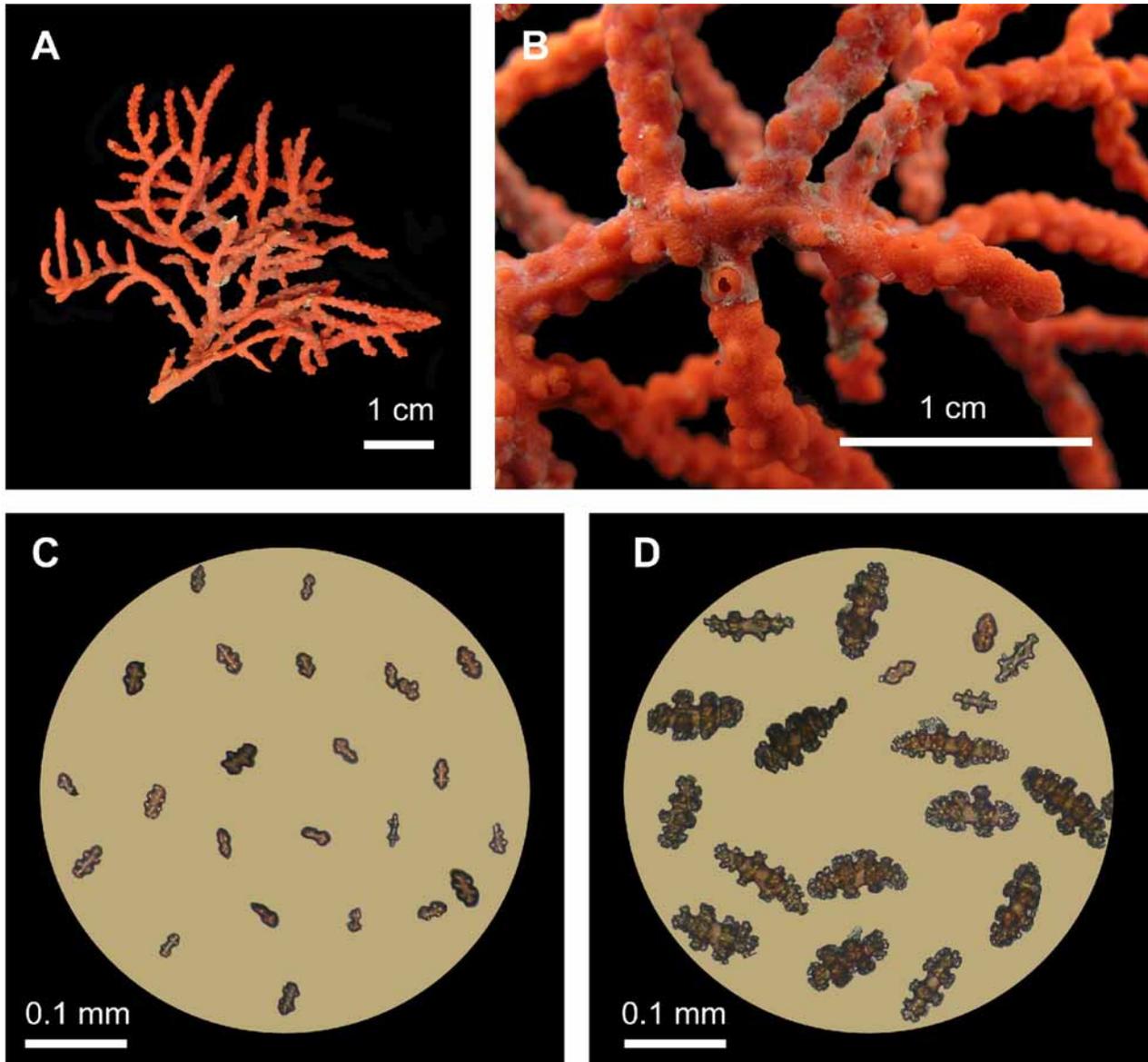


FIGURE 1. A, *Leptogorgia aequatorialis* (ZMHC 4872, holotype); B, detail of branches; C, light micrograph of anthocodial rods; D, light micrograph of coenenchymal sclerites.

Holotype description. The specimen is a fragment of the original colony which was 70 mm in height, and 70 mm in width (Bielschowsky 1929, figured specimen). What remains is a 50 mm by 50 mm piece of colony. Branching is irregularly pinnate with alternating pinnae, some subdivide again producing short branchlets. Branches are squarish (in cross section), 2.5–3.0 mm in diameter, and pinnae have the same appearance, about 2.0 mm in diameter. Free branchlets are up to 15 mm in length, with a pointed tip (Fig. 1A–B). Polyps are whitish, distributed all around the branches. Quill-like folds of coenenchyme are formed in the naked space between the polyp-rows of some branches. Polyp-mounds are prominent, dome-shaped, around 1.0 mm in diameter, with labiate apertures. Colour is deep orange. Coenenchymal sclerites are all orange. They are mostly capstans, that reach up to 0.08 mm in length, and 0.045 mm in width (Figs. 1D, 2). There are also spin-

dles that reach up to 0.10 mm in length, and 0.045 mm in width, with 3–4 whorls of tubercles. Some have bent ends. Crosses measuring up to 0.06 mm by 0.06 mm are also present (Fig. 2). Anthocodial rods are small, biscuit-shaped, and of a reddish-pink colour. They form a ring of an untidy arrangement below the polyp tentacles; they reach up to 0.04 mm in length, and 0.03 mm in width, with smooth, or lobed margins (Figs. 1C, 2).

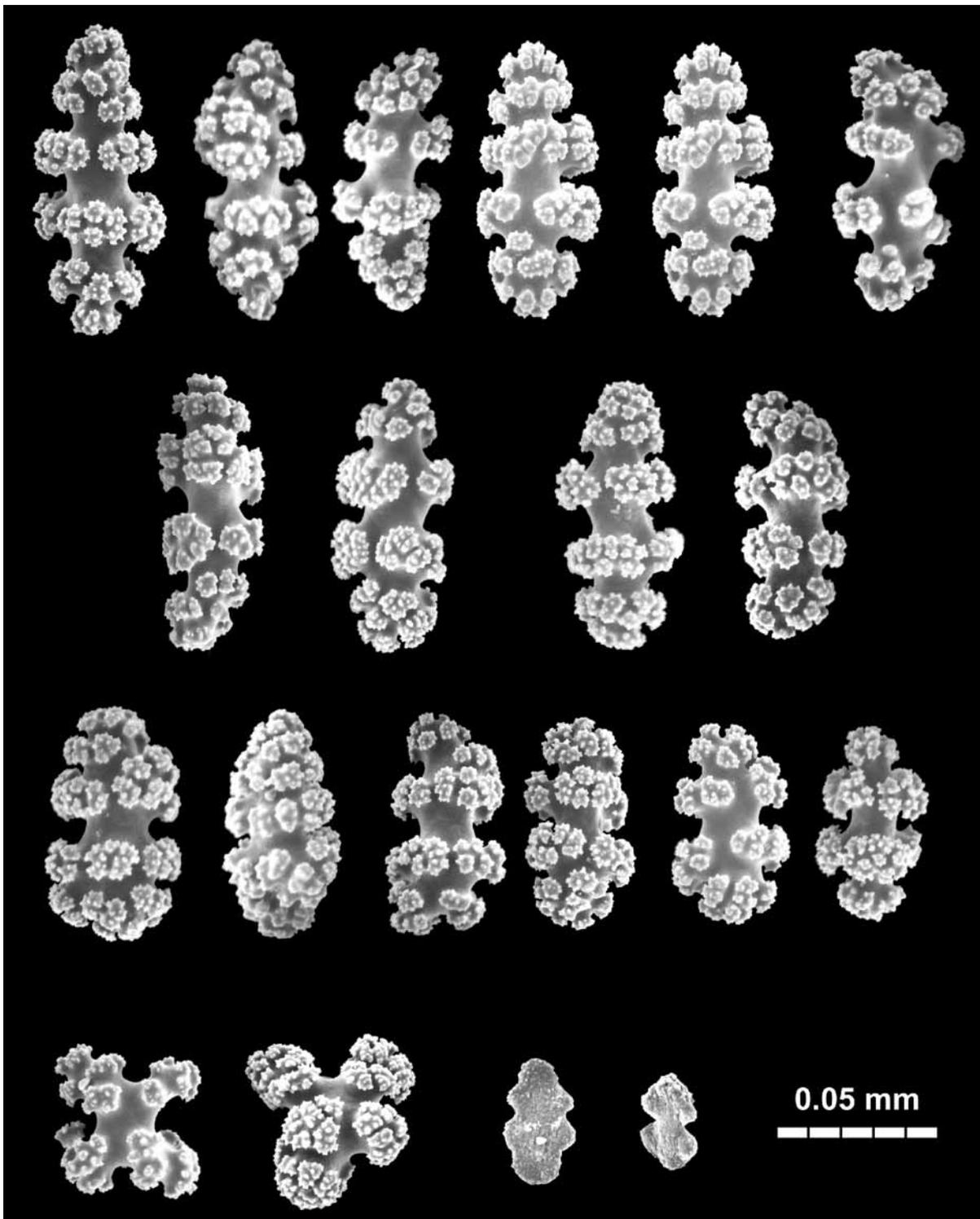


FIGURE 2. *Leptogorgia aequatorialis* (ZMHC 4872, holotype), SEM of coenenchymal sclerites and anthocodial rods.

Distribution. Only known from the type locality: Caraguez Bay, Ecuador (Table 2, Fig. 3).

Remarks. Bielschowsky (1918, 1929) made a revision of the Gorgoniidae overlooking early type designations which in some cases affected concepts of nomenclature. These were later revised and emended by

Bayer (1951). Bielschowsky (1918, 1929) described six new species of *Leptogorgia* from various localities in the eastern Pacific without designating holotypes. Herein we consider valid only three of them; *L. aequatorialis*, *L. obscura* and *L. parva* Bielschowsky, 1929, and have synonymized the other three species (see below). Of the material Bielschowsky examined, only a fragment of *L. aequatorialis*, two colonies of *L. parva*, and one small colony of *L. obscura* remain.

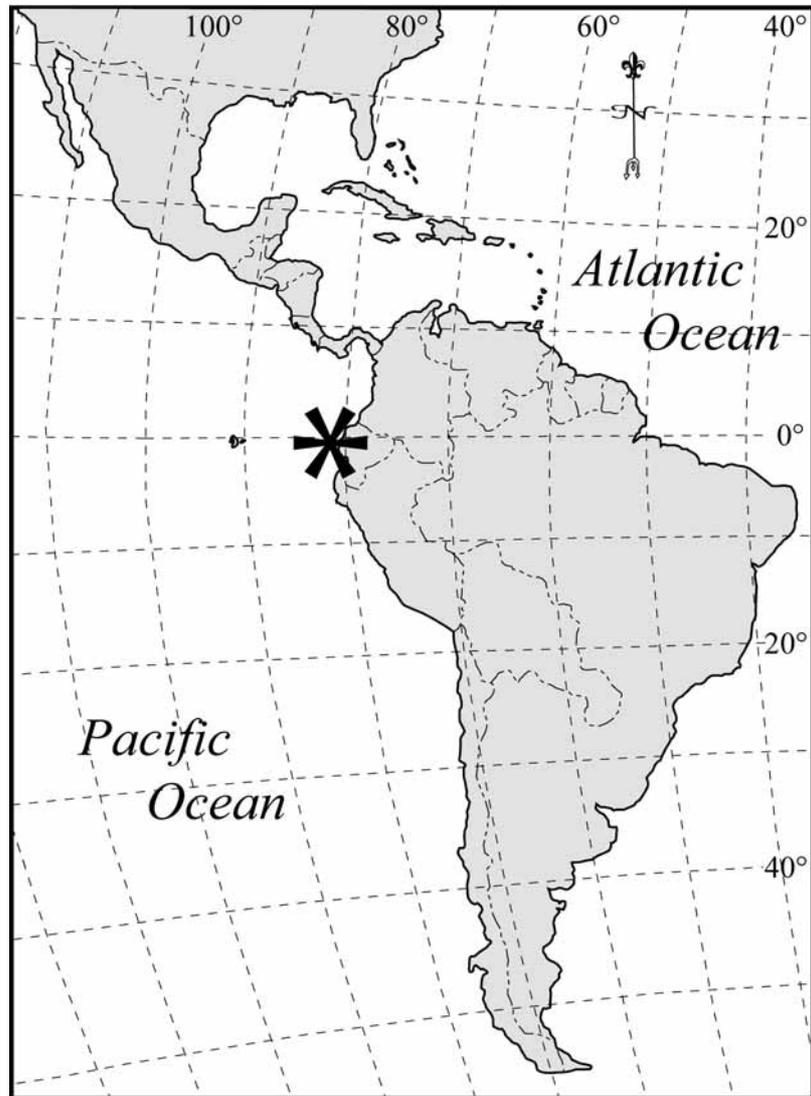


FIGURE 3 . Geographical distribution of *Leptogorgia aequatorialis* and *Leptogorgia obscura*.

These three species are similar in the style of branching (irregular pinnate), the prominent polyp-mounds, and also the size of the known specimens is similar, but they differ in the colour of the colonies, the colour of the sclerites and the sclerite composition. *Leptogorgia aequatorialis* is of a distinct deep bright orange colour, with orange coenenchymal sclerites, *L. obscura* is dark violet, with violet and pink coenenchymal sclerites, and *L. parva* is purplish red, with red, pink and yellow coenenchymal sclerites (all of these specimens are preserved in ethanol); the spindles in *L. aequatorialis* are smaller than in the other two species. In *L. parva* and *L. obscura* the longest spindles reach 0.12 mm, but the occurrence of spindles with acute ends in *L. parva* is higher than in *L. obscura* (Table 1). The small (up to 0.04 mm) biscuit-like anthocodial rods of *L. aequatorialis* differentiate this species from the other two. In *L. parva* anthocodial rods are orange and measure up to 0.05 mm, in *L. obscura* they are pale orange, amber, and pink, and measure up to 0.06 mm.

TABLE 1. Comparative characteristics of the eastern Pacific species of *Leptogorgia* Milne Edwards & Haime, 1857.

species	colour	type of branching	polyp-mounds	dominant sclerite type	sclerites colours	anth. rods colour	bi-coloured sclerites	sclerite max. length	spindles >0.1 mm	anth. rods =0.1mm	bent sclerites
<i>L. aequatorialis</i>	deep orange	irregular/pinnate	prominent	blunt spindles	orange	reddish-pink		0.10 mm			X
<i>L. alba</i>	white	dichotomous/irregular	slightly raised/flat	spindles	colourless	colourless		0.18 mm	X	0.15	X
<i>L. californica</i>	reddish ochre	irregular/pinnate	flat	capstans	red/pink/light yellow	pale orange		0.13 mm	X		X
<i>L. chilensis</i>	light orange	lax, dichotomous	flat	capstans	pale orange	pale orange		0.12 mm	X		
<i>L. clavata</i>	reddish-pink	pinnate (?)	slightly raised	capstans	reddish-pink	pale pink		0.10 mm		0.16	
<i>L. cofrini</i>	white	bushy, irregular	flat	blunt spindles	colourless	colourless		0.12 mm	X	0.14	
<i>L. cuspidata</i>	deep purple/deep yellow with yellow/purple bands and yellow/purple oval rings	irregular/pinnate	flat	capstans	deep purple/yellow	yellow/pink		0.13 mm	X		
<i>L. diffusa</i>	red	lax, pinnate	prominent	spindles	red/pink	light orange/pink		0.15 mm	X	0.14	
<i>L. exigua</i>	brownish red and thin orange oval rings	irregular/pinnate	slightly raised	capstans	red/pink/light orange/pale yellow		X	0.13 mm	X		X
<i>L. flexilis</i>	reddish brown	lax, dichotomous/irregular	flat	capstans	dark red	red	X	0.09 mm			
<i>L. floriae</i>	bright red	pinnate	prominent	spindles	red	yellow	X	0.13 mm	X	0.10	X
<i>L. fruticosa</i>	greyish-white	irregular	slightly raised	capstans	pale yellow	colourless		0.10 mm		0.10	
<i>L. labiata</i>	pink ochre	irregular/pinnate	prominent	capstans	rose-red/pink/pale yellow	yellow	X	0.10 mm			X
<i>L. laxa</i>	white	lax, dichotomous/irregular	slightly raised	spindles	colourless	colourless		0.18 mm	X	0.10	X
<i>L. obscura</i>	dark violet	irregular/pinnate	prominent	capstans	violet/pink	pale orange/amber/pink		0.12 mm	X		X
<i>L. parva</i>	purplish red	irregular/pinnate	prominent	capstans	red/pink/yellow	orange	X	0.12 mm	X		
<i>L. peruviana</i>	white	bushy, irregular	flat	capstans	colourless			0.10 mm			
<i>L. pumila</i>	light purple/pink	irregular/pinnate	prominent	spindles	pink/light yellow	orange/amber	X	0.15 mm	X	0.15	

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TABLE 1 (Continued)

species	colour	type of branching	polyp-mounds	dominant sclerite type	sclerites colours	anth. rods colour	bi-coloured sclerites	sclerite max. length	spindles >0.1 mm	anth. rods =0.1mm	bent sclerites
<i>L. ramulus</i>	white	irregular/pinnate	prominent	capstans	pale yellow/colourless	light orange		0.11 mm	X		
<i>L. ramulus</i> (pink morph)	red-rose	irregular/pinnate	prominent	capstans	red-rose	light orange		0.11 mm	X		
<i>L. regis</i>	dark orange/pale pink	bushy, irregular	prominent	spindles	pale orange/yellow/whitish	light yellow		0.14 mm	X	0.12	X
<i>L. rigida</i>	dark bluish purple	irregular/pinnate	slightly raised	capstans	deep bluish red	pink		0.12 mm	X		
<i>L. taboguilla</i>	reddish purple	irregular/pinnate	prominent	capstans	purplish red	orange		0.11 mm	X	0.14	

TABLE 2. Geographical distribution of the eastern Pacific species of *Leptogorgia* Milne Edwards & Haime, 1857. Country of the type locality is marked in bold.

Species	Type localities	Distribution
<i>L. aequatorialis</i>	Bahia de Caraguez	Ecuador , not Galapagos
<i>L. alba</i>	Panama	Costa Rica, Colombia, Ecuador, El Salvador, Galapagos, Mexico, Panama
<i>L. californica</i>	Baja California	Mexico
<i>L. chilensis</i>	Chile	California, Chile
<i>L. clavata</i>	unknown	Mexico (?)
<i>L. cofrini</i>	Golfo de Nicoya	Costa Rica , Panama
<i>L. cuspidata</i>	Baja California	Costa Rica, El Salvador, Mexico , Panama,
<i>L. diffusa</i>	Golfo de Nicoya, Archipelago Las Perlas	California, Chile, Colombia, Costa Rica , El Salvador, Panama
<i>L. exigua</i>	Acapulco, Tehuantepec, Guaymas	Costa Rica, Nicaragua, Mexico , Panama, Peru
<i>L. flexilis</i>	Archipelago Las Perlas	California, El Salvador, Panama
<i>L. floriae</i>	Archipelago Las Perlas	Panama
<i>L. fruticosa</i>	Islas Taboga, Taboguilla	Panama
<i>L. labiata</i>	Isla Taboguilla	Mexico, Panama
<i>L. laxa</i>	Isla Taboguilla	Costa Rica, Mexico, Panama
<i>L. obscura</i>	Bahia de Caraguez	Ecuador
<i>L. parva</i>	Panama	Panama
<i>L. peruana</i>	Callao	Peru
<i>L. pumila</i>	Zorritos	Costa Rica, Mexico, Panama, Peru
<i>L. ramulus</i>	Panama	Costa Rica, Colombia, El Salvador, Nicaragua, Panama , Peru
<i>L. ramulus</i> (pink morph)	Panama	Panama , Peru
<i>L. regis</i>	Archipelago Las Perlas	Costa Rica, Panama
<i>L. rigida</i>	Baja California, Acapulco, El Salvador	Costa Rica, El Salvador , Mexico , Panama
<i>L. taboguilla</i>	Isla Taboguilla	Costa Rica, Panama

***Leptogorgia alba* (Duchassaing and Michelotti, 1864)**

(Figs. 4–9)

Lophogorgia alba Duchassaing and Michelotti, 1864: 19; Rossi 1956: 198; Harden 1976: 68; Prahll, *et al.* 1986: 17; Volpi & Benvenuti 2003: 58.

Gorgonia (*Leptogorgia*) *rigida* var. *laevis*, Verrill, 1866: 327 [Nomen nudum].

Gorgonia (*Littigorgia*) *laevis* Verrill, 1868: 415.

Litigorgia levis (misspelled) Verrill, 1868b: 398.

Lophogorgia laevis Harden 1979: 75.

Leptogorgia alba Verrill 1868b: 398–399; Verrill 1869b: 421; Studer 1894: 68; Bielschowsky 1918: 30; 1929: 107–108; Kükenthal 1919: 771; 1924: 329; Hickson 1928: 400–405.

Leptogorgia alba var. *sulcata* Bielschowsky, 1929: 108–110; Kükenthal 1919: 771; 1924: 329.

Euplexaura lemasti Hickson, 1928: 349–351; Stiasny 1941: 266–267; 1943: 63.

Leptogorgia fasciculata Bielschowsky 1918: 29 [Nomen nudum]; 1929: 94–96; Kükenthal 1919: 912; 1924: 326; Stiasny 1951: 60.

Lophogorgia fasciculata Harden 1976: 74.

Material examined. Lectotype: MZUF c163, (figured specimen Duchassaing & Michelotti 1864), dry, Isla Flamenco, Golfo de Panama, Panama, no more data available. Paralectotype: MSNT 164, dry, Panama, no more data available.

Syntypes of *L. fasciculata*: ZSM 20044789, ZSM 20044790, preserved, no depth given, Panama, Hassler Expedition, A. Kölliker, 1904. Syntypes of *L. alba* var. *sulcata*: ZMHC 4496, ZMHC 5615, ZMHC 4580, preserved, Panama, no further data. Syntypes of *L. laevis*: MCZ 5416, dry, Archipelago Las Perlas, Golfo de Panama, no depth given, F. H. Bradley, 1866; MCZ 7008, dry, Golfo de Nicoya, Costa Rica, no depth given, F. H. Bradley, 1866; YPM 1639, preserved, Archipelago Las Perlas, no depth given, F. H. Bradley, 1866.

Other material examined. COSTA RICA: UCR 1471 (4 specimens), preserved, Punta Burica, 1 m, O. Breedy, 12 February 2002; UCR 1537, preserved, Bolaños Island, Salinas Bay, 3 m, J. Cortés, 1st February 2006; UCR 1542, preserved, Punta S-E, Caño Island, 18 m, O. Breedy, 14 September 1996; UCR 1543, preserved, Bajo El Diablo, Caño Island, 18 m, O. Breedy, 11 February 2000; UCR 1545 (3 specimens), preserved, Manuel Antonio National Park, Costa Rica, 18 m, O. Breedy, 6 April 2006; UCR 1546 (5 specimens), preserved, Isla Serrucho, Manuel Antonio National Park, 10 m, O. Breedy, 5 April 2006; UCR 1547, preserved, Punta Descartes, Salinas Bay, 6 m, O. Breedy, 9 June 2005; UCR 1553, preserved, Caño Island, 12 m, O. Breedy, 4 September 1996; UCR 1555, preserved, Tombolo oeste, Marino Ballena National Park, Costa Rica, 4 m, O. Breedy, 25 April 2002; UCR 1556, preserved, NE Isla Ballena, Marino Ballena National Park, 7 m, O. Breedy, 27 April 2002; UCR 1560, dry, Peñón Abrazo de la Muerte, Archipelago Murcielago, 25–30 m, O. Breedy & J. Cortes, 12 April 1996; UCR 1561, dry, Punta Matapalito, Peninsula de Osa, 18 m, O. Breedy & A. Fonseca, 15 March 1998; UCR 1661, preserved, Puertas de la Catedral, Archipelago Murcielago, 18 m, O. Breedy, 2 December 2003; UCR 1662, preserved, Nacascolito, Culebra Bay, 7 m, O. Breedy, 23 April 2002. ECUADOR: CDRS 02–25, preserved, Darwin Island, Galapagos Archipelago, 21–30 m, C. Hickman, 18 May 2002; CDRS 597, preserved, Wolf Island, Galapagos Archipelago, 13 m, C. Hickman, 12 November 2003. PANAMA: STRI 465, dry, Bajo Foul, Peninsula de Azuero, 5–20 m, H. Guzman, 9 December 2003; STRI 750, dry, Roca Trollope, Golfo de Panama, 10–20 m, H. Guzman, 6 August 2003; STRI 814, dry, Isla del Rey, Archipelago Las Perlas, 4 m, H. Guzman, 6 April 2004; STRI 850, dry, Isla Pacheca, Archipelago Las Perlas, 3m, H. Guzman, 20 April 2004; UCR 1035, 1036, 1039, 1041, 1502, dry, Islote Frailes, Península de Azuero, 10–30 m, H. Guzman, 9 December 2001; UCR 1047, 1057, dry, Isla Canal Afuera, Golfo de Chiriqui, 3–12 m, H. Guzman, 10 December 2001; UCR 1063, 1065–1066, dry, Isla Santa Cruz, Golfo de Chiriqui, 5–20 m, H. Guzman, 10 December 2001; UCR 1110–1112, dry, Roca Prosper, Golfo de Chiriqui, 10–30 m, H. Guzman, 11 December 2001; UCR 1125, 1126, 1161, dry, Islote Frailes, 5–20 m, H. Guzman, 12 December 2001; UCR 1132, 1134, 1136, 1139, dry, Isla Barca, Golfo de Chiriqui, 5–10 m, H. Guzman, 18 April 2002; UCR 1167, dry, Roca Niagara, Golfo de Chiriqui, 5–20 m, H. Guzman, 13

December 2001; UCR 1191, dry, Isla Jicaron, Golfo de Chiriqui, 5–10 m, H. Guzman, 18 April 2002; UCR 1193, 1195, 1197, 1199, 1201, dry, Isla Saboga, Golfo de Panama, 1–5 m, H. Guzman, 14 December 2001; UCR 1245, 1289, dry, Isla Jicarita, Golfo de Chiriqui, 10–12 m, H. Guzman, 19 April 2002; UCR 1323, dry, Islote Punta Soledad, Golfo de Chiriqui, 10 m, H. Guzman, 20 April 2002; UCR 1327–1328, dry, Isla Passage, Golfo de Chiriqui, 15 m, H. Guzman, 20 April 2002; UCR 1351, dry, Isla Piedra Hacha, Golfo de Chiriqui, 10–25 m, H. Guzman, 22 April 2002; UCR 1382–1383, dry, Bajo La Viuda, Golfo de Chiriqui, 30 m, H. Guzman, 23 April, 2002; UCR 1447, dry, Isla Otoque, Golfo de Panama, 5–10 m, H. Guzman, 9 May 2002; UCR 1460, 1463, Taboguilla Island, Golfo de Panama, 5–10 m, H. Guzman, 9 May 2002; USNM 49362, dry, 7° 55'N, 81° 38'W, 11 March 1948, no further data.

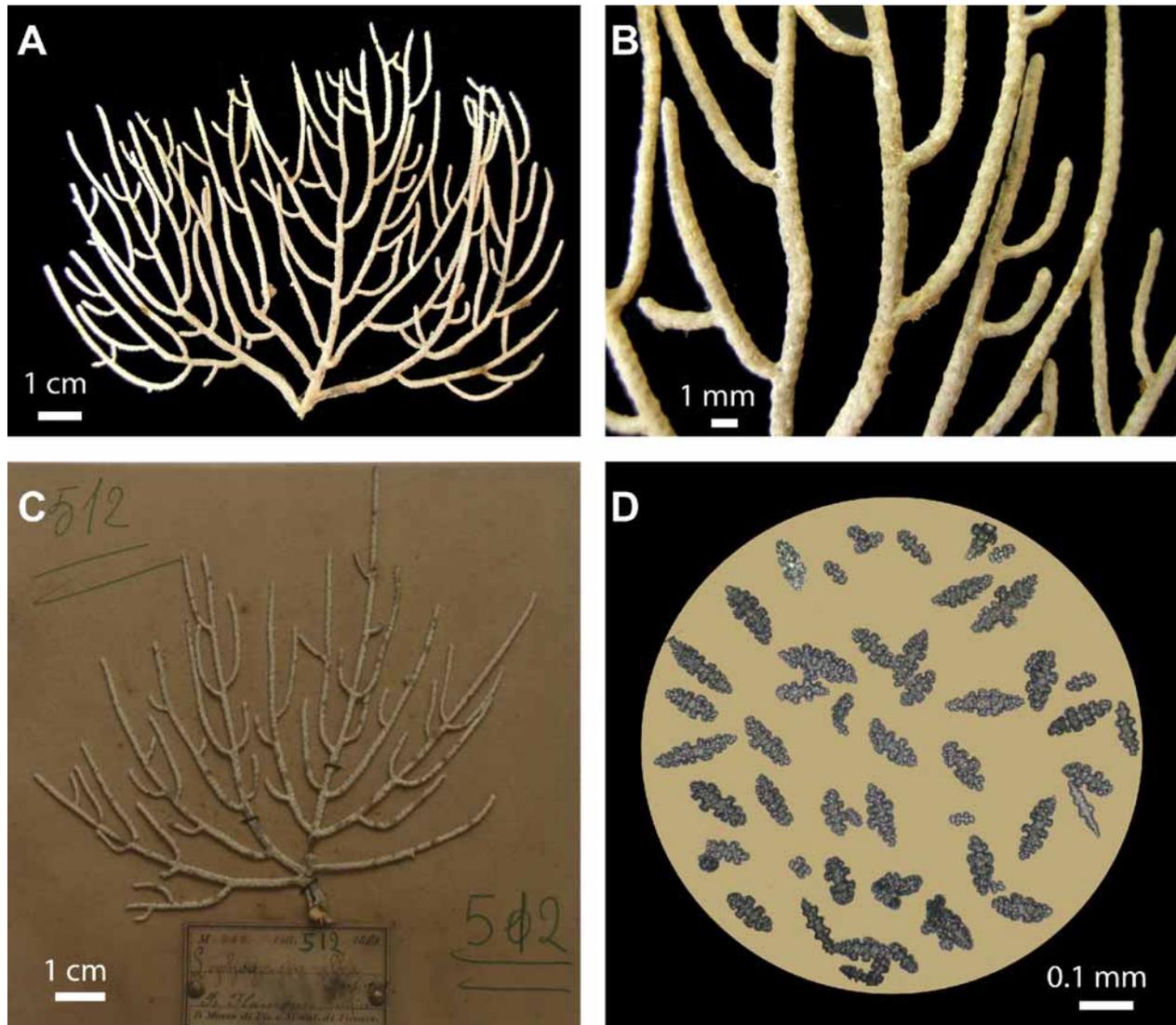


FIGURE 4. *Leptogorgia alba* **A**, paralectotype (MSNT c164); **B**, detail of branches (MSNT c164); **C**, lectotype (MZUF c163); **D**, light micrograph of sclerites (MZUF c163).

Lectotype Description. The lectotype is a flabellate colony 9.5 cm in height and 11.0 cm in width (Fig. 4C). Three primary branches sprout from a short stem, 7 mm long, producing secondary branches in an irregular, openly pinnate sequence. The stem is 3 mm in diameter, it is wider at the base and is devoid of sclerites; the holdfast is lacking. Main branches are 1.0–1.5 mm in diameter, and the pinnae are around 1.0 mm. Unbranched terminal twigs are pointed, mostly 3.0 cm or less in length. Longitudinal grooves that extend along the main branches are very distinct at the base. Polyps are arranged in two rows on each side of the branches, not crowding the branches, fully retractile into the coenenchyme, which is slightly raised around the

apertures (Fig. 4B). Colour of the colony is white. Coenenchymal sclerites are nearly all colourless; a few are pink (Fig. 4D). They are mostly long spindles, up to 0.18 mm in length, and 0.04–0.06 mm in width, with acute ends, and 4–10 whorls of complex tubercles (Figs. 4D, 5). The spindles are mostly straight, or have a slightly bent end; some have curved axes. Capstans reach up to 0.06 mm in length, and 0.03 mm in width (Figs. 4D, 6). Anthocodial sclerites are colourless, flat, long rods up to 0.15 mm in length and 0.03 mm in width, with scalloped margins or with few short, lateral projections (Figs. 4D, 6).

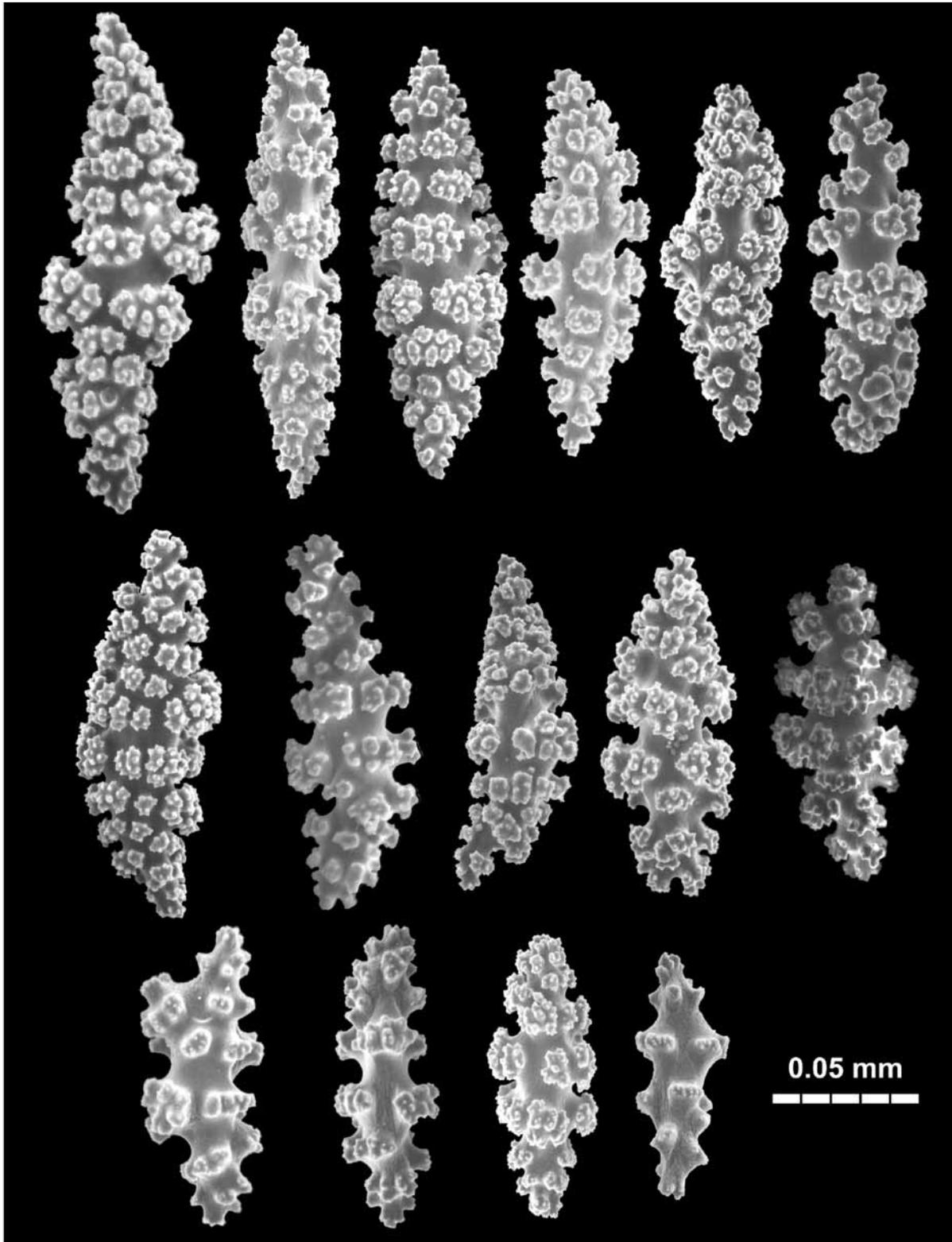


FIGURE 5. *Leptogorgia alba* (MZUF c163, lectotype), SEM of spindles.

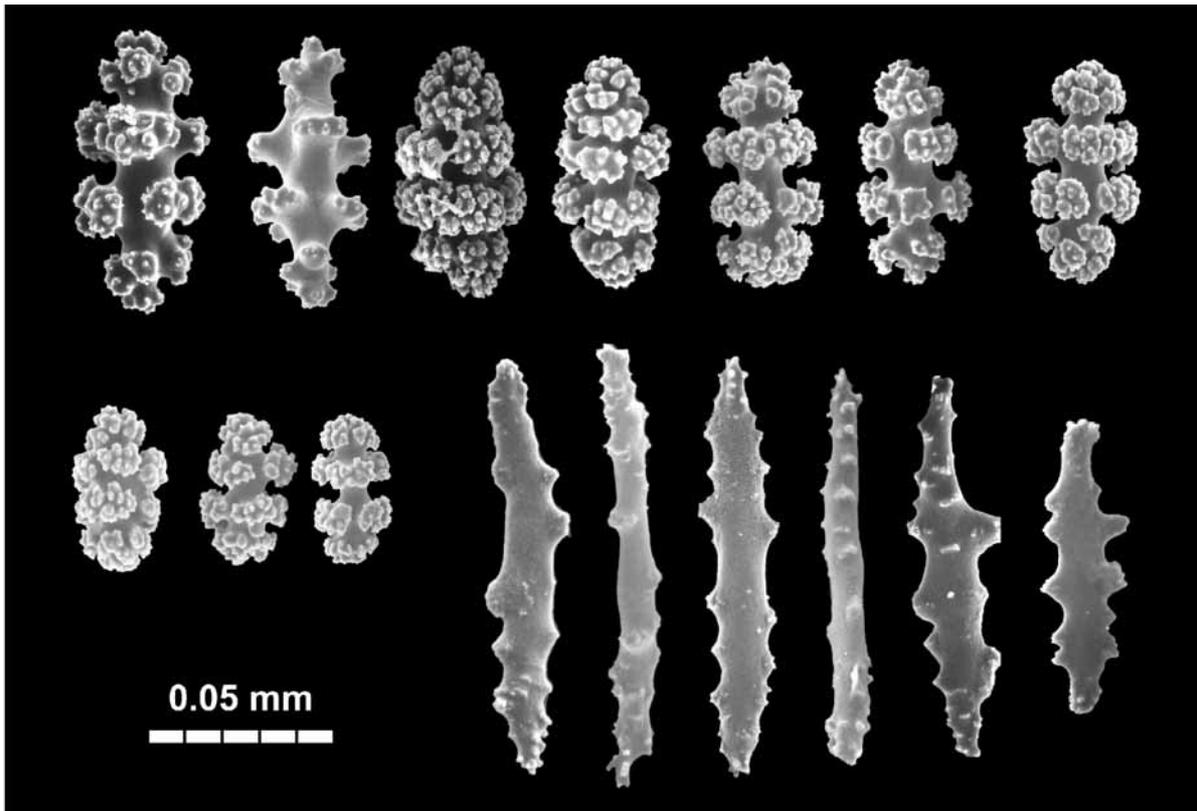


FIGURE 6. *Leptogorgia alba* (MZUF c163, lectotype), SEM of capstans, and anthocodial rods.

Other material. Examined colonies reach up to 60 cm in height, and 60 cm in width. The morphology of the colonies is basically flabelliform, irregularly dichotomous or with long, slender pinnate branches, and short, (Figs. 4A, C, 7A) or long, drooping pinnae (Fig. 7B). Colonies mostly branch from short stems, up to 2 cm in height, and up to 20 mm in diameter, mostly in one plane, but other branching arrangements can occur. Holdfasts are spreading and thick in large colonies and thin, round or oval in small colonies. Main branches are nearly round in cross-section, or sometimes flattened, reaching up to 1.5–2 mm in diameter. Pinnae are up to 1–1.5 mm in diameter, with round or pointed tips. Unbranched terminal twigs range from 2 to 16 cm long, depending on the dominant short-pinnae or long-pinnae pattern. Retracted polyps may retract completely into the coenenchyme leaving oblong openings, or form small, slightly raised polyp-mounds (Fig. 4B). They are mostly arranged in two rows on each side of the branches, sparsely distributed on the thin branches, but more close together on the thick branches. Polyps are whitish, or colourless. The anthocodial rods are arranged in points below the polyp tentacles. Colour of the dry colonies is white, but when alive the colony and polyps are light pink. Coenenchymal sclerites are very variable. In small colonies they are often as in the lectotype, where the spindles are the dominant type of sclerite, reaching up to 0.17 mm in length. In large specimens long spindles are scarce to absent, small capstans being the dominant type, e.g. UCR 1057 (40 cm in height, and 55 cm in width). However, we could not establish a relationship between the size of the colony or the branching pattern and the relative abundance of any type of sclerites, since intermediate patterns were observed. For example, UCR 1039 is a large colony (52 mm in height, and 40 cm in width), some acute spindles and blunt spindles are found in the samples along with the capstans which are the dominant type; this colony has the long-pinnae pattern of ramification which is not the case in UCR 1057, which has the normal short-pinnate pattern of the lectotype. In UCR 1057, coenenchymal sclerites are mainly small capstans, up to 0.06 mm in length, and 0.04 mm in width, with a very low occurrence of blunt spindles, and asymmetric spindles, when found they reach up to 0.08 mm in length, and 0.04 mm in width (Figs. 7C, 8A). In UCR 1039, coenenchymal sclerites are mostly capstans, but larger, 0.07 mm in length, and 0.04 mm in width, and with a

higher occurrence of spindles with acute or blunt ends and asymmetric spindles; they reach up to 0.10 mm in length, and 0.04 mm in width (Figs. 7D, 8B). Anthocodial rods are very consistent in size and shape in the examined specimens, they are long and conspicuous.

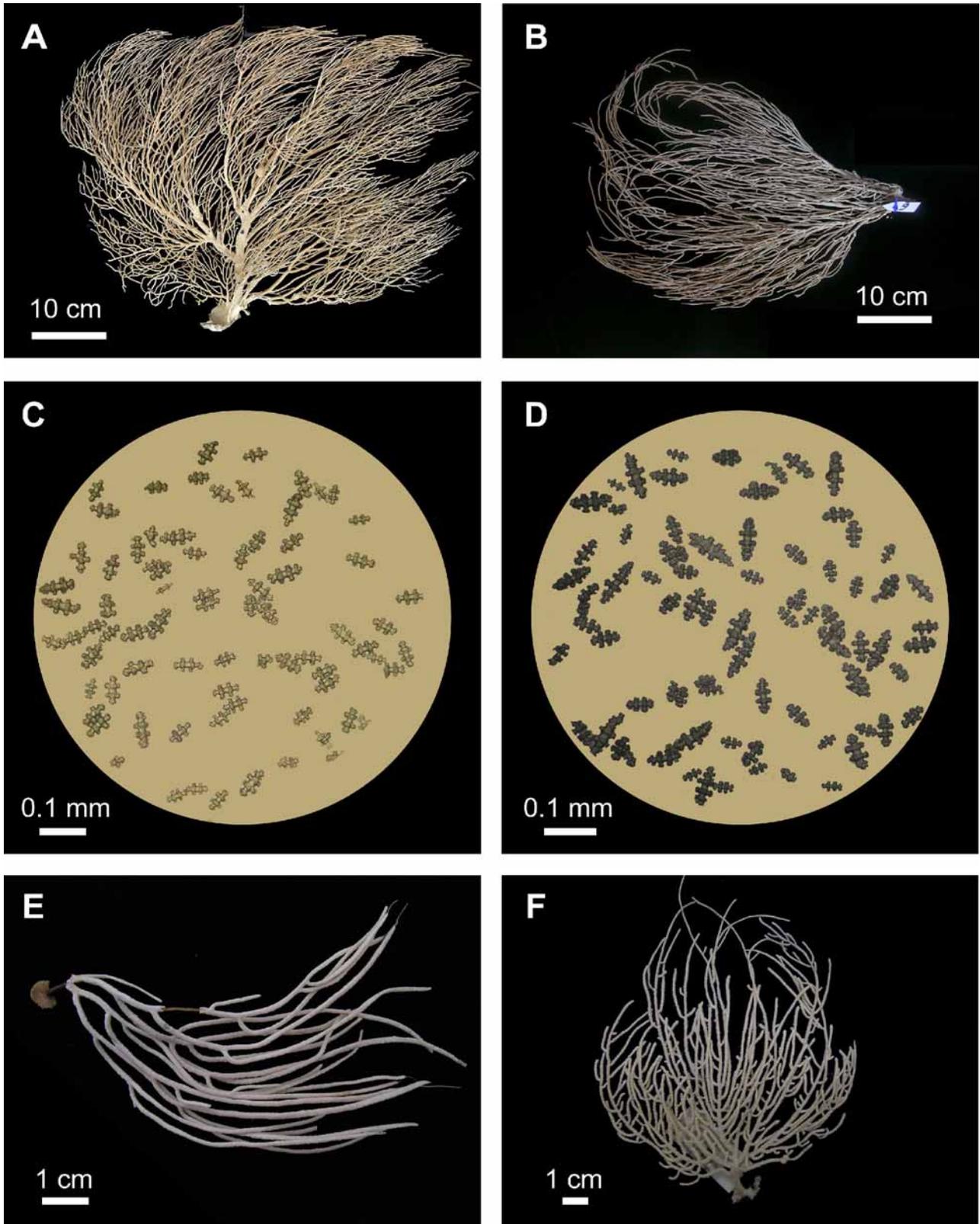


FIGURE 7. Morphology variation of *Leptogorgia alba* **A**, UCR 1057; **B**, UCR 1039; **C**, light micrograph of sclerites (UCR 1057); **D**, light micrograph of sclerites (UCR 1039); **E**, ZSM 20044790; **F**, UCR 1528.

