

A NEW SPECIES OF *CHRYSOGORGIA*
(OCTOCORALLIA: GORGONACEA) FROM NEW CALEDONIA,
WITH DESCRIPTIONS OF SOME OTHER SPECIES
FROM THE WESTERN PACIFIC

Frederick M. Bayer and Jeffrey Stefani

Abstract.—A new species of the gorgonacean genus *Chrysogorgia* from New Caledonia is described and illustrated, along with five additional new species from the Philippines, Celebes, Paumotus and Hawaii. *Chrysogorgia stellata* Nutting from Hawaii is redescribed and illustrated and tentatively recorded from the Molucca Passage on the basis of fragmentary material. A key to the species of the group "Squamosae aberrantes" of *Chrysogorgia* is presented.

Among the many novelties included among the octocorals collected in New Caledonian waters by M. Georges Bargibant is a species of *Chrysogorgia* unlike any heretofore described. It is similar in many respects to another species, also new, trawled in the Philippine Islands by the U.S. Fish Commission steamer *Albatross* during the Philippine Cruise of 1906-1910. Investigation of these specimens has necessitated the review of other Pacific chrysogorgiid material in the collections of NMNH and reemphasizes the inadequacy of present knowledge about this distinctive family of Gorgonacea.

The admirable treatment of the Chrysogorgiidae of the Siboga-Expedition by J. Versluys (1902) has yet to be surpassed in its careful detail of observation and critical evaluation of taxonomic characters. Unfortunately, the Siboga collection of these corals was limited, and even though Versluys reexamined the *Challenger* material, the only other significant collection obtained up to that time, his results suffered from an insufficiency of basic data. This insufficiency still exists. Additional material has, of course, been obtained subsequently, but specimens more often than not are unique and localities widely scattered. As a result there still is little useful information about

individual and geographical variation and, consequently, about the significance and reliability of the morphological characters now used in classification.

Family Chrysogorgiidae

Diagnosis.—Gorgonacea with scleroproteinous axis containing non-spicular crystalline calcification, core not hollow and cross-chambered, concentric layers not conspicuously undulate. Polyps contractile but not retractile into common coenenchyme, forming prominent verrucae not set in pairs or whorls. Sclerites predominantly flat scales or plates, usually smooth or nearly so, in many cases accompanied by rods or spindles with more or less conspicuous thorny sculpture. Scales viewed under crossed nicols often show concentric bands of interference colors but never a cross-shaped extinction figure.

Remarks.—Most members are easily recognized as belonging to this family by either the scalelike sclerites that show no trace of a cruciform extinction figure under crossed Nicols, or the angular, dichotomous manner of branching, or by both. In most species the axis has a noticeable to brilliant metallic luster. Therefore it is difficult to understand why so perceptive an investigator as Versluys

placed the ellisellid genus *Riisea* in this family, as its sclerites are so similar to those of *Ellisella*, its axis lacks metallic gloss and is structurally like that of other ellisellids. Conversely, Nutting (1910) assigned his new genus *Isidoidea* to the Gorgonellidae (i.e., Ellisellidae) in spite of its chrysogorgiid scales, finding instead a resemblance to isidid sclerites.

So far, no species of the Chrysogorgiidae has been taken in the lagoon or on the reefs of New Caledonia, even though the genus *Stephanogorgia* is known from the Philippines and the Palau Islands (Bayer 1974, Bayer & Muzik 1976). The delicate, feathery growth form of the colonies resembles that of certain hydroids so closely that collectors may not have recognized them as gorgonians.

Key to the Genera of
Chrysogorgiidae

- 1(7). Colonies unbranched, flagelliform, in some cases spirally twisted.
- 2(3). Polyps arranged uniserially along the stem
. *Radicipes* Stearns, 1883
- 3(6). Polyps arranged biserially along the stem.
- 4(5). Distal sclerites of polyps differentiated to form an operculum consisting of 8 triangular scales; abaxial body scales transverse
. *Chalcogorgia* Bayer, 1949
- 5(4). Distal sclerites not in the form of an operculum consisting of 8 triangular scales; abaxial body scales longitudinal
. *Distichogorgia* Bayer, 1979
- 6(2). Polyps arranged multiserially along the stem, crowded but leaving a longitudinal tract free of polyps
. *Simpsonella* Stiasny, 1940
- 7(1). Colonies repeatedly branched.

- 8(13). Terminal branches long, slender, whiplike, originating directly from the main stem or after a few bifurcations of primary branches.
- 9(10). Terminal branches simple, arising around the outside of the spirally coiled main stem; colonies not flabellate
. *Iridogorgia* Verrill, 1883
- 10(9). Terminal branches arising in one plane, colonies more or less distinctly lyrate.
- 11(12). Terminal branches flexible, slender. Sclerites exclusively in the form of small scales, or completely absent
. *Trichogorgia* Hickson, 1905
- 12(11). Terminal branches stiff, rather stout and brittle. Sclerites include unilaterally developed spheroids and thick plates with closely set, stout, rounded projections on the outer surface
. *Pleurogorgia* Versluys, 1902
- 13(8). Terminal branches short, the last of several subdivisions of the primary branches.
- 14(17). Branching in one plane.
- 15(16). Branching profuse, pinnate, producing flabellate, more or less plumose colonies; polyps small, coenenchyme extremely thin, sclerites small, up to 0.15 mm in length
. *Stephanogorgia* Bayer & Muzik, 1976
- 16(15). Branching sparse, lateral or openly pinnate, producing loose, open colonies; polyps large, coenenchyme thick, sclerites large, up to 0.45 mm in length
. *Isidoidea* Nutting, 1910
- 17(14). Branching not in one plane.
- 18(19). Branches subdividing irregularly, originating on all sides of the main stem but not in a regular spiral around it, forming

bottle-brush shaped colonies. Axis weakly calcified, without metallic luster
Xenogorgia Bayer & Muzik, 1976

