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**A REVIEW OF THE OCTOCORALLIAN GENUS *LEPTOGORGIA*
(ANTHOZOA: GORGONIIDAE) IN THE INDIAN OCEAN AND
SUBANTARCTIC, WITH DESCRIPTION OF A NEW SPECIES
AND COMPARISONS WITH RELATED TAXA**

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A remarkable new species of the large and widespread gorgoniid genus *Leptogorgia* is described from the southwestern Indian Ocean. A variant of *L. gilchristi* is described from the Mozambique/South African border region, the only known record of the genus as a member of an Indo-Pacific coral reef community. The subantarctic *L. lutkeni* is redescribed and compared to a similar species in South Africa. The genus *Leptogorgia* is compared with related taxa in the family Gorgoniidae (including the genus *Pseudopterogorgia*), and new distributional data are provided for the Indo-West Pacific species. A dichotomous key is included for all southern African and subantarctic species of *Leptogorgia* that are currently recognized as valid.

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Leptogorgia is a large genus of gorgonian octocorals (family Gorgoniidae) representing approximately 54 valid species. The genus is distributed throughout most of the Panamic Province, much of the Atlantic Ocean including the Caribbean and Mediterranean seas, and around southern Africa into the southwestern fringe of the Indo-Pacific. One species is present in the subantarctic.

Twelve tropical western Atlantic species are considered valid by Bayer (1961). Carpine and Grasshoff (1975) and Grasshoff (1982, 1986, 1988, and 1992) recognized 24 species as valid from the eastern Atlantic, which includes Europe, the Mediterranean, the Atlantic archipelagoes, and the west coast of Africa. The southern African and subantarctic taxa (at least 6 valid species) are reviewed by Williams (1992a) and the present paper. Three other southern African

species described by Kükenthal, 1919, *Leptogorgia abietina*, *L. tenuissima*, and *L. pusilla*, all from Francis Bay, Cape Province, at 100 m depth, are of questionable validity. The eastern Pacific species (southern California to Chile and the Galapagos Islands) are in major need of revision. Hardin (1979) provided an unpublished review of these taxa (approximately 12 species).

The present account provides the description of a new species of *Leptogorgia* from central Natal in the Indian Ocean. The species is remarkable in having an expanded coenenchyme, unlike any other species of the genus. A relatively small, brick-red variant of the southern African endemic species, *Leptogorgia gilchristi*, is described from the coral reefs of northern Natal near the Mozambique/South African border. In addition, *Leptogorgia lutkeni* from subantarctic Prince Edward Island is here redescribed and

compared with a superficially similar variant of the South African species *Leptogorgia palma*. Lastly, certain species of *Leptogorgia* are compared with related gorgoniid taxa including *Pseudopterogorgia*, *Pterogorgia*, and *Hicksonella*. New distribution data are provided concerning the geographic ranges of *Leptogorgia* and *Pseudopterogorgia* in the Indo-West Pacific.

MATERIAL AND METHODS

Some of the preserved material used in this study was acquired on loan from the Natural History Museum, London (NHM) and the South African Museum, Cape Town (SAM). Other material was examined from the collections of the California Academy of Sciences, Department of Invertebrate Zoology, San Francisco (CAS). All material was preserved in ethanol. Sodium hypochlorite was used to dissociate sclerites from tissue. Permout mounting medium was used to make permanent microscope slides of sclerites. An Olympus CH-2 compound microscope with drawing tube and a Nikon SMZ-10 zoom dissecting microscope with drawing tube were used to produce the figures. A Hitachi S-510 scanning electron microscope was used to make sclerite micrographs. Terminology used throughout the paper corresponds to that of Bayer, Grasshoff, and Verseveldt (1983).

SYSTEMATIC ACCOUNT

Key to the Southern African and Subantarctic Species of *Leptogorgia*

- 1. Branches conspicuously flattened with expanded coenenchyme and biserial polyps throughout. Color lemon yellow . . . *L. bayeri*
- Branches cylindrical, or if somewhat flattened, then coenenchyme not expanded. Polyps mostly disposed uniformly over entire surface of branches or in several rows on opposite sides of lower branches, but not biserially arranged. Color variable: mauve, red, orange, yellow, pink, or white 2
- 2. Branching dichotomous or somewhat lateral 3
- Branching pinnate 6
- 3. Color deep red 4
- Color yellow or white 5

- 4. Largest sclerites 0.10 mm in length *L. palma*
- Largest sclerites 0.10–0.17 mm in length *L. lutkeni*
- 5. Color white. Sclerites mostly slender and symmetrical with well-separated whorls of tubercles, up to 0.16 mm in length. *L. barnardi*
- Color yellow. Sclerites mostly robust, many of them slightly curved with asymmetrical tuberculation. *L. capensis*
- 6. Color bright orange to deep red. Sclerites mostly 0.1 mm long. Anastomoses never present. *L. palma*
- Color yellow, white, pink, mauve, rust orange, or dark brick red. Sclerites up to 0.14 mm in length. Anastomoses occasional *L. gilchristi*

Family **Gorgoniidae** Lamouroux, 1812

Genus **Leptogorgia** Milne Edwards and Haime, 1857

Leptogorgia Milne Edwards and Haime, 1857:163; Verrill, 1868:387; Verrill, 1869:420; Kükenthal, 1924:324; Bielschowsky, 1929:81; Stiasny, 1943:87; Bayer, 1956:212; Bayer, 1961:214; Grasshoff, 1988:97; Grasshoff, 1992:54; Williams, 1992a:231. Type species *Gorgonia viminalis* Pallas, 1766, by subsequent designation of Verrill, 1868:387; Eastern Atlantic.

Lophogorgia Milne Edwards and Haime, 1857:167; Kükenthal, 1924:322. Bielschowsky, 1929:73; Stiasny, 1943:87. Bayer, 1956:212. Bayer, 1961:194. Type species by monotypy: *Gorgonia palma* Pallas, 1766; South Africa.

Filigorgia Stiasny, 1937:307. Stiasny, 1939:301. Bayer, 1956:206. Type species by monotypy: *Filigorgia riadouroi* Stiasny, 1937; West Africa.

REVISED DIAGNOSIS. — Gorgoniid octocorals with branching planar and variable: pinnate, lateral, dichotomous, or filiform. Anastomosis absent in all but two species. Coenenchymal sclerites are radiates and/or spindles with symmetrically or asymmetrically sculptured tuberculation. In elongated spindles, tubercles may appear in whorls. Disc spindles may be present. Anthocodial sclerites often ovoid platelets or flat rods. Color highly variable: white, pink, yellow, orange, red, violet, or brownish; sometimes bi-colored.

DIVERSITY AND DISTRIBUTION. — Approximately 53 species in the eastern Pacific, Atlantic, and southwestern Indian oceans, and one species in the subantarctic; mostly shallow-water benthic communities (<100 m), with one species recorded at 567 m.

***Leptogorgia bayeri* sp. nov.**
(Figs. 1–5)

TYPE MATERIAL. — Holotype: SAM-H4834, Landers Reef, 7 km off Park Rynie, Durban region, Natal, South Africa, 50 m depth, December 1984, collected by W. R. Liltved by means of SCUBA.

DIAGNOSIS. — Axis cylindrical. Growth form upright, planar. Branching copious and mostly dichotomous, lateral branching rare. Anastomosis occasional between neighboring branches. Branches ribbon-like from laterally expanded coenenchyme. Polyps biserial along lateral margins of expanded coenenchyme, retractile, not forming calyces. Anthocodial sclerites flat, irregularly shaped rods and plates (0.03–0.12 mm long). Sclerites of the outer coenenchyme compact eight radiates (0.03–0.10 mm long) and elongate spindles (0.10–0.18 mm long); tuberculation symmetrical. Sclerites of inner coenenchyme mostly radiates and robust spindles (0.04–0.10 mm long). Color lemon yellow.

DESCRIPTION. — **Growth form and branching.** The holotype is 295 mm in height and 195 mm in width. The colonial growth form is upright, multiply-branched from a single trunk, and planar (Fig. 1A). The holdfast is spreading, 26 mm at its maximum diameter. The trunk arises 28 mm above the holdfast before the origin of the first branch. The trunk is 7.5 mm in width by 4.5 mm in depth.

The branching pattern is for the most part dichotomous. Lateral branching is also evident in a few areas. The distance between branching nodes varies from 8 to 55 mm. The maximum distance between branching node and distal terminus of the branches is 65 mm. Branch width varies from a minimum of 2.5 mm immediately below a distal terminus to a maximum of 11 mm at a node.

The branches appear flattened and ribbon-like from the lateral expansion of the coenenchyme, which forms opposite wing-like extensions of

tissue (Fig. 1B). This lateral compression of the edges results in a somewhat elliptical shape to the branches in cross section (Fig. 1C). The apices of the branches each have a single acute projecting point produced by the terminus of the axis (Fig. 1B).

Several adjacent branches fuse to form occasional anastomoses. The fusions occur not at the branch tips, but below the terminus of each branch, or between branching nodes. The anastomoses are only occasional, and in no way do the branches form a net-like appearance, as in species of the American gorgoniid genera *Gorgonia* and *Pacifigorgia*. The fusions apparently incorporate the axis as well as the coenenchyme.

Polyps. The polyps are arranged biserially and are contained in two opposite longitudinal rows along any particular branch. The polyps are restricted to the edges of the branches and do not appear on the flat broad surfaces of the branches, except for a few polyps in three longitudinal rows along one side of the trunk. The numerous and minute slit-like openings to the polyps are approximately 0.6 mm in length and are separated from adjacent slits by an average of 1.0 mm. The slit-like openings are arranged more-or-less parallel to the longitudinal axis of a particular branch. Most of the polyps have a slightly swollen appearance (Fig. 1B). All of the polyps are completely retracted in the holotype, and thus, aspects of polyp morphology are not distinguished. The retracted polyps do not form conspicuous calyces.