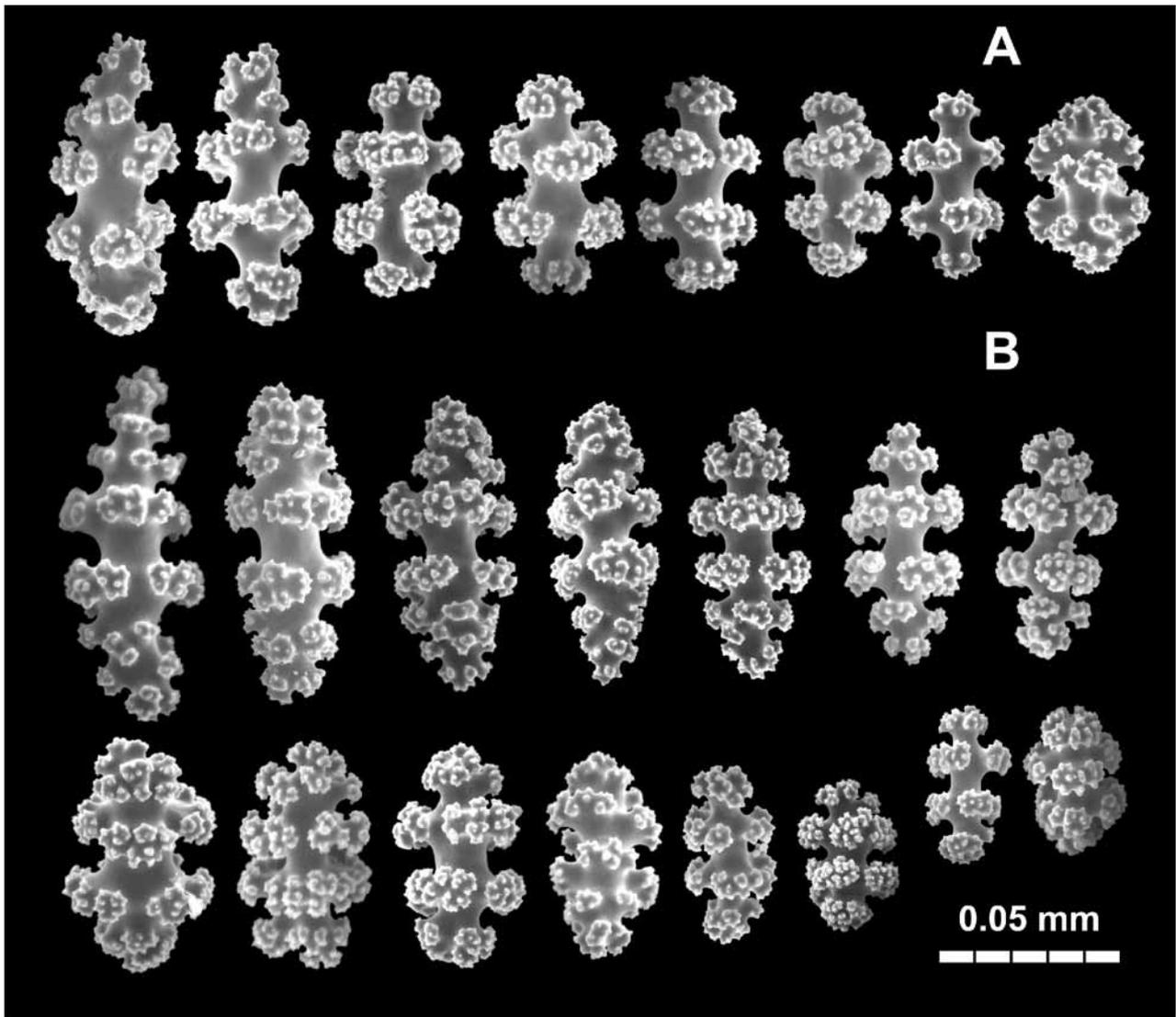


FIGURE 8. *Leptogorgia alba*, **A**, UCR 1057, SEM of coenenchymal sclerites; **B**, UCR 1039, SEM of coenenchymal sclerites.

Distribution. Isla Flamenco, Panama: type locality (Duchassaing & Michelotti 1864); all along the Pacific coast of Panama, and Costa Rica; San Salvador, Acajutla, Ecuador (Bielschowsky 1929); Malaga Bay, Punta Ardita, Gorgona Island, Colombia (Prahl *et al.* 1986); Darwin Island, Wolf Island, Galapagos Archipelago; San Carlos Bay, Mazatlan, Baja California, Isabel Island, Mexico (Table 2, Fig. 9).

Remarks. In 1860 and 1864 Duchassaing and Michelotti published two monographs dealing with species of Coelenterata from the Caribbean region in which they described a number of new species. In their 1864 work, they included two new species from the Pacific of Panama, *Lophogorgia panamensis* and *Lophogorgia alba*. The specimen of *L. panamensis* was analyzed in our study and identified as a species of the genus *Eugorgia* Verrill, 1868b.

In their description of *Leptogorgia alba* Duchassaing and Michelotti gave a brief diagnosis, but illustrated accurately only one of their two specimens. Based on the figured specimen, Volpi and Benvenuti (2003) designated the lectotype of this species. It seems that nobody before us, had access to the type material because there has been historical confusion around this species, which is evident from the synonymy list. Verrill (1868b) redescribed *L. alba* using specimens from Panama and other Central American localities. He was

unable to determine whether his specimens, deposited in YPM and MCZ, were the same as *L. alba* described by Duchassaing and Michelotti (1864). Hickson (1928) described *Euplexaura lemasti*, which was later re-assigned to *L. alba* by Stiasny (1941). Bielschowsky (1929) described two species *L. fasciculata* (ZSM 20044789, ZSM 20044790), and *L. alba* var. *sulcata* (ZMHC 4496, ZMHC 5615, ZMHC 4580). She separated these species from *L. alba* without any examination of the types. After studying her specimens, we did not find any reason to retain them as different species. Consequently, we decided to make them synonyms of *L. alba*.

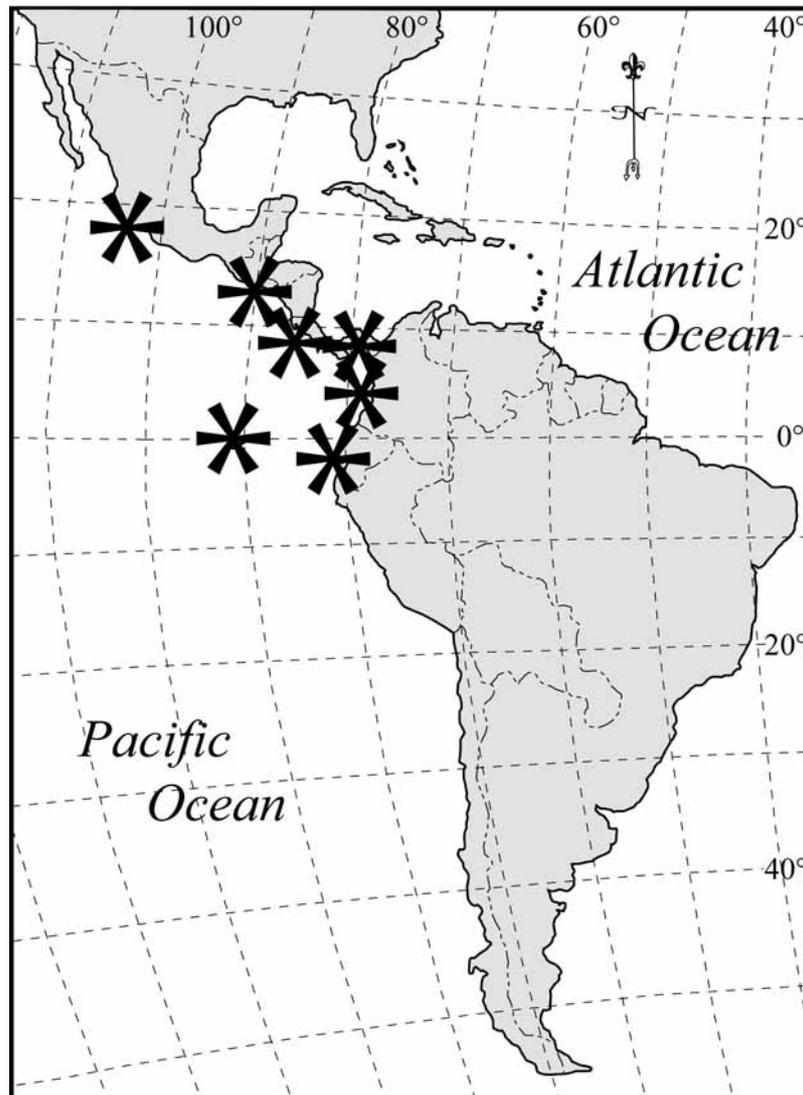


FIGURE 9. Geographical distribution of *Leptogorgia alba*.

Leptogorgia alba is one of the most difficult species to define. We observed basically three types of branching, pinnate (as in the lectotype) (Fig. 4C), the long-pinnate drooping style, as in UCR 1039 (Fig. 7B), and a more dichotomous pattern, as in ZSM 20044789 and ZSM 20044790, formerly identified as *L. fasciculata* (Fig. 7E). However, we could not determine any relationship between the branching patterns and the types of sclerites. In addition, we observed both patterns in the same colony UCR 1528 (Fig. 7F), one at the base and the other at the top. The lack of consistent patterns among the many examined specimens shows the plasticity of this species; perhaps in response to several environmental factors such as currents, wave action, depth, or habitat.

Five species of the eastern Pacific *Leptogorgia* are white and similar to *L. alba* (Table 1). *Leptogorgia ramulus* is separated from the group basically for its type of branching and the prominent polyp mounds. *Leptogorgia cofrini*, *L. fruticosa*, and *L. peruviana* are small, bushy colonies, different from the other two species. *Leptogorgia laxa* differs from the other species of this group in the lax style of branching, and the slender branches. Sclerite size and composition in *L. laxa* is similar to *L. alba* (typical form), but differs by having the highest occurrence of long spindles with acute ends (Table 1).

***Leptogorgia californica* (Verrill, 1868)**

(Figs. 10–12)

Leptogorgia californica Verrill, 1868a: 398 (1st. ed.).

Leptogorgia californica Verrill, 1868b: 398; Verrill 1869b: 421; Nutting 1910: 5; Kükenthal 1919: 772 (spec. dub); Kükenthal 1924: 334.

Not *Leptogorgia californica* Hickson 1928: 412–413 (= *L. labiata*).

Not *Lophogorgia californica* Harden 1979: 69 (= *L. labiata*).

Material examined. Lectotype (here designated): YPM 1713, dry, Sonora State, Magdalena Bay, Mexico, depth not given, A. Garret, no date, donor MCZ (“type fragment”).

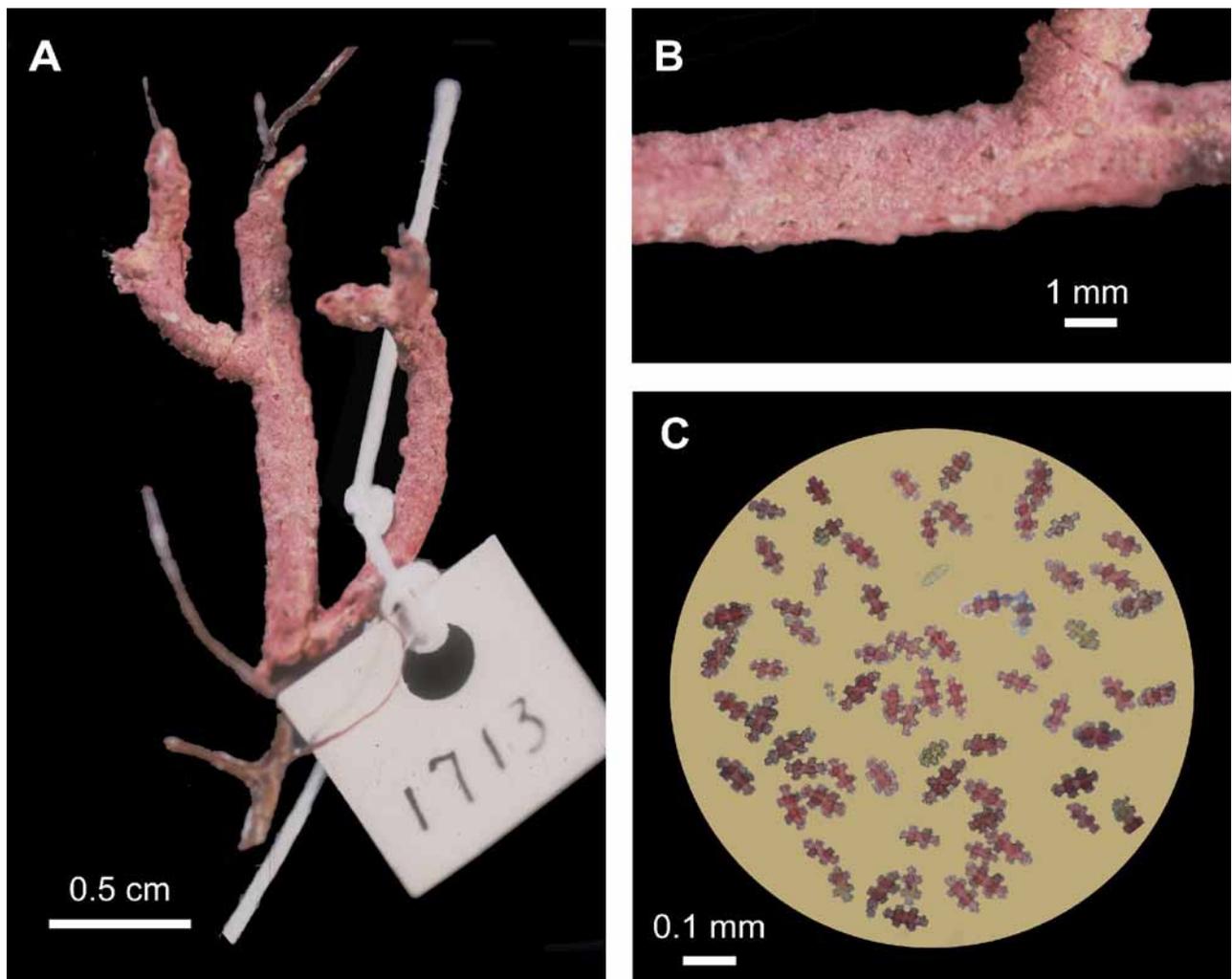


FIGURE 10. A, *Leptogorgia californica* (YPM 1713, lectotype); B, detail of a branch; C, light micrograph of sclerites.

Other material examined: MEXICO: CASIZ 097881(2), dry, Sinaloa, Mazatlan, H. N. Lowe, no further data. PANAMA: BM 1930.6.17.14, preserved, Station Balboa 3 (Pacific entrance to Panama Canal docks, tidal, half mile from sea), no depth given, St. George; Scientific Expedition, Pacific Cruise, C. Crossland, 1923–1924.

Lectotype description. The lectotype is a small, dry fragment 2.5 cm in length, and 1.3 cm in width (Fig. 10A). According to Verrill (1868b) the form of the colonies is “somewhat flabelliform, subpinnately branched, branches ascending, not coalescent”. Branches are around 2 mm in diameter. Polyps are arranged in about three rows around the branches, they retract into nearly flat protuberances in the coenenchyme leaving slit-like apertures (Fig. 10A, B). Colour is reddish purple, and yellow longitudinal grooves appear in some parts along the branches. Sclerites of the coenenchyme are mostly red and pink, some are yellow, and some bicoloured; they are mostly capstans (Fig. 10C), which reach up to 0.10 mm in length, and 0.05 mm in width (Figs. 10C, 11). Spindles occur in minor proportions; some of them with one end bent. The spindles reach up to 0.13 mm in length and 0.05 mm in width (Fig. 10C, 11). Crosses up to 0.08 by 0.07 mm occasionally occur; they have short rays with blunt warty ends (Fig. 11). The anthocodial sclerites are slender, pale orange, somewhat flattened rods, up to 0.07 mm in length, and 0.02 mm in width, with lobed margins (Figs. 10C, 11).

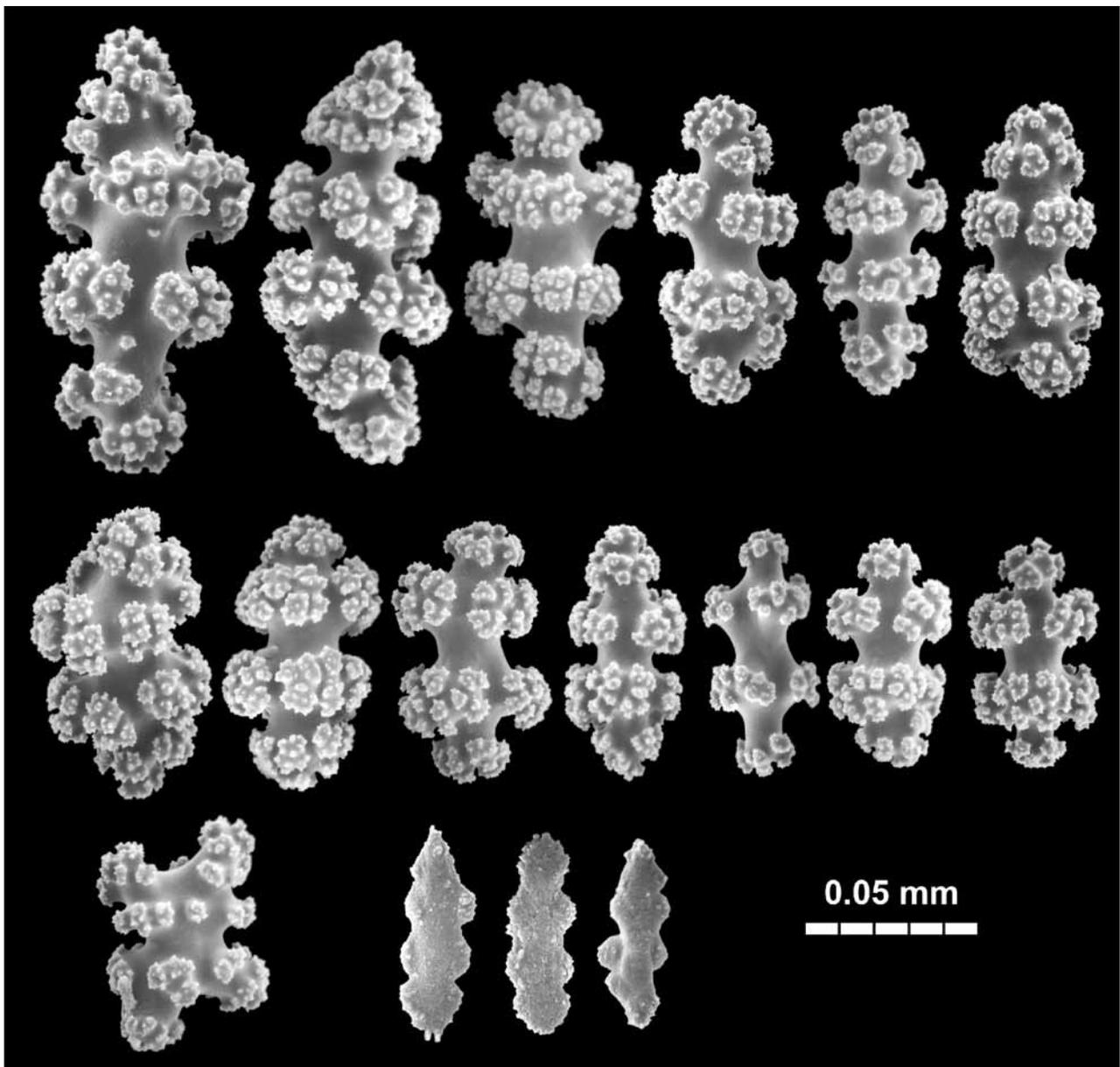


FIGURE 11. *Leptogorgia californica* (YPM 1713, lectotype), SEM of coenenchymal sclerites, and anthocodial rods.

Distribution. Only from the type locality: Baja California, Mexico (Table 2, Fig. 12).

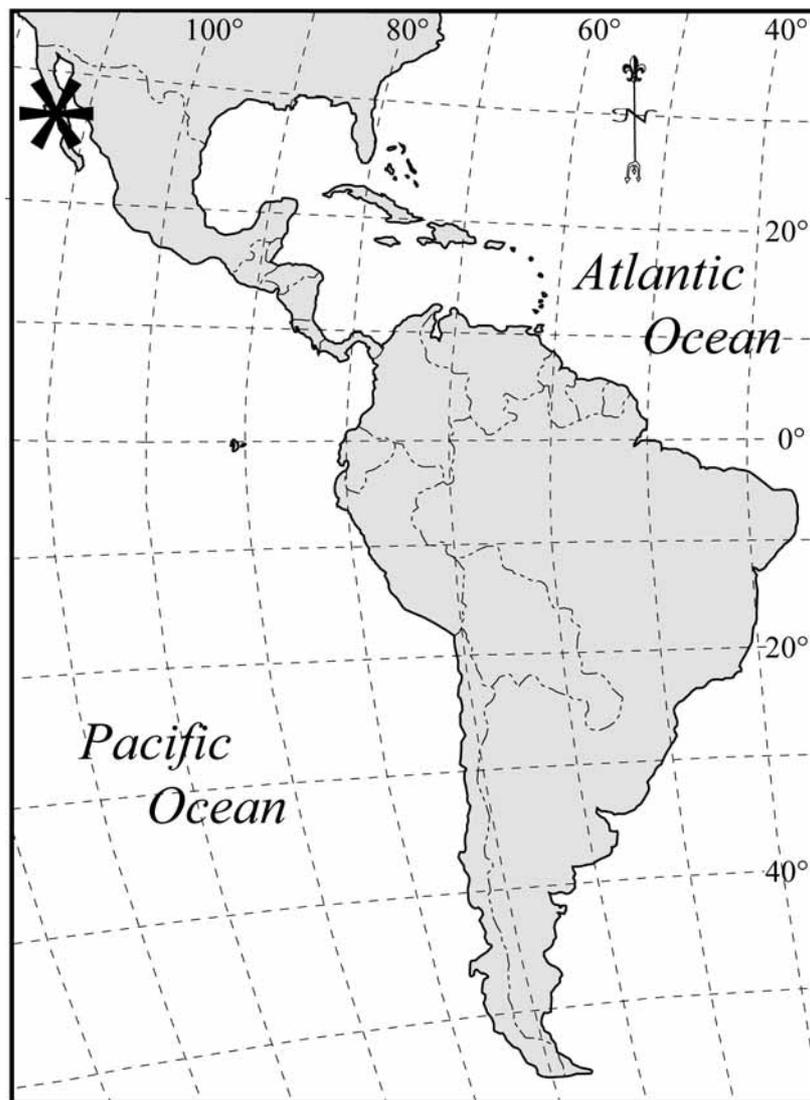


FIGURE 12. Geographical distribution of *Leptogorgia californica*.

Remarks. Verrill (1865–1870) described 12 species of *Leptogorgia*, without designating any holotypes. Nevertheless, we found original syntype material in all but two cases. Verrill (1868b, 1870) provided illustrations of branches for two species, and of sclerites for seven, however, they are not adequate for identification purposes, since only two or three types of sclerites were presented. For *Leptogorgia chilensis* and *Leptogorgia caryi* no syntypes were found.

Leptogorgia californica was described by Verrill (1868b) with a specimen 15 cm in height and 10 cm in width, from Margarita Bay or from Cape San Lucas. The only type material found is a fragment 2.5 cm in height, and 1.3 cm in width from Magdalena Bay collected by A. Garret, marked as syntype. Verrill did not illustrate the colony, and besides drawings of two sclerites, no other additional material is available for comparison purposes. The chosen type fragment is consistent with Verrill's description; however, details of colony morphology are difficult to infer. Since YPM 1713 is the only type material available, and it comes from Margarita Island, Magdalena Bay (Margarita Bay does not exist), we designate this specimen as the lectotype of *L. californica* to establish the identity of this species and avoid future misinterpretation.

The specimen BM 1930.6.17.14, described by Hickson (1928) from Balboa, Panama, as well as CASIZ 097881, identified by Harden (1979) from Mazatlan, Sinaloa, Mexico as this species, fit *Leptogorgia labiata* better (see below).

This species is similar to *L. labiata* in the colour of the colony, and the sclerites, but in *L. californica* the sclerites are larger than in previous. *Leptogorgia labiata* has very prominent polyp-mounds, which is not the case in *L. californica* where the polyp-mounds are flat (Table 1).

***Leptogorgia chilensis* (Verrill, 1868)**

(Figs. 13–15)

Plexaura rosea Philippi, 1866: 118 (junior homonym)

Litigorgia (?) *chilensis* Verrill, 1868a: 406.

Leptogorgia (?) *chilensis* Verrill, 1868b: 406.

Leptogorgia rosea Philippi, 1892: 7 (non *L. rosea* Milne Edwards & Haime, 1857: 134 (= *L. viminalis* (Pallas, 1766), Atlantic ocean).

Leptogorgia chilensis Kükenthal 1919: 772; 1924: 335; Bielschowsky 1929: 132; Harden 1979.

Material examined. CALIFORNIA: CASIZ 097770, preserved, Isla Santa Catalina, Channel Islands, Big Fisherman's Cove, 9 m, M. Wicksten, 1972; CASIZ 098028, preserved, Isla Santa Catalina, 11 m, M. Wicksten, 1971; MCZ 71317, Isla Santa Cruz, Smugglers Cove, 21 m, B. Scronce, M. Conboy, D. Sprong, G.E. & McGinitie, 24 January 1963; UCR 1596 (fragments), dry, Los Angeles, breakwater, San Pedro, 8 m, M. Wicksten, 29 September 1973; USNM 50191 (3 specimens), dry, Scripps Canyon, north branch, south wall, ¼ mile north of Scripps, La Jolla, no depth given, Parker, 4 March 1954; USNM 5988, dry, Isla Santa Catalina, no further data.

Description. Colonies examined reach up to 35 cm in length, and 30 cm in width; they are lank, bushy with long, slender, and flexible branches. Stems can reach 4 cm long, and up to 3 mm in diameter (Figs. 13A, D). Branching is irregularly dichotomous, branches are mostly cylindrical, up to 2.8 mm in diameter (Figs. 13C, D), unbranched terminal twigs could reach up to 80 mm in length, and have pointed ends. The polyps retract completely into the coenenchyme leaving oblong apertures around 0.5 mm long (Fig. 13C). Polyp-mounds are flat and sparsely distributed around the branches. Several longitudinal grooves appear along the bare spaces between the polyps (Fig. 13C). Colour of the colonies is light orange, darker when preserved (Figs. 13A, C, D). Sclerites of the coenenchyme are pale orange (Fig. 13B). The largest are spindles reaching up to 0.12 mm in length and 0.03 mm in width, with 4–8 whorls of tubercles (Fig. 13B, 14). In the specimens where the capstans are more abundant than the spindles, the spindles do not reach more than 0.09 mm. Capstans reach up to 0.08 mm in length, and 0.04 mm in width (Fig. 13B, 14). Some crosses up to 0.06 by 0.06 mm are found in the samples (Fig. 14). Anthocodial sclerites are pale orange, biscuit-like, small rods, up to 0.04 mm in length, and 0.01 mm in width.

One of the illustrated specimens is a fragment 22 cm in length and 7 cm in width that was found at the MCZ (Fig. 13A, C), the other is a large colony deposited in the USNM (Fig. 13D).

Distribution. Algarrobo, south of Valparaiso (Philippi 1892), Chile; Channel Islands, Los Angeles, San Francisco, California (Table 2, Fig. 15).

Remarks. Philippi (1866) poorly described *Plexaura rosea* with a specimen from Valparaiso present in the Museo de Zoología de Chile. Later in 1892, he once more described *L. rosea* with the same specimen as mentioned in the “Posdata” of that paper. His descriptions in both instances were very poor and could fit any other species; even the drawing of *L. rosea* is very schematic and without any detail (Philippi 1892, pl. 2, Fig. 1). As Philippi's material seems to be lost and no recently collected material from Chile resembling this species was available, we used specimens from California for the description. We do not exclude the possibility the material from California actually represents another species, but so far it most resembles Philippi's description.

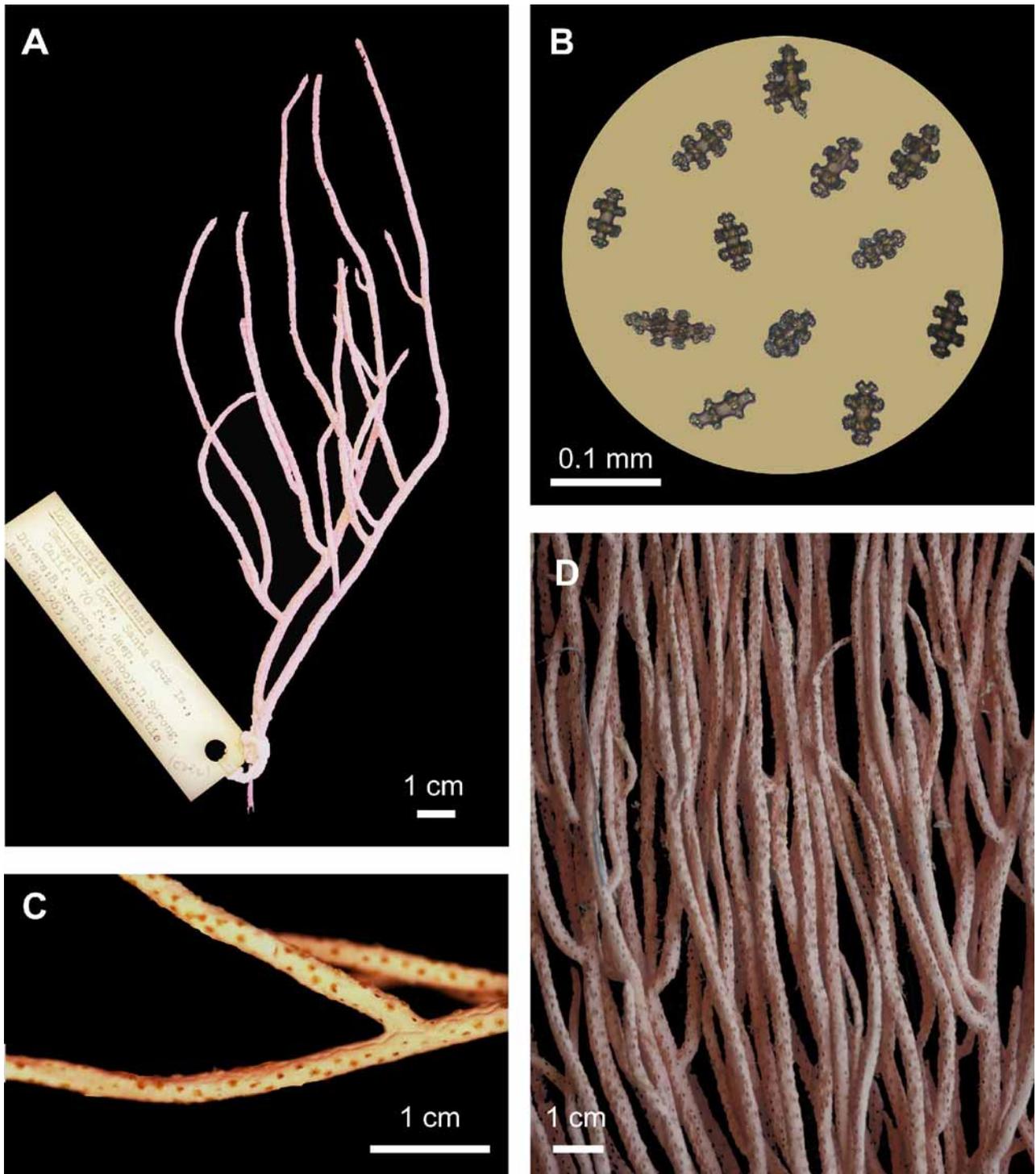


FIGURE 13. **A**, *Leptogorgia chilensis* (MCZ 71317); **B**, light micrograph of sclerites (MCZ 71317); **C**, detail of a branch (MCZ 71317); **D**, branches of USNM 50191.

The name *Leptogorgia chilensis* appears for the first time in Verrill 1868b with a “?”, and *Plexaura rosea* (non *L. rosea* Milne Edwards & Haime) in the synonymy. Verrill (1868b) renamed *L. rosea* of Philippi as *L. chilensis* to avoid homonymy with *L. rosea* of Milne Edwards and Haime.

Verrill (1968c) described *L. caryi* with one specimen from California, near San Francisco, that was supposedly deposited in the MCZ, but we found neither it nor any other specimen identified by Verrill under this

species. The drawings provided by Verrill of two sclerites could well fit any other species. The only specimen that we discovered labeled as *L. caryi* was USNM 5988 (not a type) from Isla Santa Catalina, California, which agrees in all aspects with *L. chilensis*. Therefore, we consider *L. caryi* as a dubious species.

The species is similar to *L. flexilis* in the lax dichotomous branching and the colour of the colony, but differs in the size and colours of the sclerites, especially in the anthocodial rods, which are larger, and darker in *L. flexilis* (Table 1).

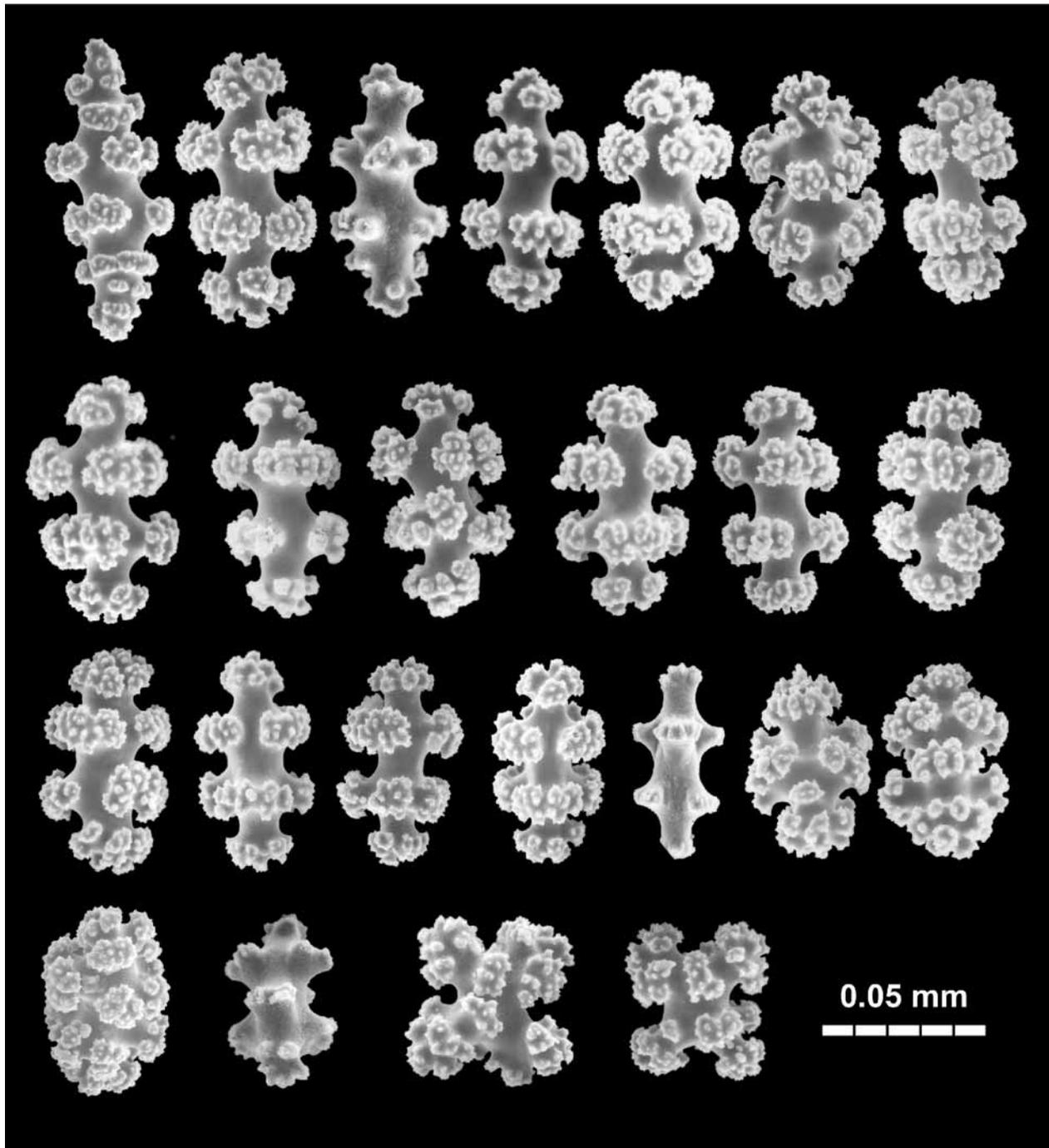


FIGURE 14. *Leptogorgia chilensis* (MCZ 71317), SEM of coenenchymal sclerites.



FIGURE 15. Geographical distribution of *Leptogorgia chilensis*.

***Leptogorgia clavata* (Horn, 1860)**
(Figs. 16–18)

Lophogorgia clavata Horn, 1860: 233.
Leptogorgia clavata Verrill 1869b: 423.

Material examined. Syntype: YPM 2268, 3 dry fragments, locality unknown (purchased), depth not given, donor A. E. Verrill (syntype of G. H. Horn, obtained from Philadelphia Academy), no further data.

Syntype Description. The syntype consists of 3 small fragments, measuring 45, 15, and 10 mm. The largest one is slightly flattened, 4.0 mm in diameter, several stumps along the branch suggest that the branching was pinnate as Horn (1860) pointed out (Fig. 16A). Polyp-mounds are small, slightly raised, and numerous, arranged all around the branches. Colour of the colony is dull reddish-pink. All the coenenchymal sclerites are reddish-pink, and mostly capstans (Fig. 16B). They reach up to 0.075 mm in length, and 0.04 mm in width (Fig. 16B, 17); some are densely tuberculated, barrel-like capstans (Fig. 16B, 17). Spindles reach up to 0.10 mm in length, and 0.05 mm in width, with 3–4 whorls of complex tubercles (Fig. 17). Anthocodial sclerites are conspicuous, pale pink, long rods, up to 0.16 mm in length, and 0.03 mm in width with scalloped margins, some with bent axes (Fig. 16B, 17).

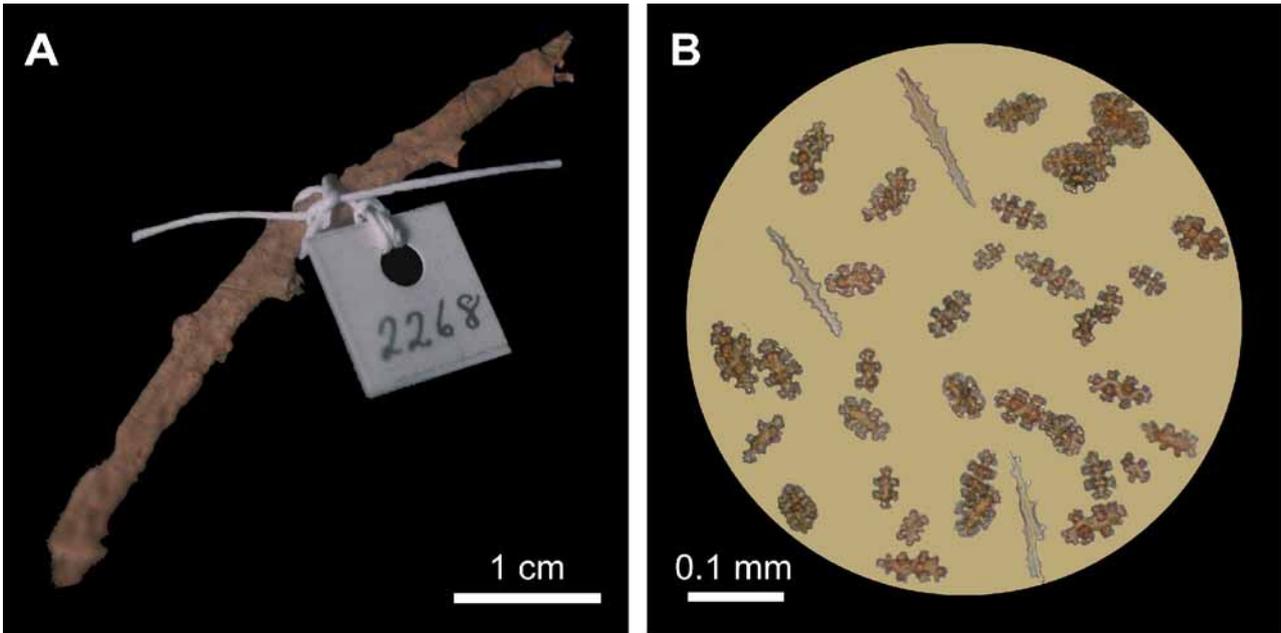


FIGURE 16. A, *Leptogorgia clavata* (YPM 2268), B, light micrograph of sclerites.

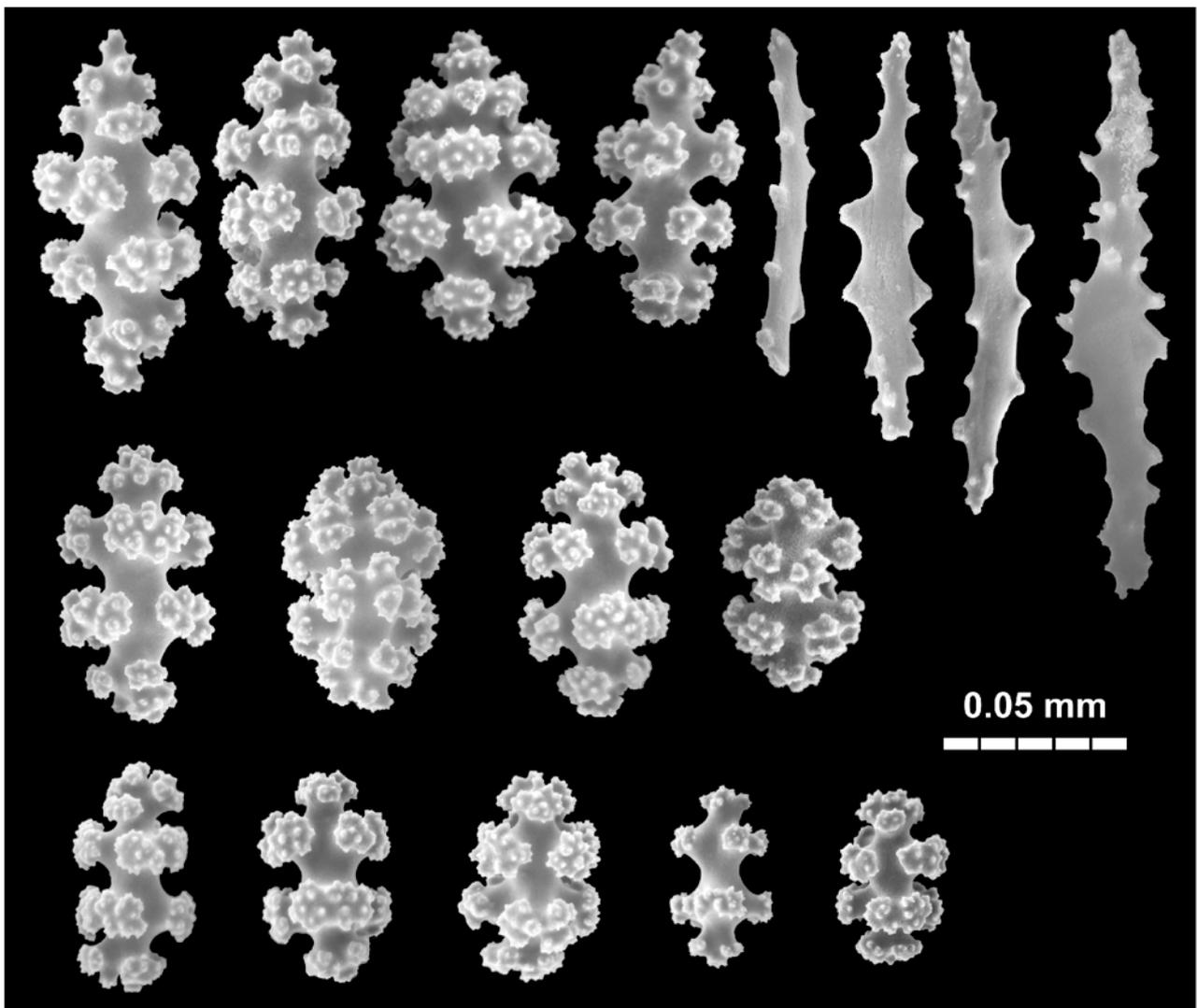


FIGURE 17. *Leptogorgia clavata* (YPM 2268), SEM of coenenchymal sclerites, and anthocodial rods.