19(20). Colonies sympodial, branches subdividing dichotomously, originating in a regular spiral around the main axis, or forming 2 parallel fans at the top of a short trunk. Axis strongly calcified, with brilliant metallic luster
 . . . *Chrysogorgia* Duchassaing & Michelotti, 1864

20(19). Colonies monopodial, dichotomously subdivided branches arising from the top of a tall, upright main stem. Axis strongly calcified, with metallic luster most conspicuous on the secondary branches, the main trunk glossy but almost black
 . . . *Metallogorgia* Versluys, 1902

Chrysogorgia

Duchassaing & Michelotti, 1864

Chrysogorgia Duchassaing & Michelotti, 1864:13.—Duchassaing, 1870:17.—Gray, 1870:45.—Verrill, 1883:21.—Studer [& Wright], 1887:41.—Wright & Studer, 1889:23.—Versluys, 1902:17.—Kükenthal, 1909:40.—Kinoshita, 1913:2.—Kükenthal, 1919:505; 1924:388.—Thomson, 1927:21.—Deichmann, 1936:227.—Bayer, 1956:F216; 1981:940 (in key only).
Dasygorgia Verrill, 1883:21.—Studer [& Wright], 1887:41.—Wright & Studer, 1889:23.

Diagnosis.—Sympodial chrysogorgiids with branches repeatedly subdividing dichotomously, either arising in a regular spiral around the main stem or forming 2 parallel uniplanar fans from a short main trunk. Axis with brilliant metallic luster.

Remarks.—In his masterful treatment of the Chrysogorgiidae of the Siboga Expedi-

tion, Versluys (1902) divided the genus *Chrysogorgia* into three groups called “Spiculosae,” “Squamosae aberrantes,” and “Squamosae typicae” on the basis of differences in spiculation.

All of the species under consideration here can be assigned to the group “Squamosae aberrantes,” in which the polyps have spindles, rods, or thick, irregular sclerites longitudinally placed in the back of the tentacles, in addition to the usual chrysogorgiid scales in the body of the polyps and in the coenenchyme.

Key to species of Squamosae aberrantes

- 1(9). Sclerites in proximal part of tentacles are rods, more or less pointed and more or less bent (i.e., “typical spicules” in the sense of Versluys), with coarse, granular sculpture but not conspicuously irregular.
- 2(5). Polyps 1.8–3.0 mm tall.
- 3(4). Polyps 1.8–2.0 mm tall; body scales up to 0.43 mm, coenenchymal scales to 0.13 mm; colonial form and branching sequence unknown *intermedia*
- 4(3). Polyps 2–3 mm tall; body scales may exceed 1 mm in length, coenenchymal scales to 0.5 mm.; colony flabellate *stellata*
- 5(2). Polyps at most 1.5 mm tall.
- 6(7). Branching sequence 1/4R; polyps up to 1.5 mm tall; body scales up to 0.5 mm, coenenchymal scales to 0.45 mm *calypso* n. sp.
- 7(8). Branching sequence 1/6R; polyps up to 1.2 mm tall but mostly 1 mm or less; body scales up to 0.2 mm, coenenchymals to 0.08 mm *bracteata* n. sp.
- 8(6). Branching sequence 1/7R; polyps up to 1.5 mm tall; body scales up to 0.3 mm, coenen-

- chymal scales to 0.12 mm . . .
 *admete* n. sp.
- 9(1). Sclerites in proximal part of tentacles are irregularly shaped, often with one end marginally lobed.
- 10(13). Colonies with a distinct and persistent main axis that gives rise in regular spiral sequence to dichotomously subdivided lateral branches.
- 11(12). Polyps 1.75 mm tall; coenenchyme with nematozooids . . .
 *expansa*
- 12(11). Polyps up to 2.5 mm tall; coenenchyme without nematozooids *octagonos*
- 13(10). Colonies in the form of two to several more or less planar fans arising from the upper end of a short main trunk, without a distinct axis that persists throughout the height of the colony.
- 14(15). Base of tentacles covered by coarse, irregular sclerites with dentate projections at one or both ends; no naked area *curvata*
- 15(14). Base of tentacles with a naked area not completely covered by sclerites.
- 16(17). Proximal sclerites of tentacles are coarse, blunt roads up to 0.3 mm long, often with lobed ends; body scales terete, tapering smoothly toward pointed ends; coenenchymal scales with conspicuously lobed margins *chryseis* n. sp.
- 17(16). Proximal sclerites of tentacles are flat scales with one end pointed and the other broad, with more or less distinct lobes.
- 18(19). Polyps 2.75 mm tall, with distinct points beneath the tentacles; margins of body scales with low, broad lobes; coenenchymal scales are slipper-

- shaped up to about 0.33 mm long *scintillans* n. sp.
- 19(18). Polyps 1.75–2 mm tall, with only low, inconspicuous projections beneath the tentacles; margins of body scales often with narrow, prominent lobes; coenenchyme with narrow, tapered scales often with prominent marginal lobes
 *electra* n. sp.