Sclerites. The sclerites are of three main types: plate-like forms, radiates, and spindles.

The sclerites of the anthocodiae are irregularly-shaped, flattened rods or plates, 0.03–0.12 mm in length (Figs. 2A, 4A and B). The margins are not smooth but rather are scalloped or irregularly dentate.

Sclerites of the outer coenenchyme are of two main types (Fig. 2B). Firstly, there are numerous compact, ovoid radiates (mostly eight-radiates), 0.03–0.05 mm in length, with some up to 0.10 mm (Figs. 3A, B, D, G; 4E–N). In contrast to these highly ornamented forms, some of the radiates are sparsely tuberculated (Fig. 3C–F). Secondly, many elongate spindles are also present, 0.10–0.18 mm in length. These spindles are narrow to more robust, and have several parallel whorls of tubercles (Figs. 2B, 4C, D). Although some of these spindles may be slightly curved,

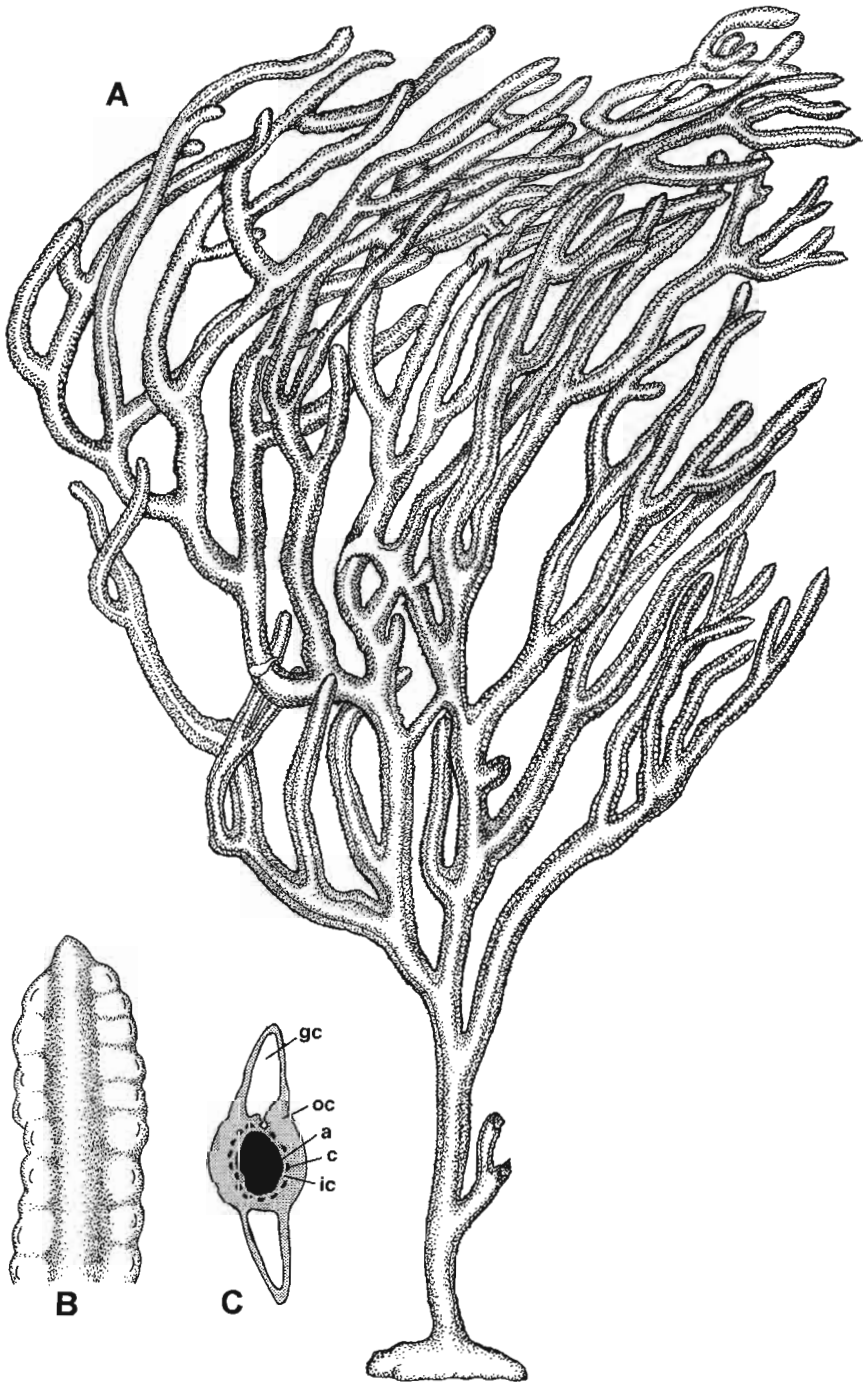


FIGURE 1. Holotype of *Leptogorgia bayeri*. A. Entire holotype, 295 mm in height. B. Terminal branch tip, 11 mm in length. C. Transverse section of terminal branch, 5 mm in length; a - axis, c - canal, gc - gastric cavity, ic - inner coenenchyme, oc - outer coenenchyme.

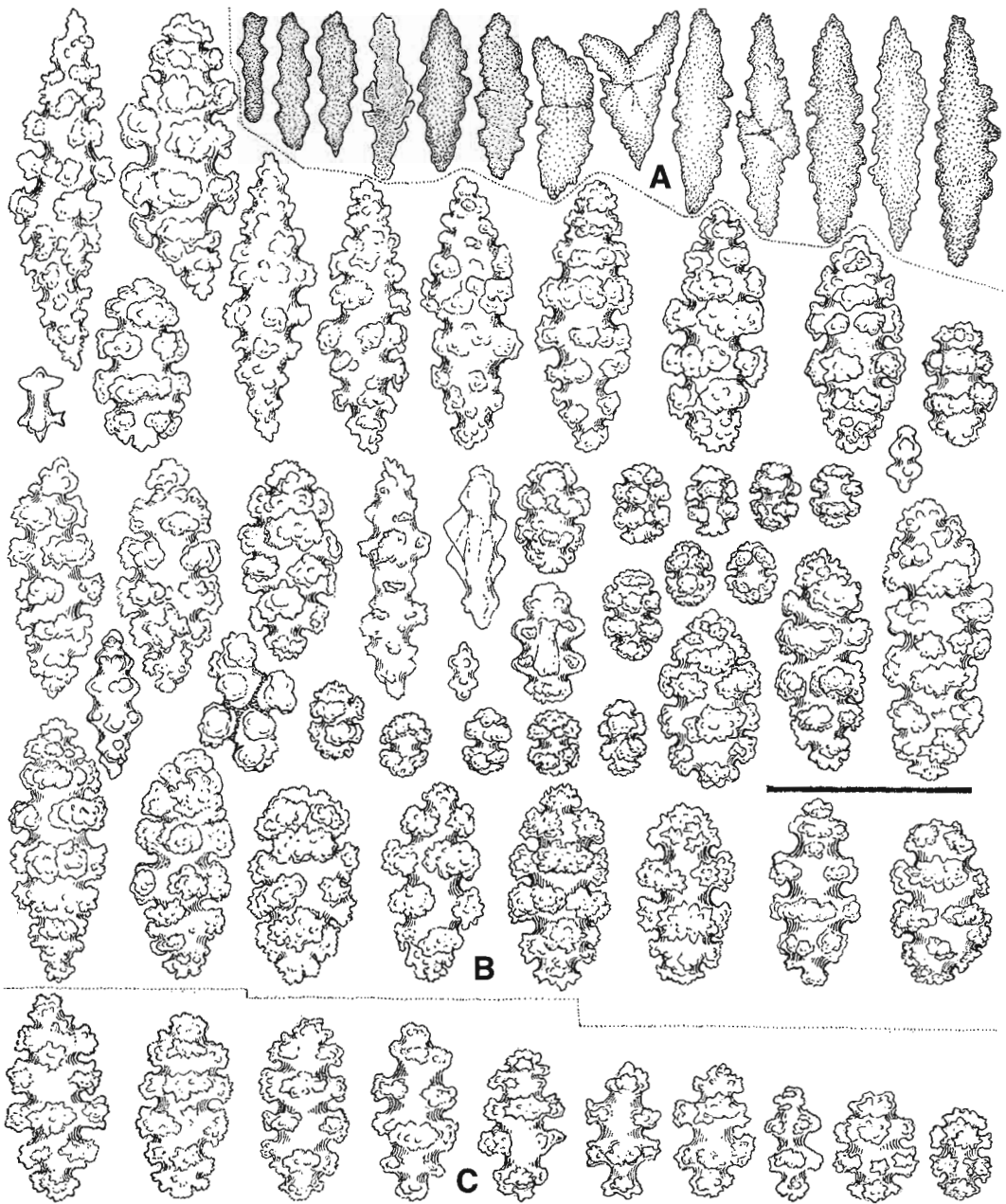


FIGURE 2. Sclerites of *Leptogorgia bayeri* (holotype). A. Polyp sclerites. B. Sclerites of the outer coenenchyme. C. Sclerites of the inner coenenchyme. Scale bar = 0.1 mm.