Distribution. The syntype was probably found in Mazatlan, Mexico, and no other specimens of this species were available for examination (Table 2, Fig. 18).

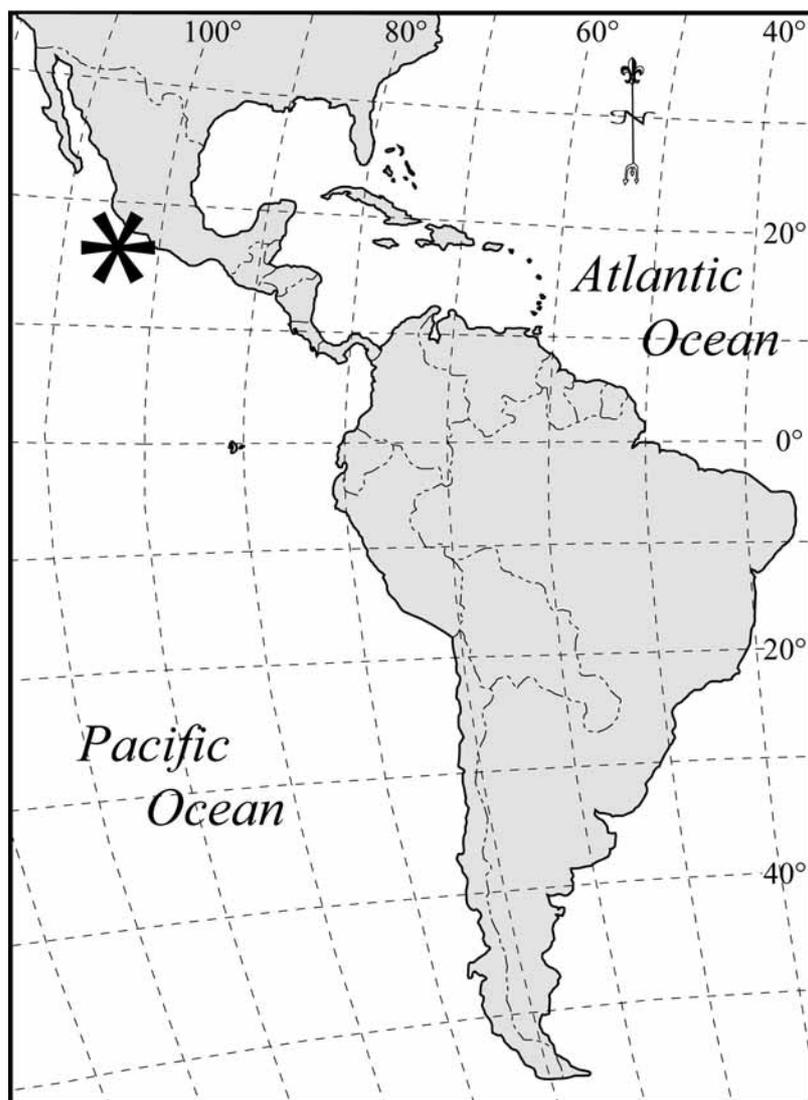


FIGURE 18. Geographical distribution of *Leptogorgia clavata*.

Remarks. Horn (1860) described two species of *Lophogorgia* from unknown localities (*L. aurantiaca*, and *L. clavata*), and one species of *Rhipidigorgia* (now *Pacifigorgia englemanni*), however, only a small fragment of *P. englemanni* and some fragments of *L. clavata* were found at YPM. It seems that the fragments of *L. clavata* were given to A. E. Verrill by the Philadelphia Academy, and he donated them to YPM (Breedy & Guzman 2002). None of the Horn's complete specimens was found. The specimen of *P. englemanni* was the only one with collecting site recorded as Mazatlan, thus, Verrill (1868b) assumed that the other two were from the same locality. Because of the scant nature of the type material and the lack of any other specimen that matches Horn's description, it is not possible to validate the taxonomic status of *L. clavata*. Herein we describe the type fragments for reference until new material that fits this species is collected.

It is not possible to tell much about similarities of *L. clavata* with other species, but the conspicuous long anthocodial rods distinguish it at present (Table 1).

***Leptogorgia cofrini* Breedy & Guzman, 2005**

(Fig. 36A, 65)

Leptogorgia cofrini. Breedy & Guzman, 2005: 3–9.

Material examined. Holotype: UCR 398A, preserved, Islas Tortugas, Golfo de Nicoya, Costa Rica, 1.5 m, J. Cortés, 18 July 1985.

Other material examined: PANAMA: ZMUC-ANT 129 q, s, u, v, Taboguilla Island, 5 m, T. Mortensen, 2 November 1915.

Diagnosis (according to Breedy & Guzman 2005). Small, white colonies, up to 7 cm in length, and 5 cm in width. Axis cylindrical. Growth form upright, branching abundant, and in multiple planes with a single stem, reaching up to 3 mm in height before branching, or multiple stems (up to 4). Polyps sparsely placed all around branches, fully retractile. Sclerites colourless, and mostly capstans, up to 0.09 mm in length, and spindles, up to 0.12 mm in length, and long anthocodial rods up to 0.14 mm in length. The illustrated specimen is a colony 7.0 cm in length, and 6.0 cm in width.

Description. Full description in Breedy & Guzman 2005.

Distribution. Islas Tortugas, Golfo de Nicoya: type locality. Commonly found along the Pacific coasts of Costa Rica, and Panama (Table 2, Fig. 65).

***Leptogorgia cuspidata* Verrill, 1865**

(Figs. 19–21)

Leptogorgia rigida (pars) Verrill, 1864: 32.

Leptogorgia cuspidata Verrill, 1865: 186; 1868b: 403; 1869b: 421; Nutting 1910: 5; Bielschowsky 1918: 29; 1929: 132; Kükenthal 1919: 772; 1924: 335.

Gorgonia (*Eugorgia*) *cuspidata* Verrill, 1868: 415.

Litigorgia cuspidata Verrill, 1868a: 403 (1st. ed.).

Lophogorgia cuspidata Harden 1979: 71.

Material examined. Lectotype (here designated): MCZ 4061 (MCZ 263), Cape San Lucas, Baja California, no depth given, donor: Smithsonian Institution, J. Xantus, 1869–1861. Paralectotypes: MCZ 4058 (MCZ 349) (2), dry, Acapulco, no depth given, D.V. Vanbrunt, 1863; YPM 954, 1709, Baja California Sur, Cape San Lucas, no depth given, J. Xantus, 1869–1861; USNM 1676 (2 specimens), dry, Baja California Sur, Cape San Lucas, no depth given, J. Xantus, 1869–1861.

Other material examined: COSTA RICA: UCR 628–633, preserved, Isla Chora, Bahía Sámara, 7 m, H. Guzman, 18 March 1984; UCR 755 (3 specimens), preserved, Islote Chancha, Punta Salsipuedes, 1–3 m, VH1, Victor Hensen Expedition, 22 January 1984; UCR 773, preserved, S Isla Colorada, 3 m, J. Cortés, 5 March 1994; UCR 789, preserved, Archipiélago Murcielago, 27 m, J. Cortés, 4 March 1994; UCR 790, preserved, Los Pedrones, Cape Blanco, 7 m, L. Mena, 18 April 1999; UCR 1510, preserved, San Pedrito, Archipiélago Murcielago, 20 m, O. Breedy, 10 April 1996; UCR 1541, preserved, Peñon Palmitas W, Culebra Bay, 5 m, C. Jimenéz, 28 August 1997; UCR 1523 (2 specimens), preserved, Palmitas W, Culebra Bay, 5 m, E. Ruiz, 27 August 1997; UCR 1525, preserved, Isla Chora, 10–12 m, O. Breedy & H. Guzman, 30 May 1997; UCR 1527 (2 specimens), preserved, NE Cabeza de Mono, Culebra Bay, 9 m, E. Ruiz, 24 May 1997; UCR 1528, preserved, Peñon Cabeza de Mono, 10 m, O. Breedy, 26 June 1997; UCR 1530 (2 specimens), preserved, S Islote El Muerto, Salinas Bay, 15 m, O. Breedy, 9 July 2002; UCR 1534, preserved, Cabeza de Mono, 20 m, O. Breedy, 21 November 1997; UCR 1664 (2 specimens), preserved, Bajo Sámara, Bahía Sámara, 18 m, O. Breedy & H. Guzman, 1 March 1998; UCR 1665, preserved, Roca Afuera, Punta Descartes, 20 m, O. Breedy, 9 June 2005; UCR 1666 (3 specimens), preserved, Playa Nacascolito, Culebra Bay, 15 m, O. Breedy, 23 April

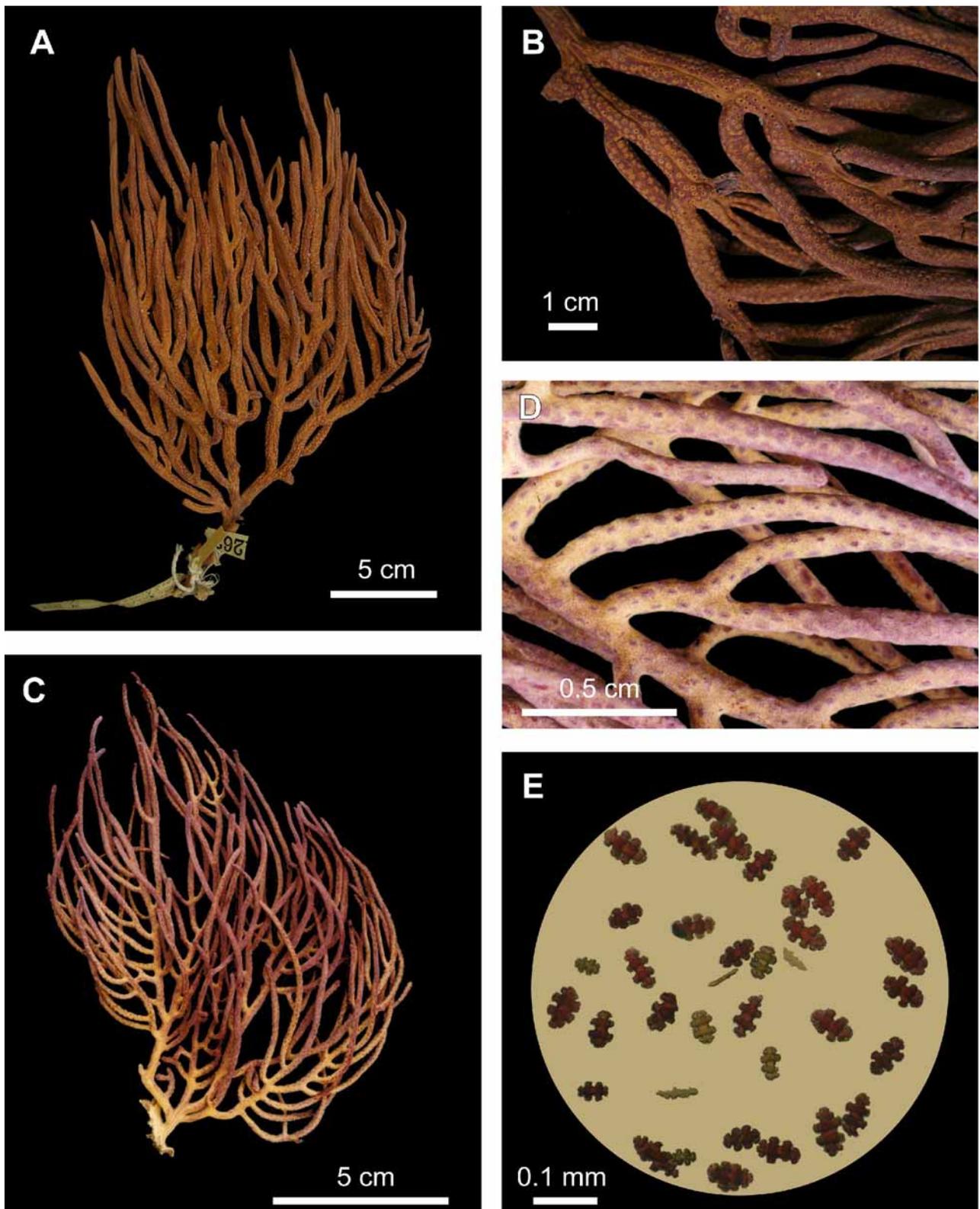


FIGURE 19. *Leptogorgia cuspidata* **A**, MCZ 4061, lectotype; **B**, detail of branches (MCZ 4061, lectotype); **C**, UCR 1528; **D**, detail of branches (UCR 1528); **E**, light micrograph of sclerites (MCZ 4061, lectotype).

2002. PANAMA: STRI 457, dry, Isla Roncadores, Golfo de Chiriqui, 10–20 m, H. Guzman, 30 August 2002; STRI 554, dry, Isla Bolañito, Golfo de Chiriqui, 6 m, H. Guzman, 16 April 2003; STRI 669, dry, Isla Pacora, Golfo de Chiriqui, 6 m, H. Guzman, 7 May 2003; STRI 713, dry, Los Octavios, Golfo de Chiriqui, 7 m, H. Guzman, 7 July 2003; UCR 1044, 1051, 1055, 1056, dry, Isla Canal Afuera, 3–12 m, H. Guzman, 10 Decem-

ber 2001; UCR 1107–1109, dry, Roca Prosper, 10–30 m, H. Guzman, 11 December 2001; UCR 1196, dry, Isla Jicaron NE, 5–10 m, H. Guzman, 18 April 2002; UCR 1313, dry, Islote Punta Soledad, 10 m, H. Guzman, 20 April 2002; UCR 1397–1398, dry, Islote Santa Cruz, 5–10 m, H. Guzman, 24 April 2002; UCR 1437, dry, Islote Almohada, Golfo de Chiriqui, 5–15 m, H. Guzman, 29 April 2002; UCR 1524, preserved, Isla Canal Afuera, 3–12 m, H. Guzman, 10 December 2001; UCR 1540, preserved, Roca Prosper, 10–20 m, H. Guzman, 11 December 2001.

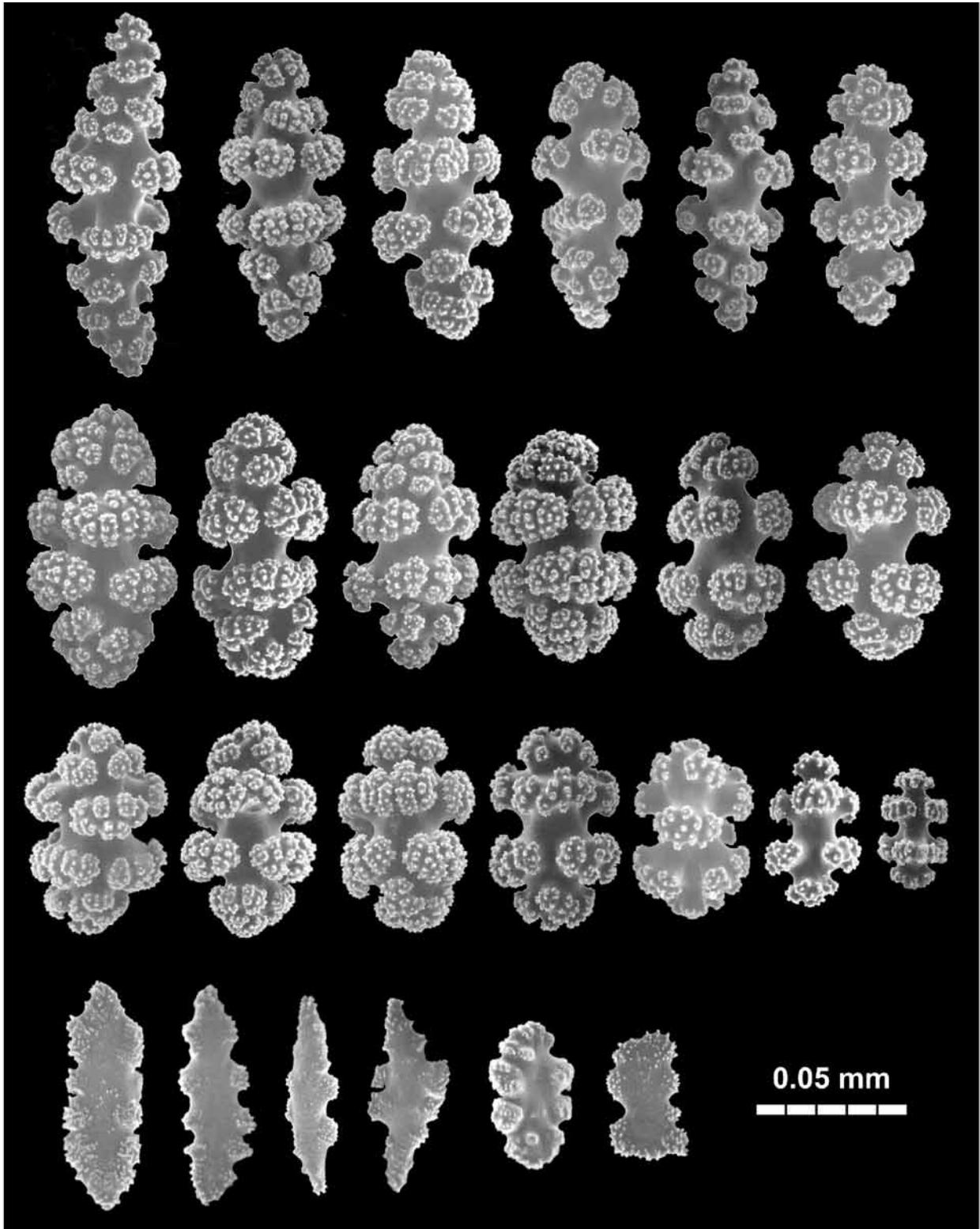


FIGURE 20. *Leptogorgia cuspidata* (MCZ 4061, lectotype), SEM coenenchymal sclerites, and anthocodial rods.

Lectotype description. The colony is 26 cm in height and 16 cm in width (Fig. 19A, B). Stout branches arise from a 30 mm long stem, slightly flattened at the base, 7 mm in diameter, it gives off three main branches basically in one plane, that subdivide in an irregular or pseudodichotomous style (sensu Alderslade 1998) forming fasciculate clusters; a lateral branch is loosely pinnate, and one of the pinnae rebranches in a dichotomous manner (Fig. 19B). Branches are mostly cylindrical, thick and rigid, 3.25–4.0 mm in diameter throughout, and slightly tapered to produce pointed ends. Unbranched twigs reach up to 90 mm in length. Colony is deep purple with polyp apertures surrounded by bright yellow rings. Distinct bright yellow longitudinal grooves occur along the thick branches, and near the base they form several thin strips that continue along the remains of the holdfast (Fig. 14A, B). The polyps are retracted into the coenenchyme leaving small circular apertures (around 0.25 mm in diameter). Polyp-apertures are distributed all around the branches, and crowd the surface. The stem is devoid of polyp-apertures. Sclerites of the coenenchyme are deep purple and bright yellow (Fig. 19E). They are mostly capstans, reaching up to 0.09 mm in length and 0.05 mm in width (Figs. 19E, 20). Spindles are long, up to 0.13 mm in length, and 0.05 mm in width, with 3–7 whorls of tubercles (Fig. 20). Some long spindles have a slightly curved axis. Anthocodial sclerites are yellow, lobed rods up to 0.08 in length, and 0.03 in width (Figs. 19E, 20).

Other material. Colonies examined range in length from 5 cm to 37 cm, and 4 cm to 22 cm in width. Colonies are upright and bushy. Branching is sparse in small colonies, to profuse in larger ones. Branches arise from a single basal stem that is usually flattened, and conspicuously marked by longitudinal bands of dark purple and dark yellow coenenchyme. Stems reach up to 40 mm long, and up to 4 mm in diameter, they give off 2–4 main branches in one plane, or they spread at angles of about 45° in respect to the stem. The branches subdivide mostly in a pseudodichotomous style producing pinnate clusters (Fig. 19A–C). Branches are mostly cylindrical, but in large colonies they are somewhat flattened near to the stem. They are thick and rigid, 3.0–4.0 mm in diameter throughout, including the pinnae, some are slightly tapered to produce pointed ends. Unbranched terminal twigs or pinnae can be up to 120 mm in length. Most of the colonies examined are of a deep purple colour with polyp apertures surrounded by bright yellow rings, but a variety is also found where the rings are purple and the coenenchyme appears more tinted with yellow throughout. Distinct bright yellow longitudinal grooves occur along the thick branches, very marked at the base and following a sinuous path diffusing up to the distal branches. The polyps retract completely into the coenenchyme leaving small circular apertures (around 0.2–0.3 mm in diameter); they are distributed all around the branches, and crowd the surface. Polyps are white, with a thin ring (2 or 3 rows) of rods at the base of the tentacles. Sclerites of the coenenchyme are mostly as in the lectotype, but some variation is observed in a few specimens where the occurrence of spindles is higher. Anthocodial sclerites are as in the lectotype, some colonies have rods of a pink colour, but we have not found the two colours in the rods of the same colony.

Distribution. Cape San Lucas, Baja California, Mexico: type locality. San Salvador, El Salvador (Verrill 1868b); along the Pacific coasts of Panama and Costa Rica (Table 2, Fig. 21).

Remarks. In 1864 Verrill described *Leptogorgia rigida* with specimens from Mexico (Acapulco, collected by A. Agassiz and D. B. Vanbrunt, Cape San Lucas, Baja California by J. Xantus) and Panama (collected by J. H. Sternberg). His description was vague, mentioning that the specimens were “very variable in form and colour”. Verrill probably had a mixture of specimens, which he later separated as *L. alba*, *L. cuspidata*, and *Leptogorgia exigua* (Verrill 1868b, 1870). Verrill (1868b) made a meticulous redescription of *L. rigida*, excluded Panama from the type localities, and added San Salvador (that should be somewhere along El Salvador coast) instead. The syntype series of *L. rigida* also includes specimens that agree more with *L. cuspidata* (e.g. MCZ 4058 (MCZ 349), YPM 1648b). Although Verrill’s description (1868b) is meticulous, the lack of illustration, and the lack of a holotype designation produced confusion. For these reasons, we herein designate a lectotype, MCZ 4059, to fix the identity of *L. rigida*, and a lectotype, MCZ 4061 (MCZ 263), to establish the identity of *L. cuspidata*.

Leptogorgia cuspidata is similar to *L. rigida*, *L. exigua*, and *L. californica* in the type of branching, but the yellow or purple oval rings around the polyp-mounds are sufficient to recognise and separate *L. cuspidata* from the others (Table 1).

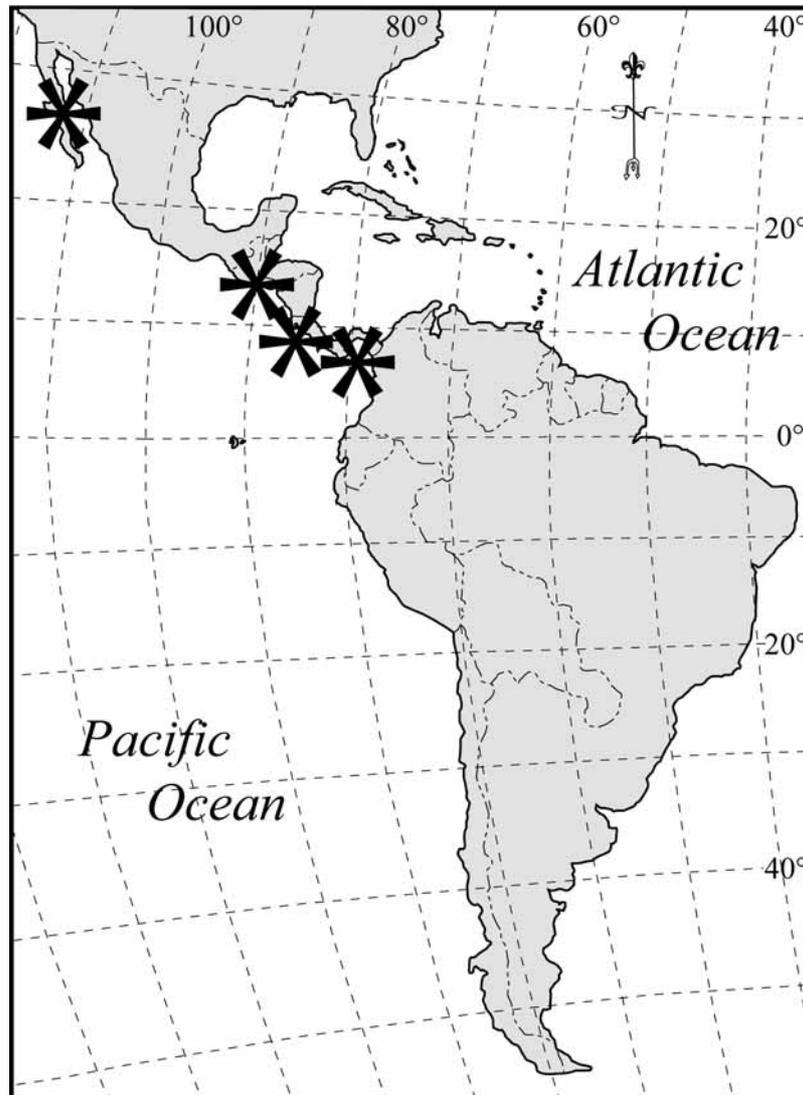


FIGURE 21. Geographical distribution of *Leptogorgia cuspidata* and *Leptogorgia rigida*.

***Leptogorgia diffusa* (Verrill, 1868)**

(Figs. 22–25)

Litigorgia diffusa Verrill, 1868a: 397 (1st. ed.).

Gorgonia (Litigorgia) diffusa Verrill, 1868: 415.

Leptogorgia diffusa Verrill, 1868b: 397; 1869b: 421; Nutting 1910: 5; Bielschowsky 1918: 30; 1929: 112; Kükenthal 1919: 771; Kükenthal 1924: 329–330; Hickson 1928: 413–414; Stiasny 1938: 29.

Not *Leptogorgia diffusa* Stiasny 1951: 71 (Guyane Française, Ile Royale) (= *Leptogorgia punicea* (Milne Edwards & Haime), 1857 (see Bayer 1961)).

Leptogorgia rubra Bielschowsky, 1918: 29 [Nomen Nudum]; 1929: 92–94; Kükenthal 1919: 911–912; 1924: 325.

Lophogorgia rubra Harden 1979: 85.

Lophogorgia diffusa Harden 1976: 73; Prahl *et al.* 1986: 21.

Material examined. Lectotype (here designated): YPM 1659, dry, Archipelago Las Perlas, Panama, depth not given, F. H. Bradley, 1866–1867. Paralectotypes: MCZ 7081, dry, Golfo de Nicoya, Costa Rica, no depth given, collected by pearl divers, J. A. Mc. Neil, 1866–1867; YPM 5151, preserved, Golfo de Nicoya, no depth given, J. A. Mc. Neil, 1866–1867.

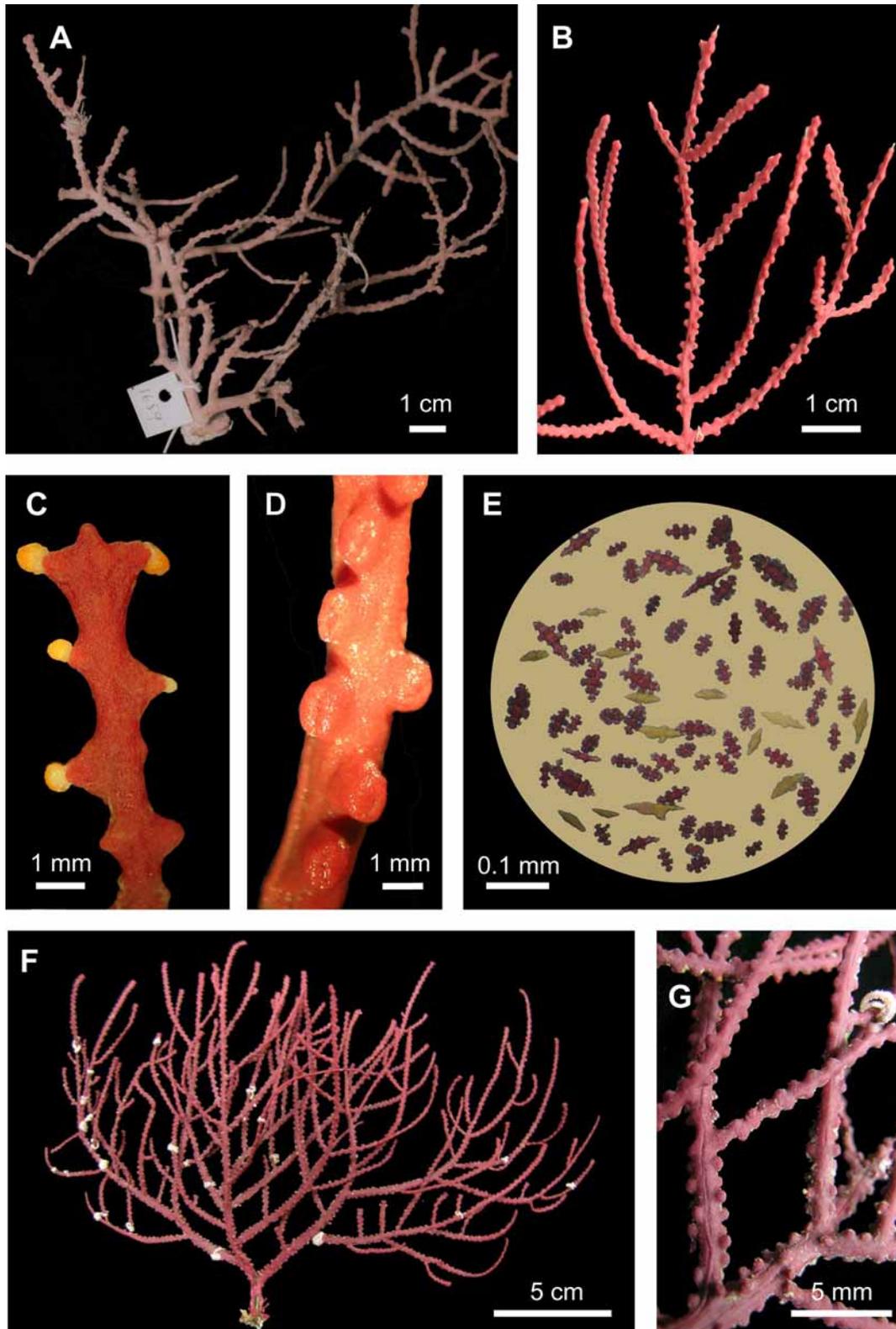


FIGURE 22. *Leptogorgia diffusa* A, YPM 1659, lectotype; B, ZMHC 2244, colony fragment; C, UCR 1586, tip of a branch; D, polyp-mounds (ZMHC 2244); E, light micrograph of sclerites (YPM 1659, lectotype); F, UCR 1584; G, detail of branches (UCR 1584).

Other material examined: CALIFORNIA: CASIZ 97890, dry, San Diego off shore, J. Stewart, 1965. COSTA RICA: UCR 1551, preserved, Punta Aguja, Golfo de Nicoya, 15 m, O. Breedy & J. Cortés, 22 November 2002; UCR 1582, dry, Isla Tolinga, Islas Tortuga, 15 m, 23 March 2002, A. Segura; UCR 1583, preserved, Isla Chora, 18 m, 31 March 1998, H. Guzman & O. Breedy; UCR1585 (2), preserved, Marino Ballena National Park, Costa Rica, 26 m, 27 April 2002, O. Breedy; UCR 1584, preserved, Punta Matapalito, 17 m, 12 March 2004, O. Breedy; UCR 1586, preserved, Punta Matapalito, 18 m, 15 March 1998, O. Breedy. EL SALVADOR: ZMHC 2244, 2245, 3134 (id. *L. rubra*), preserved, Acajutla, no further data. GUYANE FRANÇAISE: MNHN, Ile Royale, , 28 February, no further data. PANAMA: BM 1946.1.14.58, preserved, Taboga Island, Panama, 7–9 m, C. Crossland; STRI 387, dry, Isla Jicarita, Golfo de Chiriqui, 30 m, 8 August 2002, H. Guzman & C. Guevara; STRI 409, dry, Isla Seca Grande, Golfo de Chiriqui, 20 m, H. Guzman & O. Breedy, 26 August 2002; STRI 462, 487, dry, Bajo Foul, Península de Azuero, 15 m, H. Guzman & C. Guevara, 11 April 2003; YPM 1659a, b, preserved, Archipelago Las Perlas, no depth given, F. H. Bradley, 1866–1867 (not this species).

Lectotype description. The lectotype is a small, lax colony 11 cm in height and 12.5 cm in width. Branches arise from a single basal stem, 3.0 mm in diameter, it forks near the base into two branches, 2.0–3.0 mm in diameter, which branch pinnately. Pinnae separated at distances of 1–3 cm, they are slightly flattened, 1.0–2.0 mm in diameter, and arise almost perpendicular to the main branches reaching up to 7–8 cm in length, before they subdivide again into secondary pinnate branching, or just extend unbranched. Unbranched terminal twigs reach up to 4 cm in length. Colony is of a dull orange colour. Polyp-mounds are sparsely distributed, they are raised and project about 0.5–0.8 mm from the surface of the coenenchyme with slit-like apertures, up to 0.5 mm in diameter (Fig. 22A). The polyp-mounds are mostly arranged in two alternating rows on each side of the branches, and in a single row on each edge of the branchlets. Sclerites of the coenenchyme are red and pink, mostly large spindles, and small capstans (Fig. 22E). The anthocodial sclerites are light orange and are distinctly large, and wide. The coenenchymal sclerites are long, up to 0.15 mm in length and 0.05 mm in width, with warts in girdles (Figs. 22E, 23). Most of these sclerites in the lectotype have acute ends (Figs. 22E, 23). Some spindles are slightly bent. Capstans reach up to 0.09 mm in length and 0.06 mm in width (Figs. 22E, 23). The anthocodiae mostly contain long, somewhat flattened rods, up to 0.14 mm in length, and 0.04 mm in width, smooth, or with short lobed-like marginal projections (Figs. 22E, 24).

Other material. The specimens examined reach up to 20 cm in height and up to 25 cm in width. Colonies are ramose and lax, and a main stem may be present, especially in some small specimens. When it exists it is cylindrical and reaches up to 2.0–3.0 mm in length; however, it is mostly absent, thus the branches emerge directly from the holdfasts. Main branches are somewhat flattened and about 4.0–5.0 mm in diameter and they spread in a single plane. Branching is openly pinnate and irregular. Pinnae are flat, around 1.0 mm thick and up to 25 mm long. They are sparsely arranged at distances of 1–3 cm, and arise more-or-less perpendicular to the main branches, but then, in most of the examined specimens, branches turn upwards. Pinnae often rebranch giving off secondary pinnae or just extend unbranched up to 12 cm in length (Fig. 22B, F). Tips of the twigs are mostly tri-lobed and pointed (Fig. 22C). Polyps are sparsely distributed, and retract into mound-like protuberances, projecting about 0.5–1.0 mm from the surface of the coenenchyme with slit-like apertures, up to 0.5 mm in length (Fig. 22C, D, G). The polyp-mounds are mostly arranged in two alternating rows on each side of the thicker branches, and in a single row on each edge of the branchlets. In the lower part of the branches, polyp-mounds are blunt and the appearance of the branch is crenulated. In some cases, polyps are concentrated on one side of the branch (Fig. 22D, G). In general, the upper part of the branches shows a more undulating, and delicate contour (Fig. 22B, C). This arrangement of polyp-mounds on the branches gives a zig-zag appearance to the colony (Fig. 22F). Longitudinal grooves appear in some places along the bare space between the rows of polyps (left side Fig. 22D). Colonies are red, when preserved, or alive, and fade to a lighter hue when dry (Fig. 22A, B, F). Coenenchymal sclerites are as in the lectotype. The anthocodial rods are closely set in points below the polyp tentacles; this gives a light orange colour to the polyps. Anthocodial

rods are light orange, dark pink, or both; they are large and conspicuous.

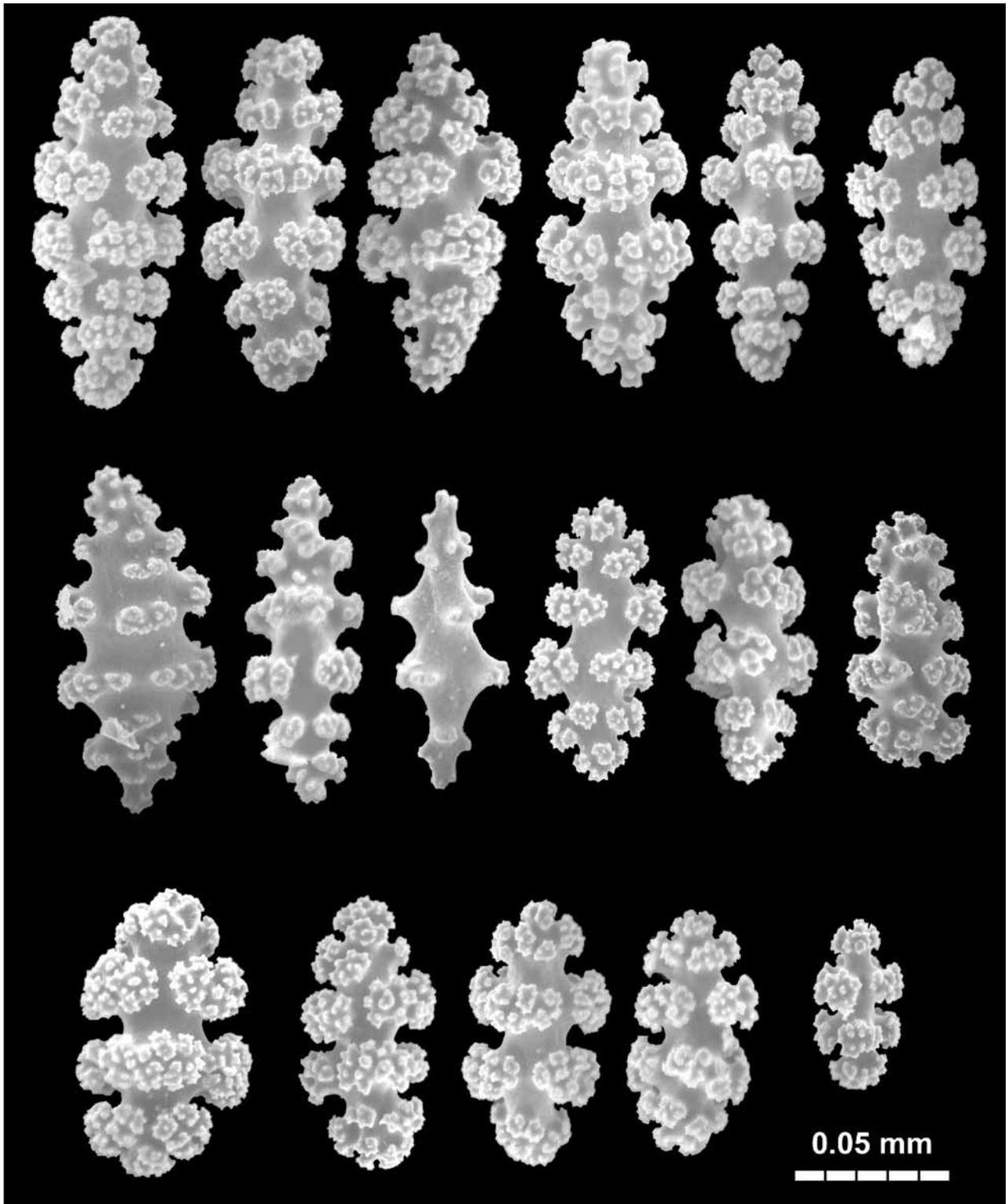


FIGURE 23. *Leptogorgia diffusa* (YPM 1659, lectotype), SEM of coenenchymal sclerites.

Distribution. Archipelago Las Perlas (Panama); Golfo de Nicoya (Costa Rica): type localities. Iscuandé, Punta Ardita, Punta Mulatos, Colombia (Prah *et al.* 1986); Port Acajutla, El Salvador; Canal de Sarmiento, Chile; Brockway Point, Isla Santa Rosa, California; (?) Bahía (Bielschowsky 1929) (Table 2, Fig. 25).

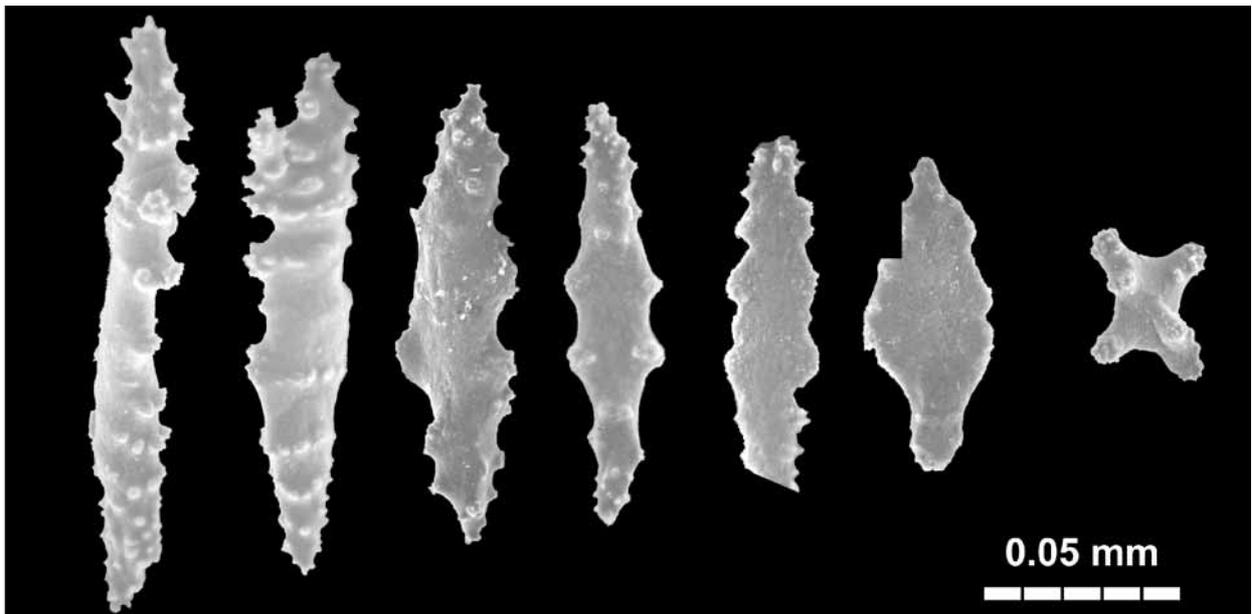


FIGURE 24. *Leptogorgia diffusa* (YPM 1659, lectotype), SEM of anthocodial rods.



FIGURE 25. Geographical distribution of *Leptogorgia diffusa*.

Remarks. Verrill (1868b) described this species with specimens from the Archipelago Las Perlas, Panama, and Golfo de Nicoya, Costa Rica. There is a type series in the YPM, which consists of two specimens from Panama and one from Costa Rica; the latter is not labeled as a type (YPM 5151) but it matches the description of the species and the locality. The specimen YPM 1659, a dry colony, not only agrees with Verrill description, but also one of the branches fits the figured specimen. However, specimens YPM 1659a, b, small colonies preserved in alcohol, marked as types, do not agree with this species. Specimen MCZ 7081, however, clearly belongs to this species. Bielschowsky (1929), made reference to 4 specimens from Acajutla, El Salvador similar to *Leptogorgia purpurea* Wright & Studer, 1889, which she described as a new species, *Leptogorgia rubra*. After studying her syntypes we found that they agree with *L. diffusa*, which was previously described by Verrill (1868c). Consequently, *L. rubra* is a new synonym of *L. diffusa*. Verrill's and Hickson's descriptions of this species agree closely with our observations.

The specimen illustrated in Stiasny (1951) perfectly matches *L. diffusa*, however, the locality given is Ile Royale, Guyane Française, which is very improbable. In order to avoid confusion we designate YPM 1659 as the lectotype of *L. diffusa*.

The large and conspicuous anthocodial rods, and the lax, pinnate style of branching, with prominent polyp-mounds that produces the zig-zag appearance of the colony differentiate this species from the others (Table 1).

***Leptogorgia exigua* Verrill, 1870**

(Figs. 26–28)

Leptogorgia rigida (pars) Verrill, 1864: 32.

Leptogorgia exigua (pars) Verrill, 1870: 552; (?)Bielschowsky 1929: 141.

Material examined. Lectotype (here designated): YPM 4602, dry, Guaymas, Sonora, Mexico, no depth given, E. Palmer, no date. Paralectotypes: MCZ 4057 (MCZ 186) (3 specimens), dry, Acapulco, Mexico, no depth given, A. Agassiz, no date; YPM 789, dry, Panama, no depth given, F. H. Bradley, 1866–1867; YPM 1614 (2 specimens), dry, Tumbes Department, Zorritos, Peru, no depth given, F. H. Bradley, 1866–1867; YPM 4601, dry, Oaxaca State, Golfo de Tehuantepec, no depth given, Sumichrast, no date; YPM 4621, dry, Panama, no depth given, J. A. McNeil, no date; YPM 5153, 5154, dry, Corinto, Nicaragua, no depth given, J. A. Mc. Neil, no date; YPM 5155, dry, Golfo de Nicoya, no depth given, J. A. Mc. Neil, no date.