Chrysogorgia admete, new species
 Figs. 1, 2

Material examined. — New Caledonia: 22°49'S, 167°12'E, 390 m. Dredge no. 1, 13 Apr 1978; HGP-14. Two specimens, one dry (paratype, USNM 80433), one in alcohol (holotype, MNHN OCT.A.1988.2 Paris).

Diagnosis. — *Chrysogorgia* (group *Squamosae aberrantes*) with counterclockwise spiral branching in 1/7 sequence.

Description. — The colony is 10 cm high, 6.5 cm wide, arising from a calcareous holdfast that had been attached to solid substrate. The stout main stem is slightly curved, ascending in a smooth counterclockwise spiral giving off from its outside dichotomously subdivided branches. The branches of the first 5 turns of the main stem are broken off leaving only short stumps, so the first complete branch occurs 2.5 cm above the holdfast. The branching sequence is 1/7, so the main branches are aligned in 7 regular longitudinal rows. The main stem ascends about 5 mm with each turn of its spiral, i.e., the distance from one branch to the one aligned vertically above it (the 8th). The branches arise at such short intervals that their bases are nearly in contact; the stem internodes thus are extremely short. The branches arise at decreasing angles from the base upward, the lowest at about 60° from the vertical, those at mid-height at about 45°, and the uppermost even less. They subdivide dichotomously at angles from about 25° to 45°. The first bifurcation occurs

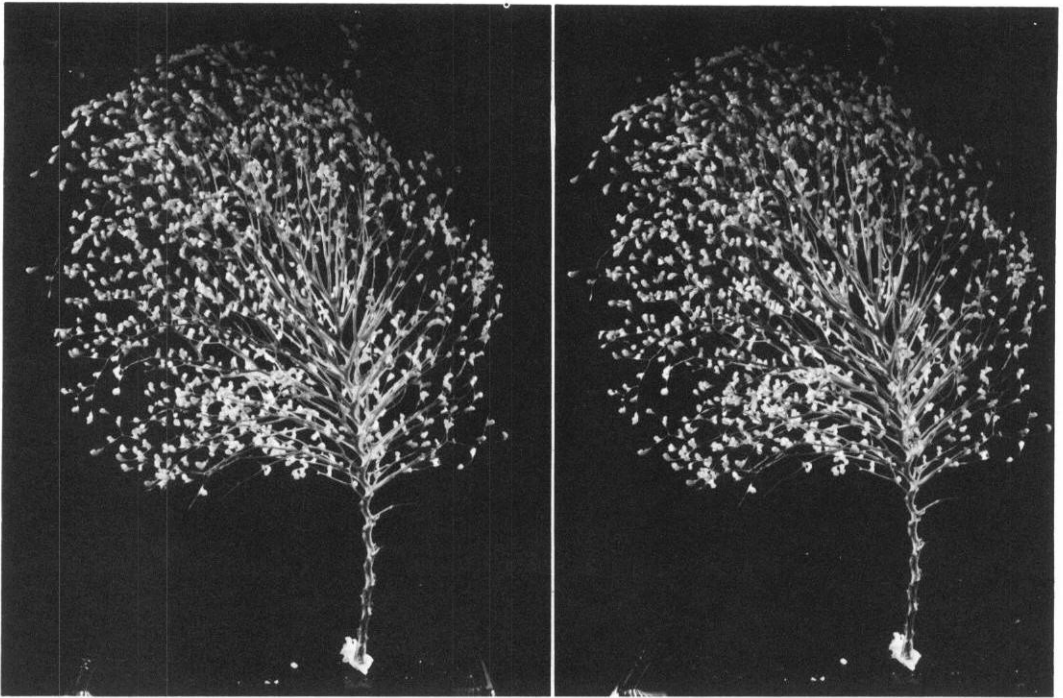


Fig. 1. *Chrysogorgia admete*, holotype colony; height 10 cm. Stereoscopic pair.

at about 5 mm from the main stem, the second from as little as 5 or 6 mm to as much as 20 mm, usually more or less unequal, and the third at 6–10 mm; some of the uppermost branches may have a fourth and sometimes a fifth bifurcation, also at 6–10 mm, sometimes unilaterally. The internodes commonly are 5 mm long, but on the more distal branches the second internode may be as much as 15 mm long. Polyps are situated 1 to 5 per internode, commonly 2, especially on the more distal internodes; only infrequently is a polyp located at a node. In most cases the first internode of the branches is devoid of polyps, as is often the second.

The polyps (Fig. 2a) are about 1.5 mm tall except the distalmost ones on each branchlet, which tend to be somewhat shorter. They are of the general type illustrated by Versluys (1902:64, fig. 98) for *C. expansa* and by Kinoshita (1913:26, fig. 24) for *C. versluysi*, having at the base of each

tentacle an area free of sclerites that permits the unimpeded outfolding of the tentacles when extended. The body is at most about 1 mm high and often is less, especially in the apical polyps, and about 0.8 mm wide toward the base but only 0.6 mm at the conspicuous constriction below the tentacular crown. The body wall is filled with a dense layer of thin scales with finely serrate edges, mostly of rounded or oval outline but not uncommonly irregularly lobate, the largest about 0.3 mm in greatest diameter (Fig. 2b). Above the neck-like constriction the body wall flares outward, forming a projecting shelf beneath the tentacle bases. The backs of the tentacles are filled with longitudinally placed irregular rods with granular sculpture, more or less curved and rather flattened, up to 0.3 mm long (Fig. 2c); those approaching and surrounding the naked space of the tentacle bases are somewhat thinner. The thin coenenchyme is filled with scales similar to those of the polyps but at