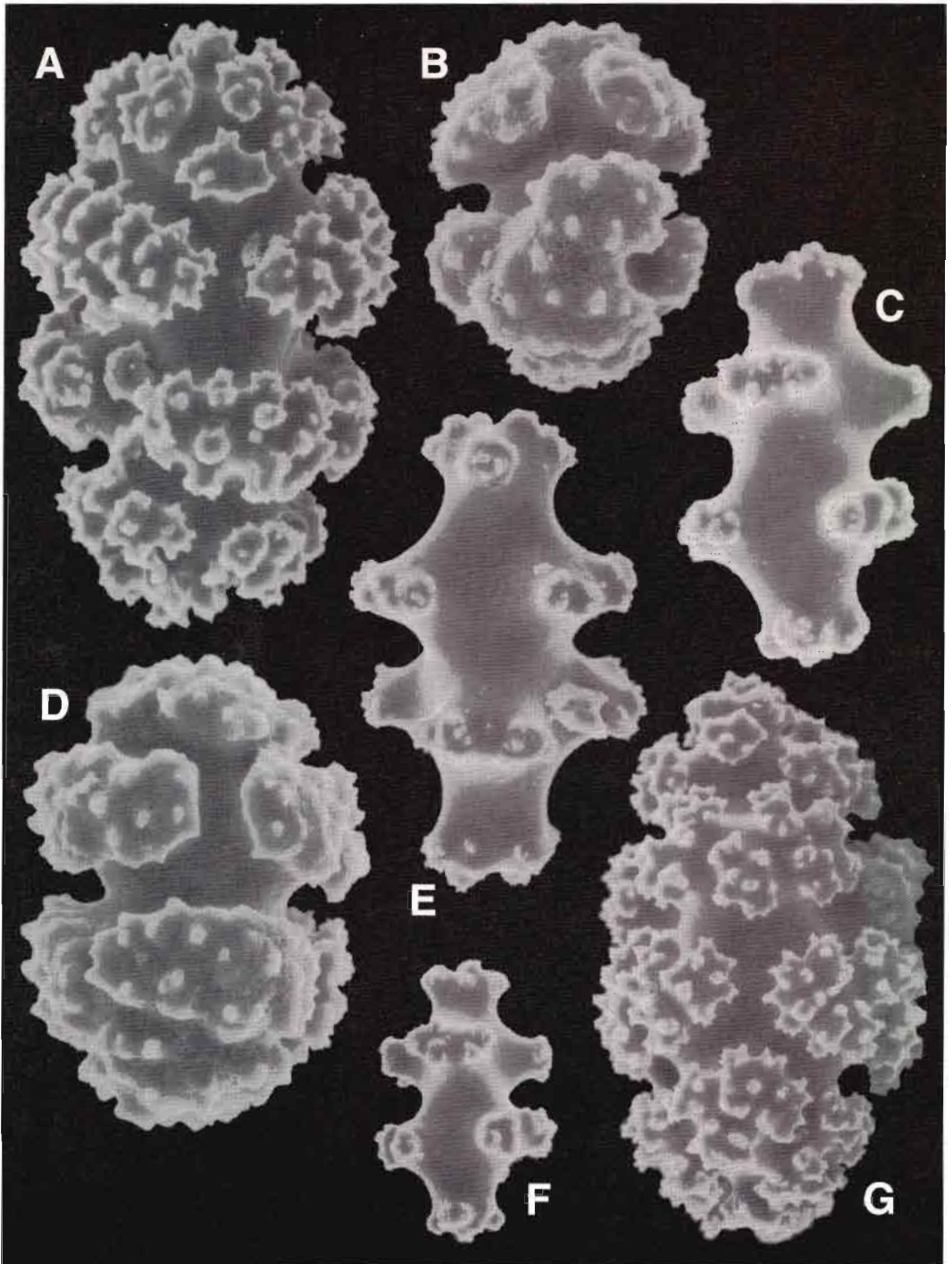


FIGURE 3. *Leptogorgia bayeri* (holotype). Scanning electron micrographs of coenenchymal sclerites. A. 0.075 mm. B. 0.028 mm. C. 0.052 mm. D. 0.035 mm. E. 0.059 mm. F. 0.060 mm. G. 0.085 mm.

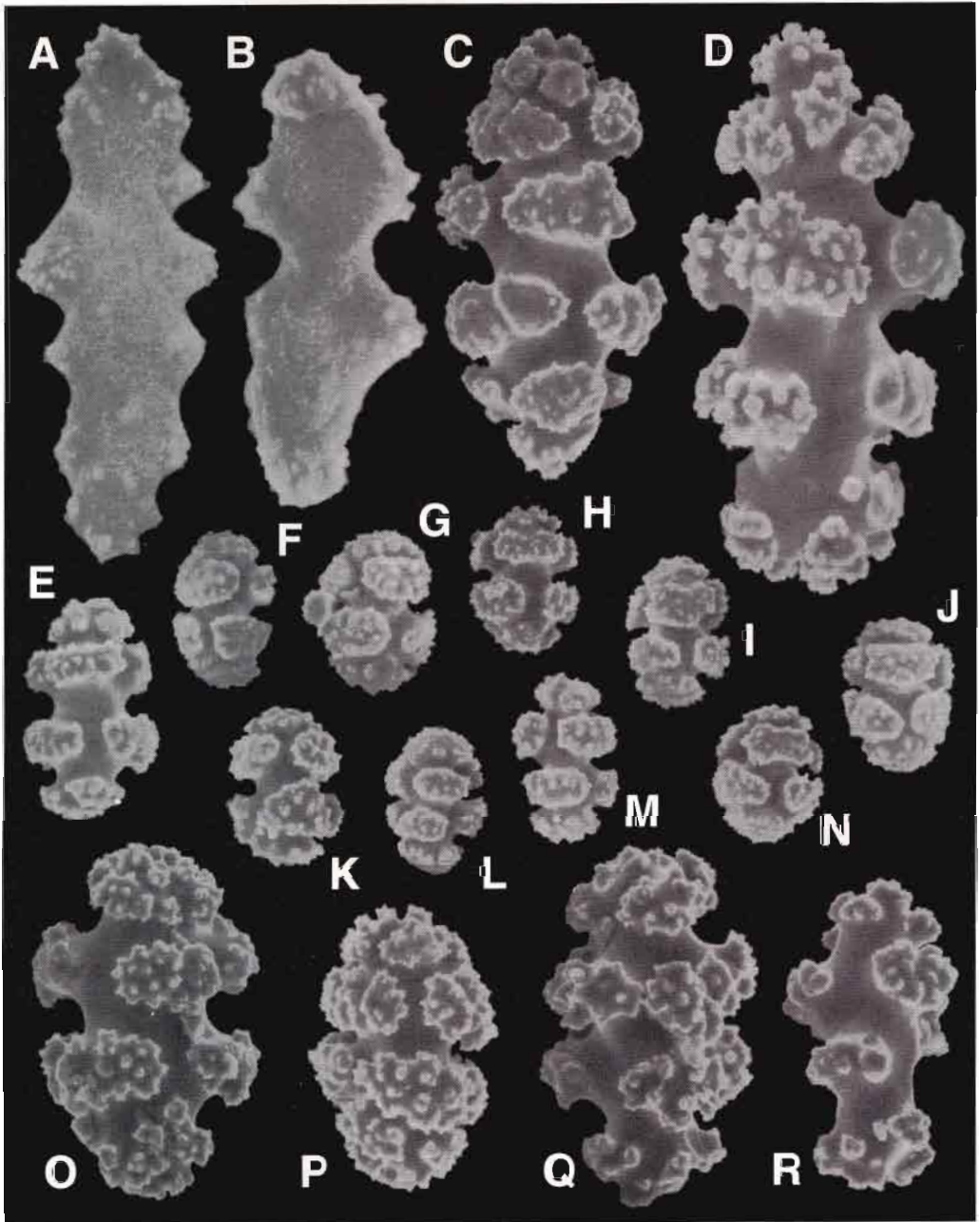


FIGURE 4. *Leptogorgia bayeri* (holotype). Scanning electron micrographs of polyp sclerites (A-B), and coenenchymal sclerites (C-R). A. 0.052 mm. B. 0.030 mm. C. 0.092 mm. D. 0.081 mm. E. 0.047 mm. F. 0.031 mm. G. 0.032 mm. H. 0.030 mm. I. 0.031 mm. J. 0.031 mm. K. 0.033 mm. L. 0.032 mm. M. 0.036 mm. N. 0.030 mm. O. 0.074 mm. P. 0.058 mm. Q. 0.073 mm. R. 0.064 mm.