Lectotype description. The colony is 6.2 cm in height and 5.0 cm in width. Two short stems, about 9.5 mm long and 4–5 mm in width, give off thick irregularly pinnate branches. They are flattened at the base, 3–4 mm in diameter, more cylindrical, and slightly tapered at the ends, with rounded tips, and about 2 mm in diameter. Branching is somewhat bushy. Unbranched terminal twigs reach up to 14 mm in length. Colony is deep brownish red throughout, with a yellowish hue to some branches (Fig. 26A, B). Several longitudinal grooves occur along the thick branches, and near the base. A small part of the holdfast is preserved. The polyps are evenly distributed all around the branches (Fig. 26B). Polyp-apertures are small, around 0.25 mm in diameter, and crowd the surface (Fig. 26B). Polyp-mounds are slightly raised. Colours of the coenenchymal sclerites are red, pink, light orange, pale yellow and a characteristic mixture of these in various proportions in the same sclerite (Fig. 26C). They are mostly capstans reaching up to 0.10 mm in length and 0.05 mm in width (Figs. 26C, 27). Spindles are long, up to 0.13 mm in length, and 0.05 mm in width, with 4 whorls of tubercles (Figs. 26C, 27). No anthocodial sclerite were found for examination.

Other material. Colonies examined range in length from 4 cm to 15 cm, and 1.5 cm to 14 cm in width. Branching is irregularly pinnate, and in almost one plane. Branches arise directly from the holdfast or from short, thick and slightly flattened stems, up to 4 mm in length, and 10 mm in width. Thick branches are also somewhat flattened at the base and cylindrical, up to 4 mm in diameter, at the ends, which are rounded.

Unbranched terminal twigs are generally short and 10–15 mm long, but in some specimens they can reach up to 20 mm in length. Colour of the colonies is of a deep brownish red to a dark orange, and this is very characteristic of the species. A close examination of the surface shows a mixture of purplish red and deep orange sclerites. In some cases, thin orange rings surround the polyp-apertures (e.g. MCZ 4057). Distinct purplish red longitudinal grooves occur along the branches, although in some cases they are deep orange. Polyps are distributed all around the branches, and crowd the surface. Polyp-mounds are slightly raised, with round apertures 0.2–0.3 mm in diameter. Sclerites of the coenenchyme are mainly as in the lectotype (Fig. 27), with some variation in colours with brighter hues occurring or with a higher occurrence of light orange sclerites instead of pale yellow.

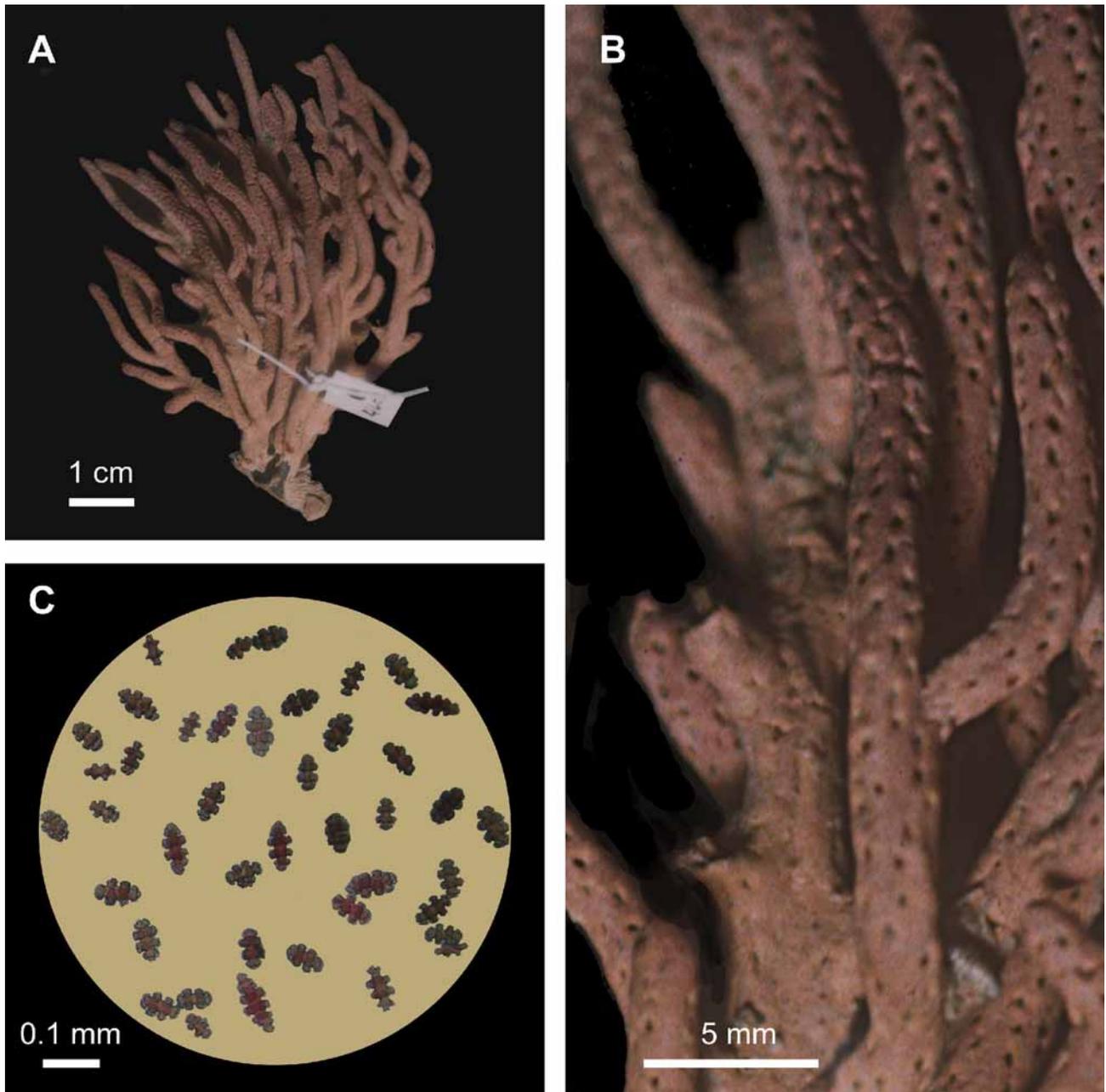


FIGURE 26. A, *Leptogorgia exigua*, YPM 4602, lectotype; B, detail of branches; C, light micrograph of sclerites.

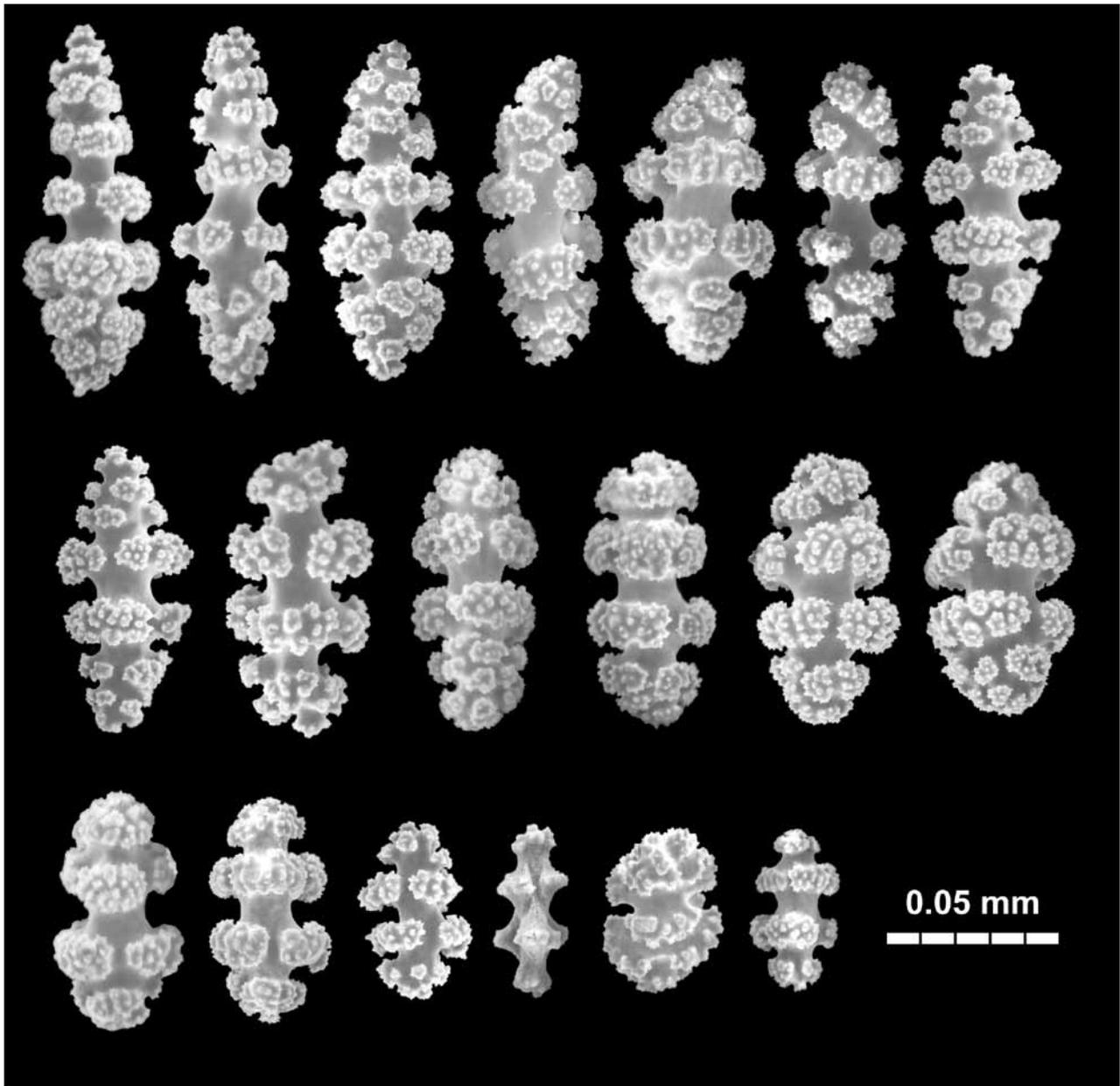


FIGURE 27. *Leptogorgia exigua* (YPM 4602, lectotype), SEM of coenenchymal sclerites.

Distribution. Acapulco, Tehuantepec, and Guaymas, Mexico: type localities. Nicaragua, Costa Rica, Panama and Peru (Verrill 1870) (Table 2, Fig. 28).

Remarks. Verrill (1870) described this species from specimens that he formerly regarded as a “dwarf variety” of *L. cuspidata*. He made his decision based on the typical colour pattern that he described as sometimes being a mixture of purplish red and yellow in varying proportions (the yellow sclerites more or less concentrated around the polyp-apertures, and often tinging the whole surface), or sometimes being of red or purple sclerites, producing a purplish colony. No illustration was provided and the description of the branching pattern, and sclerites could well fit specimens of *L. cuspidata* or *L. rigida*, for example, MCZ 4057 (MCZ 186) is a syntype of *L. rigida*, but better matches *L. exigua*. We acknowledge the specimens from Mexico (Guaymas, Tehuantepec and Acapulco) found at YPM collection as the representatives of this species. To establish the identity of *L. exigua* we designate YPM 4602 as the lectotype.

Even though Peru was not listed in the type localities by Verrill (1870), two specimens from there (YPM

1614 a, b) that are labeled as “types” fit this species. *L. exigua* has not been found in recent extensive collections in Costa Rica and Panama. The small yellowish specimens from Golfo de Nicoya (Costa Rica), and Corinto (Nicaragua) labeled as syntypes, do not accurately match the description of the species.

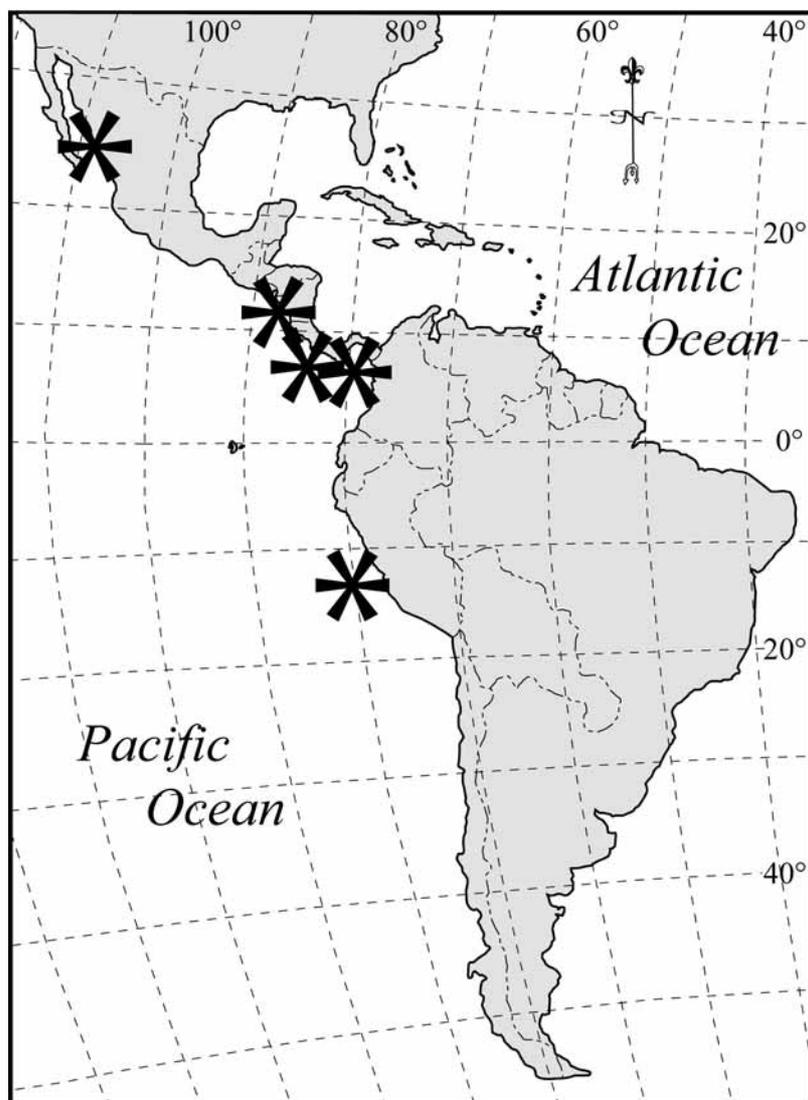


FIGURE 28. Geographical distribution of *Leptogorgia exigua*.

The species is similar to *L. californica*, *L. rigida* and *L. cuspidata* in the style of branching, but its branches are thicker and with very small polyp-mounds. These species also have a similar dominant type and size of sclerites, but differ in the shapes, e.g. in *L. rigida*, they are mostly wide capstans, different from the capstans of the others, and in *L. californica* and *L. exigua*, there are bent sclerites that are not in *L. rigida*, or in *L. cuspidata* (Table 1).

***Leptogorgia flexilis* (Verrill, 1868)**
(Figs. 29–31)

Gorgonia (Eugorgia) flexilis Verrill, 1868: 415
Litigorgia flexilis Verrill, 1868a: 400 (1st. ed.).

Leptogorgia flexilis Verrill, 1868b: 400; 1869b: 421; Nutting 1910: 5; Bielschowsky 1918: 29; 1929: 96; Kükenthal 1919: 771; 1924: 326; Bielschowsky 1929: 96; Hickson 1928: 414–416; Stiasny 1943: 82.

Material examined. Syntype series: YPM 1553a, b, MCZ 4123 (722), dry, Archipelago Las Perlas, Panama, 11–15 m, F. H. Bradley, 1866.

Other material examined: CALIFORNIA: CASIZ 096811, dry, Channel Islands, off south end Santa Catalina Island, Fransworth, 24–30 m, J. G. Vedder, September 1963; CASIZ 096813, Channel Islands, Santa Catalina Island, 11 m, E. Hochberg, 1967; CASIZ 097887, dry, Los Angeles County, off Redondo, no depth given, H. N. Lowe, July 1970. PANAMA: BM 1946.1.14.74, preserved, off Taboguilla Island, 5.4 m, T. Mortensen, 1915.

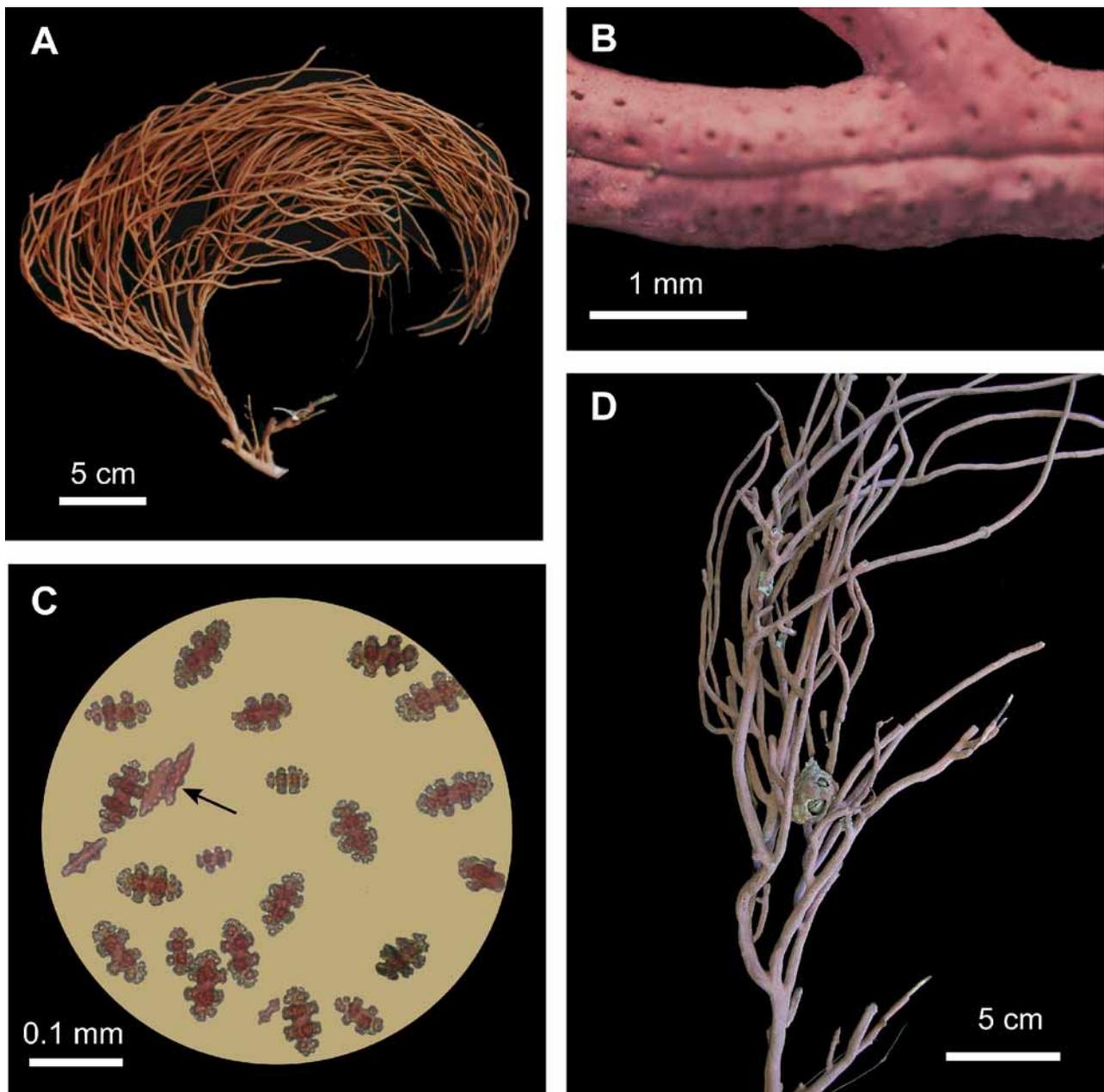


FIGURE 29. *Leptogorgia flexilis*, **A**, YPM 1553b; **B**, detail of a branch (YPM 1553b); **C**, light micrograph of sclerites (YPM 1553b), the arrow shows the anthocodial sclerites; **D**, MCZ 4123.

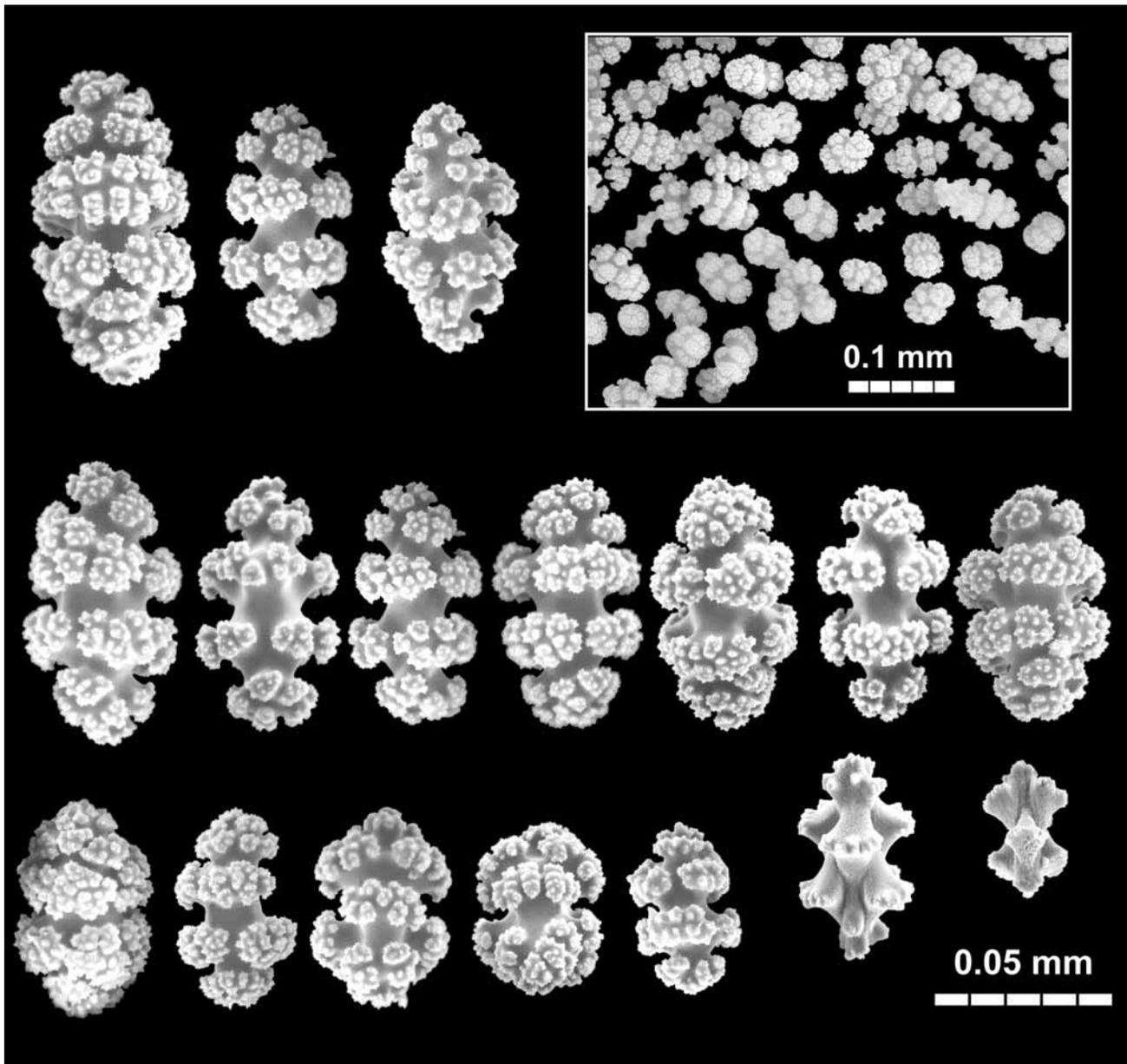


FIGURE 30. *Leptogorgia flexilis* (YPM 1553b), SEM of coenenchymal sclerites; upper inset, unsorted sample of coenenchymal sclerites.

Description of syntypes. The examined specimens reach up to 40 cm in height and up to 30 cm in width. Colonies are lank, bushy with long, slender, and flexible branches. In small specimens, branches are more upright, drooping slightly at the ends. The main stem is cylindrical; or somewhat flattened, up to 8.0 mm in diameter, and up to 2.5 cm long before it gives off irregularly spaced (2.5 to 25 cm) large, primary branches (4.0 to 6.0 mm thick), which arise mostly at acute angles (40–45°); they give off secondary branches in the same way. These branches produce some very long, lax, slender, cylindrical branchlets (1.0–1.5 mm thick), which extend unbranched up to 20 cm in length, giving a flexible appearance to the colony (Fig. 29A, D). Tips of the branchlets are pointed. Almost nothing is preserved of the holdfasts. Polyps are sparsely distributed, and retracted completely in to the coenenchyme into very low, oval polyp-mounds leaving small (about 0.8 mm) oval apertures (Fig. 29B). These are arranged in four to five irregular longitudinal rows on each side of the thicker branches, and in two or three rows on each edge of the thinner branches. According to Hickson (1928) the expanded anthocodiae are about 1.0 mm in height, and there are few scattered anthocodial sclerites

at the base of the tentacles, not showing any special arrangement. Several longitudinal grooves occur along the bare space between the rows of polyps (Fig. 29B). Dry colonies are reddish-brown throughout (Fig. 29A, B, D). Sclerites of the coenenchyme are mostly dark red, and some are red with a characteristic bright yellow halo on the periphery (Fig. 29B). They are mostly capstans (Figs. 29B, 30, 30 inset), up to 0.09 mm in length and 0.05 mm in width (Figs. 29B, 30). Spindles are up to 0.09 mm in length, and 0.06 mm in width (Figs. 29B, 30). Anthocodial sclerites are red, somewhat flattened rods, up to 0.08 mm in length, and 0.02 mm in width. They are smooth, or have short lobe-like marginal projections (Fig. 29C, arrow). Hickson (1928) stated that they are 0.07 mm in length, dark red in colour, and usually pointed with two pairs of irregular tubercles. The illustrated specimen (YPM1553b) is the largest of the syntype-series (Fig. 29A). It is a reddish-brown colony, with curved branches, perhaps from the drying process. Stretched out, it is almost about 40 cm in height and about 25 cm in width. The main stem reaches about 1.0 cm before it branches in to several main branches, only one of which is unbroken. This branch shows the characteristic ramification of the species. The sclerites do not show variation among all the syntypes.

Distribution. Archipelago Las Perlas: type locality. Taboguilla Island, Panama; El Salvador; Santa Catalina Island, California. We have not found any specimen of this species in our recent collections from Panama, including the Archipelago Las Perlas (Table 2, Fig. 31).

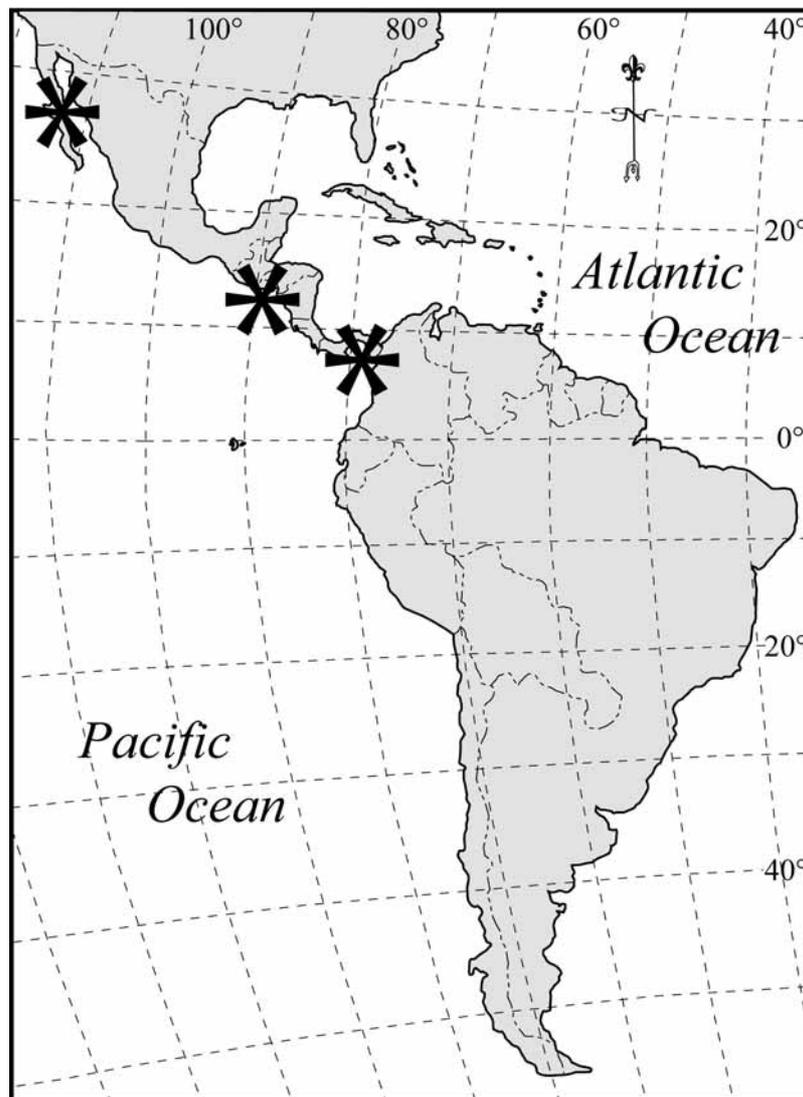


FIGURE 31 . Geographical distribution of *Leptogorgia flexilis*.

Remarks. This species was described by Verrill (1868b), and he mentioned specimens from Panama, and from San Salvador (El Salvador), but from the latter locality no material was found in the collections. Verrill did not designate a holotype, and presented poor illustrations of three sclerites.

As Hickson (1928) noticed, Verrill (1868b) remarked that the polyp-mounds (“cells”) are “rather large for the genus”, however, the polyp-mounds in this species measure less than 1.0 mm, which is considered small in the genus. Verrill also, reported the occurrence of large spindles, slender, acute with three-four whorls of separated nearly simple warts. Though some spindles with acute ends and three whorls of tubercles appear in the sclerites preparations, they are not large for the genus (up to 0.06 mm in length, and 0.04 mm in width); and no spindle with four defined whorls occur in this species. In some cases, a possible fourth whorl in a spindle is almost merged into knobby, complex tuberculate ends. Additionally, no crosses were found in the samples examined, although Verrill (1868b) said they occur occasionally.

Except from some similarity with *L. chilensis* that was discussed above, this species differs from the others in the lax, and abundant drooping branches.

***Leptogorgia florum* (Verrill, 1868)**

(Figs. 32–35)

Litigorgia florum Verrill, 1868a: 387–388 (1st. ed.).

Gorgonia (*Litigorgia*) *florum* Verrill, 1868: 415.

Leptogorgia florum Verrill, 1868b: 387–388; 1869b: 421; ?Nutting 1909: 722–723; Nutting 1910: 5; Bielschowsky 1918: 31; 1929: 121–122; Kükenthal 1919: 771; 1924: 333; Hickson 1928: 410–411.

Material examined. Syntype series: MCZ 718 (4 specimens), 1175, dry, Archipelago Las Perlas, Panama, no depth given, F. H. Bradley, 1866–1867; MCZ 4006, preserved, Archipelago Las Perlas, no depth given, F. H. Bradley, 1866–1867; YPM 1175 a–n, dry, YPM 1533, preserved, YPM 1638, 3 specimens, preserved, Archipelago Las Perlas, no depth given, F. H. Bradley, 1866–1867; YPM 1775, YPM 1575, dry, Archipelago Las Perlas, no depth given, F. H. Bradley, 1866–1867; YPM 570, dry, Panama, no depth given, F. H. Bradley, 1866–1867.

Other material examined: PANAMA: BM 1946.1.14.55, preserved, Station Balboa 2; Pacific Cruise, no depth given, C. Crossland, 1923–1924; BM 1930.6.17.15, preserved, no depth given, Station Balboa 3 (Pacific entrance to Panama Canal docks, tidal, half mile from sea), St. George, Scientific Expedition, Research Association, Pacific Cruise, C. Crossland, 1923–1924.

Description of syntypes. The examined specimens reach up to 15 cm in height and 24 cm in width. The colonies are flabelliform, broad, and pinnately branched. Main stems are 1.5–2.0 mm in diameter, and are very short (up to 10 mm long) or almost absent, so the branches emerge directly from the holdfasts. The main branches are about 1.5 mm in diameter, the pinnae, around 1.0 mm in diameter and up to 20 mm long, they are irregularly arranged and closely spaced (Fig. 32A, B, D). Branching angles are usually 35–50°, but can be 90°. Some of the pinnae may rebranch giving off secondary pinnae. Unbranched terminal twigs reach up to 20 mm in length. Tips of the twigs are tridentate formed by two lateral polyps and a pointed end between them (Fig. 32B). Polyps are colourless, sparsely distributed, and retract into raised mounds, with small bilabiate apertures and diffuse yellow spots. The polyp-mounds are distinct and arranged in pairs in longitudinal rows, on the external part of the branches, but form only single marginal row on the terminal branchlets (Fig. 32B). Colonies are bright red when preserved, sometimes slightly tinged with yellow, and deep orange, more yellowish, when dry (Fig. 32A, D). Some of the main branches have yellow, thin longitudinal grooves that are more evident on dry specimens. Sclerites of the coenenchyme are mostly red spindles; a few are bicoloured with pale yellow (Fig. 32C). Spindles are long, some slightly curved, up to 0.13 mm in length and 0.05 mm in width (Figs. 32C, 33). Few spindles present a characteristic bent end. The less abundant capstans are mostly

pale yellow, with some bicoloured with red, and up to 0.09 mm in length, and 0.05 mm in width (Figs. 32C, 34). The anthocodiae mostly contain long, yellow, somewhat flattened rods, up to 0.10 mm in length, and 0.03 mm in width, with several lobed-like marginal projections (Figs. 32C, 34). The anthocodial rods are arranged in points below the polyp tentacles.

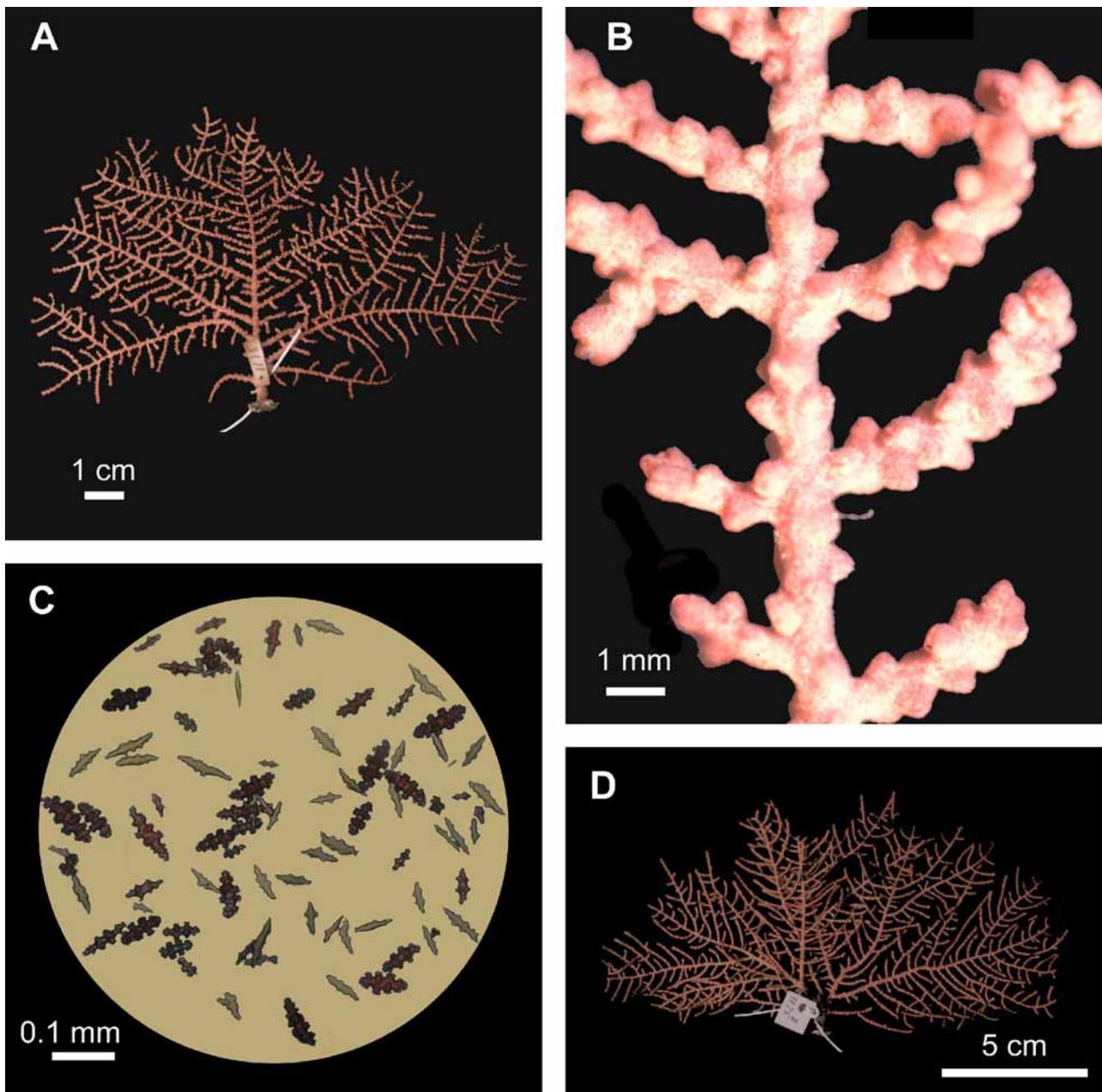


FIGURE 32. *Leptogorgia florae*, **A**, YPM 1175b; **B**, detail of a branch (YPM 1175b); **C**, light micrograph of sclerites (YPM 1175b); **D**, YPM 1175g.

The illustrated specimens, part of the syntypes (YPM1175b, 1175g), are 8 cm in height, 12.4 cm in width, and 8 cm in height, 16 cm in width, respectively (Fig. 32).

Distribution. Archipelago Las Perlas, Golfo de Panama, Panama: type localities. We have not found any specimen of this species in our recent collections from Panama, including Archipelago Las Perlas (Table 2, Fig. 35).

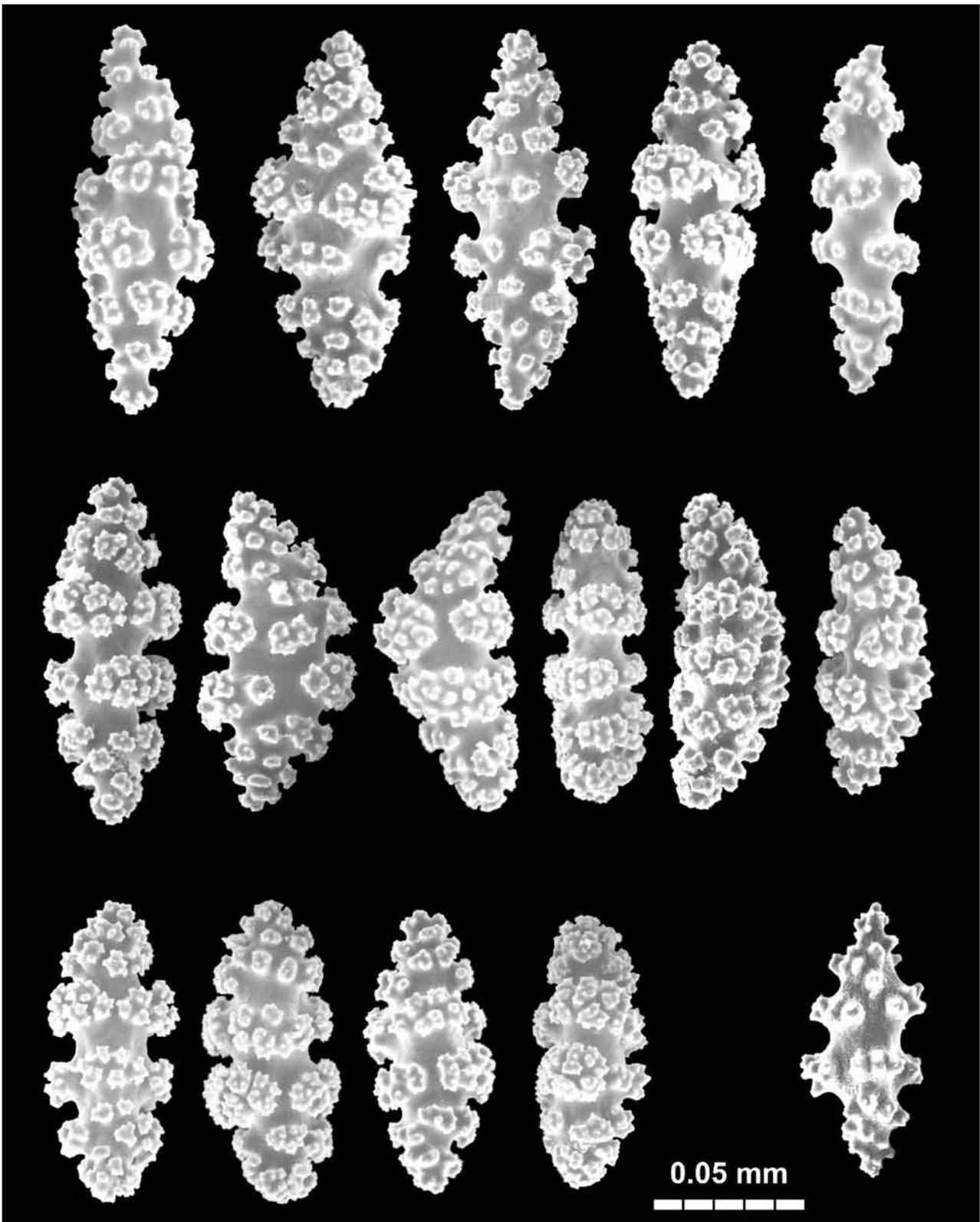


FIGURE 33. *Leptogorgia florae* (YPM 1175b), SEM of spindles.

Remarks. This species was described by Verrill (1868b), he did not designate a holotype, but the material deposited in the YPM and MCZ collections agrees with all aspects of Verrill's description, to which a few details are added here.

This species differs from the others mainly in the pinnate style of branching, which is more irregular in other species like *L. aequatorialis*, *L. parva*, and *L. taboguilla* (Table 1).

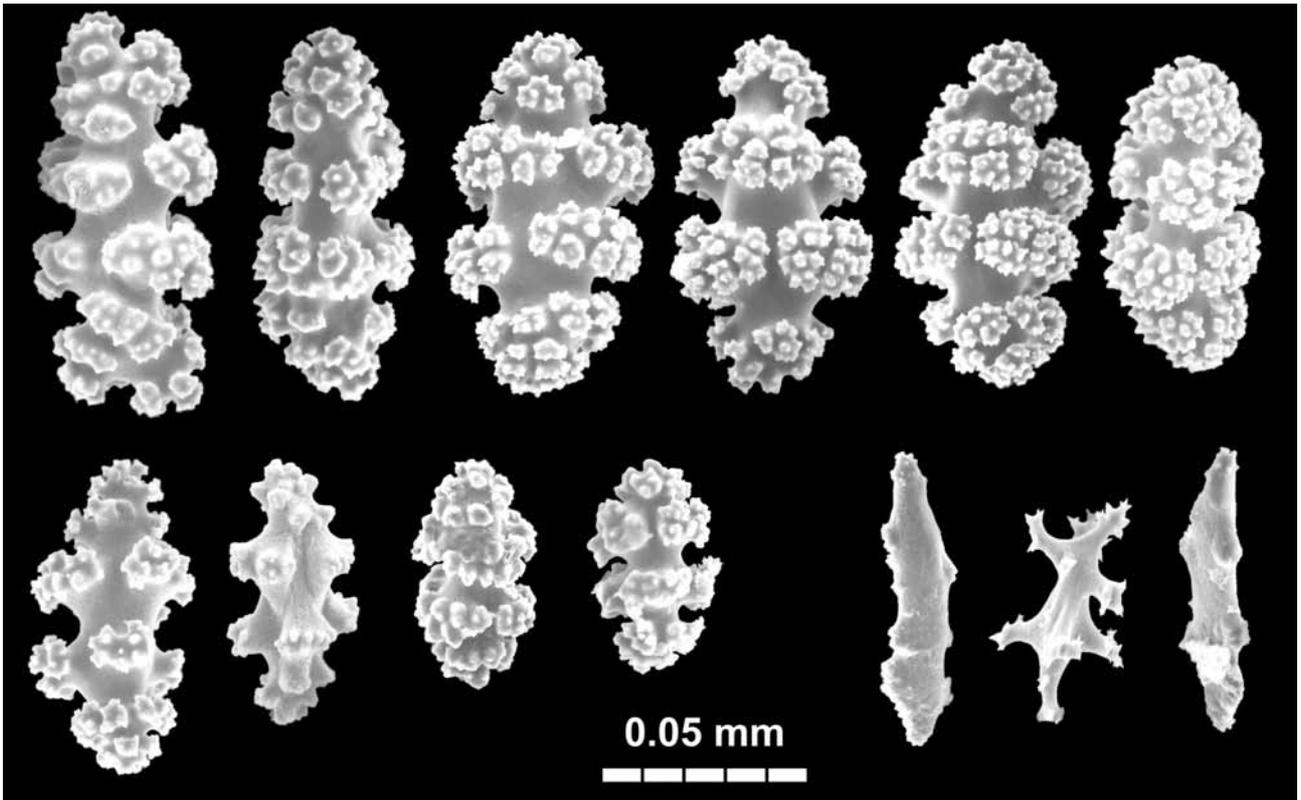


FIGURE 34. *Leptogorgia florae* (YPM 1175b), SEM of capstans, and anthocodial rods.