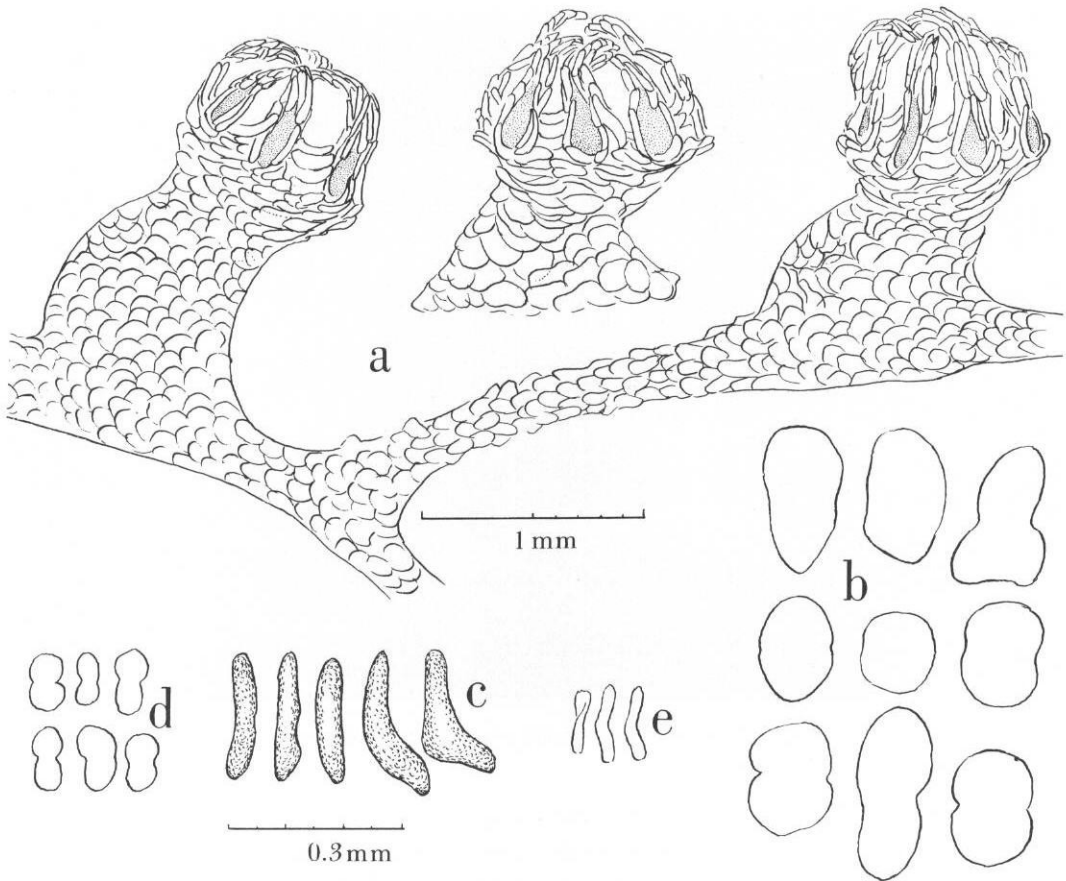


Fig. 2. *Chrysogorgia admete*: a, Polyps; b, Body scales; c, Sclerites from tentacle base; d, Coenenchymal scales; e, Pinnular sclerites. 0.3 mm scale applies to all sclerites.

most only 0.12 mm long; blunt-conical projections resembling nematozooids are widely scattered over its surface but true nematozooids are not present. The conical projections are formed by the protruding edge of some of the larger coenenchymal scales, which are longer than the diameter of the axis but not curved to conform to its shape.

The axis is heavily calcified, brown in the main stem, becoming lighter on the branches until it is pale straw-color in the distal branchlets, with only weak metallic reflections. The holdfast is a white calcareous expansion attached to solid substrate.

Etymology.—Admete, one of the oceanids, descendant of Oceanus.

Discussion.—As this species has only thin

scale-like sclerites in the body of the polyps, and rod-like forms longitudinally arranged in the backs of the tentacles, it fits subgroup B₂ of the group “Squamosae aberrantes” proposed by Versluys (1902:61). Several species have similar polyps with the upper part of the body flared to form a ring beneath the bases of the tentacles, and with an oval space without sclerites at the base of each tentacle. These are *C. expansa* Versluys, *octagonos* Versluys, *versluysi* Kinoshita, *stellata* Nutting, and *scintillans* (= *curvata* Nutting not Versluys).