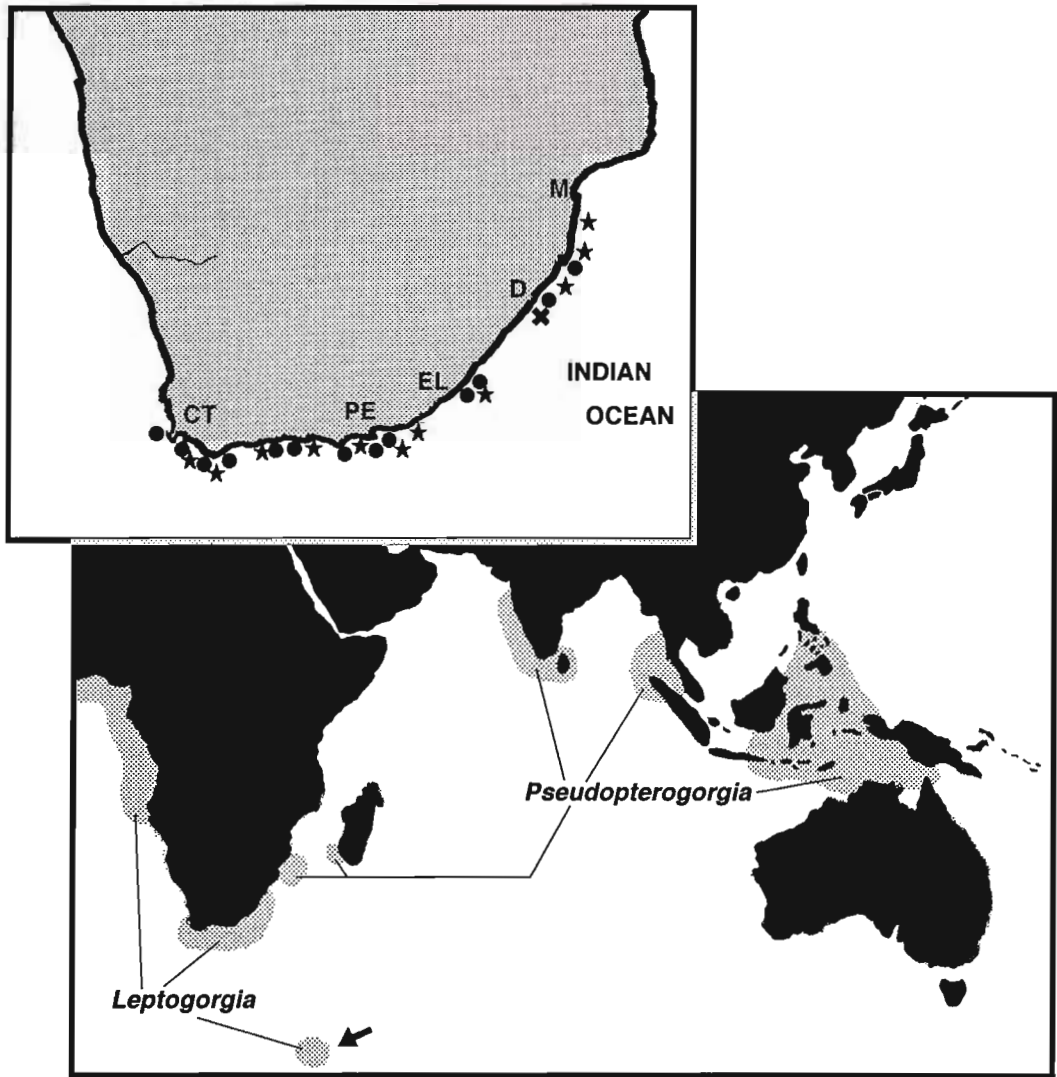


FIGURE 5. Distribution of *Leptogorgia* and *Pseudopterogorgia* in the Indo-West Pacific. Arrow shows distribution of *L. lutkeni*. Inset at top shows distribution of three species of *Leptogorgia* in southern Africa: *L. palma* (●), *L. gilchristi* (★), and *L. bayeri* (×); CT - Cape Town, PE - Port Elizabeth, EL - East London, D - Durban, M - Maputo.

the tuberculation is symmetrical; one side is not modified relative to the other. In addition, adjacent tubercles do not fuse to form disk spindles, as in some species of the genus.

The sclerites of the inner coenenchyme are radiates and robust spindles, mostly 0.04–0.10 mm in length (Fig. 2C). The elongate spindles found in the outer coenenchyme do not seem to be present in the inner coenenchyme.

Color. The holotype is a vivid lemon yellow throughout. The coenenchymal sclerites are lemon yellow, while the plate-like sclerites of the polyps are salmon pink to pale orange.

Internal Anatomy. A transverse section at a level approximately 10 mm below a branch terminus reveals the following internal anatomy (Fig. 1C). The axis is cylindrical throughout, circular to ovoid in cross section. It is not markedly flattened or laminar. In this particular trans-

verse section, the axis measures 1.2 by 0.8 mm. Large, conical gastric cavities occupy the wing-like expansions of the coenenchyme. These two deltoid expansions emanate laterally from the axis, and are disposed opposite one another. The long plane of this entire complex is parallel to the growth plane of the whole colony (Fig. 1A). The inner coenenchyme immediately surrounds the axis and occupies the area between the axis and a single ring of canals. This inner coenenchyme is approximately 0.08 mm thick. Between the canal ring and the surface is the outer coenenchyme, which averages 0.3 mm in thickness. The canals that compose the canal ring are approximately 15–16 in number and do not exceed 0.1–0.2 mm in diameter.

DISTRIBUTION. — The new species is at present known only from the type locality: Park Rynie, Durban, Natal, South Africa (Fig. 5).

ETYMOLOGY. — This species is named in honor of Dr. Frederick M. Bayer, Curator of Coelenterates (National Museum of Natural History, Smithsonian Institution, Washington, D. C.) and diligent student of the Octocorallia.

REMARKS. — *Leptogorgia bayeri* sp. nov. is distinguished from other species in the genus in two main ways. Occasional anastomosis is known to occur in only one other species of the genus, *Leptogorgia gilchristi*. Therefore, the presence of anastomosis in *L. bayeri* sp. nov. distinguishes it from the remaining 52 species of genus. The laterally expanded coenenchyme along all the flattened branches together with biserial polyps distinguishes the new species from all other members of the genus. This is a major difference and might seem to be enough for the creation of a new genus. However, as Alderslade (1986) has shown in the original description of *Hicksonella expansa*, which has a remarkably leaf-like coenenchyme expansion, the species should still be retained in the genus *Hicksonella*, since the sclerites are so similar to those of the type species, *H. princeps* Nutting, 1910, which has cylindrical branches with no expansion of coenenchyme.

The ribbon-like branches give the holotype of *Leptogorgia bayeri* sp. nov. a superficial resemblance to species of the West Indian gorgoniid genus *Pterogorgia*, such as *P. citrina* and *P. anceps*, in which the polyps also retract into the edges of the branches. Both *Leptogorgia bayeri* and species of *Pterogorgia* have flattened

branches with expanded coenenchyme and biserially arranged polyps. However, a comparison of Figs. 2–4 with Fig. 12D and E shows that *Leptogorgia bayeri* may have curved or C-shaped spindles, but not scaphoids, which are numerous in *Pterogorgia citrina* and *P. anceps*.

Grasshoff (1988:105) reports that several West African species of *Leptogorgia*, such as *L. gaini* (Stiasny 1940), may have strongly flattened branches (at least in the proximal regions of the colonies), and Bayer (1961:222) records the occurrence of biserial polyps in the West Indian species *L. euryale* (Bayer 1952). However, neither *Leptogorgia gaini* or *L. euryale* has markedly expanded coenenchyme as in *L. bayeri*.

***Leptogorgia gilchristi* (Hickson, 1904)**
(Figs. 5–8)

Eugorgia Gilchristi Hickson, 1904:230. pl. 9 (figs. 15, 19). J. S. Thomson, 1917:38.

?*Leptogorgia africana* J. S. Thomson, 1917:28, pl. 5 (fig. 7).

Leptogorgia alba var. *capensis* J. S. Thomson, 1917:29.

Leptogorgia aurata J. S. Thomson, 1917:32, pl. 1 (fig. 5), pl. 4 (fig. 2).

Eugorgia lineata J. S. Thomson, 1917:39, pl. 2 (fig. 3), pl. 5 (fig. 2).

?*Leptogorgia abietina* Kükenthal, 1919:639, text fig. 289, p. 32 (fig. 15).

Eugorgia gilchristi Kükenthal, 1924:347. Stiasny, 1940:27, text fig. E.

Leptogorgia gilchristi Grasshoff, 1992:79, text fig. 141; pl. 7 (fig. 4). Williams, 1992a:244; figs. 46–49. Williams, 1992b:383, 397, fig. 24G.

Leptogorgia: Williams, 1993:53, figs. 9H, I, 25A–C.

MATERIAL. — SAM-H4016, Sodwana Bay, Natal, South Africa, 18–19 m depth, 4 July 1986, collected by G. C. Williams by means of SCUBA, six whole and five partial specimens. CAS 108559, permanent microscope slide of sclerites from holotype, Saint Francis Bay, Cape Province, South Africa, 95 m depth, 1 November 1898, S.S. Pieter Faure.

DESCRIPTION. — The following description is based on the six entire specimens from lot SAM-H4016.

Growth form and branching. The six whole specimens vary in height from 47 to 143 mm and 35–135 mm in width. The colonial growth form is upright, copiously branched from a single

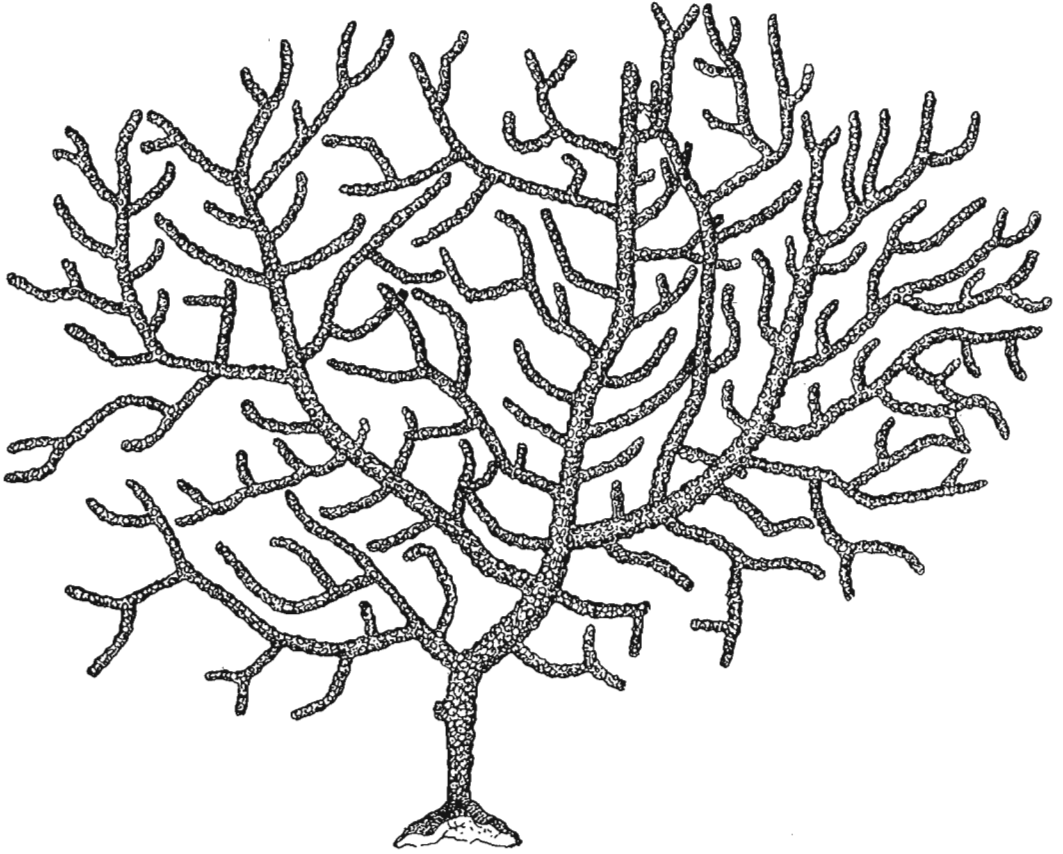


FIGURE 6. *Leptogorgia gilchristi* (SAM-H4016) from Sodwana Bay, Natal; 100 mm in height, 132 mm in width.

trunk, and planar (Fig. 6). The holdfasts are spreading and vary in diameter from 5 to 15 mm. The trunks vary in length from 12 to 26 mm between the holdfasts and the first branching node, and from 1 to 3 mm in diameter.