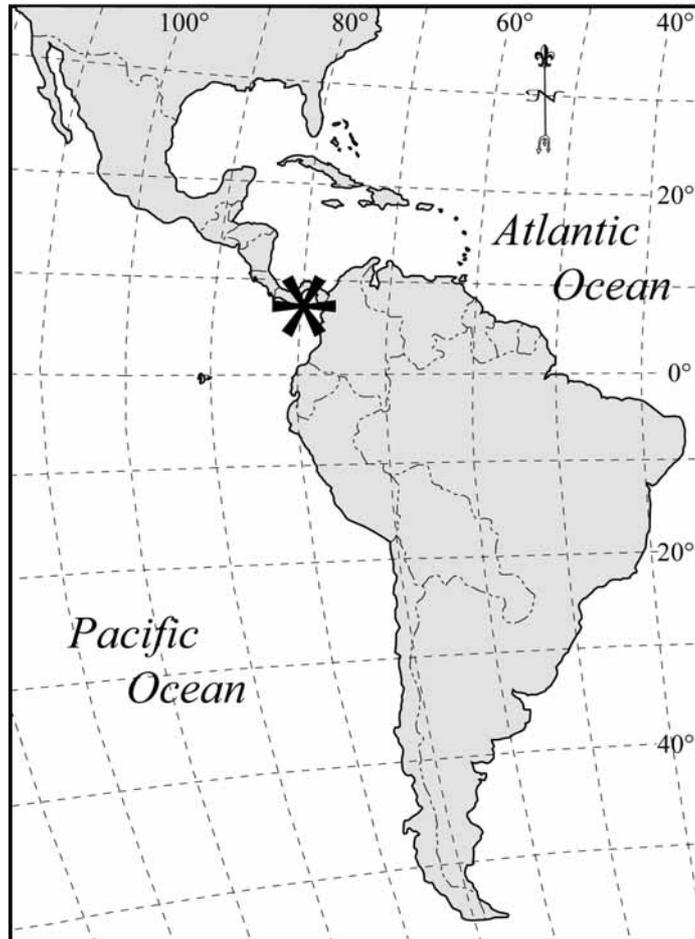


FIGURE 35. Geographical distribution of *Leptogorgia florae*, *Leptogorgia fruticosa*, and *Leptogorgia parva*.

***Leptogorgia fruticosa* Hickson, 1928**

(Figs. 35, 36B, 37)

Leptogorgia fruticosa (pars) Hickson, 1928: 407–408; Stiasny 1943: 80–81.

Material examined. Syntypes. BM 1946.1.14.72, off Taboga Island, Panama, 7–9 m, C. Crossland, Pacific Cruise 1923–1924; ZMUC-ANT 129 q, s, u, v, Taboguilla Island, Panama, 5 m, T. Mortensen, 2 November 1915.

Description. Syntypes. The species is represented by a fragment 7.3 cm in height and 4 cm in width (Fig. 36B). Branching is irregular, not planar, with some branchlets arising out at right angles. Main branches are 1.5–2.0 mm in diameter; branchlets are 1.0–1.5 mm in diameter. Unbranched terminal twigs are blunt and up to 9.0 mm in length. Polyps are pale yellow when contracted, but light brown when expanded, with anthocodial rods arranged in points below the polyp tentacles. They are sparsely distributed all around the branches, and retract in slightly raised polyp-mounds. Colour of the colony is greyish-white. Coenenchymal sclerites are pale yellow and mostly capstans. Spindles are up to 0.10 mm in length, and 0.03 mm in width, with 4–6 whorls of tubercles (Fig. 37). Capstans reach up to 0.07 mm in length, and 0.04 mm in width (Fig. 37). Anthocodial sclerites are colourless, long flat rods, up to 0.10 mm in length, and 0.02 mm in width with regular margins, some with lateral projections on the margins (Fig. 37).

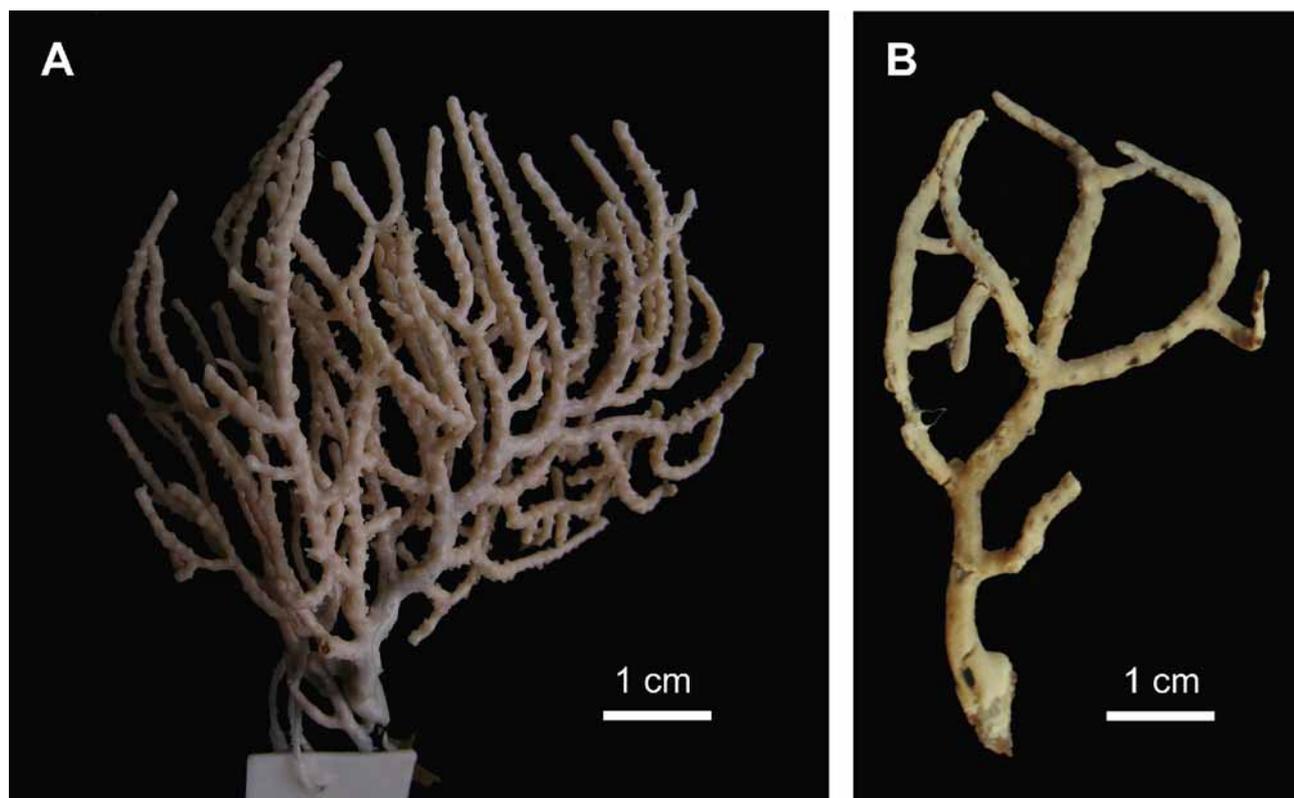


FIGURE 36. A, *Leptogorgia cofrini* (ZMUC ANT 129); B, *Leptogorgia fruticosa* (BM 1946.1.14.72).

Distribution. Only from the type locality: Taboga and Taboguilla Islands, Golfo de Panama, Panama (Table 2, Fig. 35).

Remarks. Hickson (1928) described six species of *Leptogorgia* from the C. Crossland collection made during the voyage of the *S. Y. St. George*, in the Panama region, and from T. Mortensen's collection from the same region (Hickson 1928). Three of these species he incorrectly placed in the genus *Euplexaura* Verrill,

1869 (family Plexauridae). Stiasny (1941, 1943) revised Hickson's species, but apart from the addition of some details for the descriptions, he did not make any new contribution. In the description of *L. fruticosa*, Hickson (1928) listed 5 specimens from off Taboguilla Island, and another small specimen from Taboga Island. We found 4 small specimens in the ZMUC collection marked as "cotypes" from off Taboguilla; the larger specimens cited by Hickson (1928), 90 mm x 100 mm, and 70 x 40 mm were not found. A small fragment from Taboga Island was found in the BM together with a small fragment of *L. laxa*. Hickson's description of *L. fruticosa* disagrees in some aspects with the ZMUC specimens, especially in the sclerites, but is more accurate for the BM fragment marked as type. In addition, the microscopic slides made by Hickson for the description of the species match the BM fragment. The ZMUC specimens that do not match the description of *L. fruticosa* were included in *L. cofrini* by Breedy and Guzman (2005) (see the description of *L. cofrini* in this paper).

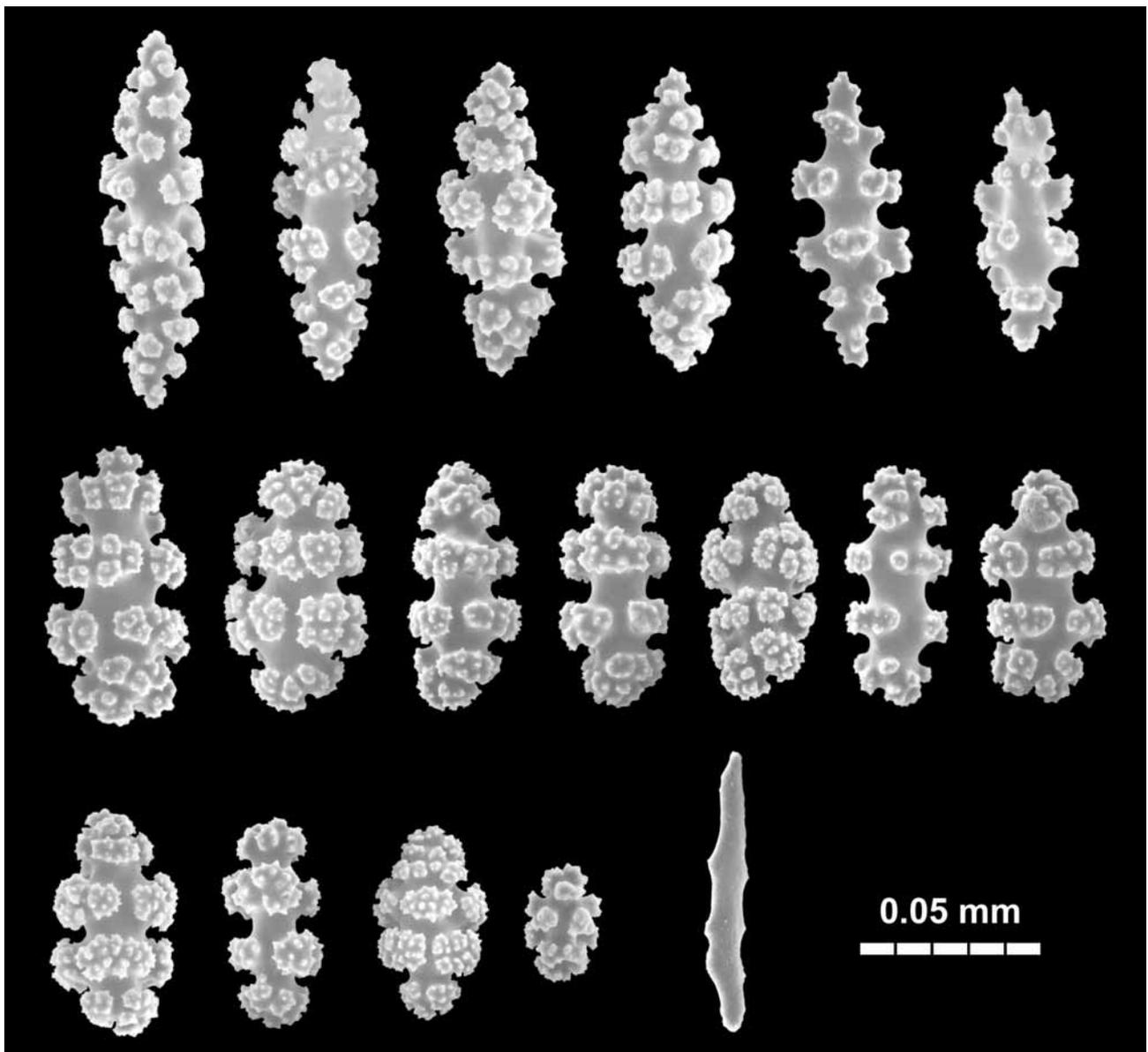


FIGURE 37. *Leptogorgia fruticosa* (BM 1946.1.14.72), SEM of coenenchymal sclerites, and anthocodial rod.

Leptogorgia labiata Verrill, 1870

(Figs. 38–40)

Leptogorgia ramulus (pars) Verrill 1868b: 394–396

Leptogorgia labiata Verrill, 1870: 552; Nutting 1910: 5; Kükenthal 1919: 772; 1924: 336; Bielschowsky 1929: 135.

Lophogorgia labiata Harden 1979: 74.

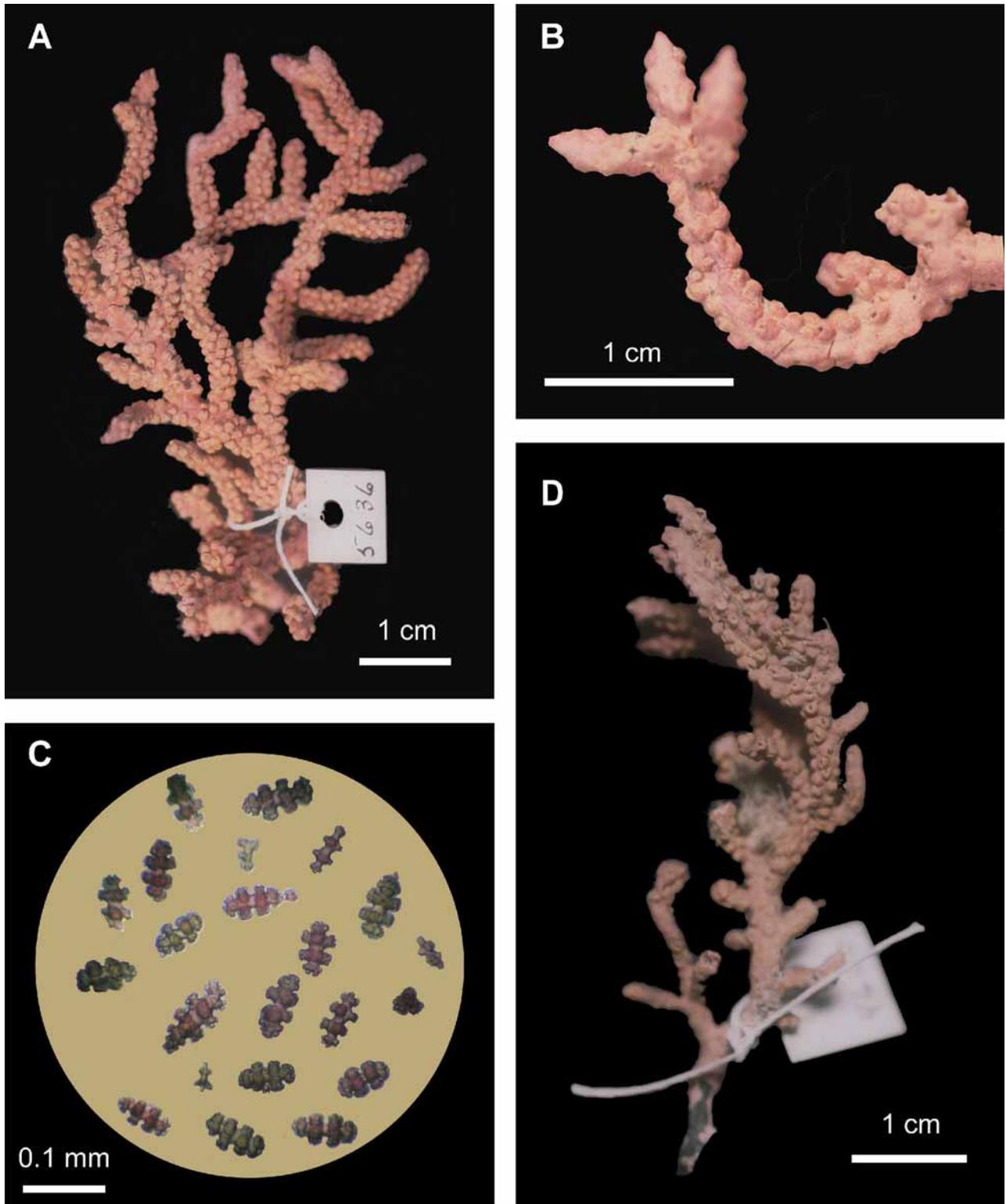


FIGURE 38. *Leptogorgia labiata*, **A**, YPM 5636; **B**, detail of a branch (YPM 4600, lectotype); **C**, light micrograph of coenenchymal sclerites (YPM 4600, lectotype); **D**, YPM 4600, lectotype.

Material examined. Lectotype (here designated): YPM 4600, dry, Oaxaca State, Golfo de Tehuantepec, Mexico, no depth given, G. Sumichrast, 1866–1867. Paralectotype: YPM 5636, dry, Mexico, no depth given, A. Dugès, donor: National Museum, probably 1880 (E. Lazo-Wasem, pers. comm.).

Other material examined. MEXICO: CASIZ 097881(2 specimens), dry, Mazatlan, H. N. Lowe, no further data. PANAMA: BM 1930.6.17.14, preserved, Station Balboa 3 (Pacific entrance to Panama Canal docks, tidal, half mile from sea), no depth given, St. George; Scientific Expedition, Pacific Cruise, C. Crossland, 1923–1924.

Lectotype description. The colony fragment consists of a thick, slightly flattened branch 5.5 cm in length, and 1.3 cm in width, that ramifies in short rigid branchlets, 2 mm in diameter, in an irregularly pinnate manner. Free branchlets extend up to 10 mm in length; they are finger-like and pointed (Fig. 38B, D). Colour is pink ochre throughout, with a yellowish not very marked concentration around the polyp-mounds (Fig. 38B, D). The polyps are closely arranged in about 4 rows along the branches and more laterally distributed at the ends. Polyp-mounds are conspicuously elevated and dome-shaped, with oval, labiate apertures around 0.3–0.4 mm in diameter (Fig. 38B, D). Coenenchymal sclerites are rose red to pink, pale yellow to colourless, and bicoloured (Fig. 38C). They are mainly capstans measuring up to 0.08 mm in length and 0.06 mm in width, (Figs. 38C, 39). Spindles are scant, with 3–4 whorls of tubercles, reaching up to 0.10 mm in length and 0.05 mm in width (Figs. 38C, 39). Anthocodial sclerites are small, yellow rods, 0.05 mm in length and 0.02 mm in width, biscuit-shaped, or with short lobes. Very few anthocodial rods appear in the samples.

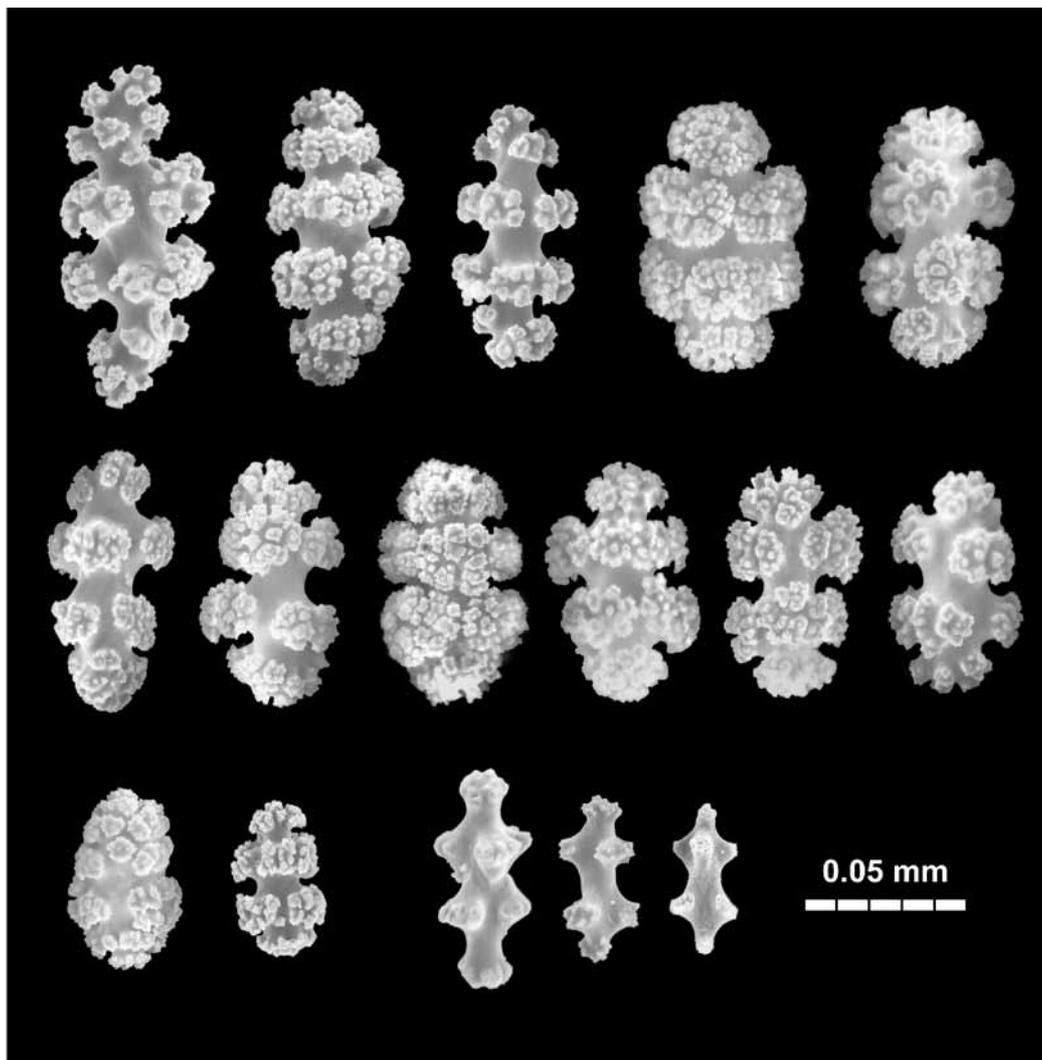


FIGURE 39. *Leptogorgia labiata*, (YPM 4600, lectotype), SEM of sclerites.

The paralectotype, YPM 5636, is a fragment 6 cm in height, and 4 cm in width; it matches the lectotype in all features (Fig. 38A).

Distribution. Golfo de Tehuantepec, Mexico: type locality. Mazatlan (Sinaloa, Mexico) and Panama. No specimen of *L. labiata* has been found in our recent collections from Panama (Table 2, Fig. 40).

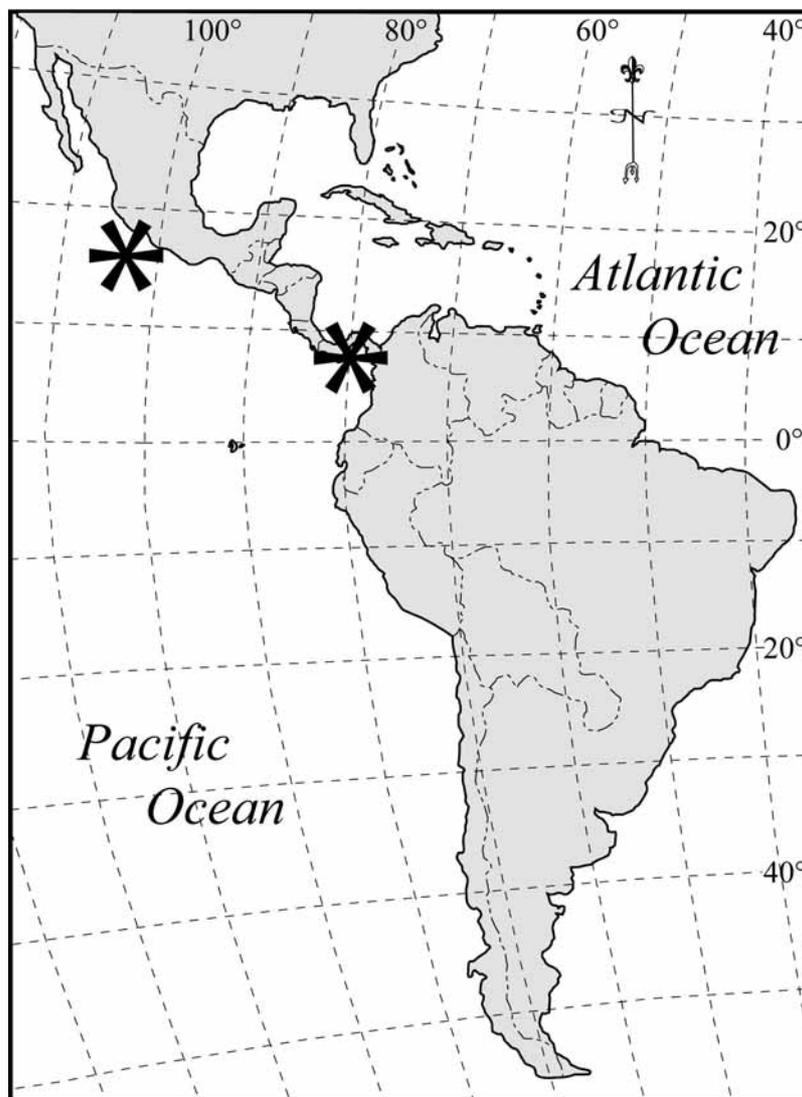


FIGURE 40. Geographical distribution of *Leptogorgia labiata*.

Remarks. In Verrill's description of *L. ramulus* (Milne Edwards & Haime, 1857) (1868b), he recognised a pink variety of *L. ramulus* and briefly described specimens from Acapulco and Cape San Lucas that he considered very different from those of Panama. Later Verrill (1870) established a new species, *L. labiata* for that group of specimens, but added in the type localities Golfo de Tehuantepec (Mexico) and Corinto (Nicaragua). However, the only material marked as "type" that we found is a fragment, YPM 4600, from Golfo de Tehuantepec. Another fragment, YPM 5636, from Mexico, was correctly identified by Verrill as *L. labiata* but was not marked as "type". Verrill did not provide any illustration, or designate any holotype, the only trustable sample YPM 4600 is herein designated the lectotype for this species to fix its identity, YPM 5636 becomes the paralectotype.

The species is similar to *L. pumila*, and *L. ramulus*, and differences are discussed under *L. ramulus* (Table 1).

Leptogorgia laxa Hickson, 1928

(Figs. 41–44)

Leptogorgia laxa (pars) Hickson, 1928: 405–406; Stiasny 1943: 78–79.

Material examined. Lectotype (here designated): ZMUC ANT-121, preserved, Taboguilla Island, Panama, 9 m, 16 December 1915, T. Mortensen, Pacific Expedition 1915–1916. Paralectotypes: BM 1946.1.14.60 (4 fragments), preserved, Taboguilla Island; ZMUC ANT-122-T (marked cotype), preserved, off Taboguilla Island, 5.5 m, 2 November 1915, T. Mortensen, Pacific Expedition 1915–1916, ZMUC ANT-122-R (marked cotype), preserved, off Taboguilla Island, 5.5 m, 2 November 1915, T. Mortensen, Pacific Expedition 1915–1916.

Other material examined. COSTA RICA: USNM 50615, dry, Golfo de Nicoya, no depth given, January 1952, D. S. Erdman. MEXICO: M 568, dry, Isabel Island, E. Lopez, voucher collection, no further data. PANAMA: UCR 1064, dry, Isla Santa Cruz, Golfo de Chiriqui, 5–20 m, H. Guzman, 10 December 2001; UCR 1163, 1165, 1169, dry, Roca Niagara, Golfo de Chiriqui, 5–20 m, H. Guzman, 13 December 2001; STRI 880, dry, Isla Pedro Gonzalez, Archipelago Las Perlas, 3–10 m, H. Guzman, 24 May 2004.

Lectotype description. The colony is 15.0 cm in height and 7.0 cm in width and arises from a circular holdfast attached to a shell fragment. A short stem, 15 mm long, and 2 mm in diameter divides into three main branches, 1.0–1.5 mm in diameter. Some of the branches produce secondary branches in an irregular, dichotomous, very lax style of branching. The branching angle is almost perpendicular (Fig. 41A). Unbranched terminal twigs are pointed, about 3.0 cm in length (Fig. 41A). Polyps are colourless and alternating in two rows on each side of the branches, about 1 mm apart. Polyp-mounds are slightly raised around the circular apertures (Fig. 41B, C). Colour of the colony is white (Fig. 41A–C) and the coenenchymal sclerites are colourless (Fig. 41D). The largest are spindles, up to 0.18 mm in length and 0.07 mm in width, have 4–8 whorls of compound tubercles (Figs. 41D, 42, 43). Capstans are up to 0.08 mm in length and 0.05 mm in width (Figs. 41D, 43). Anthocodial sclerites are colourless, long flat rods, up to 0.1 mm in length, and 0.02 mm in width with dentate or lobed margins (Fig. 43).

Other material. The examined specimens reach up to 25 cm in height and 17 cm in width and arise from a spreading holdfast. The stems are up to 10 mm in length, and the subsequent branching is planar, sparse, and irregularly dichotomous, producing relatively long, thin, flexible ramifications. The stems are up to 2 mm in diameter and the branches are mostly 1–1.5 mm in diameter. Unbranched terminal twigs are pointed and around 3–5 cm in length. Polyps can be arranged in alternating biserial rows, as in the lectotype, or are evenly placed around the branches at distances of about 1.0 mm apart. Sclerites are as in the lectotype with some variation in the abundance of spindles in the samples. The BM syntypes have smaller spindles reaching up to 0.15 mm in length (Fig. 41C).

Distribution. Taboguilla Island, Panama: type locality (Hickson 1928). Golfo de Chiriqui, Panama; Golfo de Nicoya, Costa Rica; Isabel Island, Mexico (Table 2, Fig. 44).

Remarks. Hickson (1928) described this species from a mixture of species; for example, ZMUC ANT-122, a specimen labeled as cotype, is a specimen of *L. alba*, not *L. laxa* where Hickson placed it. We could not find all of the colonies described in his paper, and no specimen at hand matches the figured specimen. To establish the identity of this species, we herein designate ZMUC ANT-121 the lectotype of *L. laxa*.

The lax ramification with branchlets sticking out at angles of 90° is the main feature to identify this species, and distinguishes it from *L. alba*. In addition, the anthocodials are smaller, and fewer spindles occur in samples of *L. laxa* than in *L. alba* (Table 1).

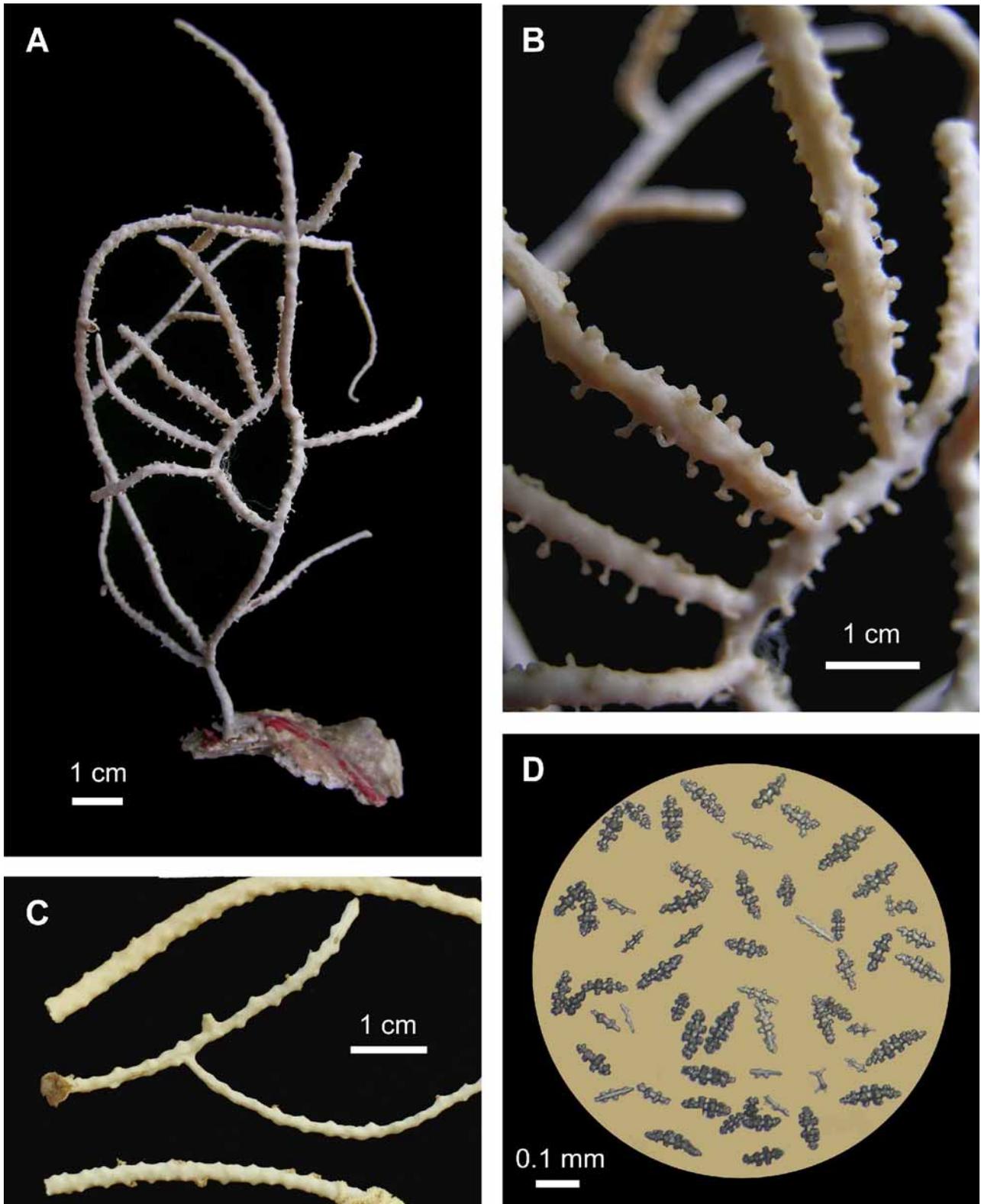


FIGURE 41. *Leptogorgia laxa*, **A**, ZMUC ANT 121; **B**, detail of branches (ZMUC ANT 121); **C**, BM 1946.1.14.60; **D**, light micrograph of coenenchymal sclerites (ZMUC ANT 121).

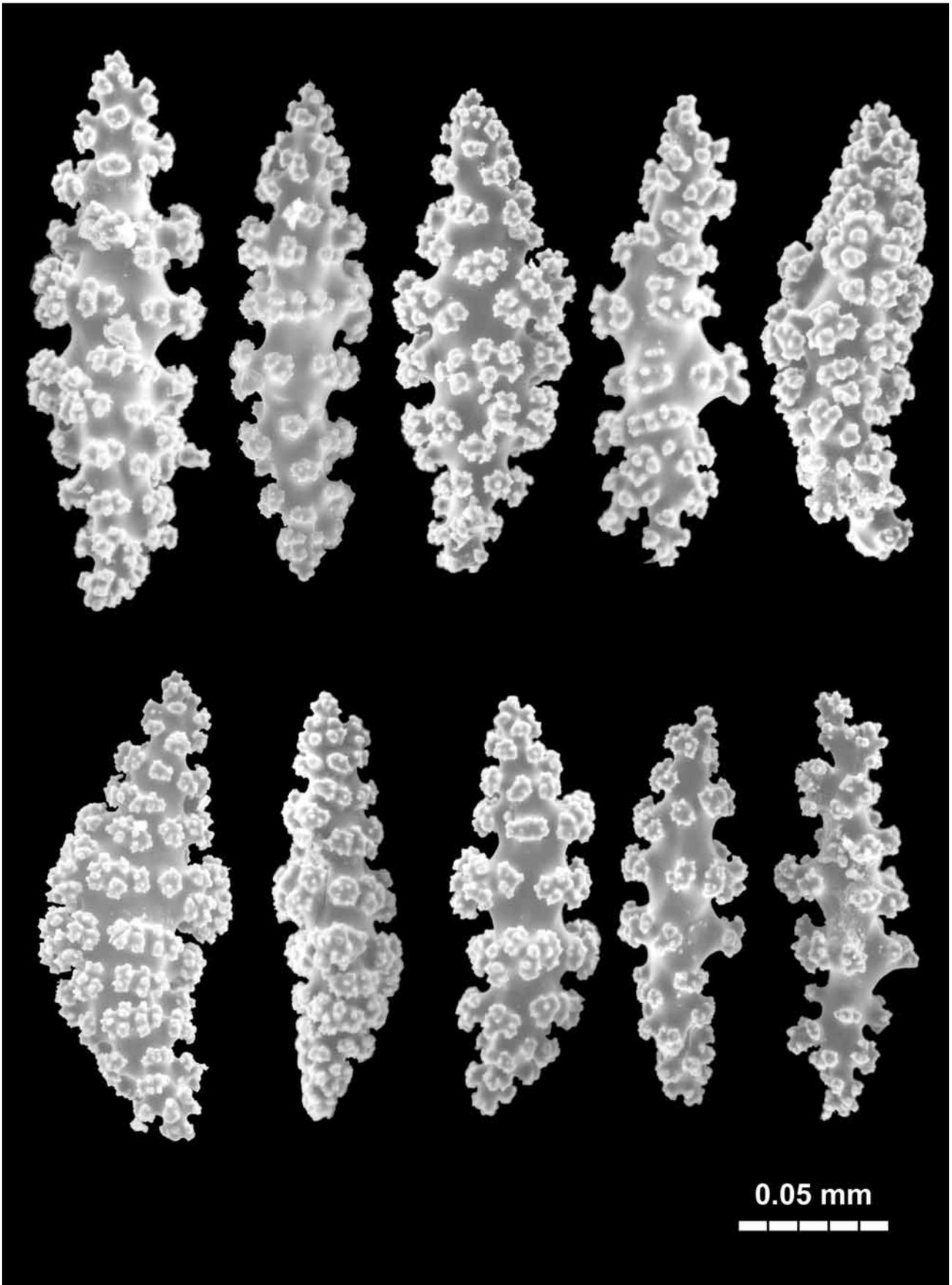


FIGURE 42. *Leptogorgia laxa*, lectotype, SEM of spindles.

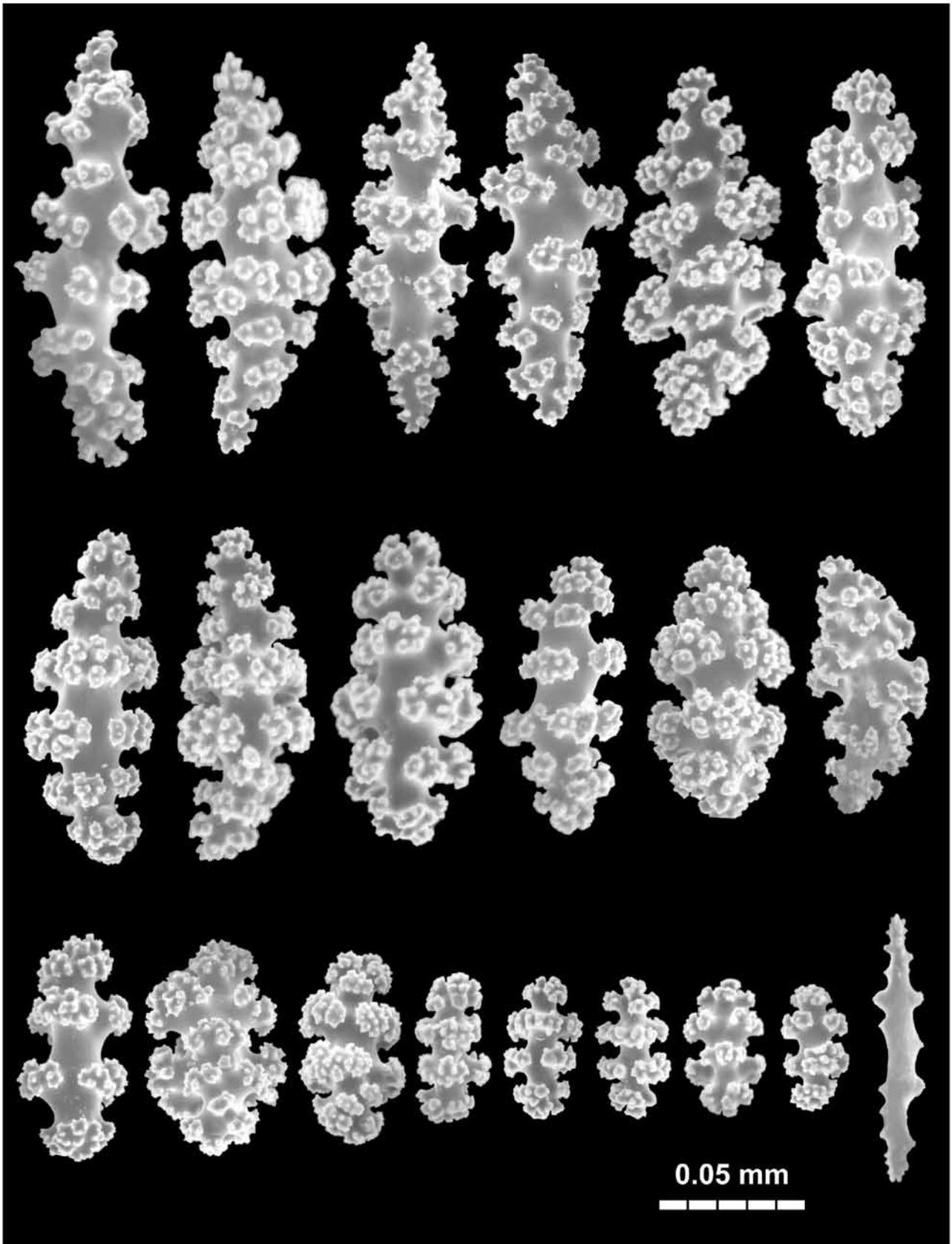


FIGURE 43. *Leptogorgia laxa*, lectotype, SEM of coenenchymal sclerites, and anthocodial rod.

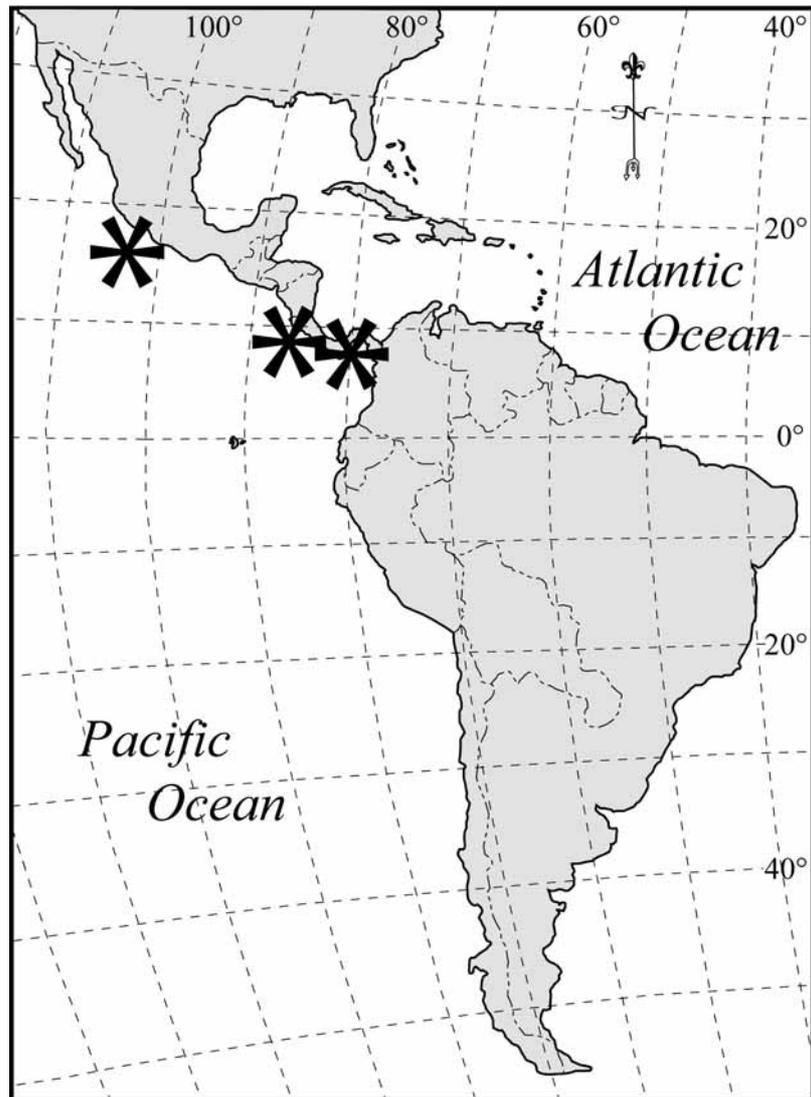


FIGURE 44. Geographical distribution of *Leptogorgia laxa*.