This species differs in its counterclockwise 1/7 branching sequence from all species of *Chrysogorgia* that have been adequately described up to the present time. It differs

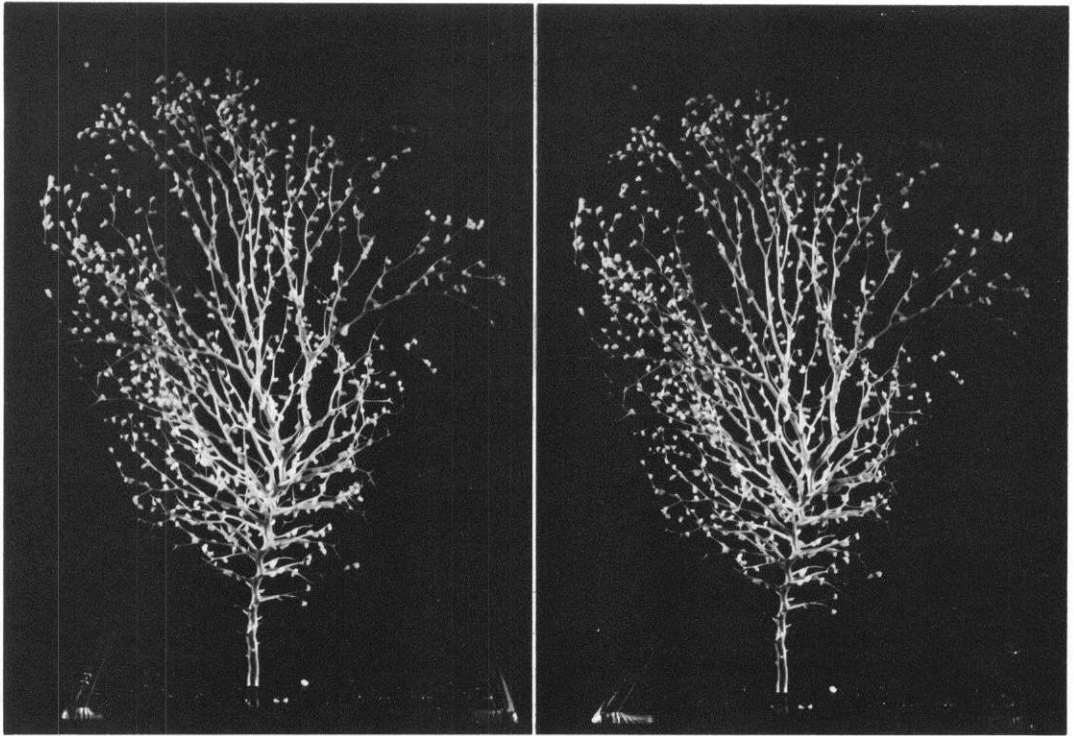


Fig. 3. *Chrysogorgia bracteata*, holotype colony; height 10 cm. Stereoscopic pair.

from species having similar polyps but unknown branching sequence in its much smaller polyps (*admete*: 1.5 mm tall; *versluysi*: 2–4 mm tall; *stellata*: 2–3 mm tall; *scintillans*: 2.75 mm tall). *C. versluysi* differs further in having elongate, narrow rather than broadly oval body scales, and prominent points formed by converging sclerites beneath each tentacle; *C. stellata* has even narrower acute body scales and more prominent points beneath the tentacles; *C. scintillans* has larger, often irregular body scales as much as 0.5 mm in greatest dimension.

Chrysogorgia bracteata, new species

Figs. 3, 4

Material.—Philippine Islands, Verde Island Passage: 13°34'37"N, 121°07'30"E (Malabrigo Light N 81°E, 8 miles), 180 fath., USFC steamer *Albatross*, sta. D-5367, 22 Feb 1909. Four incomplete colonies, in al-

cohol. Holotype, USNM 80432; paratypes, USNM 49973.

Diagnosis.—*Chrysogorgia* (group *Squamosae aberrantes*) with counterclockwise spiral branching in 1/6 sequence.

Description.—The colony is 10 cm high, 7.5 cm wide, the main stem broken off just above the holdfast. The stout main stem ascends in a smooth counterclockwise spiral giving off from its outside dichotomously subdivided branches. The branches of the first 3 turns of the main stem are broken off leaving only short stumps, so the first complete branch occurs 14 mm above the holdfast. The branching sequence is 1/6, so the branches are aligned in 6 longitudinal rows. The main stem ascends about 4.5–5 mm with each turn of its spiral, i.e., the distance from one branch to the one aligned vertically above it (the 7th). The branches arise at short intervals, the stem internodes being about 1 mm long. The branches arise at