The branching pattern is pinnate throughout (Fig. 6). Many of the branches are curved or somewhat sinuous. The lower branches are more-or-less flattened with a slightly flattened axis in the proximal regions of the main branches. This contrasts with the distal regions of the ultimate branches, which are for the most part cylindrical, not distinctly flattened. The distance between branching nodes varies from 2 to 15 mm. The ultimate branches vary from 3 to 13 mm in length and from 1.0 to 1.5 mm in width. Anastomoses occur occasionally between adjacent branches, but do not form a reticulated pat-

tern anywhere on the specimens. The coenenchyme is thin throughout and is not differentially expanded or spreading.

Polyps. The polyps in all the material examined are tightly retracted into the coenenchyme, and therefore, features of their morphology were not observed. The retracted polyps form rounded or conical protuberances (calyces) approximately 0.5 mm in diameter, each with a single, minute, slit-like opening (0.2–0.3 mm in length). In the proximal region of the specimens and in the proximal regions of the branches, the polyps are arranged in two opposite series of one or more rows per side. In the distalmost portions of the ultimate branches, the polyps are disposed on all sides of the cylindrical or nearly cylindrical branches. The branch tips are blunt and rounded or are terminated with a minute apical point.

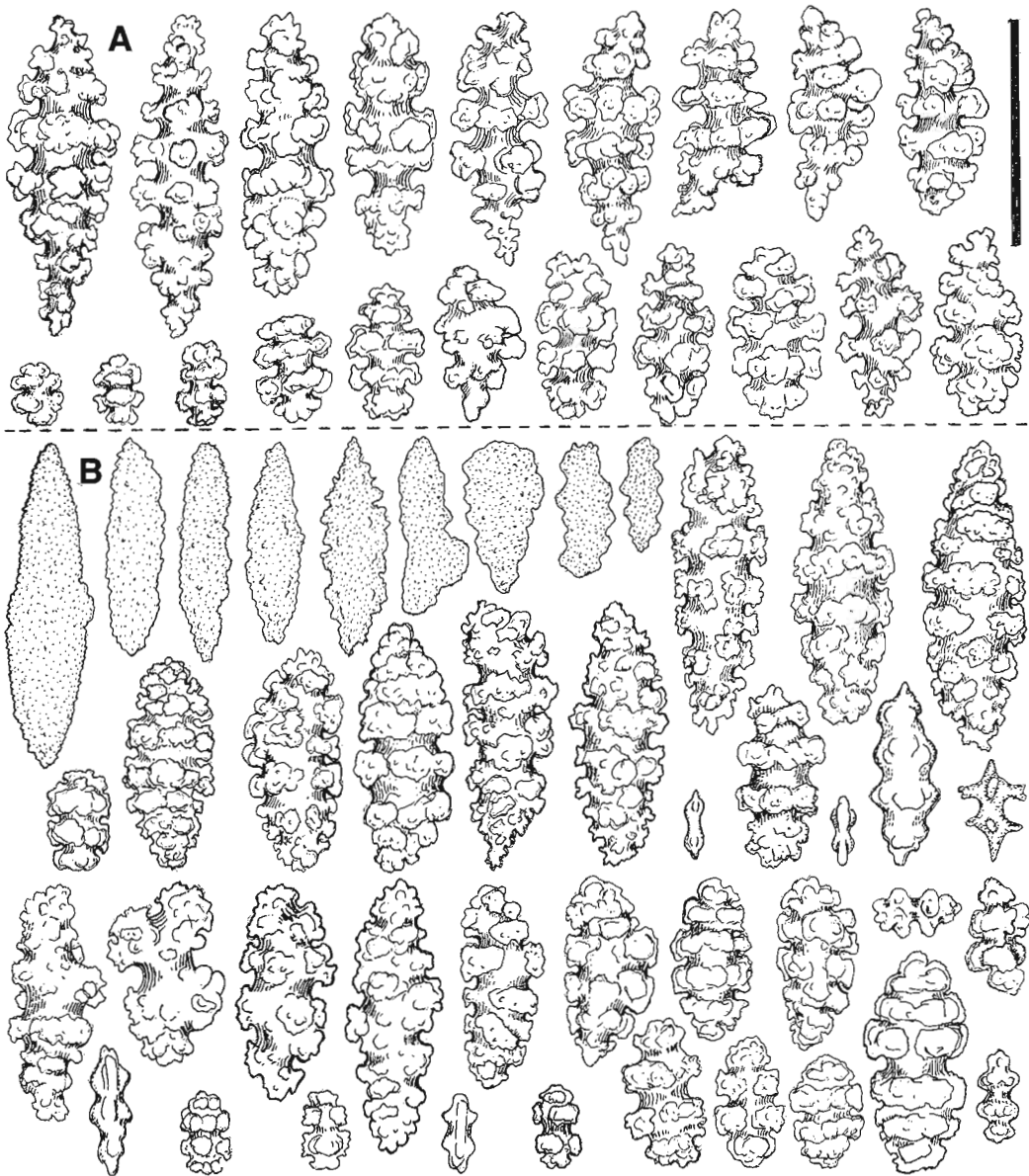


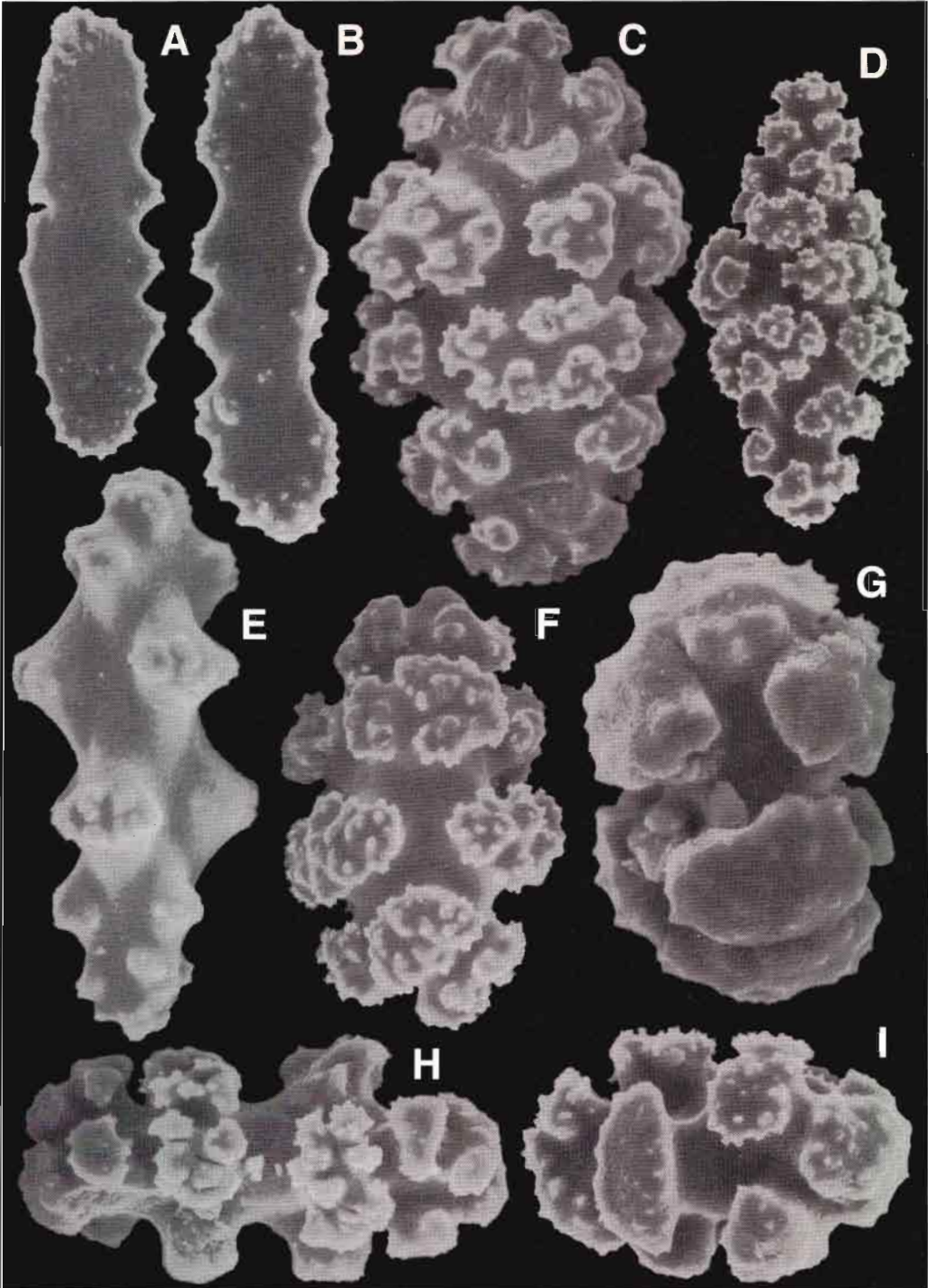
FIGURE 7. Sclerites of *Leptogorgia gilchristi*. A. Coenenchymal sclerites (holotype). B. Polyp and coenenchymal sclerites of Sodwana Bay material (SAM-H4016). Scale bar = 0.1 mm.