***Leptogorgia obscura* Bielschowsky, 1929**

(Figs. 3, 45–46)

Leptogorgia obscura Bielschowsky, 1918: 31 [Nomen nudum]; 1929: 119–120; Kükenthal 1919: 914; 1924: 332.
Lophogorgia obscura Harden 1976: 76.

Material examined. Holotype. ZMHC 4880, Caraguez Bay, Ecuador, 4–5 m, no further data.

Holotype description. The colony is 4 cm in height and the same in width. It arises from a circular hold-fast, 13 mm in diameter, with a very short stem that subdivides into three branches, 1.5–2 mm in diameter, that branch in an irregularly pinnate style (Fig. 45A, B). Free branchlets are up to 13 mm in length, 1–1.5 mm in diameter, with blunt or acutely pointed ends. Colour is dark violet (Fig. 45A, B). Polyps are arranged in 2 lateral rows along the branches separated by longitudinal grooves; they are more scattered and irregularly distributed on the thicker branches. Polyp-mounds are prominent, around 0.5 mm in diameter, dome-shaped with circular, small apertures (Fig. 45B). Coenenchymal sclerites are violet and pink (Fig. 45C), and are mostly capstans up to 0.08 mm in length, and 0.05 mm in width (Figs. 45C, 46). Spindles reach up to 0.12 mm in length and 0.05 mm in width, with 3–5 whorls of tubercles (Figs. 45C, 46). Anthocodial rods are from pale

orange to amber, and some are rose. They are closely set in 2–3 rows below the polyp tentacles and they reach up to 0.06 mm in length, and 0.02 mm in width, with wide lobed margins (Figs. 45C, 46).

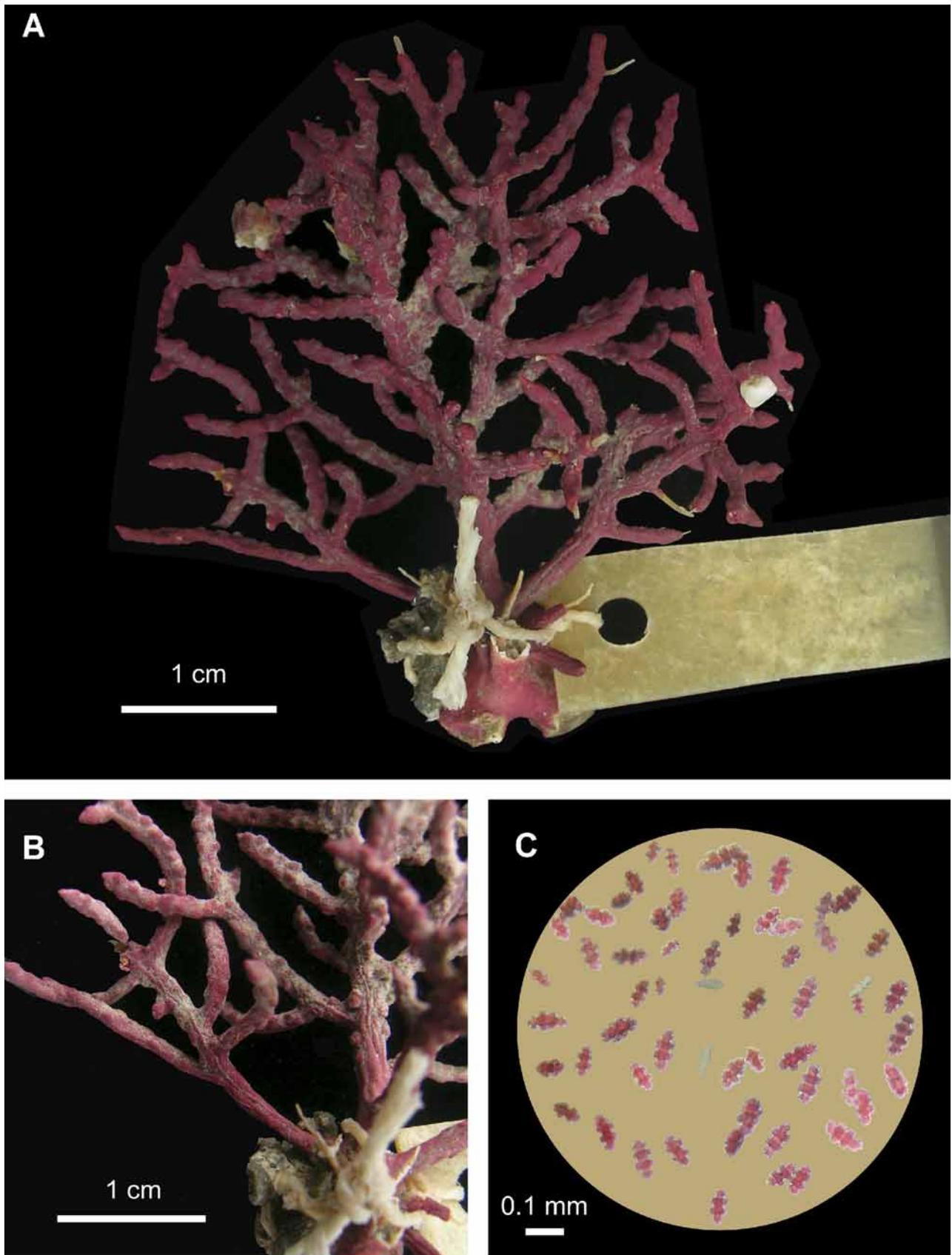


FIGURE 45. A, *Leptogorgia obscura*, holotype (ZMHC 4880); B, detail of branches; C, light micrograph of sclerites.

Distribution. Known only from the type locality: Caraguez Bay, Ecuador. Harden (1979) reports this species in various localities along Baja California, but we could not study his specimens (Table 2, Fig. 3).

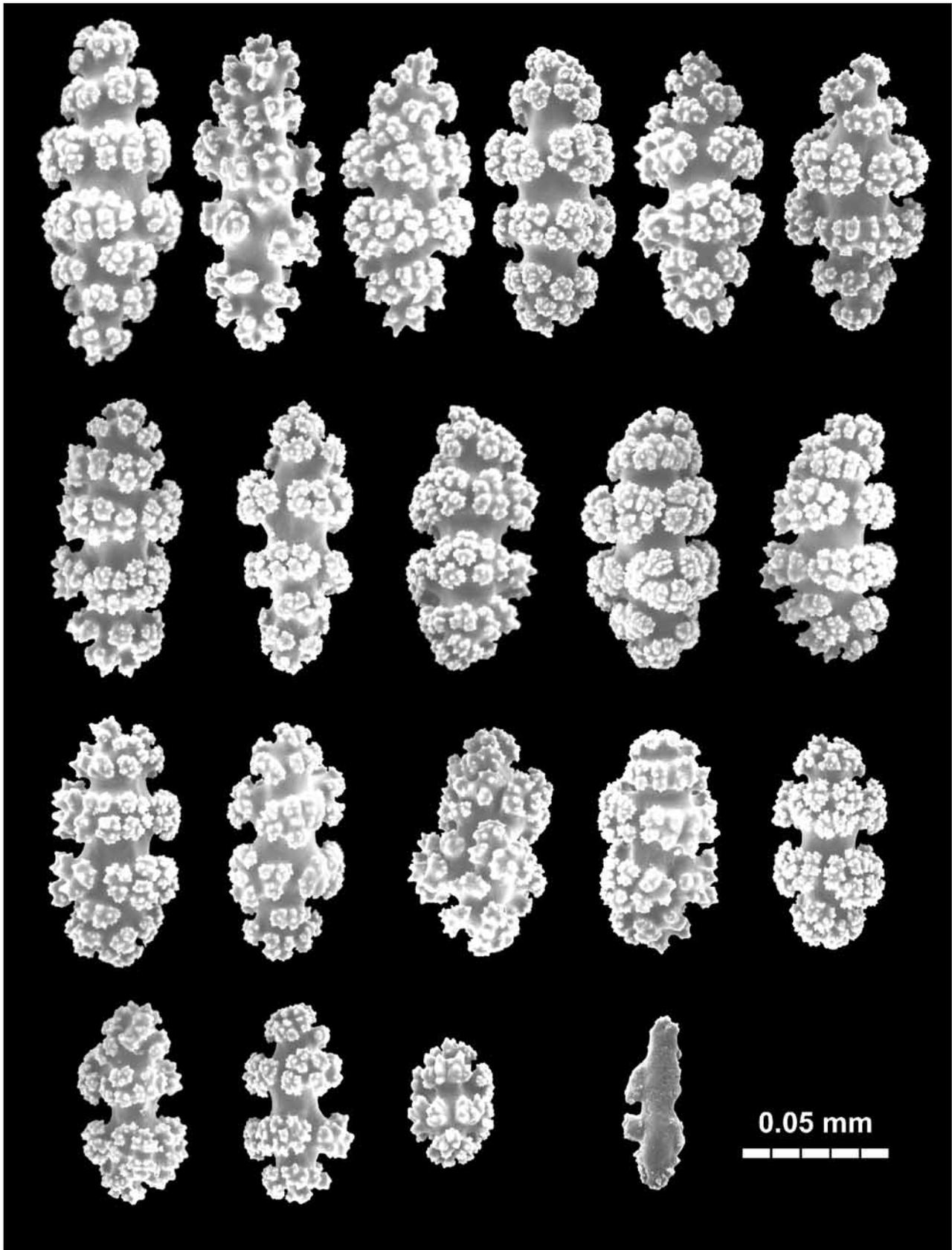


FIGURE 46. *Leptogorgia obscura*, holotype (ZMHC 4880), SEM of coenenchymal sclerites, and anthocodial rod.

Remarks. Similarities between this species and *L. aequatorialis*, and *L. parva* were discussed under *L. aequatorialis* ((Table 1).

***Leptogorgia parva* Bielschowsky, 1929**

(Figs. 35, 47–48)

Leptogorgia parva Bielschowsky, 1918: 31 [Nomen nudum]; 1929: 116–118; Kükenthal, 1919: 913–914; 1924: 331.
Lophogorgia parva Harden 1976: 80.

Material examined. Syntypes: ZSM 20043890 preserved, no depth given, Panama, Amerika, Hassler Expedition, A. Kölliker, 1904 (figured specimen, Bielschowsky 1929); ZSM 20043889, preserved, no depth given, Panama, Hassler Expedition, A. Kölliker, 1904.

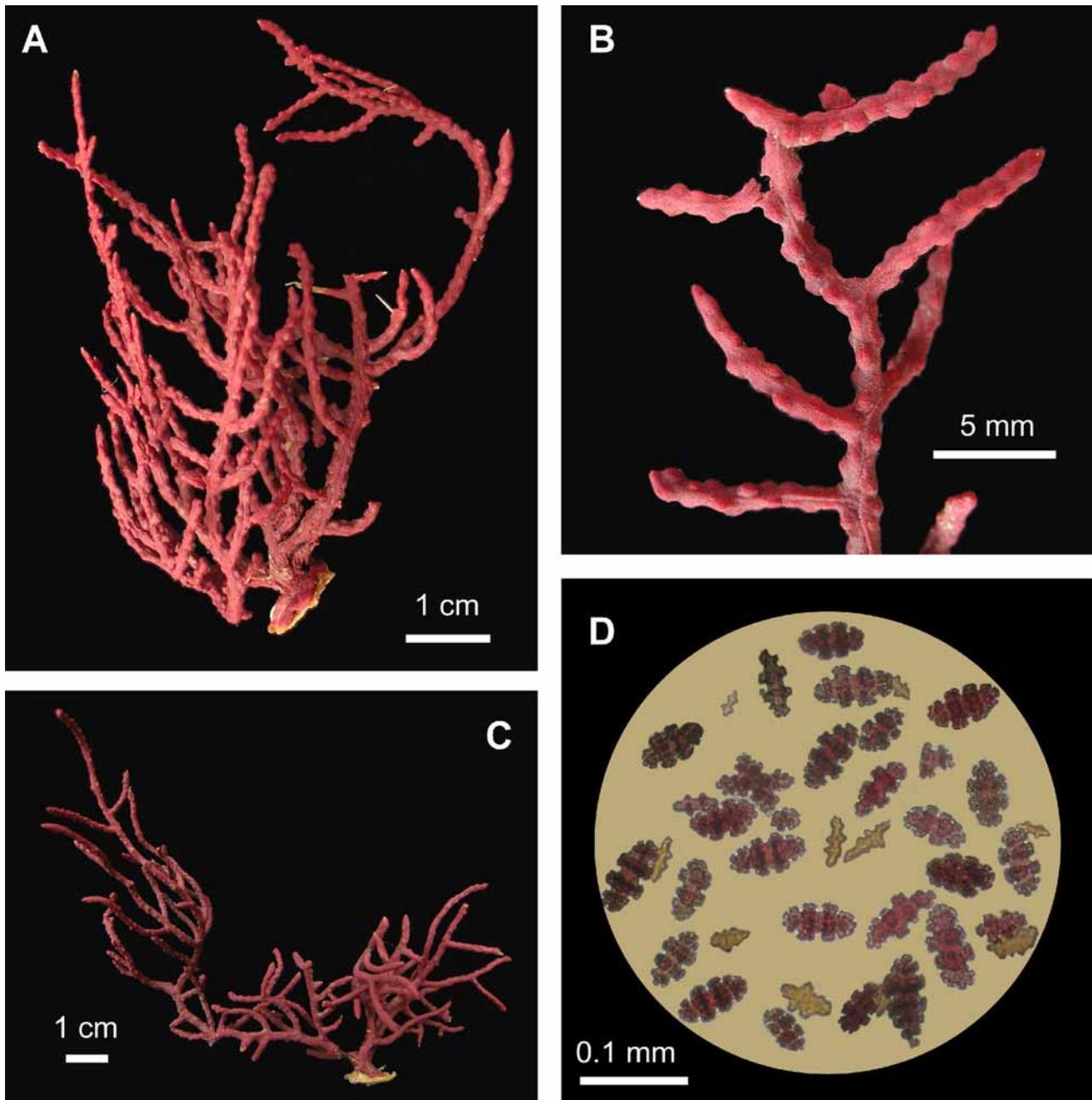


FIGURE 47. *Leptogorgia parva*, **A**, ZSM 20043890; **B**, detail of branches (ZSM 20043890); **C**, ZSM 20043889; **D**, light micrograph of sclerites (ZSM 20043890).

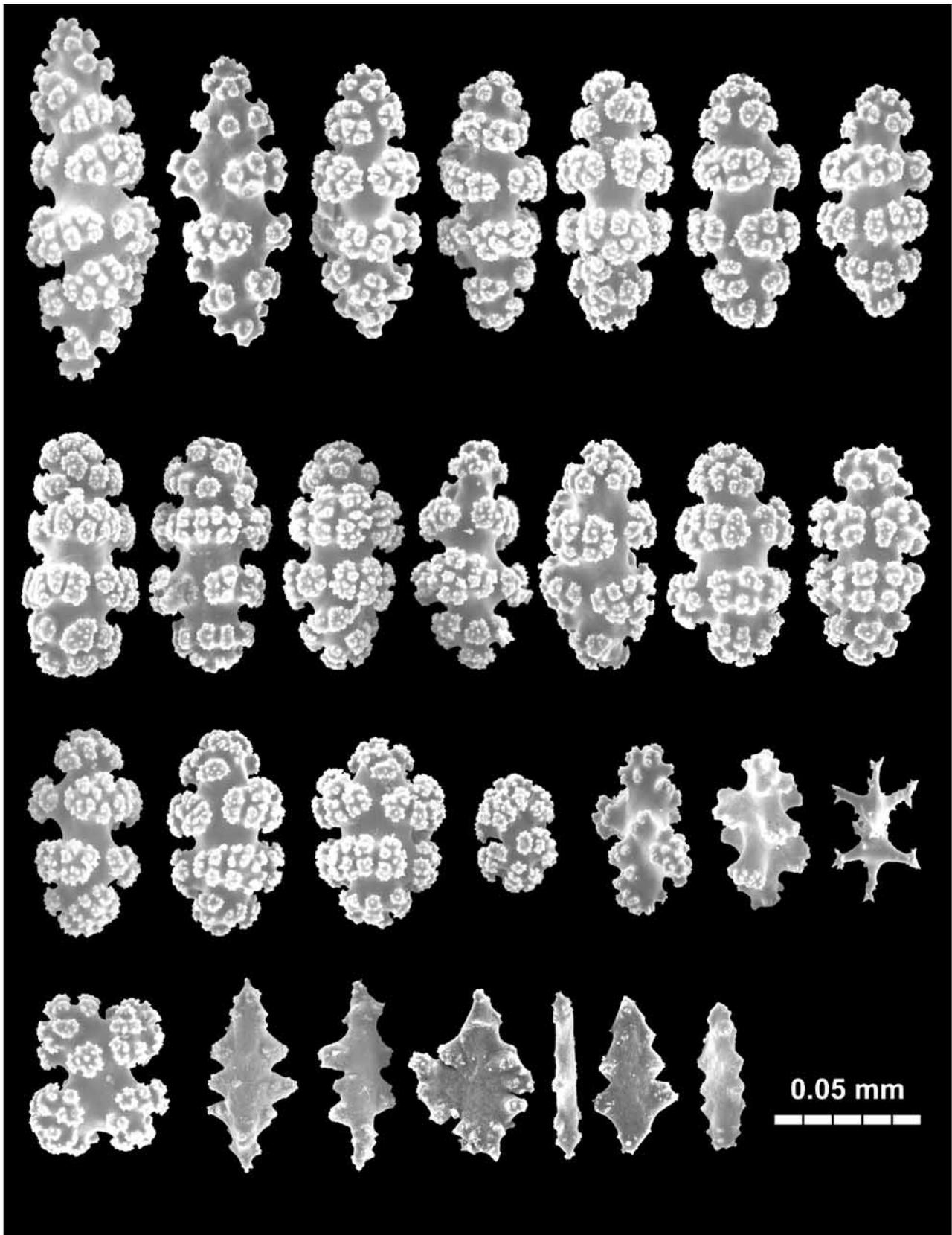


FIGURE 48. *Leptogorgia parva* (ZSM 20043890) SEM of sclerites.

Description of syntypes. The syntypes are two colonies, one is 5 cm in length, and 10 cm in width, and the other is 6 cm in length, and 6 cm in width, the latter matches the figured specimen (Bielschowsky 1929)

(Fig. 47A, C). Colonies have very short stems, 3–4 mm in diameter, subdividing almost directly from the holdfasts into 2–3 main branches, which are slightly flattened and about 2 mm in diameter. Ramification is irregularly pinnate. Free branchlets are up to 30 mm in length, about 1 mm in diameter, with acute, pointed ends. Colour is purplish red (Fig. 47A–C). Polyps are whitish, arranged in 2 lateral rows along the branches that are separated by very marked longitudinal grooves, which produce quill-like folds of coenenchyme in some branches (Fig. 47B). Polyps are more scattered and irregularly distributed on the thicker branches, more closely placed at the end branches. Polyp-mounds are prominent, dome-shaped with labiate apertures, around 0.5 mm long (Fig. 47B). Coenenchymal sclerites are red, and pink, some with an orange hue, and a few are pale yellow (Fig. 47D). They are mostly capstans, reaching up to 0.08 mm in length and 0.045 mm in width (Figs. 47D, 48). Spindles are up to 0.12 mm in length and 0.04 mm in width, with 3–4 whorls of tubercles. Crosses measuring about 0.058 mm by 0.058 mm, with round tuberculate ends are also present (Figs. 47D, 48). Anthocodial rods are orange, closely set in points below the polyp tentacles. They reach up to 0.08 mm in length and 0.03 mm in width, (although some are wider and up to 0.05 mm) with lobed margins and small tubercles on the surface (Figs. 47D, 48).

Distribution. Only reported for Panama: type locality. We have not found this species during our recent collections from the shallow waters of Panama (Table 2, Fig. 35).

Remarks. This species is similar to *L. taboguilla* in the branching pattern, the prominent polyp-mounds, and the colour of the colony and sclerites, but the wide band of anthocodial rods in the points of *L. taboguilla* is more conspicuous and composed by longer rods than in *L. parva*. Similarities between this species, *L. aequatorialis* and *L. obscura* were discussed under *L. aequatorialis* (Table 1).

***Leptogorgia peruviana* (Verrill, 1868)**

(Fig. 49–51)

? *Plexaura reticulata* Ehrenberg, 1834: 141; Philippi 1866: 119.

Gorgonia (Litigorgia) peruviana Verrill, 1868: 414 [Nomen nov.].

Litigorgia peruana Verrill, 1868a: 405 (1st. ed.) [Unjustified emendation]

Leptogorgia peruana Verrill, 1868b: 405; 1869b: 421; Nutting 1910: 5; Kükenthal 1924: 336; Bielschowsky 1929: 135.

Lophogorgia peruana Harden 1979: 80.

Material examined. Syntype series. YPM 1654a–d, ZMUC ANT-185, dry, no depth given, Callao, Peru, F. M. Bradley, 1866–1867.



FIGURE 49. *Leptogorgia peruviana*, A, YPM 1654b; B, detail of branches (YPM 1654b).

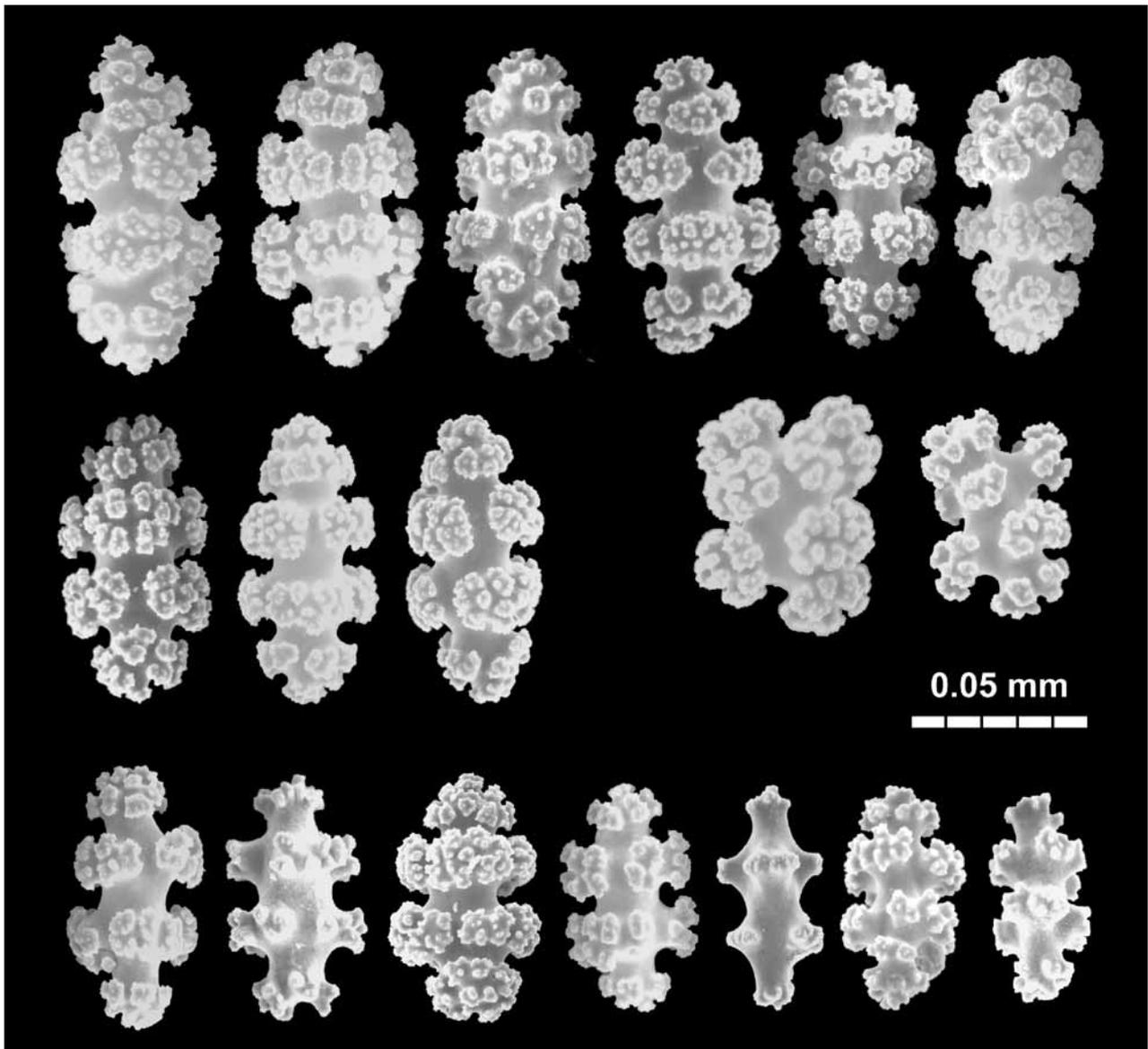


FIGURE 50. *Leptogorgia peruviana* (YPM 1654b), SEM of coenenchymal sclerites.

Description of syntypes. Colonies examined range from 6 cm to 8 cm in length, and from 50 mm to 135 mm in width (Fig. 49A). Colonies are low and bushy; they arise from short stems, 2–4 mm in length and up to 4 mm in width and they have encrusting holdfasts. Stems give off several main branches, 3–5 mm in diameter, which immediately subdivide irregularly into numerous, unevenly pinnate branches. Branches and branchlets are all thick and round in cross section, 2–3 mm in diameter throughout. The tips of the branches seem to be crooked, but it is difficult to observe since all of the syntype series is infected with polychaete tubes (Fig. 49A, B). Colour is whitish. All specimens are dry; the coenenchyme is brittle easily falls off leaving nude, flat, dark axes. Polyp-mounds are small, flat and numerous, closely arranged all around the branches (Fig. 49B). Coenenchymal sclerites are all white and mostly capstans reaching up to 0.07 mm in length, and 0.04 mm in width (Fig. 50). Spindles are up to 0.10 mm in length and 0.05 mm in width, and some have a slightly bent tip. Some cross-like sclerites up to 0.07 mm in length, and 0.07 mm in width occur in the samples (Fig. 50, right at second row). No anthocodial sclerites were found in the examined specimens. The figured specimen measures 60 mm in length, and 135 mm in width.

Distribution. It is only reported from the type locality, Callao, Peru (Table 2, Fig. 51).

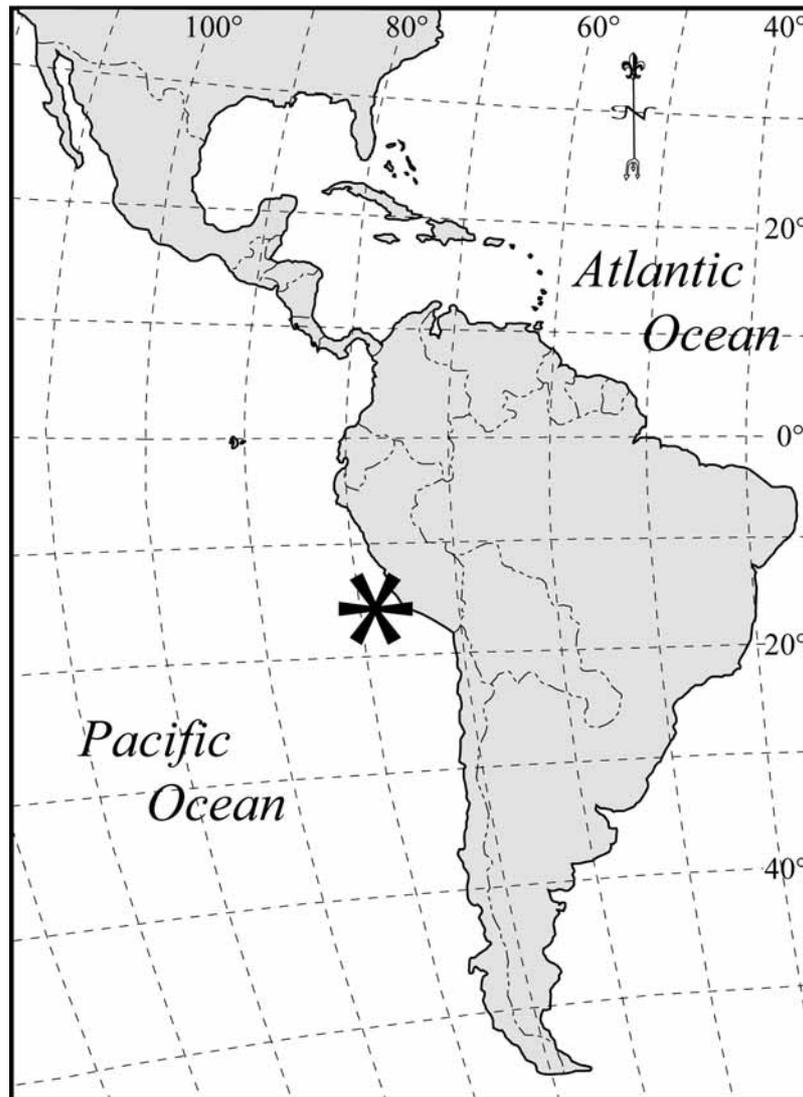


FIGURE 51. Geographical distribution of *Leptogorgia peruviana*.

Remarks. Philippi (1866) received a specimen from Callao that according to him matched Ehrenberg's (1834) description of *Plexaura reticulata* (from an unknown locality). Besides mentioning that the specimen was white, Philippi did not offer any description of this species. Neither Philippi's nor Ehrenberg's specimens were available for examination. In those days the genus *Plexaura* Lamouroux, 1812 contained seven species which Verrill (1912) sorted and at the same time restricted the genus *Plexaura* to West Indian species, designating *Plexaura homomalla* (Esper, 1872) as the type species (Bayer 1961). However, in 1868, this delimitation was not clear, and Verrill assumed that the specimens collected from Callao were *Plexaura reticulata*. As he decided to transfer the species to *Gorgonia*, where the species name *reticulata* was already in use, he gave a new name, *Gorgonia (Litigorgia) peruviana*, to this species (Verrill 1868a). Later Verrill (1868b) placed the species in the genus *Leptogorgia*, and unjustifiably considered it necessary to once more, give it a new name, *Leptogorgia peruana*. This species is well represented by a syntype series YPM 1654 from Callao, Peru, and the specimen ZMUC-ANT 185 also belongs to the YPM 1654 series. No other specimen that fits this species has been found in any other museum collection or collected in recent expeditions.

All the syntypes were infested with polychaetes in the upper branches. The natural form of this species is only observed in the lower part of the colonies and close to the base, the rest of the branches are formed by the remains of the polychaete's tubes. Verrill (1868b) remarks that the branchlets of this species are hollow "due

perhaps to some parasite". Since no other uninfected specimen exists, this feature seems to be a character to recognize this species for the time being.

The species is similar to *L. cofrini* in the size of the colony and the bushy type of branching, but differs in that *L. peruviana* has wider, flattened branches, with flat polyp-mounds that are smaller and more numerous all around the branches than in *L. cofrini*. Sclerites are very different in these two species (Table 1).

***Leptogorgia pumila* (Verrill, 1868)**

(Figs. 52–55)

Gorgonia (*Litigorgia*) *pumila* Verrill, 1868: 415.

Litigorgia pumila Verrill, 1868a: 396–397 (1st. ed.).

Leptogorgia pumila Verrill, 1868b: 396–397; 1869b: 421; Nutting 1910: 5;

Not *Leptogorgia pumila* Bielschowsky 1918: 29; 1929: 97–98; Kükenthal 1919: 771; 1924: 326–327 (= *Pacifigorgia sculpta* Breedy & Guzman, 2004).

Material examined. Lectotype: ZMUC ANT-186, dry, Zorritos, Peru, no depth given, F. H. Bradley, 1866, donor Verrill (YPM 1573).

Other material examined: CALIFORNIA: CASIZ 96905, dry, Santa Maria, Baja California south, no depth given, RV Zaca, 1932; CASIZ 97968, preserved, Cape San Lucas, Baja California, 1965, no further data. COSTA RICA: UCR 1535, preserved, Playa Platanares, Puerto Jiménez, 16 m, O. Breedy & J. Cortés, 12 March 2004; UCR 1557, preserved, Isla Chora, 15 m, O. Breedy, 1st April 1998; UCR 1558, preserved, Bajo Sámará, 16 m, O. Breedy, 29 March 1998; UCR 1587, preserved, Punta Aguja, Golfo de Nicoya, 13 m, O. Breedy, 22 November 2002; UCR 1588, preserved, Marino Ballena National Park, 24 m, O. Breedy & J. Cortés, 27 March 2003; UCR 1589 (2 specimens), preserved, Marino Ballena National Park, 19 m, O. Breedy, 25 April 2002. PANAMA: STRI 456, dry, Isla Roncadores, Golfo de Chiriqui, 10–20 m, H. Guzman & O. Breedy, 30 August 2002; STRI 467, dry, Bajo Foul, Peninsula de Azuero, 5–20 m, H. Guzman, 11 April 2003; STRI 538, dry, Bajo Bolaño, Golfo de Chiriqui, 25 m, H. Guzman, 16 April, 2003; STRI 567, dry, Islas Viudas, Golfo de Chiriqui, 10–20 m, H. Guzman, 18 April, 2003; STRI 748–749, Roca Trollope, Golfo de Panama, 10–20 m, H. Guzman, 6 August 2003; STRI-C15, STRI-C23, dry, Isla Coiba, Golfo de Chiriqui, 4–7 m, H. Guzman, 3 August 2002; UCR 1227–1234, 1271, 1272, dry, Isla Jicarita, Golfo de Chiriqui, 10–30, H. Guzman, 19 April 2002; UCR 1320, 1321, dry, Islote Punta Soledad, 10 m, H. Guzman, 20 April 2002; UCR 1424, dry, Punta Brincanco SW, Golfo de Chiriqui, 3–15 m, H. Guzman, 27 April 2002; ZSM 20044791, preserved, no depth given, A. Agassiz, Hassler Expedition, 1871–1872 (not *L. pumila* Verrill). PERU: MCZ 4004, dry, Paracas Bay, Paracas Peninsula, no depth given, A. Agassiz, Hassler Expedition, 1871–1872 (not *L. pumila* Verrill). UNKNOWN LOCALITY: MNHN, dry, (not *L. pumila* Verrill), only data on label; MNHN, dry, (no *L. pumila* Verrill), only data on label.

Lectotype description. The lectotype is a small fragment 6.5 cm in height, and 2.5 cm in width (Fig. 52B). Ramification is irregularly pinnate. Branches are from cylindrical (thicker branches) to slightly flattened and from 3.0 mm to 2.0 mm in diameter. Unbranched terminal twigs reach up to 28 mm in length, and are lobed at the tips. Polyps are sparsely distributed in almost two rows at each side along the branches. Polyp-mounds are raised, dome-shaped, up to 1.0 mm wide at the base, with slit-like apertures (Fig. 52B). Coenenchymal sclerites are pink and light yellow (Fig. 52C). The largest are spindles up to 0.15 mm in length and 0.05 mm in width, with 4–7 whorls of tubercles, some have a slightly bent axis (Figs. 52C, 53). Capstans reach up to 0.10 mm in length and 0.06 mm in width (Figs. 52C, 53, 54). Furthermore, tuberculate cross-like sclerites about 0.08 mm in length and 0.06 mm in width, and rectangular, oblong shapes up to 0.10 mm in length and 0.05 mm in width, are present, some of these are just spindles that are twinned (Fig. 54). Anthocodial sclerites are long flat rods, longer than any spindle, reaching up to 0.15 mm in length and 0.03 mm in

width, with smooth or serrated margins, and occasionally lobed (Figs. 52C, 54). These are very characteristic of this species.

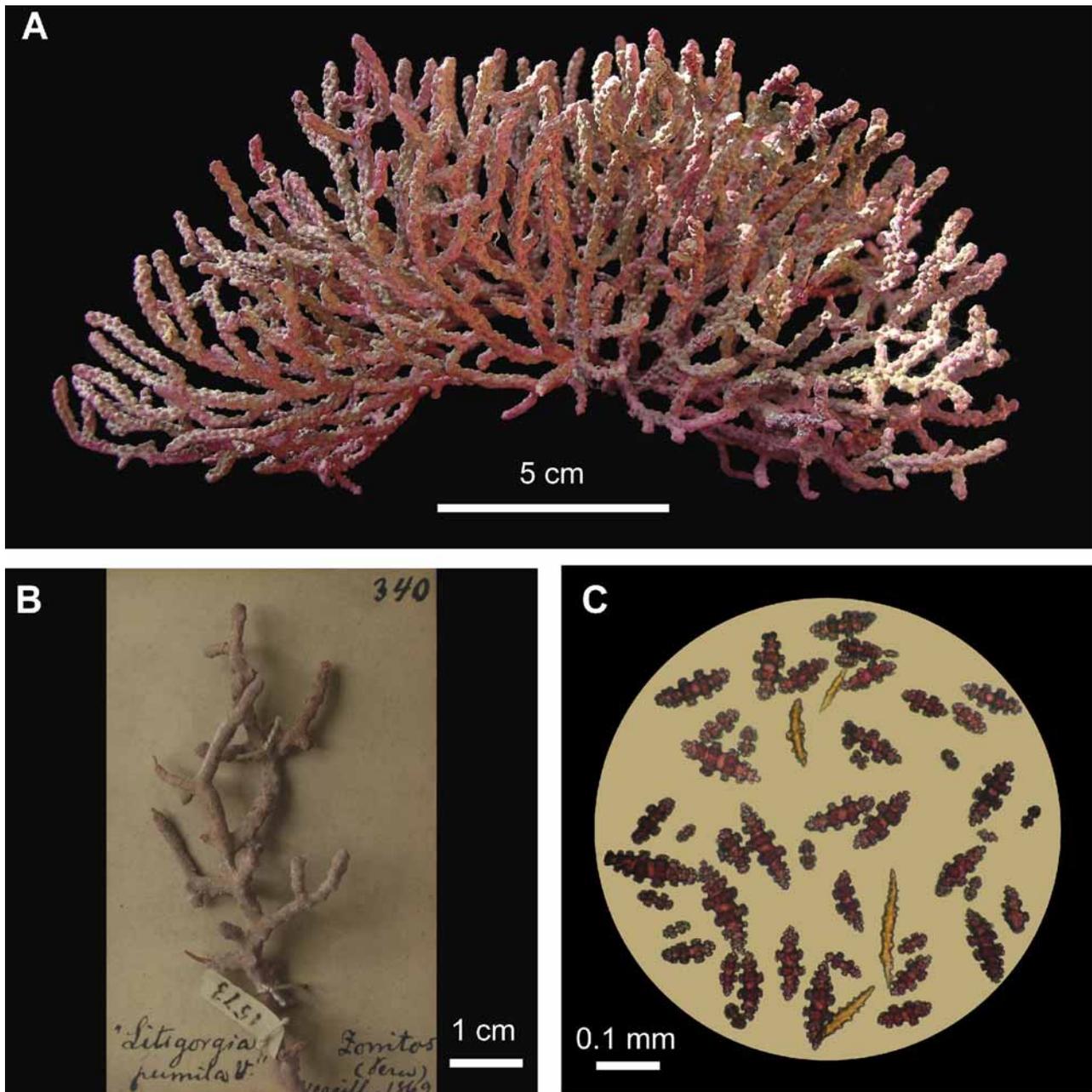


FIGURE 52. *Leptogorgia pumila*, **A**, UCR 1233; **B**, ZMUC ANT 186, lectotype; **C**, light micrograph of sclerites (ZMUC ANT 186).

Other material. The examined specimens reach up to 10 cm in height, and 15 cm in width. Colonies are bushy, densely branched in various planes arising from encrusting holdfasts. Short stems, up to 5.0 mm in diameter, and up to 10.0 mm in length, subdivide in several main branches, 2.0–3.0 m in diameter, in an irregular pinnate style (Fig. 52A). Branches and pinnae arise almost perpendicular to the main branches, and then curve upwards or downwards out of the plane of the colony. Branches are flattened in cross section. Unbranched terminal twigs reach up to 3 cm in length. Polyps are sparsely distributed in two rows along each side along the branches they are absent on the holdfast, and more disperse on thick branches. Polyp-mounds are raised, dome-shaped with slit-like apertures (Fig. 52A). Polyps are whitish, but they look orange due to the broad band of orange anthocodial rods arranged in crown and points below the tentacles, and even in dry col-

onies, orange spots can be observed on the top of the polyp-mounds. Colonies are light purple, fading to a dull pink when dry (Fig. 52A). Coenenchymal and anthocodial sclerites are as in the lectotype. The combination of large pink sclerites, small pale yellow capstans, and long, amber, anthocodial rods is very characteristic in the samples of this species.

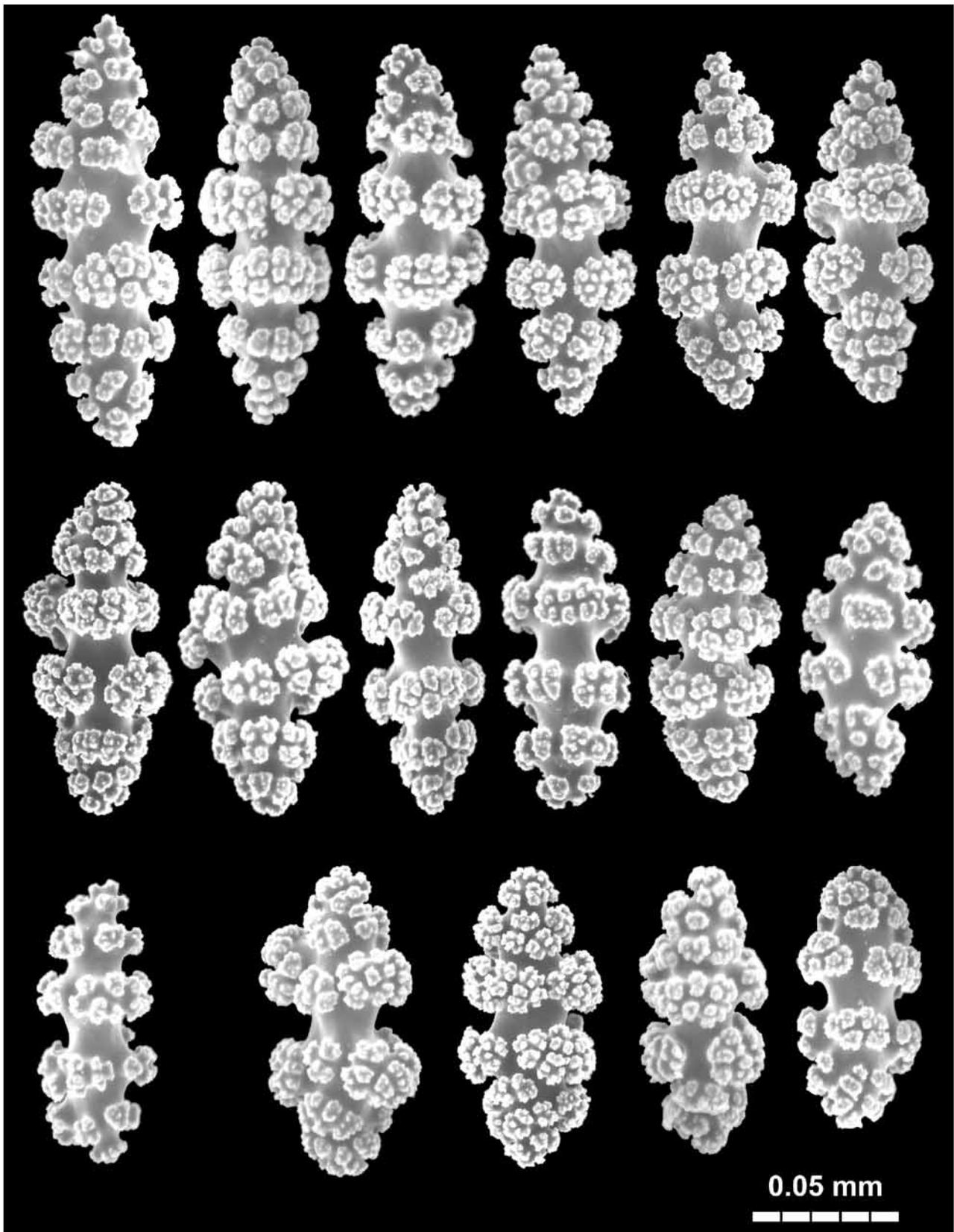


FIGURE 53. *Leptogorgia pumila* (ZMUC ANT 186), coenenchymal sclerites.