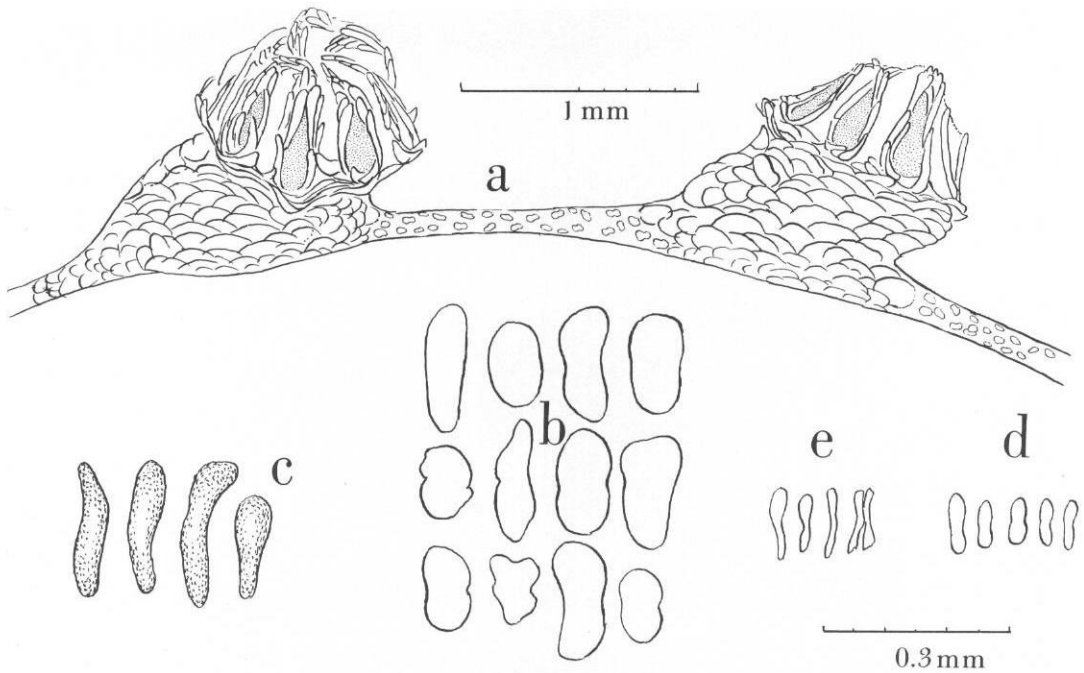


Fig. 4. *Chrysogorgia bracteata*: a, Polyps; b, Body scales; c, Sclerites from tentacle base; d, Coenenchymal scales; e, Pinnular sclerites. 0.3 mm scale applies to all sclerites.

gradually decreasing angles from the base upward, the lowest at about 75° from the vertical, those of the eighth turn at about 65° . The dichotomous bifurcations diverge at an angle of about 50° . The branch internodes are mostly about 5 mm long, the bifurcations usually about equal; the lower branches have 3 bifurcations but the uppermost branches have as many as 9, spreading almost in a single plane. Polyps are situated 1 or 2 per internode, commonly 2, but the terminal twigs may have 3 or 4.

The polyps are at most about 1.2 mm tall, generally only 1 mm or even less, the body up to the tentacle bases 0.5–0.9 mm; they are about 0.7 mm wide basally but only 0.4 mm at the constriction below the tentacles. They are similar in form to those of *C. admete*, the body tapering upward to a constriction just below the tentacles. Above the neck-like constriction the body wall flares outward, forming a projecting shelf beneath the tentacle bases. The body wall is filled with a dense layer of thin scales with the

edges extremely finely serrate, most oval in outline with median constriction, occasionally irregularly lobate, the largest about 0.2 mm in greatest dimension. The backs of the tentacles are filled with longitudinally placed irregular rods with granular sculpture, rather flattened and up to 0.24 mm long, those approaching and surrounding the naked space of the tentacle bases somewhat thinner and curved. The pinnules contain narrow, thin scales about 0.1 mm long, slightly bent in the middle and with the twist characteristic of pinnular scales. The thin coenenchyme contains widely scattered slipper-shaped scales up to 0.08 mm in length.

The axis is heavily calcified, brown in the main stem, becoming lighter on the branches until it is pale straw-color in the distal branchlets, with only weak metallic reflections.

Etymology.—Latin *bracteata*, gilt or glittering like gold, in allusion to the metallic luster of the axis.

Comparisons.—*Chrysogorgia bracteata*

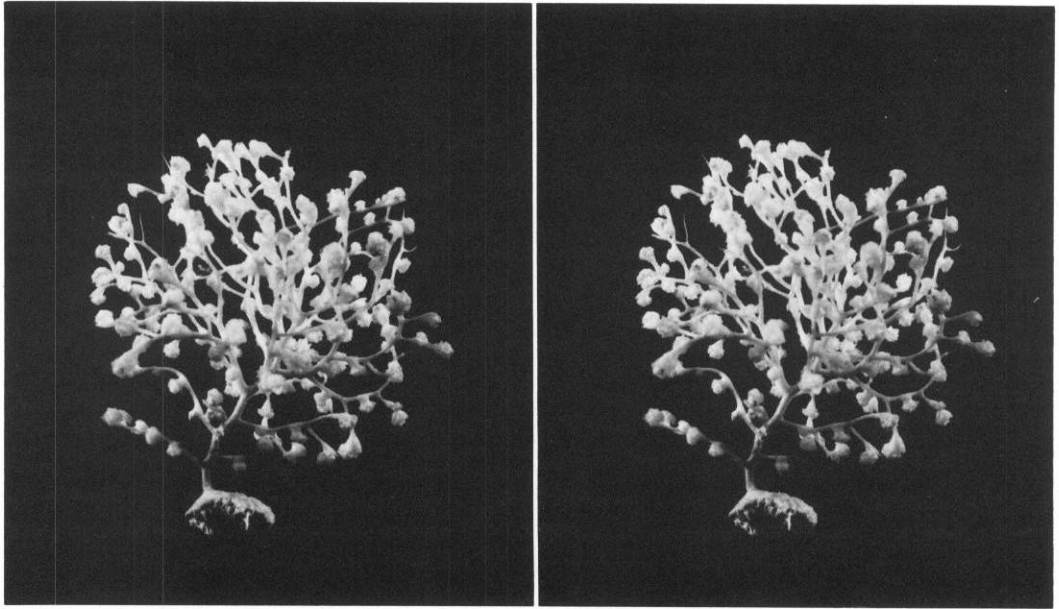


Fig. 5. *Chrysogorgia calypso*, holotype colony; height 3 cm. Stereoscopic pair.

closely resembles *Chrysogorgia admete*. Although it is possible that the two are subspecies, or even merely geographical variants, of a single species, the differences between them warrant recognition at species level until additional material is available to clarify their status. As branching sequence (“Aststand”) has traditionally been treated as a character of major importance, the difference between a counterclockwise 1/6 and 1/7 is here considered significant; this coupled with the smaller size of the polyps and the smaller and differently shaped sclerites justifies maintaining the Philippine material as distinct from *C. admete*.