Sclerites. The form and size of the sclerites closely resemble those of the holotype (Fig. 7B vs. 7A). The sclerites are of three main types: anthocodial plate-like forms, and coenenchymal eight radiates and spindles.

The anthocodiae contain plates and flattened rods, 0.05–0.15 mm in length. These sclerites are

mostly elliptical in shape. They have irregularly shaped margins, which may be somewhat scalloped or toothed but not smooth (Fig. 7B top left; 8A, B).

The radiates are mostly eight radiates, which are variously shaped: compact (Fig. 8G) to relatively elongate (Fig. 8H), ranging in length from



0.04 to 0.06 mm (Figs. 7B, 8E–I). Some radiates are only sparsely ornamented (Fig. 8E).

The spindles are relatively robust and measure 0.07–0.14 mm in length. Some of these have conspicuously parallel whorls of tubercles; however, others have tubercles more randomly placed on the surface of the spindle, not in clearly defined linear or parallel whorls (Figs. 7B, 8C, D). Some spindles may be slightly curved, but tuberculation is mostly symmetrical on opposite sides of any given sclerite. Most of the sclerites are uniformly rose red to deep red, while some of the larger spindles are bicolored: red-orange toward one end and yellow at the opposite end.

Color. The specimens are uniformly colored deep cherry red.

DISTRIBUTION. — *Leptogorgia gilchristi* is considered a southern African endemic and was previously known to be distributed along the coast of South Africa from Danger Point (Cape Province) to Durnford Point (Natal) (Williams 1992a:247; 1992b:394). Discovery of this new variant extends the range north along the coast of Natal to Sodwana Bay, in the vicinity of the Mozambique border (Fig. 5).

Leptogorgia bayeri sp. nov. and *L. gilchristi* are the only two species of the genus in which anastomosis has been observed or recorded (Williams 1992a:246, and present paper).

REMARKS. — Williams (1992b:383) reported on the high amount of phenotypic variability observed in several southern African octocorals, including *Leptogorgia gilchristi*. The material described above represents a hitherto unknown variant of *L. gilchristi* and is the only member of the genus known to occur in an Indo-Pacific coral-reef community (the subtidal reefs of Sodwana Bay, northern Natal).

Leptogorgia lutkeni (Wright and Studer, 1889) (Figs. 5, 9, 10A)

Lophogorgia lutkeni Wright and Studer, 1889:150, pl. 30 figs. 1 and 1a, pl. 34 fig. 1.

Lophogorgia lutkeni (non Wright and Studer, 1889) J. A. Thomson and Henderson, 1905:306, pl. 3 fig.

6. J. A. Thomson and Simpson, 1909:264. J. A. Thomson and Crane, 1909:132, fig. 11. J. S. Thomson, 1917:35, pl. 1 fig. 2.

Leptogorgia lutkeni Bielschowsky, 1918:30. Kükenthal, 1924:328.

MATERIAL. — Holotype: NHM 1889.5.27.86, H.M.S. Challenger St.145a, off Prince Edward Island, 310 fathoms (567 m).

REDESCRIPTION. — **Growth form and branching.** The holotype is 245 mm in length. The colonial growth form is upright, multiply branched from a single trunk, and planar (Fig. 9). The holdfast spreads slightly and is 7–8 mm in diameter. The trunk measures 13 mm between the holdfast and the first branching node, and is 1.8–2.0 mm in diameter.

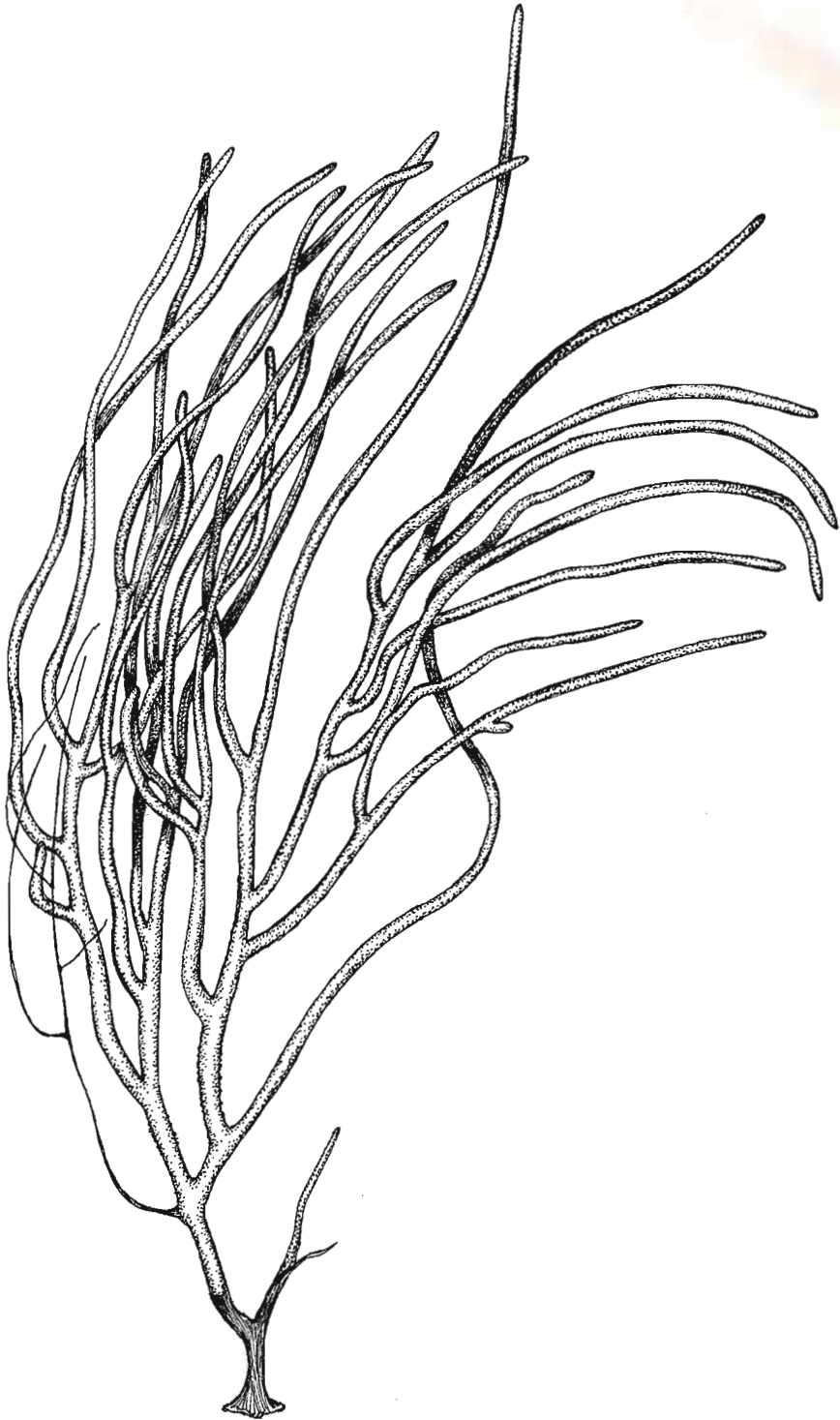
The proximal-most 20 to 25 mm of the specimen is denuded of coenenchyme. The surface of this exposed axis is covered with short longitudinal furrows, dark brown to black in color, with mottled areas that are tan or light gray. The proximal regions of the branches are somewhat flattened, resulting from the axis itself being flattened. The axis in this region is thus elliptical in transverse section. One lower branch measures 2.3 mm wide by 1.0 mm in depth. The distal most portions of the branches are mostly cylindrical or only slightly flattened. The coenenchyme is thin and of relatively equal thickness throughout. It is not differentially expanded or spreading.

The branching pattern throughout the specimen is dichotomous to somewhat lateral. The distance between branching nodes varies from 5 to 26 mm, but mostly exceeds 10 mm. The ultimate branches are mostly elongate and narrow and vary from 60 to 140 mm in length. The branches near their apices are 1.0–1.5 mm in diameter. The apices of the ultimate branches are mostly uniformly rounded. Anastomosis does not occur anywhere in the holotype.

Polyps. The polyps in the holotype are all tightly retracted into the coenenchyme, and thus details of morphology are not discernible. The retracted polyps form minute slits on the surface

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FIGURE 8. *Leptogorgia gilchristi* (SAM-H4016). Scanning electron micrographs of polyp sclerites (A–B) and coenenchymal sclerites (C–I). A. 0.070 mm. B. 0.069 mm. C. 0.090 mm. D. 0.101 mm. E. 0.074 mm. F. 0.068 mm. G. 0.035 mm. H. 0.050 mm. I. 0.040 mm.



of the branches. These slits do not exceed 0.4 mm in length. The retracted polyps form rounded protuberances on the branches approximately 1.0 mm in diameter. Polyp calyces are absent. The polyps are not biserially arranged; however, on the lower branches the polyps are arranged in two opposite series of several longitudinal rows each, along the narrow edges of the branches. The broad flattened surfaces of the branches are devoid of polyps. By contrast, in the distal-most regions of the branches, the polyps for the most part cover the entire surface area of each branch.

Sclerites. The coenenchymal sclerites are of two kinds: radiates and spindles (Fig. 10A).