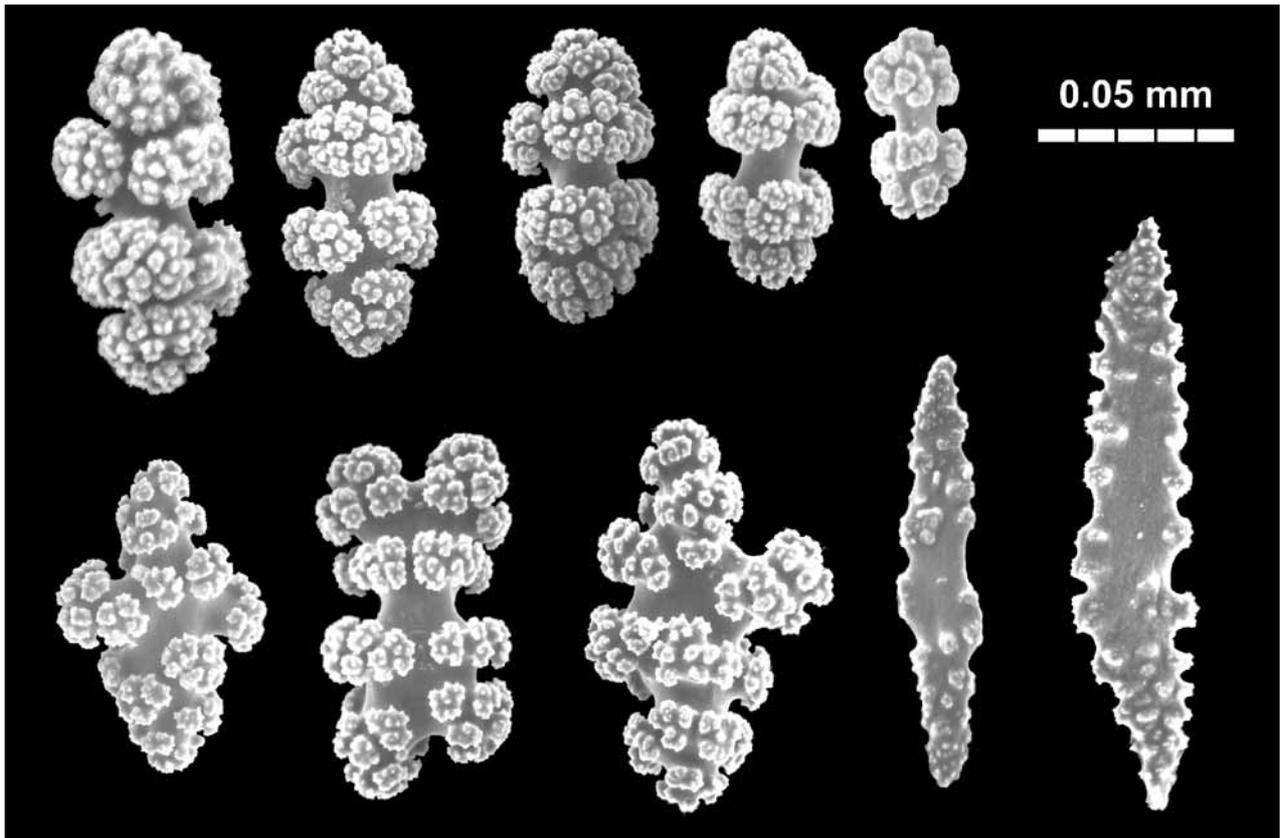


FIGURE 54. *Leptogorgia pumila* (ZMUC ANT 186), coenenchymal sclerites, and anthocodial rods.

Distribution. Zorritos, Peru: type locality. Panama, Costa Rica, and Baja California (Table 2, Fig. 55).

Remarks. Verrill (1868b) described this species with specimens from Zorritos, Peru, he mentioned that the largest specimen was 13 cm in height, and about the same in width. It can therefore be assumed that he had more than one specimen, however, no type material was found neither in the YPM, nor in the MCZ. Only a small fragment of a colony attached to a piece of cardboard (Verrill left a large collection of this type of “cardboard slides”) was found in the ZMUC labeled as a “cotype” (ZMUC 186) with an original YPM label (YPM 1573) in Verrill’s handwriting attached to the slide, distinguishing it as a type. However, in the YPM collection, another label without a corresponding specimen says “*Lophogorgia ramulus* (Valenciennes, 1846)” from the Archipelago Las Perlas, Panama.

In Verrill’s description of *L. pumila* he noticed that some branches anastomose which can not be observed in the type fragment. The main branches agree in width given by Verrill (1.5 mm), but the branchlets are thicker than the ones in the description (1–1.2 instead of 0.8 mm). Verrill’s recorded distribution and arrangement of polyps does however agree with the type fragment. The description of the colours of the colony and sclerites given by Verrill could be interpreted as colony pink and sclerites pink and some light yellow, and anthocodial rods light orange, which matches the type fragment. According to Verrill, this species is allied to *L. ramulus*, but he separated them based on the thickness of the branches (thicker in *L. ramulus*), arrangement of polyps (more separate), and the lack of anastomosis in *L. ramulus*. However, the sclerites of both species are very different, being enough reason to separate them.

Bielschowsky (1929) reported this species from Panama, and indicated that two specimens were deposited in the Zoology Museum of Munich. We examined the figured specimen, (that also appears in Kükenthal (1924)) but the colony does not match Verrill’s description, since the specimen is a fan with a loose mesh, not a colony with some anastomosis. Her specimen fits well in *Pacifigorgia sculpta* Breedy & Guzman, 2004, a sea fan very common in Panama from shallow to deep waters (Breedy & Guzman 2004).

We found four specimens in the MNHN, under *L. pumila*, but, one is *Pacifigorgia stenobrochis* (Valenciennes, 1846), and the other belongs to another species, perhaps a variety of *Leptogorgia rigida*.

Verrill's (1868b) description of this species is not accurate, lacks illustrations, and lacks holotype designation, for these reasons we, herein, designate ZMUC ANT-186 as the lectotype to fix the identity of the species and avoid confusion.

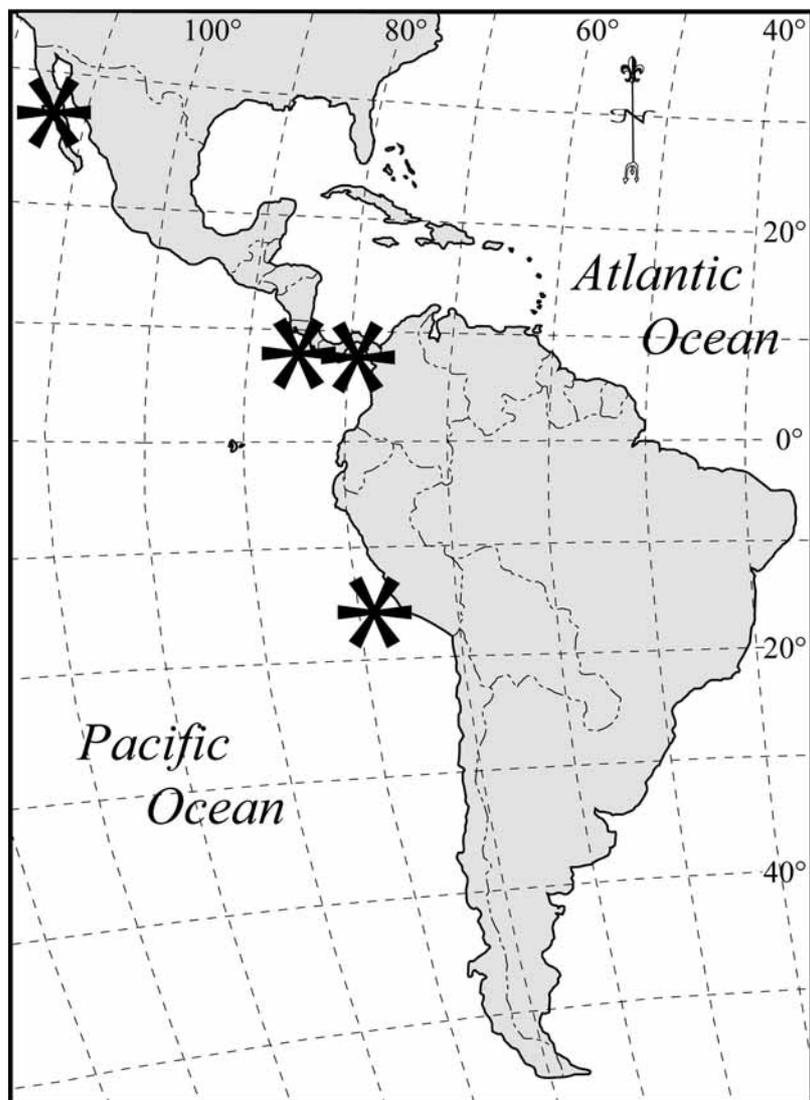


FIGURE 55. Geographical distribution of *Leptogorgia pumila*.

***Leptogorgia ramulus* (Milne Edwards & Haime, 1857)**

(Figs. 56–61)

Gorgonia ramulus Valenciennes, 1855: 12 [Nomen nudum.]; Milne Edwards & Haime, 1857: 160; Verrill 1864: 33; 1866: 326.

Gorgonia humilis Verrill, 1863: 6 [non Dana].

Gorgonia (*Litigorgia*) *ramulus* Verrill, 1868: 415.

Litigorgia ramulus Verrill, 1868a: 394–396 (1st ed).

Leptogorgia ramulus Verrill 1868b: 394–396; 1869b: 421; Studer 1883: 4; Nutting 1910: 5; Bielschowsky 1918: 29; 1929: 121; Kükenthal 1919: 914; 1924: 336.

Lophogorgia ramulus Prahl *et al.* 1986: 20.

Material examined. Holotype: MNHN no catalogue number, dry, Panama, P. Duchassaing, 1851, no further data.

Other material examined: PANAMA: MCZ 714, dry, no depth given, F. M. Bradley, 1866–1867; YPM 558a–d, YPM 557 f–j; dry, no depth given, F. M. Bradley, 1866–1867. PERU: MCZ 4967 (MCZ 716), dry, no depth given, Zorritos, F. M. Bradley, 1866–1867; YPM 1615a–c, dry, no depth given, Zorritos, Peru, F. M. Bradley, 1866–1867.

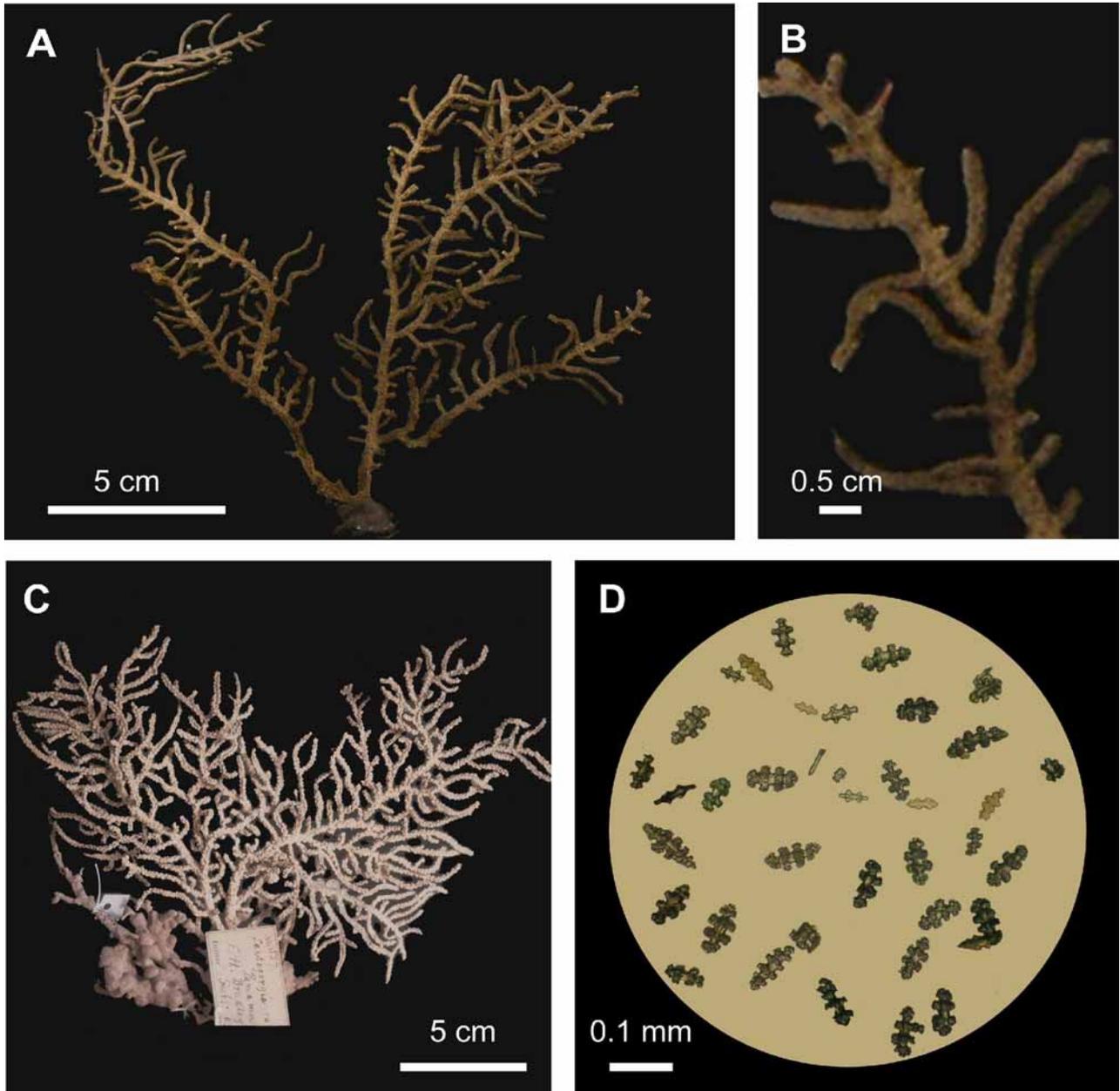


FIGURE 56. *Leptogorgia ramulus*, **A**, MNHN, holotype; **B**, detail of a branch (MNHN); **C**, YPM 557; **D**, light micrograph of sclerites (MNHN).

Holotype description. Colony is 14 cm in length, and 14 cm in width formed by two main branches that arise together from the very base (Fig. 56A, B). Since the base of the colony is cemented to a stand, no detail of the holdfast or the stem is visible. The branches vary from cylindrical to slightly flattened and of about 4 mm in diameter. Ramification is irregularly pinnate. Main branches diverge and subdivide giving off ascending branches, 2 mm in diameter that arise at angles of less than 45°, and further subdivide up to four times in the same pinnate manner (Fig. 56A, B). Free branchlets are up to 3 mm in length, about 2 mm in diameter, with

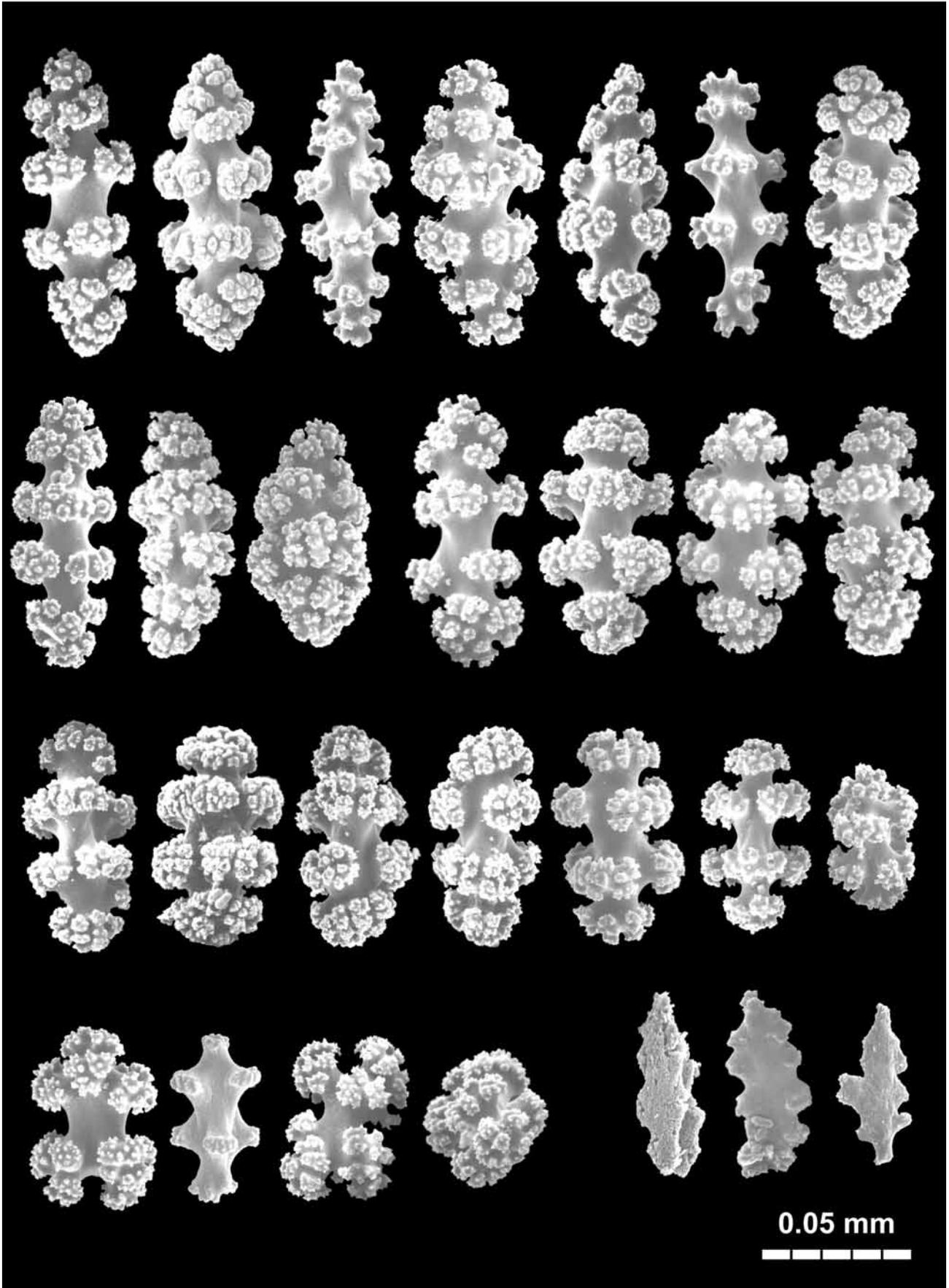


FIGURE 57. *Leptogorgia ramulus*, (MNHN, holotype), SEM of coenenchymal sclerites, and anthocodial rods.

acute ends. Colour is bluish grey, as the result of being shelved for more than a hundred years. Originally it was probably much whiter (Fig. 56A, B). The polyps are closely arranged in about four lateral rows along the branches separated by two by longitudinal grooves. Polyps are more scattered and irregularly distributed on the thicker branches. Polyp-mounds are prominent, dome-shaped, with oval apertures around 0.2 mm in diameter (Fig. 56B). Coenenchymal sclerites vary from a very pale yellow to colourless (Fig. 56D). They are mostly capstans and spindles with blunt ends. Spindles reach up to 0.11 mm in length and 0.05 mm in width, with 4–6 whorls of tubercles (Figs. 56D, 57). Capstans reach up to 0.08 mm in length and 0.05 mm in width (Figs. 56D, 57). Crosses measuring about 0.06 mm by 0.06 mm, with strongly tuberculate ends, are not very abundant (Fig. 57). Anthocodial sclerites are lobed rods of a characteristic light orange. They can reach up to 0.09 mm in length and 0.03 mm in width, but are mostly around 0.07 mm in length (Figs. 56D, 57).

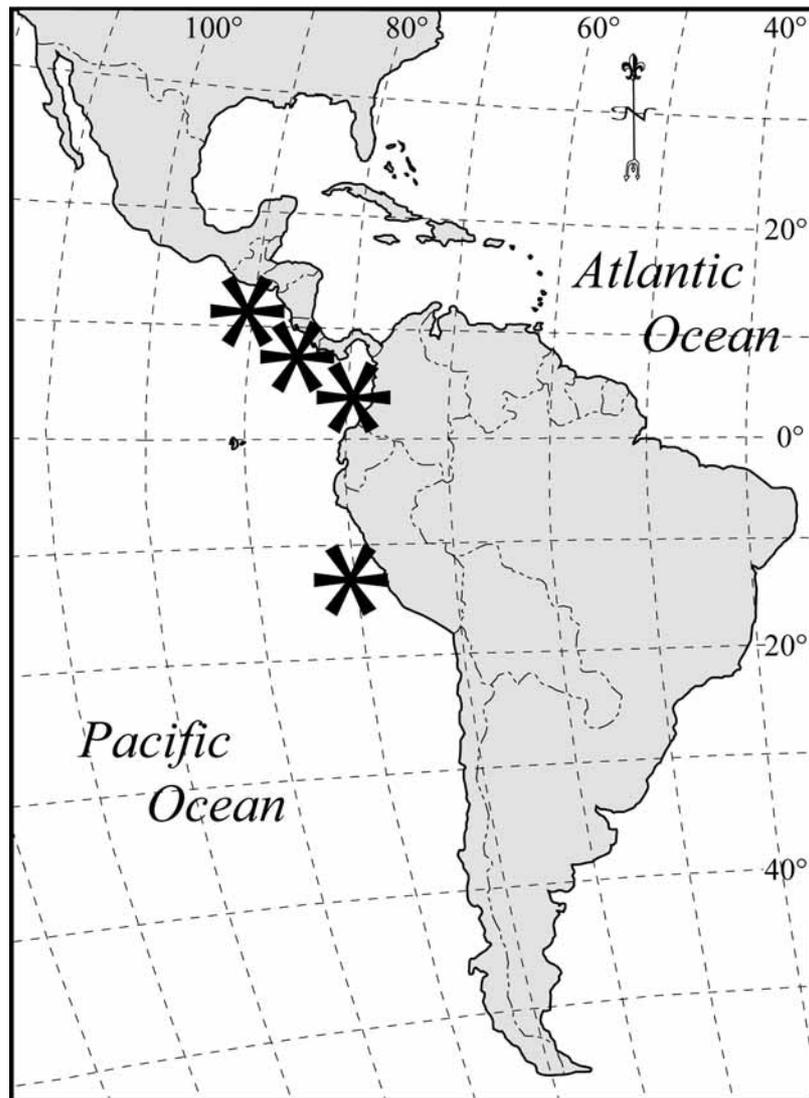


FIGURE 58. Geographical distribution of *Leptogorgia ramulus*.

Other material. The examined specimens range from 4 cm to 35 cm in length, and from 6 cm to 32 cm in width. Colonies are mostly bushy and densely branched in various planes (Figs. 56C, 59A, B) although some small colonies are flabelliform and grow in one plane. Main branches subdivide from short stems, up to 20 mm in length, or just sprout directly from a common spreading holdfast. Branching and polyp-arrangement are very consistent with the holotype. Colour is whitish grey, as in the typical form (Fig. 56C), but also shows variation from red rose to Bordeaux (Fig. 59A) and a mixture of these colours in the same colony has been

observed (Fig. 59B). The coloured colonies are not evenly tinted; some parts are of lighter hues of pink to white (Fig. 59A). This feature is very characteristic of the species. Coenenchymal sclerites are as in the holotype, and have the same sizes, but in the coloured variety, there is a dominance of wide capstans, and almost all the sclerites are rose-pink (Figs. 59C, 60). The anthocodial rods have the same light orange colour as the holotype in both varieties, but in the pink colonies, they are mostly around 0.08 mm in length, larger than the ones recorded for the white holotype (Fig. 60).

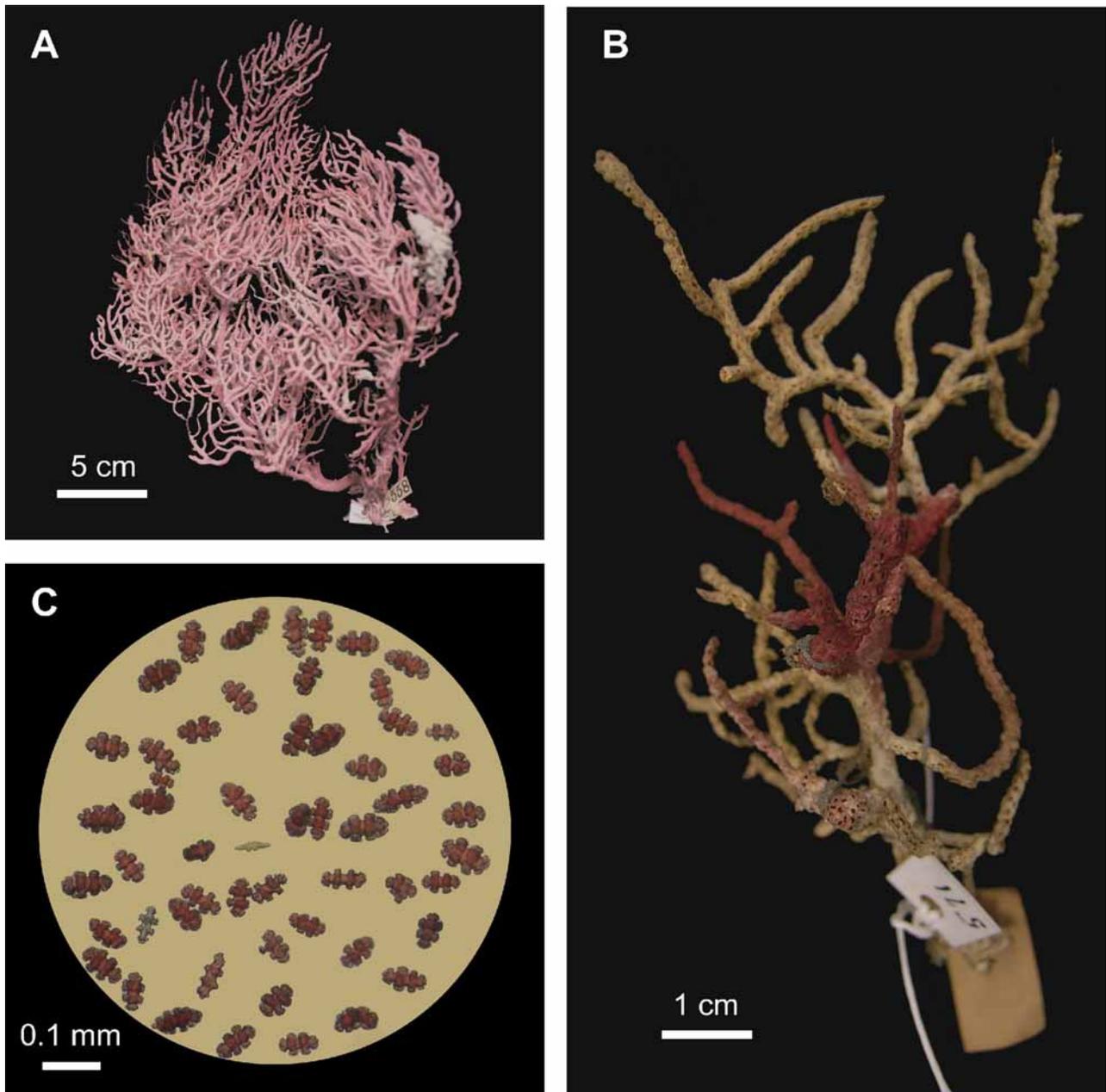


FIGURE 59. *Leptogorgia ramulus*, pink variety, **A**, YPM 558A; **B**, YPM 571; **C**, light micrograph of sclerites (YPM 558).

Distribution. Panama: type locality. Archipiélago Las Perlas, Panama; Corinto, Nicaragua; San Salvador, El Salvador (Verrill 1868b); Zorritos, Peru; Bahía Málaga, Colombia (Prah *et al.* 1986). We have not found any specimen of *L. ramulus*, neither white nor pink in our recent surveys in Panama (Table 2, Fig. 58, 61).

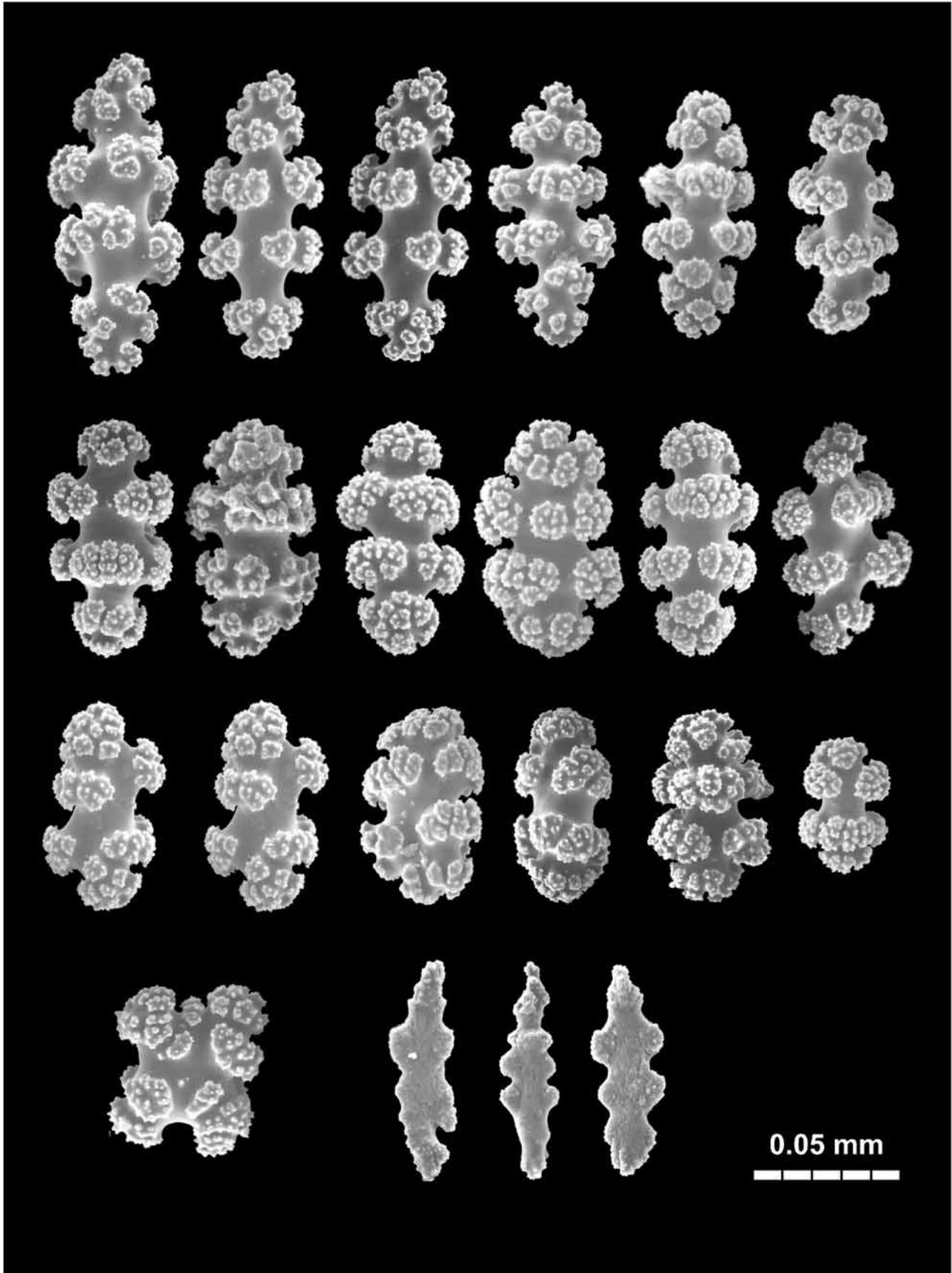


FIGURE 60. *Leptogorgia ramulus*, pink variety, (YPM 558A), SEM of coenenchymal sclerites, and anthocodial rods.

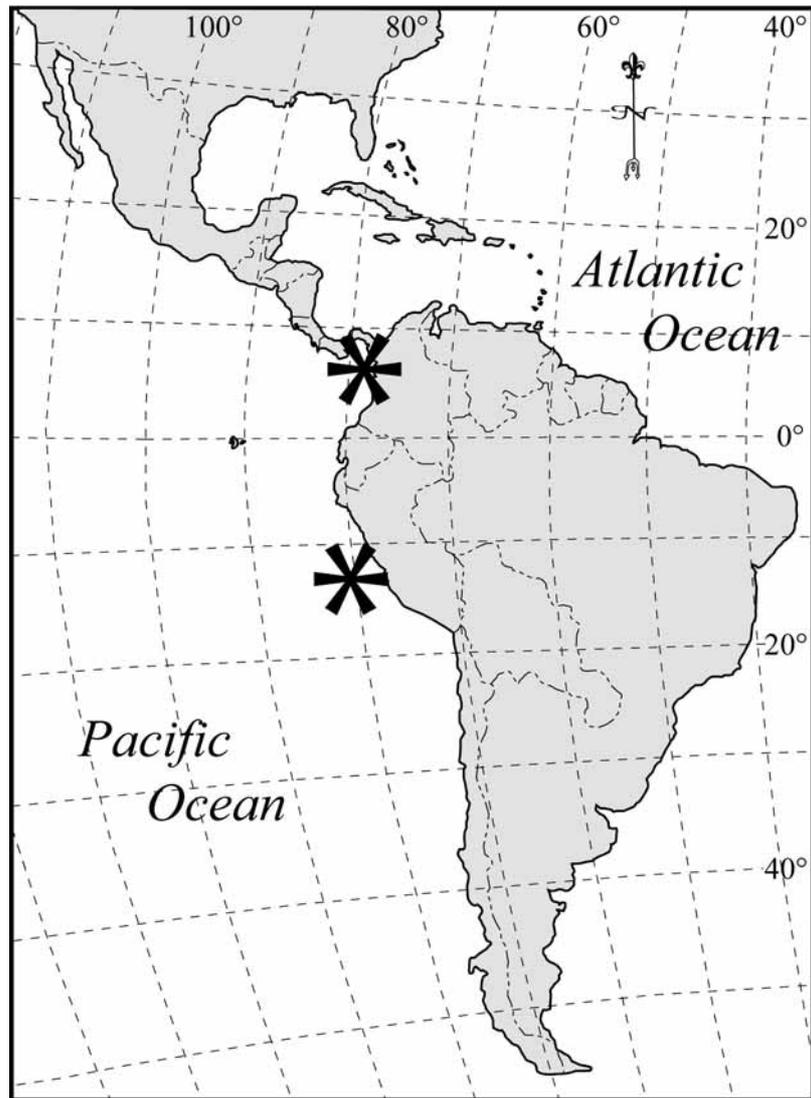


FIGURE 61. Geographical distribution of *Leptogorgia ramulus*, pink variety.

Remarks. This species was first mentioned in Valenciennes (1855), without any description or illustrations. Milne Edwards & Haime (1857) gave the first brief description without illustrations. The only specimen identified as *Gorgonia ramulus* in the MNHN is considered the holotype of Valenciennes (1855). Verrill (1868b) redescribed this species with specimens from Archipelago Las Perlas (Panama), Corinto (Nicaragua), San Salvador (El Salvador), Zorritos (Peru), and Acapulco (Mexico). He added details of a pink variety for this species, but mixed it up with specimens belonging to *L. pumila*, and *L. labiata*. In fact, Verrill (1870) established *L. labiata* for the Mexican specimens and regarded those colonies as a northern dwarf variety of *L. ramulus*. We found a large collection of pink and white specimens of *L. ramulus*, and recognized that Verrill's pink variety is different from both *L. labiata*, and *L. pumila*, but very similar to the white variety of *L. ramulus*. Indeed, both colours appear together in the same colony in some of the examined specimens (Fig. 59B). Therefore, we consider the pink colonies as a different colour morph of the white species or the contrary, and keep them as the same species.

The pink phenotype of *L. ramulus* differs from *L. labiata* in the size and arrangement of the polyp-mounds. In *L. ramulus* they are smaller and sparsely placed while in *L. labiata*, they are larger, and set very close together. These species are allied to *L. pumila*, they branch in a similar pinnate manner, but in *L. pumila* branches are thicker in cross section, and the polyp-mounds more prominent and closer. Clear differences

among these species are in the sclerites, especially in the anthocodial rods. In *L. pumila* they are large and of a characteristic orange colour, while in *L. ramulus* and *L. labiata* they are smaller and light amber in the former and light yellow in the latter (Table 1).

Verrill (1868b) suggested that perhaps *Lophogorgia panamensis* Duchassaing and Michelotti was the pink phenotype of this species, but after we examined the holotype (MZUF c.159) we discovered that it is a species of *Eugorgia*.

***Leptogorgia regis* Hickson, 1928**

(Figs. 62–65)

Leptogorgia regis Hickson, 1928: 409–410; Stiasny 1943: 81–82.

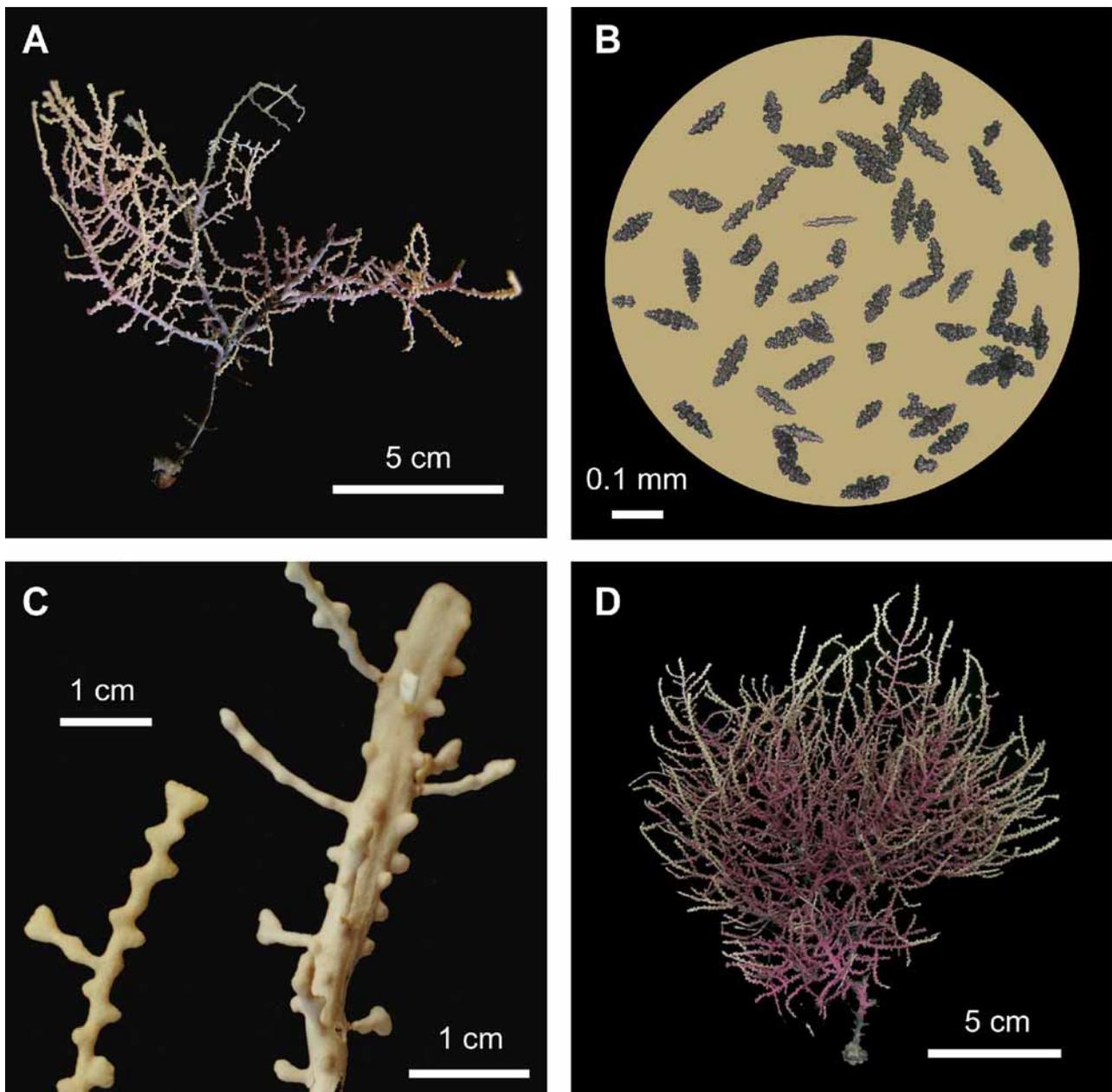


FIGURE 62. A, *Leptogorgia regis* (ZMUC 123); B, light micrograph of sclerites (ZMUC 123); C, detail of branches (BM 146.1.14.56); D, UCR 1563.

Material examined. Syntype series: BM 1946.1.14.57, preserved, Isla San Jose, Archipelago Las Perlas, 45 m, T. Mortensen, 1916–1917; BM 146.1.14.56, ZMUC ANT-123, preserved, S. W. Isla del Rey, Archipelago Las Perlas, Panama, 18.2 m, T. Mortensen, 26 January 1916.

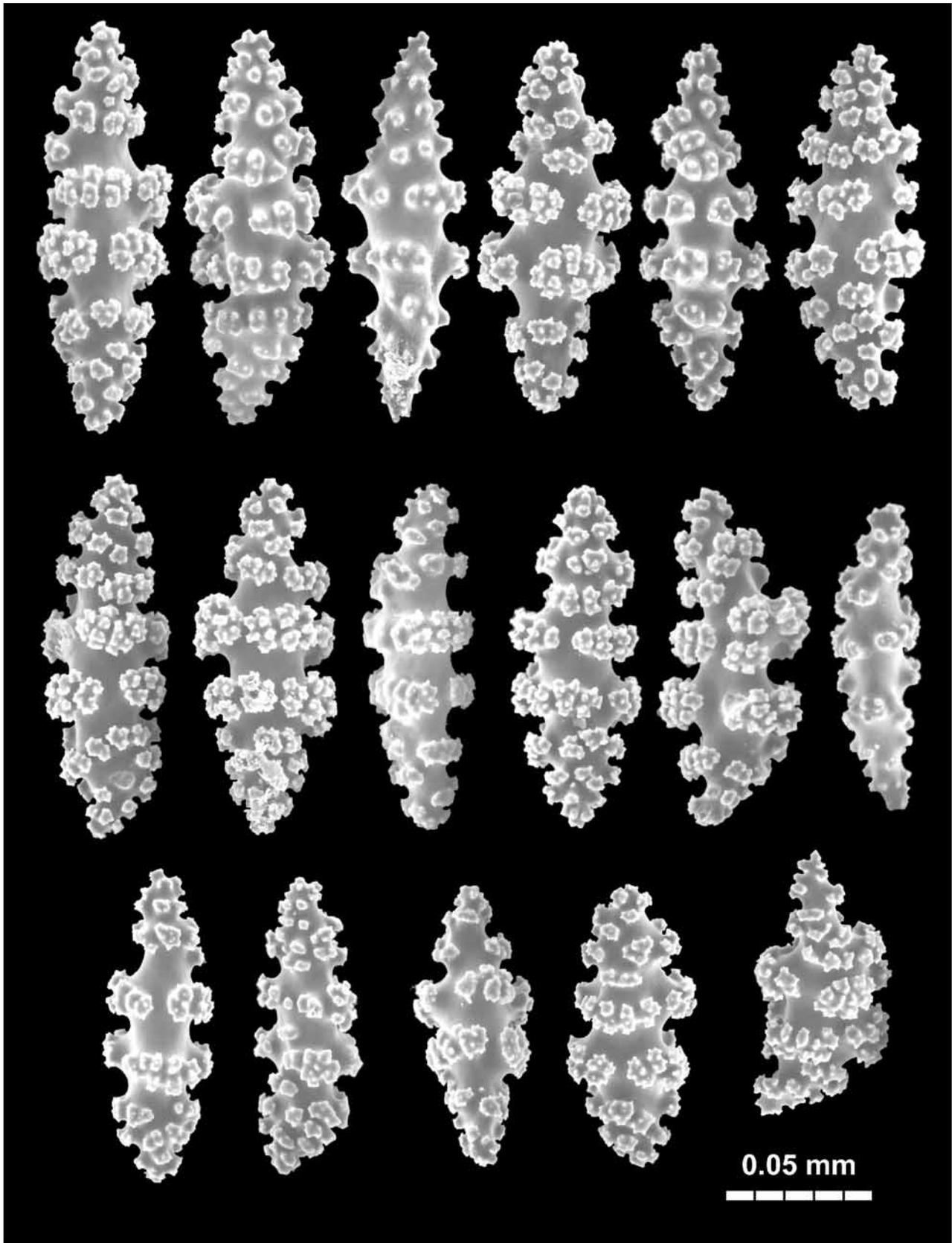


FIGURE 63. *Leptogorgia regis* (ZMUC 123), SEM of coenenchymal sclerites.