Chrysogorgia calypso, new species

Figs. 5, 6

Material. —Celebes: off Kapoposang Light, 4°43'22"S, 118°53'18"E, 400 fath., USFC steamer *Albatross* sta. 5564, 28 Dec 1909. One colony with holdfast, USNM 50019 (holotype).

Diagnosis. —*Chrysogorgia* (group *Squamosae aberrantes*) with counterclockwise

spiral branching in 1/4 sequence; polyps 1.5 mm tall, tentacle bases with bent, granulate rods.

Description. —The holotype is a colony 3 cm tall, complete with holdfast attached to a small pebble. The main stem is distinctly developed and gives off dichotomously subdivided lateral branches in a counterclockwise 1/4 spiral at intervals of about 1 mm. The internodes of the branches mostly are about 2 mm long save the terminal ones, which are as long as 7 mm; all the internodes have a single polyp except the distalmost, which may have 2 or even 3. No nematozooids could be found on stem or branches. The axis is calcified, smooth, basally bronze colored gradually paling distad to light golden yellow with metallic iridescence.

The polyps are up to 1.5 mm tall, the terminal ones usually the largest, distally expanded around the tentacles, below each of which a prominent point is formed by converging body scales. Above the projecting points an oval area at the base of each tentacle is without sclerites; coarsely granulated rods up to 0.4 mm long, more or less curved and sharper at one end than the oth-

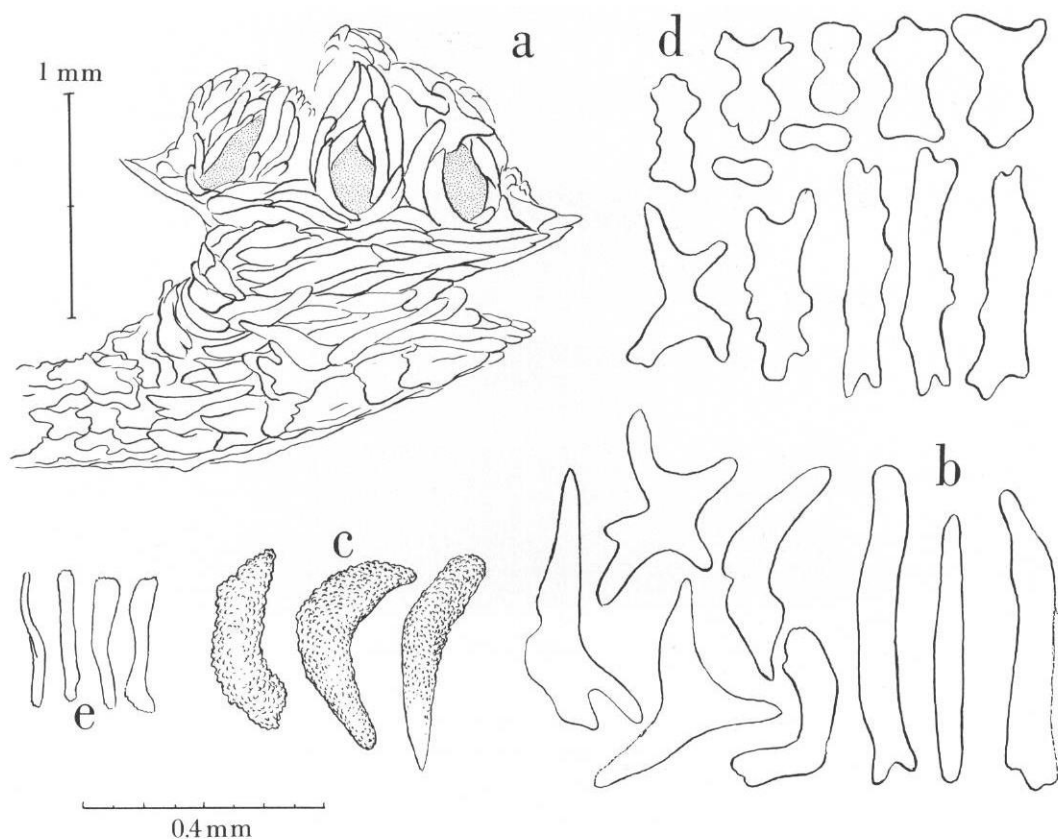


Fig. 6. *Chrysorgia calypso*: a, Polyp; b, Body scales; c, Sclerites from tentacle base; d, Coenenchymal scales; e, Pinnular sclerites. 0.4 mm scale applies to all sclerites.

er border the naked space and extend longitudinally along the backs of the tentacles. The pinnules are supported by narrow, concave scales reaching 0.23 mm in length. Below the 8 projections the body sclerites are transversely arranged, narrow, elongate scales up to 0.5 mm in length. Proximad, the body scales become irregularly lobed and merge with the coenenchymal scales, many of which are long, narrow, and marginally somewhat lobed, reaching a length of 0.45 mm, interspersed with numerous smaller, lobed scales with a constricted waist.