The radiates are predominantly eight-radiates and are 0.04 to 0.085 mm in length. Some radiates are highly ornamented, while others are only sparsely tuberculated. The spindles are mostly 0.10 to 0.17 mm in length. These spindles are for the most part elongate and contain 3–5 parallel whorls of tubercles. Some of the spindles are somewhat curved. In some, the tuberculation is asymmetrical: the large tubercles on one side may be smooth while those of the opposite side are rough and ornamented with fine tuberculation. In such cases, the divergent tubercles are of equal size and none are highly modified or reduced.

Color. The holotype is dull orange-red to brick red throughout. The sclerites are reddish orange.

DISTRIBUTION. — The species is known only from the type locality, Prince Edward Island in the subantarctic (Fig. 5, arrow).

REMARKS. — The holotype was examined and redescribed to confirm that the specimen does indeed belong to the genus *Leptogorgia*, and that the genus is distributed in the subantarctic.

Leptogorgia lutkeni was originally described as *Lophogorgia lutkeni*, but Grasshoff (1988:97–98; 1992:77–78) has shown that *Lophogorgia* Milne Edwards and Haime, 1857:167 is a synonym of *Leptogorgia* Milne Edwards and Haime, 1857:163. The holotype of *Leptogorgia lutkeni*, is the only known specimen. Comparative examination of the holotype with the southern African species of *Leptogorgia* has shown that it most closely resembles dichotomously

branched colonies of *Leptogorgia palma* (Pallas, 1766) (Fig. 11). Both *Lophogorgia lutkeni* and this variant of *L. palma* are dichotomously branched and a deep brick red or cherry red in color. This form of *L. palma* was previously named as a separate species, *Lophogorgia crista* Möbius, 1861, which Grasshoff (1992:77) and Williams (1992a:239, 242) considered to be a junior synonym of *Leptogorgia palma* (Fig. 12).

Comparison of the sclerites of *Leptogorgia lutkeni* and the “crista” variant of *L. palma*, serve to distinguish the two taxa (Fig. 10). *Leptogorgia lutkeni* has larger sclerites, up to 0.17 mm in length, and many of them are elongate spindles (Fig. 10A). In the “crista” variant of *L. palma*, the sclerites are mostly more compact eight radiates and spindles, and do not exceed 0.1 mm in length (Fig. 10B and Williams 1992a:240).

Material identified as *Lophogorgia lutkeni* by J. A. Thomson and Henderson, 1905, from Cheval Paar, Gulf of Manaar, Sri Lanka; J. A. Thomson and Simpson, 1909, from the Andaman Islands, Bay of Bengal; J. A. Thomson and Crane, 1909, from Okhamandal, Arabian Sea, India; and J. S. Thomson, 1917, from Gordon’s Bay, Cape Province, South Africa, should not in my view be considered conspecific with Wright and Studer’s subantarctic species. Stuart Thomson’s material appears to be synonymous with *Leptogorgia palma* (compare pl. 1, fig. 2, of J. S. Thomson, 1917 with fig. 41, page 241, of Williams, 1992a), while all of J. A. Thomson’s specimens from the Indian Ocean are more likely assignable to the genus *Pseudopterogorgia* (see Fig. 5).

DISCUSSION

GORGONIIDS WITH EXPANDED COENENCHYME. — Alderslade (1986:81) observed that only a few species of holaxonian gorgonians have an expanded or spreading coenenchyme and these are restricted to the Gorgoniidae. These include *Phycogorgia fucata* (Valenciennes, 1846) from Chile; *Phyllogorgia dilatata* (Esper, 1806) from Brazil; three tropical western Atlantic species of *Pterogorgia*: *P. anceps* (Pallas,

←

FIGURE 9. *Leptogorgia lutkeni* (holotype); 240 mm in height.

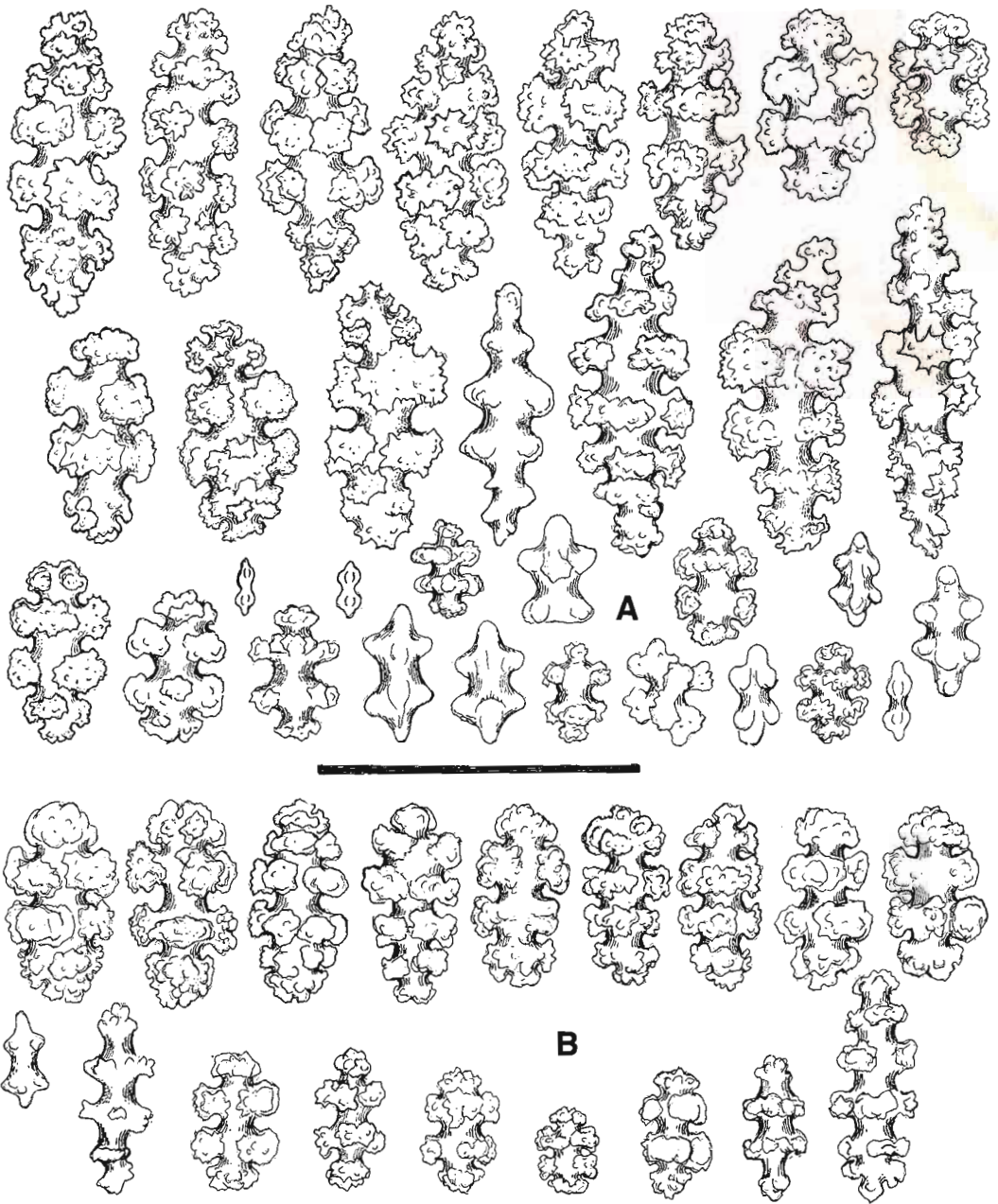


FIGURE 10. Coenenchymal sclerites. A. *Leptogorgia lutkeni* from Prince Edward Island (holotype). B. *Leptogorgia palma* (var. "crista") from South Africa (CAS 108321). Scale bar = 0.15 mm.

1766), *P. citrina* (Esper, 1792), and *P. guadalupensis* Duchassaing and Michelin, 1846; *Hicksonella expansa* Alderslade, 1986 from the Great Barrier Reef; *Leptogorgia bayeri* sp. nov. from Natal; and to a lesser extent some tropical west-

ern Atlantic species of *Pseudopterogorgia*, such as *P. americana* (Gmelin, 1791) and *P. acerosa* (Pallas, 1766). Table 1 provides a summary of differentiating characteristics for these taxa.



FIGURE 11. A variant of *Leptogorgia palma* (formerly *Lophogorgia crista*) (SAM-H3344) from South Africa; 210 mm in height.

THE GENUS *LEPTOGORGIA* IN THE INDIAN OCEAN. — Of the approximately 54 species in the genus *Leptogorgia*, perhaps 12 are found in the Panamic Province of the eastern Pacific, 36 are distributed in the Atlantic Ocean, five are endemic to southern Africa, and one is known from the subantarctic/Southern Oceans. Thus, the Atlantic has the highest diversity with outliers of lesser diversity in the eastern Pacific, southern Africa, and the subantarctic.

Williams (1992b) described the biogeographic aspects of the Cape Endemic Province with regard to the octocoral fauna. The five species considered endemic to southern Africa are *Lep-*

togorgia barnardi Stiasny, 1940, *L. bayeri* sp. nov., *L. capensis* (Hickson, 1900), *L. gilchristi* (Hickson, 1904), and *L. palma* (Pallas, 1766). Although the ranges of *Leptogorgia barnardi* and *L. capensis* extend eastward along the south coast of South Africa into the eastern Cape Province, only *L. bayeri*, *L. gilchristi*, and *L. palma* extend northward along the coast of Natal and well into the Indian Ocean (Williams 1992b:394, fig. 24E-H). It is therefore evident that of the 54 species of *Leptogorgia*, three extend into the southwestern fringe of the Indo-Pacific Province (Fig. 5).

TABLE 1. Comparison of gorgoniid taxa with expanded coenenchyme.