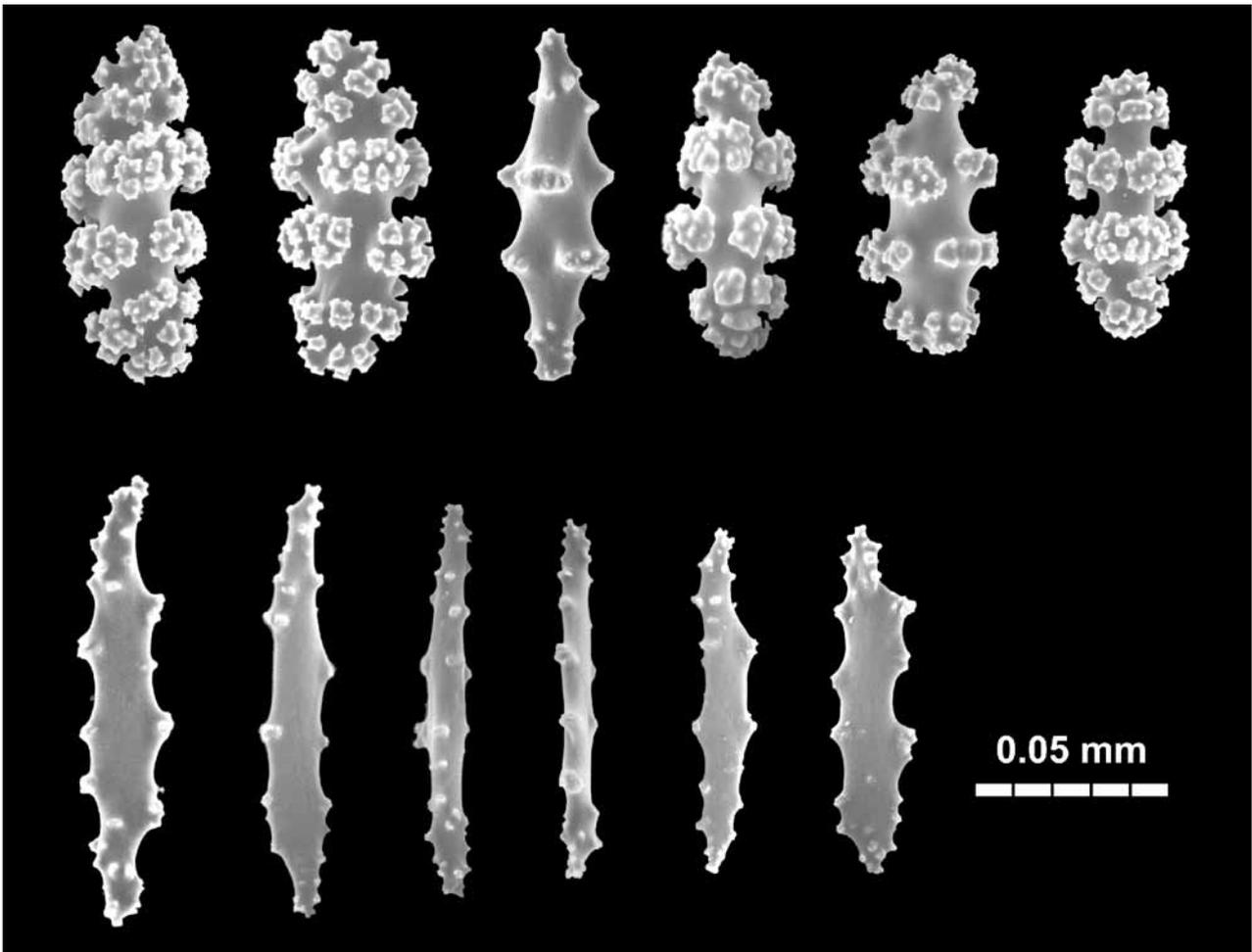


FIGURE 64. *Leptogorgia regis* (ZMUC 123), SEM of coenenchymal sclerites, and anthocodial rods.

Other material examined. COSTA RICA: UCR 635–637, preserved, Isla Cocinera, Archipelago Murcielago, on the beach, O. Piedra, 20 June 1965; UCR 1563, dry, S Carrillo, Bahia Santa Elena, R/V Urraca Expedition, trawl 5, 73–57 m, Y. Camacho, 11 July 2005; UCR 1564, 1590–1591, dry, Bahia Santa Elena, R/V Urraca Expedition, trawl 3, 51–54 m, Y. Camacho, 9 July 2005; UCR 1562, 1565–1566, 1592, dry, Bahia Santa Elena, R/V Urraca Expedition, trawl 4, 50–52 m, Y. Camacho, 9 July 2005; UCR 1593, dry, S Carrillo, Bahia Santa Elena, R/V Urraca Expedition, trawl 27, 65–66 m, Y. Camacho, 11 July 2005; UCR 1594, preserved, Golfo de Nicoya, R/V Urraca Expedition, trawl 46, 44–46 m, Y. Camacho, 12 July 2005.

Description of syntypes. The syntype series comprises 4 small fragments, and a complete colony. The complete colony is 11.5 cm in height and 15 cm in width (Fig. 62A). Arising from a small holdfast, the decorated stem is 3 mm in diameter, and reaches up to 15 mm before branching starts. Branching is profuse in all directions, the thick branches are slightly flattened, reaching up to 2.0 mm in diameter, and numerous short branchlets stick out from them and rebranch producing clusters of thinner branchlets up to 1.0 mm in diameter and more rounded in cross section. Branches and branchlets are truncated at the ends; terminal twigs are very variable and can be up to 25 mm in length (Figs. 62A, C). Polyps are sparsely distributed all around the branches (Fig. 62C). Polyp-mounds are raised and conical (projecting about 0.6 mm with polyps retracted). They are irregularly placed around the thick branches where they resemble thorns, while on the thin branches they are arranged alternately on opposite sides at intervals of 0.5 mm (Fig. 62A, C). Polyps are whitish with bilabiate apertures. Coenenchyme is thin, as stated by Hickson (1928) and could easily be damaged or lost. Colour of the colony may vary from pale to dark orange to pinkish white, darker at the base and fading up to

the tips, while some colonies are totally white (Fig. 62A, C). The sclerites vary from pale orange or yellow to whitish (Fig. 62B). Coenenchymal sclerites are mostly spindles; small capstans occur rarely. Spindles reach up to 0.14 mm in length, and 0.05 mm in width, with 3–8 whorls of tubercles (Figs. 62B, 63, 64). A few capstans occur, up to 0.06 mm in length and 0.03 mm in width (Figs. 62B, 64). Anthocodial sclerites are long, flat, light yellow rods, up to 0.12 mm in length and 0.03 mm in width with dentate margins (Figs. 62B, 64). Several specimens of *L. regis* collected by trawling along the Pacific of Costa Rica, reach up to 20 cm in height and 20 cm in width, and agree in all aspects with the type series. Some of these specimens are of darker hues of orange than the syntypes (Fig. 62D).

Distribution. Islas San José and del Rey, Archipiélago Las Perlas, Panama: type localities. Bahía Santa Elena, and Golfo de Nicoya, Costa Rica (Table 2, Fig. 65).

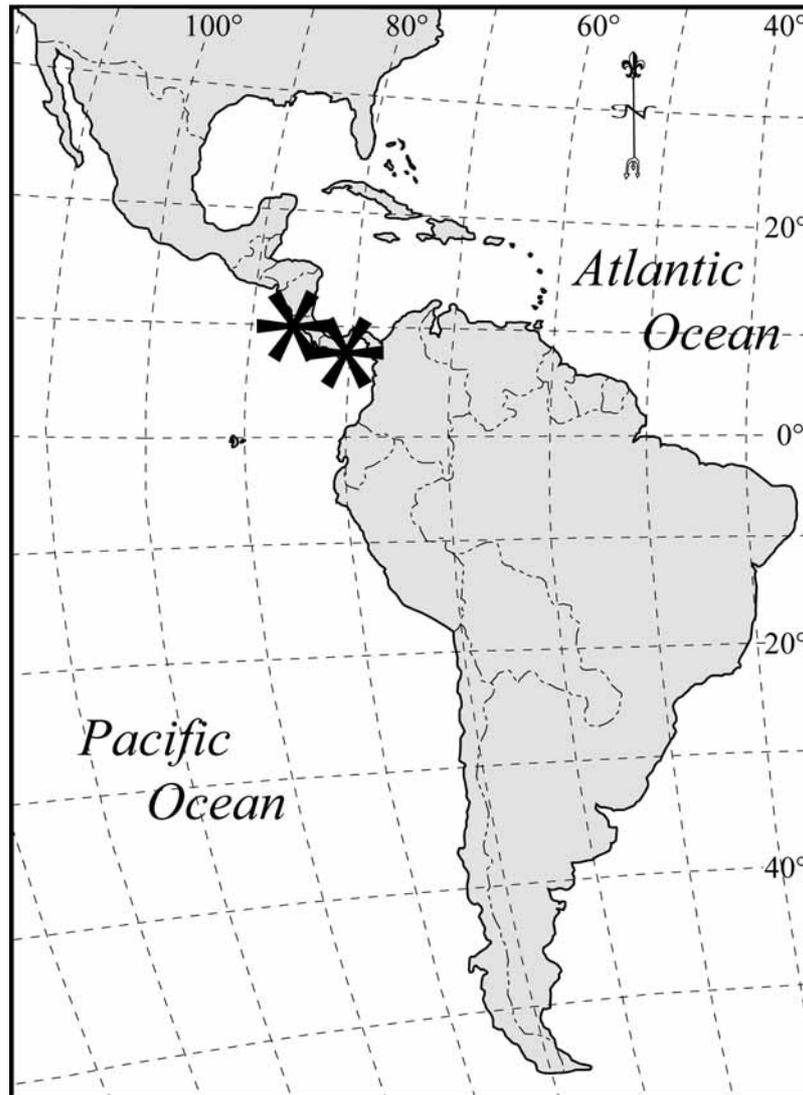


FIGURE 65. Geographical distribution of *Leptogorgia regis*, *Leptogorgia cofrini*, and *Leptogorgia taboguilla*.

Remarks. This species was characterized by Hickson (1928) and Stiasny (1943). The illustration of sclerites given by Stiasny is insufficient and his measurements inadequate for identification, while the illustration of a colony given by Hickson (1928) is appropriate for comparative purposes. Hickson did not designate a holotype, but his type series is consistent.

This species is very distinctive from the other *Leptogorgia* species because of the branching pattern that rather resembles some species of the genus *Eugorgia* (e.g. *Eugorgia rubens* Verrill, 1868b).

***Leptogorgia rigida* Verrill, 1864**

(Figs. 21, 66–68)

Leptogorgia rigida (pars) Verrill, 1864: 32.

Gorgonia (*Leptogorgia*) *rigida* (pars) Verrill, 1866: 327.

Gorgonia (*Eugorgia*) *rigida* Verrill, 1868: 415.

Litigorgia rigida Verrill, 1868a: 401 (1st. ed.).

Leptogorgia rigida Verrill 1868b: 401; 1869b: 421; Studer 1883: 4; Nutting 1910: 5; (not) Thomson 1916: 31–32; Bielschowsky 1918: 29; 1929: 102; Kükenthal 1919: 771; 1924: 326; Stiasny 1951: 62.

Euplexaura rigida Hickson, 1928: 347.

Euplexaura taboguilla var. *tabogae* Hickson, 1928: 346–349; Stiasny 1943: 62–63.

Material examined. Lectotype (here designated): MCZ 4059, dry, Cape San Lucas, Baja California Sur, Mexico, no depth given, J. Xantus, 1860. Paralectotypes: MCZ 4051 (MCZ 186), 4057 (MCZ 186) (2 specimens), 7004 (MCZ 186) (2 specimens), dry, Acapulco, A. Agassiz, no date; MCZ 349, 4058 (MCZ 349), 4054 (MCZ 350) (3 specimens), dry, Acapulco, Vanbrunt, 1863; YPM 957 a–d, dry, Cape San Lucas, no depth given, J. Xantus, 1860; YPM 1642a, 1642b, preserved, Archipelago Las Perlas, no depth given, F. H. Bradley, 1866; USNM 1674, 1675 (7 specimens), 2388, 33602 (72 specimens), 33605, dry, Cape San Lucas, no depth given, J. Xantus, 1860.

Other material examined. MEXICO: M 366, dry, Isabel Island, E. López, voucher collection, no further data. COSTA RICA: UCR 619–622, preserved, Isla Chora, 7 m, H. Guzman, 18 March 1984; UCR 774 (2 specimens), preserved, S Isla Colorada, 6 m, J. Cortés, 3 May 1994; UCR 786, preserved, Los Pedrones, Cape Blanco, 7 m, L. Mena, 18 April 1999; UCR 1511, preserved, San Pedrito, Archipelago Murcielago, 20 m, O. Breedy, 12 April 1996; UCR 1512–1513, preserved, Peñón Abrazo de la Muerte, 20 m, 12 April 1996; UCR 1548, preserved, E Islas Negritos, Golfo de Nicoya, 12 m, O. Breedy & J. Cortés, 21 November 2002; UCR 1667 (5 specimens), preserved, W Islas Negritos, 6 m, O. Breedy & J. Cortés, 21 November 2002; UCR 1536, preserved, off Islas Negritos, 6 m, C. Gamboa, 24 July 2000; UCR 1668 (2 specimens), preserved, Isla Chora, 20 m, O. Breedy, 30 May 1997. PANAMA: UCR 1121–1124, dry, Islote Frailes, 5–20 m, H. Guzman, 12 December 2001; UCR 1314–1315, 1322, dry, Islote, Golfo de Chiriqui, 10 m, H. Guzman, 20 April 2002; UCR 1425–1426, dry, Bajo Urraca, Golfo de Chiriqui, 10–30 m, H. Guzman, 27 April 2002; UCR 1539, preserved, Roca Prosper, 10 m, H. Guzman, 11 December 2001; STRI 396, dry, Islote Larry, Golfo de Chiriqui, 25 m, H. Guzman, 16 April 2003; STRI 603, dry, Islote Frailes, 20 m, H. Guzman, 1 May 2003; ZMUC ANT-114, preserved, off Taboguilla Island, Panama, no depth given, T. Mortensen, 11 November 1915.

Lectotype description. Dark bluish-purple colony 22.5 cm in height and 13.5 cm in width (Fig. 66A, B). Three main branches arise in various planes from a thick stem, 60 mm in diameter and 40 mm in length; a small fragment of the holdfast is preserved. Branches are slightly flattened at the base, 8–9 mm in diameter, with distinct longitudinal grooves. Branching is pinnate, producing pinnae 2.0–3.0 mm in diameter that are irregularly arranged, separated by short distances (around 10–20 mm), and branch at acute angles (around 35–45°). The pinnae rebranch giving off secondary pinnae, up to 1–1.5 mm in diameter with somewhat enlarged and blunt ends. Unbranched terminal twigs reach up to 30 mm in length (Fig. 66A, B). The polyps are retracted within slightly raised dome-shaped polyp-mounds with small oval apertures (around 0.2 mm). Polyp-mounds are distributed all around the branches, and do not crowd the branches. They are closer together on the large branches, and arranged in 3–4 longitudinal rows with naked median spaces alongside of the median grooves (Fig. 66B). Sclerites of the coenenchyme are all deep purplish red (Fig. 66C). They are mostly stout ovals, or capstans with short waists, up to 0.08 mm in length and 0.06 mm in width (Figs. 66C, 68). Spindles are long and tuberculate, up to 0.12 mm in length, and 0.05 mm in width, with 3–4 whorls of tubercles (Figs. 66C, 68). Few spindles with a slightly curved end are also present. Some cross-shaped small sclerites occasionally occur, about 0.04 by 0.04 mm, with compound tubercles and blunt ends (Figs. 66C, 68).

Anthocodial sclerites are pink, somewhat flattened rods, up to 0.08 mm in length, and 0.02 mm in width, with lobed-like marginal projections (Figs 66D, 68). We choose MCZ 4059 as the lectotype.

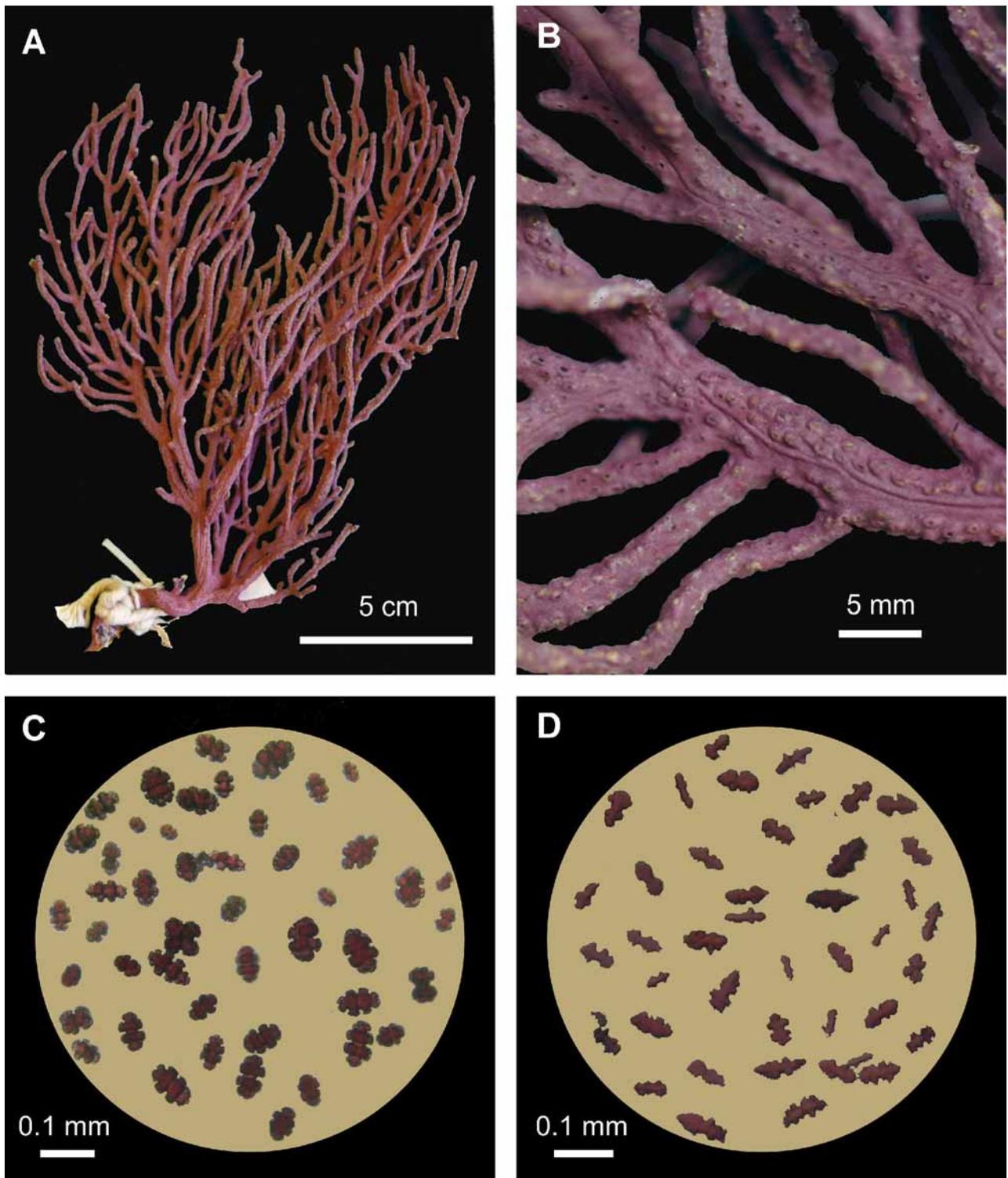


FIGURE 66. *Leptogorgia rigida*, MCZ4056, lectotype; **A**, colony; **B**, detail of branches; **C**, light micrograph of coenenchymal sclerites; **D**, light micrograph of anthocodial rods.

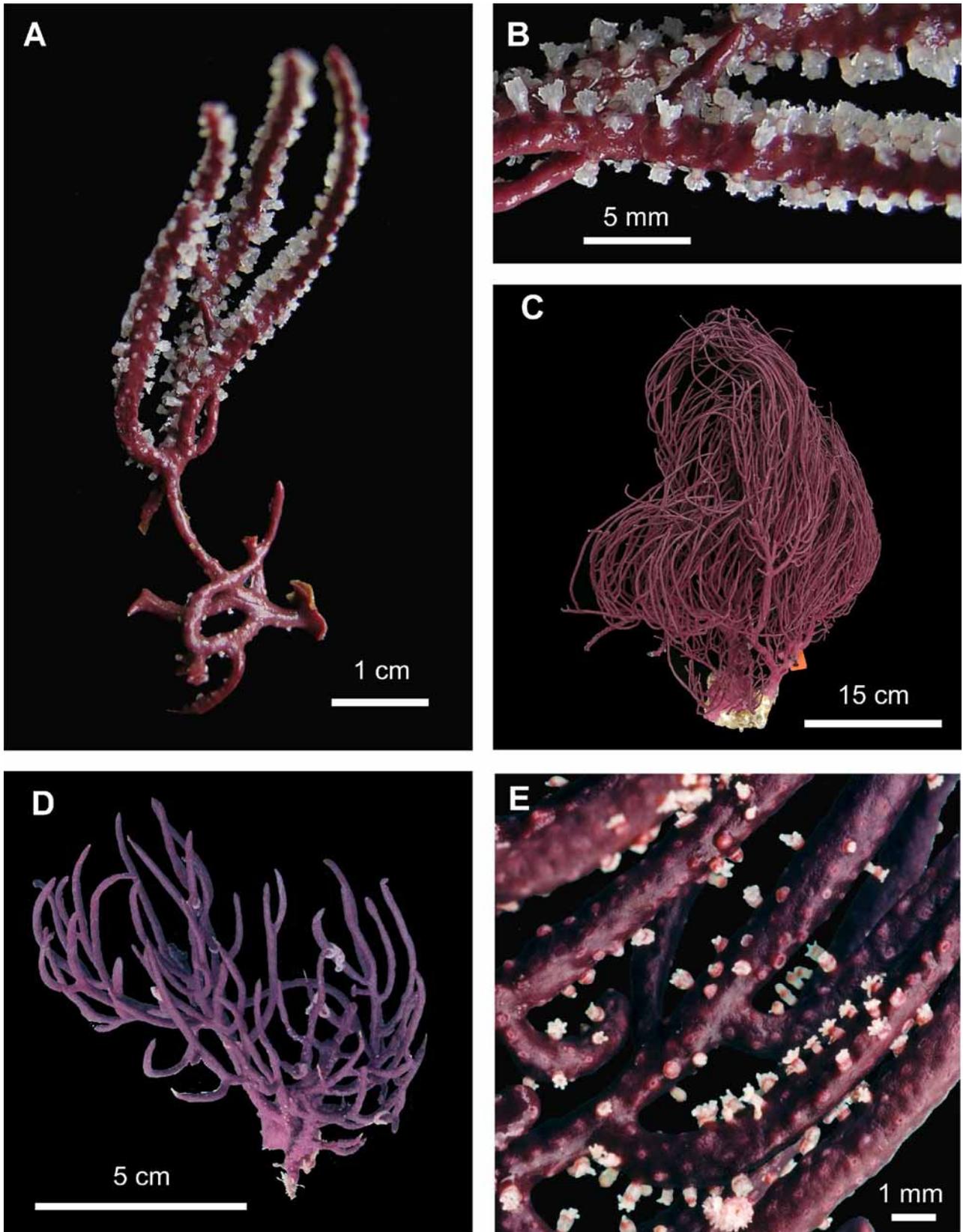


FIGURE 67. *Leptogorgia rigida*, **A**, ZMUC ANT 114 (previously *Euplexaura taboguilla* var. *tabogae*); **B**, detail of a branch, and polyps (ZMUC ANT 114); **C**, UCR 1425; **D**, UCR 1512; **E**, detail of a branch, and polyps (UCR 1512).

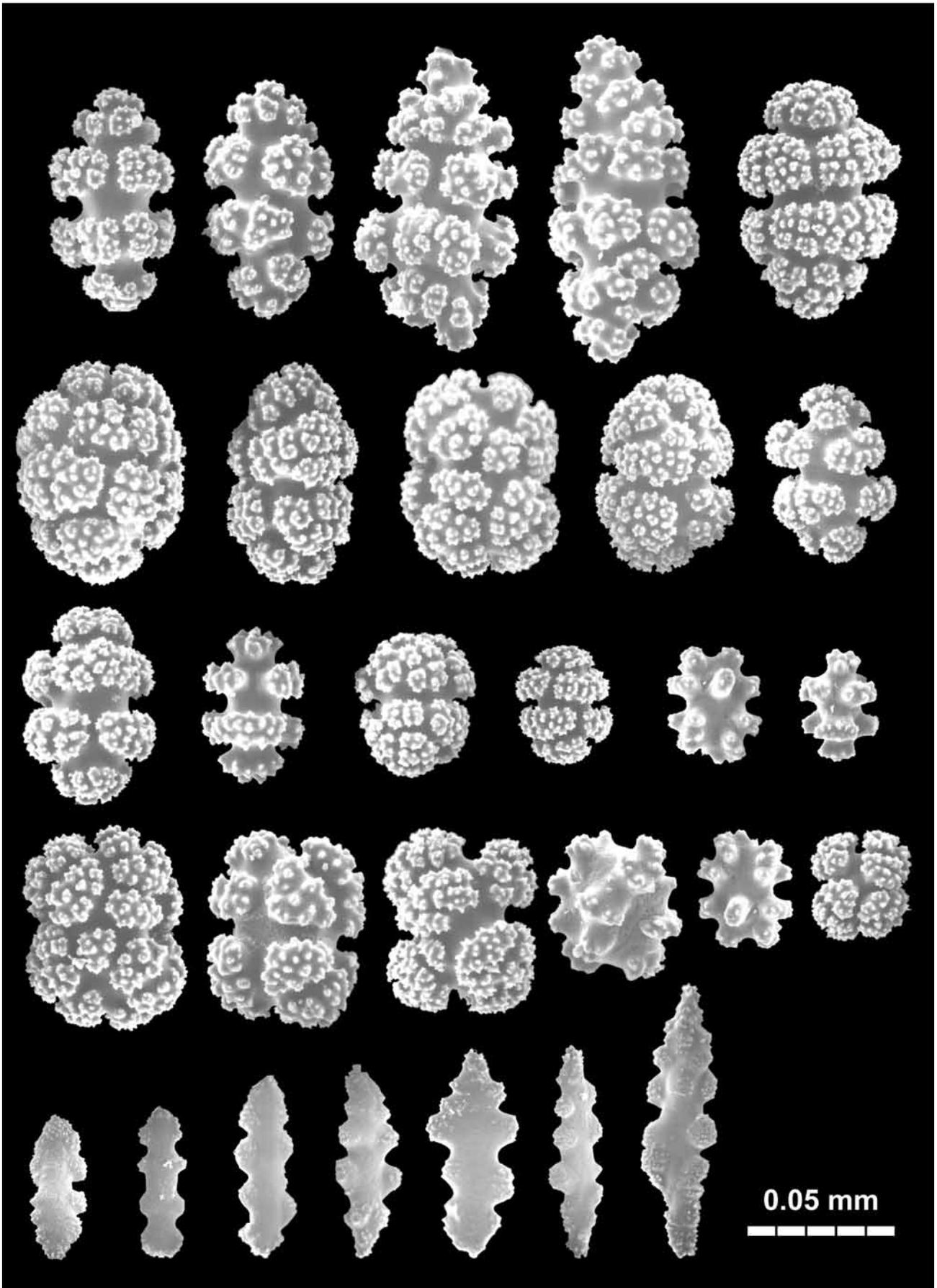


FIGURE 68. *Leptogorgia rigida*, MCZ4056, lectotype, SEM of coenenchymal sclerites, and anthocodial rods.

Other material. Colonies examined range in length from about 5 cm to 55 cm, and 5 cm to 40 cm in width (Fig. 67A, C, D). They grow upright with mostly pinnate branching that is sparse and flabelliform in small colonies, and copious, multiplanar in large specimens (Fig. 67C). Branches arise from single or multiple main stems that, in the case of large colonies, are slightly flattened with marked longitudinal grooves. Stems can reach up to 25 mm in diameter at the base of the holdfast. They subdivide in an irregular pinnate manner producing secondary branches. These rebranch pinnately in one plane. Branches are mostly cylindrical and tapered. Their tips can be somewhat enlarged and blunt, or pointed; both forms can be found in the same colony. In large colonies, the unbranched terminal twigs measure about 20–25 cm in length, giving an untidy appearance (Fig. 67C). Colour is deep purplish red throughout, fading to a violet hue in some dry specimens (Fig. 67A, C, D). Polyps are generally whitish, with anthocodial rods arranged in points (Fig. 67B, E), but they can be pink, white, or pale yellow. Retracted polyps form slightly raised dome-shaped mounds, or are completely flush with the coenenchyme, leaving small oval slits on the surface of the branches. Coenenchymal sclerites are mainly compact capstans, as in the lectotype. In some of the examined specimens, the occurrence of spindles is high (e.g. UCR 1426, 1122, 1123). All the sclerites have a lighter colour, and a few small colourless capstans. Anthocodial sclerites are as in the lectotype, but vary in colour from pink to yellow, and can reach up to 0.09 mm in length.

Distribution. Cape San Lucas, La Paz, Baja California, and Acapulco, Mexico; San Salvador: type localities. Panama, and Costa Rica. Thompson (1916) lists a specimen of *L. rigida* from “off East London”, but it probably is *Leptogorgia gilchristi* (Pallas, 1766) (G. Williams, pers. com. 2006) (Table 2, Fig. 21).

Remarks. As it was mentioned above, this species was described by Verrill (1864) from a mixture of specimens, with no holotype designation nor any illustration. Later, Verrill (1868b) redescribed the species with some detail, however, we consider the need to designate a lectotype to fix the identity of *L. rigida*.

Hickson (1928) proposed *Euplexaura taboguilla* var. *tabogae* as a variety of *L. taboguilla* based on a single specimen from Taboga Island, but after examining this specimen we concluded that it is actually *L. rigida*, thus we herein synonymize the two species.

Specimens from Costa Rica are small, do not reach more than 12 cm in length, and branching is untidy (Fig. 67D). Specimens from Mexico, in general, have thicker branches, and show the typical pinnate pattern of the others from Central America.

The deep bluish purple colour of the colony and the sclerites of this species, and the conspicuous ovals and stout capstans, distinguish this species from the others, including *L. taboguilla*, which has the same colour, but a very different pattern of branching. Comparison of this species to *L. californica*, *L. cuspidata*, and *L. exigua* is discussed above (Table 1).

***Leptogorgia taboguilla* (Hickson, 1928) comb. nov.**

(Figs. 65, 69–70)

Euplexaura taboguilla Hickson, 1928: 343–346; Stiasny 1941: 266–268; 1943: 62.

Material examined. Syntype series: BM 1961.3.9.282 (fragments), ZMUC ANT 113 (2 specimens), preserved, Taboguilla Island, Panama, 5.4 m, T. Mortensen, 27 November 1915.

Other material examined. COSTA RICA: UCR 1663, preserved, 10 m, Salinas Bay, J. Cortés, November 2005. PANAMA: STRI 402, dry, Islote Larry, 3–10 m, H. Guzman, 25 August 2002; STRI 455, dry, Isla Roncadores, 10–20 m, H. Guzman, 30 August 2002; STRI 538–540, dry, Bajo Bolano, Golfo de Chiriqui, 25 m, H. Guzman, 16 April 2003; STRI 646, dry, Bajo Brincanco, 8–10 m, H. Guzman, 5 May 2003; STRI 670, dry, Isla Pacora, Golfo de Chiriqui, 6 m, H. Guzman, 7 May 2003; UCR 1088, dry, Isla Santa Cruz, Golfo de Chiriqui, 5–10 m, H. Guzman, 10 December 2001; UCR 1236, 1238–1244 dry, Isla Jicarita, 10–30 m, H. Guzman,

man, 19 April 2002; UCR 1352, dry, Piedra Hacha, 10–25 m, H. Guzman, 22 April 2002; UCR 1427, dry, Bajo Urraca, 10–30 m, H. Guzman, 27 April 2002; UCR 1436, dry, Islote Almohada, 5–15 m, H. Guzman, 29 April 2002.

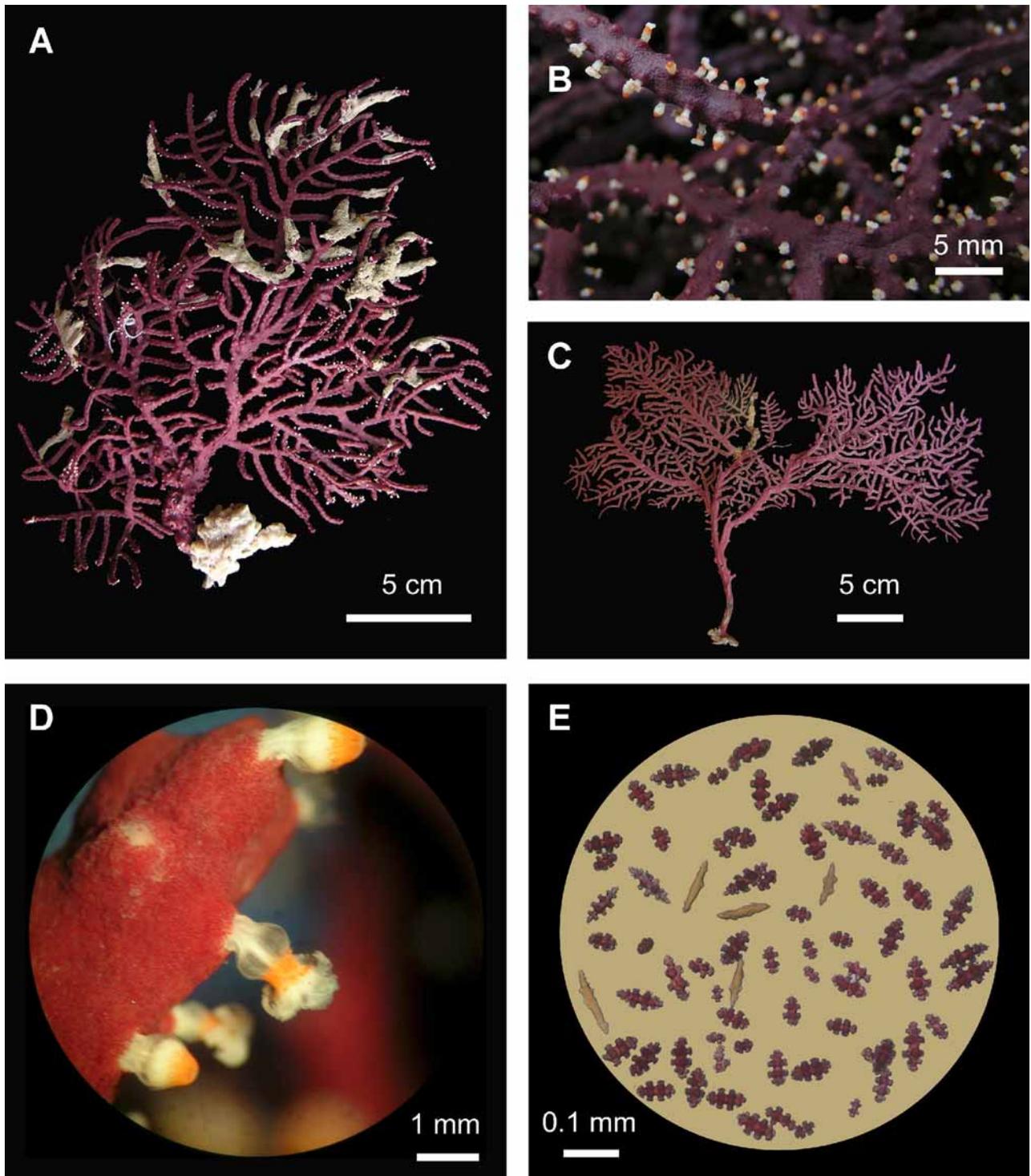


FIGURE 69. *Leptogorgia taboguilla*, **A**, ZMUC ANT 113; **B**, detail of branches (ZMUC ANT 113); **C**, UCR 1352; **D**, detail of polyps (ZMUC ANT 113); **E**, light micrograph of coenenchymal sclerites and anthocodial rods (ZMUC ANT 113).

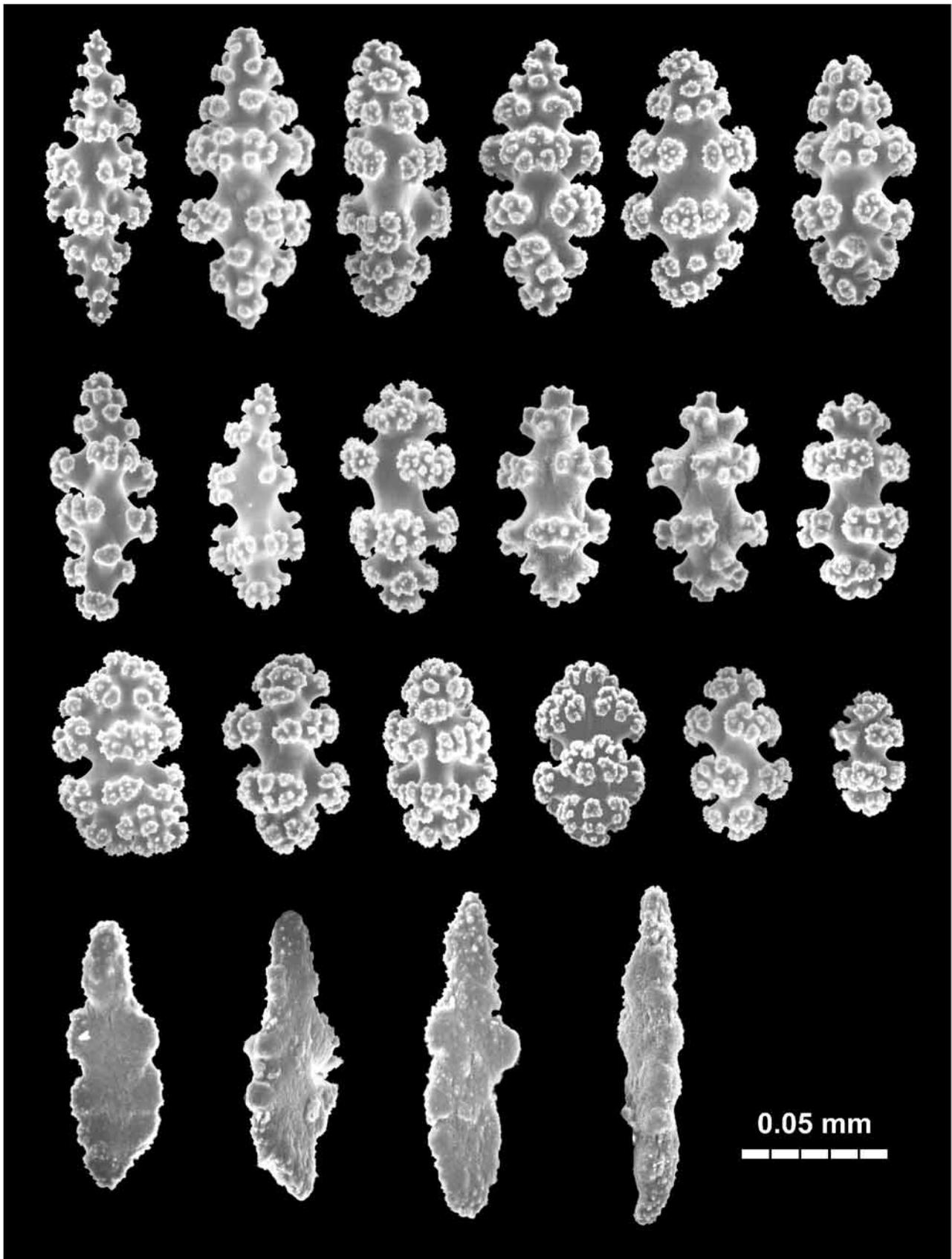


FIGURE 70. *Leptogorgia taboguilla* (ZMUC ANT 113), SEM of coenenchymal sclerites, and anthocodial rods.

Description of syntypes. The syntypes series consists of two colonies and a fragment. One colony is 14 cm in height, 12 cm in width, copiously branched and without a holdfast. The other is 20 cm in height, 18 cm in width (Fig. 69A), and the branching is more planar. The base of this colony is incrustated with calcareous algae and cirripedes, and some of the branches are covered with an encrusting sponge. The fragment is 10 mm in height and 5 mm in width, and it was probably part of one of the other colonies. The examined specimens reach up to 30 cm in height, 25 cm in width. Colonies are bushy, densely branched in various planes arising from spreading holdfasts (Fig. 69C). Stems are slightly flattened, 10–12 mm in diameter and up to 5 cm in length. They subdivide into several main branches, 3–4 mm in diameter, in an irregular pinnate style. Branches are flattened in cross section, and in many colonies, they show a conspicuous sinuous or divergent growth style enhanced by the course of longitudinal grooves. Main branches can reach up to 10 mm in diameter and some colonies resemble bonsai trees. Unbranched terminal twigs reach up to 25 mm in length and 2–3 mm in diameter; some tips are pointed, but most of them are clubbed. Polyps are distributed all around the branches and sparsely placed. Polyp-mounds are prominent, dome-shaped, with slit-like apertures (Fig. 69B). Polyps are whitish with a wide band of orange anthocodial rods arranged in points below the tentacles (Fig. 69B, D). Colonies are reddish purple. Coenenchymal sclerites are purplish red (Fig. 69E) and the largest ones are spindles up to 0.11 mm in length and 0.05 mm in width, with 4–8 whorls of tubercles (Figs. 69E, 70). Some have a slightly bent axis. Capstans reach up to 0.08 mm in length and 0.04 mm in width (Figs. 69E, 70). Hickson (1928) reported, “curious dumb-bell shaped spicules” (his illustration p. 344, text-figure 4 shows a dumb-bell sclerite characteristic of the genus *Ellisella*) which are not present in the samples. Anthocodial sclerites are very representative, they are long flat rods, longer than any spindle reaching up to 0.14 mm in length, and 0.03 mm in width, with smooth or serrated margins; some are lobed (Figs. 69E, 70).

Distribution. Taboguilla Island, Panama: type locality. Golfo de Chiriqui and Peninsula de Azuero, Panama; Salinas Bay, Costa Rica (Table 2, Fig. 65).

Remarks. Hickson (1928) described this species, and wrongly placed it under the genus *Euplexaura*. He did not designate a holotype, but the type series is consistent in all aspects with his description.

Leptogorgia taboguilla resembles, in external morphology, some Caribbean species of *Pseudopterogorgia* Kükenthal, 1919, but the scaphoid sclerites characteristic of this genus are not present in this species. This species is very distinct from the other species that present pinnate branching, prominent polyp-mounds and thick branches (*L. labiata*, *L. parva*, *L. pumila*, *L. ramulus*), and is easily recognised by the dark purple colour, flat branches, and the conspicuous ring of orange sclerites at the base of the polyp-tentacles. The large and conspicuous anthocodial rods of this species are similar to the ones of *L. diffusa* and *L. pumila*, but the branching pattern and the arrangement of the polyps are different (Table 1).

Final remarks

The taxonomy of *Leptogorgia* is based on morphological criteria; the form and color of the colony and the sclerites (Table 1). In the eastern Pacific species of the genus *Leptogorgia*, we found a high phenotypic variation which has also been acknowledged in several southern African (Williams 1992, Williams & Lindo 1997), West African (Grasshoff 1988, 1992), and tropical western Atlantic (Bayer 1961) species. Perhaps *Leptogorgia* is the most plastic genus of Gorgoniidae. Information of the physical environment upon which the taxonomists could improve taxonomical decisions is still scarce (Bayer 1961, Rees 1972, Velimirov 1976, West 1993). The growth forms and polyp arrangements in the colonies show a large range of variation. In some cases, these characteristics are very distinct among species and allow field identification, e.g. *L. diffusa*, *L. taboguilla*, *L. laxa*, and *L. regis*. The colour of the colonies is determined by the colour of the sclerites and the specific arrangement of them in the coenenchyme. In the living animals, the colour of a colony changes if the polyps are expanded or withdrawn, e.g. *L. alba* looks pink when the polyps are expanded and white when the

polyps are contracted. Colonies of almost all examined species are of one colour, but in some cases, this is evenly intermingled with another, e.g. *L. californica*, pink and yellow. *Leptogorgia cuspidata*, is the only examined species that has rings surrounding the polyp-mounds that are a different colour from the rest of the coenenchyme; yellow spots on purple coenenchyme, or the contrary, purple spots on yellow coenenchyme. This alternating pattern has been observed in West African species, e.g. the Mauritanian species *Leptogorgia albipunctata* Stiasny, 1936, where white spots occur on violet coenenchyme, and the contrary (Grasshoff 1992). Although differences in all the former features are necessary to determine a species, the coenenchymal sclerites, and especially the anthocodials are definitely the structures that mostly show changes and define a species.

According to Williams & Lindo (1997), of the approximately 54 species of *Leptogorgia*, 36 are distributed in the Atlantic Ocean, five are endemic to southern Africa, one is known from the subantarctic, and 12 species are found in the Panamic Province of the eastern Pacific. We herein recognise 21 valid species and one dubious for the eastern Pacific: 16 for Panama, 11 for Costa Rica, 7 for Mexico, 6 for El Salvador, 4 for Peru, 4 for Ecuador, including the only report for Galápagos Islands, 3 for Colombia, 3 for California, 2 for Nicaragua, and 2 for Chile. The present distribution is shown in Table 2. Our sampling effort has been concentrated in Costa Rica and Panama; perhaps this has biased the results leading to the higher number of species being recorded from these two regions.

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