	Type of branching	Axis	Branch shape	Expanded coenenchyme	Anastomosis	Sclerites	Distribution
<i>Hicksonella expansa</i>	irregularly pinnate	cylindrical	strongly flattened	strong and leaflike	occasional	wart clubs and spindles	Great Britain, Australia
<i>Phyllogorgia dilatata</i>	pinnate	cylindrical	strongly flattened	strong and leaflike	common	scaphoids and spindles	Brazil
<i>Phycogorgia fucata</i>	—	flat	flattened	—	—	—	Chile
<i>Pterogorgia</i> spp.	lateral or dichotomous	cylindrical	weakly to strongly flattened	strong	absent	scaphoids and spindles	W Atlantic
<i>Pseudopterogorgia</i> spp.	pinnate	cylindrical	cylindrical to weakly flattened	weak	absent	scaphoids and spindles	W Atlantic, Indo-West Pacific
<i>Leptogorgia bayeri</i>	dichotomous	cylindrical	strongly flattened	strong	occasional	spindles only	Natal
<i>Leptogorgia</i> spp.	variable	cylindrical or flattened	cylindrical to flattened	absent	absent	spindles only	E Pacific, SW Atlantic, Indian Ocean, subantarctic

TABLE 2. Comparative features for the gorgoniid genera *Leptogorgia* and *Pseudopterogorgia*.

	<i>Leptogorgia</i>	<i>Pseudopterogorgia</i> (Indo-Pacific)	<i>Pseudopterogorgia</i> (Caribbean)
Type of branching	variable	lateral or pinnate	pinnate-plumose
Amount of branching	variable	sparse to abundant	abundant
Anastomosis	occasional to absent	absent	absent
Scaphoids	absent	weakly developed	well developed
Largest tubercles on C-shaped sclerites	convex side	concave side	concave side
Distribution	Panamic/Atlantic/ southern Africa	Indo-West Pacific (Mozambique to Torres Strait)	Tropical western Atlantic

COMPARISON BETWEEN *LEPTOGORGIA* AND *PSEUDOPTEROGORGIA*—Table 2 compares three groups of related gorgoniid taxa: *Leptogorgia*, the Indo-Pacific *Pseudopterogorgia*, and tropical western Atlantic species presently allocated to the genus *Pseudopterogorgia*. It is not clear if the western Atlantic taxa are congeneric with the Indo-Pacific taxa. Kükenthal (1919:854) proposed the name *Pseudopterogorgia* for several Indo-Pacific taxa with scaphoids, originally described in the genera *Gorgonia* and *Leptogorgia*. Kükenthal (1924:355) recognized four species of *Pseudopterogorgia*: *P. australiensis* (Ridley, 1884), *P. oppositipinna* (Ridley, 1888), *P. pinnata* (Nutting, 1910), and *P. luzonica* Kükenthal, 1919. Bayer (1951:97) established the genus *Antillogorgia* to accommodate the West Indian plumose gorgoniids with scaphoids that were differentiated from *Pterogorgia* Ehrenberg, 1834 (restricted to non-plumose forms with broad and flattened branches). Bayer (1961:224) subsequently considered the Indo-Pacific and tropical western Atlantic taxa to be generically inseparable, and thus relegated *Antillogorgia* to the synonymy of *Pseudopterogorgia*. It is possible that the two geographically disparate groups may represent separate genera, but we here retain the existing classification of *Pseudopterogorgia* and *Leptogorgia* in the Indo-Pacific, as a detailed comparative examination of

more material will have to be made first before the problem can be satisfactorily resolved.

If the two geographically distinct groups of taxa do indeed represent two distinct genera, then the generic name *Antillogorgia* would have priority for the western Atlantic species. However, a good argument can be made for the continued application of the name *Pseudopterogorgia* for the western Atlantic taxa. A substantial body of literature outside the field of pure taxonomy is adequate justification for action by the International Commission of Zoological Nomenclature to conserve a threatened name (F. M. Bayer, pers. comm.). This is certainly the case with *Pseudopterogorgia* where a large body of literature has been produced in the past two decades, particularly in the fields of chemical ecology and natural products chemistry (e.g., McEnroe and Fenical 1978; Look et al. 1986; Fenical 1987; Harvis et al. 1988; Harvell and Fenical 1989; Roussis et al. 1990; Tinto et al. 1991; and Haiyin et al. 1995). A reasonable argument in favor of conservation could therefore be brought before the ICZN for consideration.

Table 2 and Fig. 12A–C shows differences between the genera *Leptogorgia* and the two groups of *Pseudopterogorgia*. A detailed comparison of scaphoids and curved spindles of these groups reveal that the sclerite differences be-

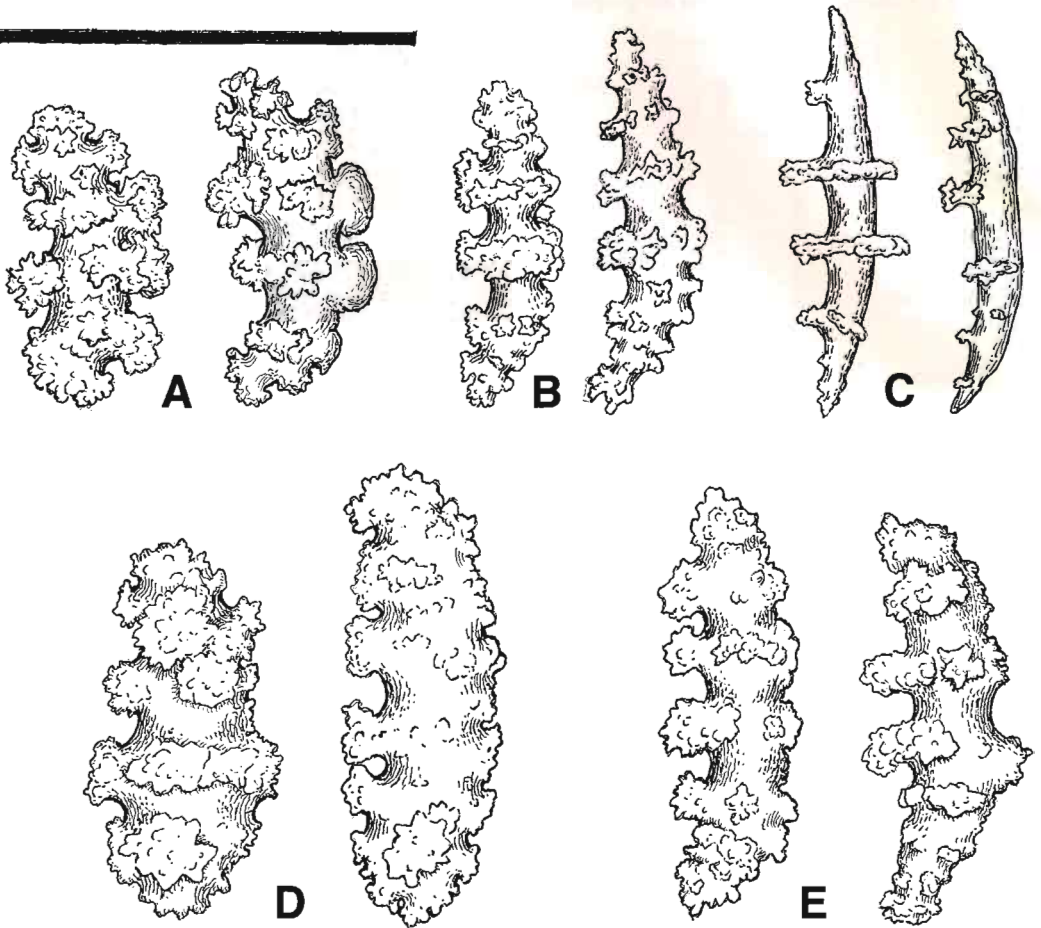


FIGURE 12. Comparison of C-shaped sclerites in the genera *Leptogorgia*, *Pseudopterogorgia*, and *Pterogorgia*. A. Curved spindles in *Leptogorgia capensis* from South Africa (NHM 1901. 7. 6. 3). B. Scaphoids in *Pseudopterogorgia* sp. from Darwin, Australia (MTM C.11 117). C. Scaphoid with transverse crests and smooth scaphoid in *Pseudopterogorgia acerosa* from Florida, U. S. A. (CAS 097785). D. Scaphoids in *Pterogorgia citrina* from Florida (CAS 098024). E. Scaphoids in *Pterogorgia anceps* from Florida (CAS 097934).

tween some species of *Leptogorgia*, such as *L. capensis* and some specimens of Indo-Pacific *Pseudopterogorgia*, are very subtle (Fig. 12A vs. 12B). Bayer, Grasshoff, and Verseveldt (1983:21) define a scaphoid as a "spindle more or less distinctly curved in the form of a 'C' and with the warts of the convex side suppressed or modified." In *L. capensis*, the warts on the convex side of curved spindles are modified but not suppressed. In a specimen of *Pseudopterogorgia* sp. from Darwin, Australia, the warts on the convex side of curved sclerites are only slightly modified and reduced. As a matter of compari-

son, the warts on the convex side of curved sclerites (scaphoids) in the West Indian species *P. acerosa* are highly reduced and/or modified (Fig. 12C). In many species of *Leptogorgia*, such as *L. bayeri* and *L. lutkeni*, the warts on the convex side of curved spindles are neither markedly reduced or modified (Fig. 2B and 10A).

Examination of Indo-Pacific loan material from the Natural History Museum (London) and the Northern Territory Museum (Darwin), as well as the holdings of the California Academy of Sciences, has revealed that the genus *Pseudopterogorgia* has a widespread distribution in the

Indian Ocean with collecting sites in Mozambique, India, Sri Lanka, and Myanmar, as well as Madagascar (Tixier-Durivault 1972:47) (Fig. 5). The known distribution of *Leptogorgia*, on the other hand, includes the eastern Pacific (California to Chile) and western Atlantic (Carolinas to Brazil); and from the Iberian Peninsula and Mediterranean Sea extends down the west coast of Africa to Angola, and then in southern Africa from the Cape Peninsula to the vicinity of the Natal/Mozambique border (Fig. 5).

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