Etymology.—Greek Καλυψώ, daughter of Oceanus and Tethys.

Comparisons.—Among Squamosae aberrantes, two other species have counterclockwise branching in 1/4 sequence: *C. expansa* (Wright & Studer) and *C. octagonos* Ver-

sluys. *C. calypso* differs from *C. expansa* (1) by lacking nematozooids, (2) by having bent, granulate rods in the tentacle bases instead of elongate flattened forms, and (3) by having narrow flat scales and irregularly lobed forms in the coenenchyme instead of oval and slipper-shaped scales. The polyps of *C. calypso* are much smaller (1.5 mm) than those of *C. octagonos* (2.5 mm), the sclerites of the tentacle bases are typical spindles and rods rather than coarse, irregular forms, and its coenenchymal sclerites are narrow, flat scales up to 0.45 mm long mixed with smaller lobed scales, rather than slipper-shaped scales up to 0.25 mm long.

Among the species with biplanar colonies, *C. calypso* is closer to *C. chryseis* than to any other, but its polyps have a conspicuous naked area at the base of each tentacle,

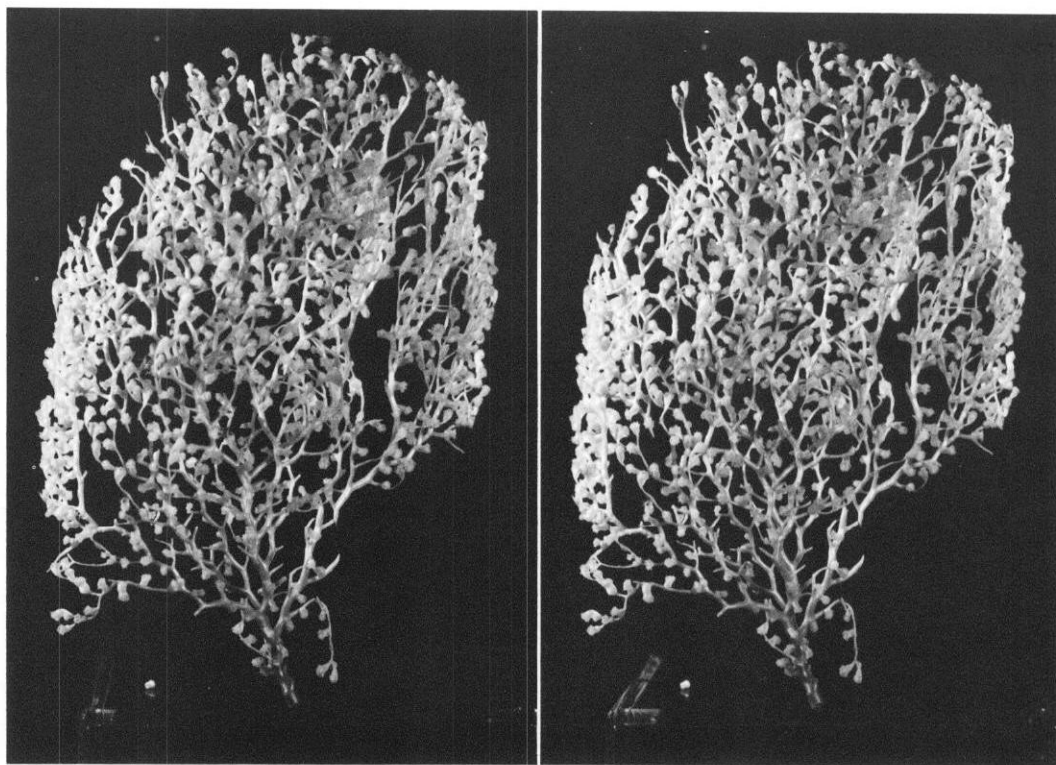


Fig. 7. *Chrysogorgia chryseis*, holotype colony; height 10 cm. Stereoscopic pair.

its body scales are much smaller, and the sclerites of the tentacle bases are more regular spindles and rods.

Remarks.—Even though the spiral deployment of the lateral branches in a counterclockwise 1/4 sequence around the main axis is distinct, the small size of this specimen leaves a question whether with maturity the main axis would persist, as is the case in *C. octagonos*, or would yield to planar development of two of the lateral branches, resulting in a biplanar or multiplanar colony. Nevertheless, it differs sufficiently from all species now on record to be considered distinct.

Chrysogorgia chryseis, new species

Figs. 7, 8

Material.—Ceram Sea: 1°53'30"S, 127°39'00"E (Gomomo Island (E.) N 14°W, 2.5 miles), 400 fath., USFC steamer *Alba-*

tross sta. D-5635, 3 Dec 1909. One colony lacking holdfast. Holotype, USNM 49967.

Diagnosis.—*Chrysogorgia* (group *Squamosae aberrantes*) with planar branching producing a biflabellate colony; polyps with distinct projecting points beneath each tentacle, bases of tentacles with small naked area followed by coarse blunt rods to 0.3 mm in length; body scales narrow, terete, with weak marginal lobes or none; no nematozooids.

Description.—The holotype is a colony 10 cm tall, in the form of 2 parallel uniplanar fans arising from a short trunk broken off from its holdfast. The branching is regularly dichotomous, with internodes mostly about 5 mm long, even the terminal ones. Anastomoses occur irregularly where the course of neighboring branches coincided during the course of growth. Nematozooids are not discernible even on the stem and large branches, and are therefore presumed to be

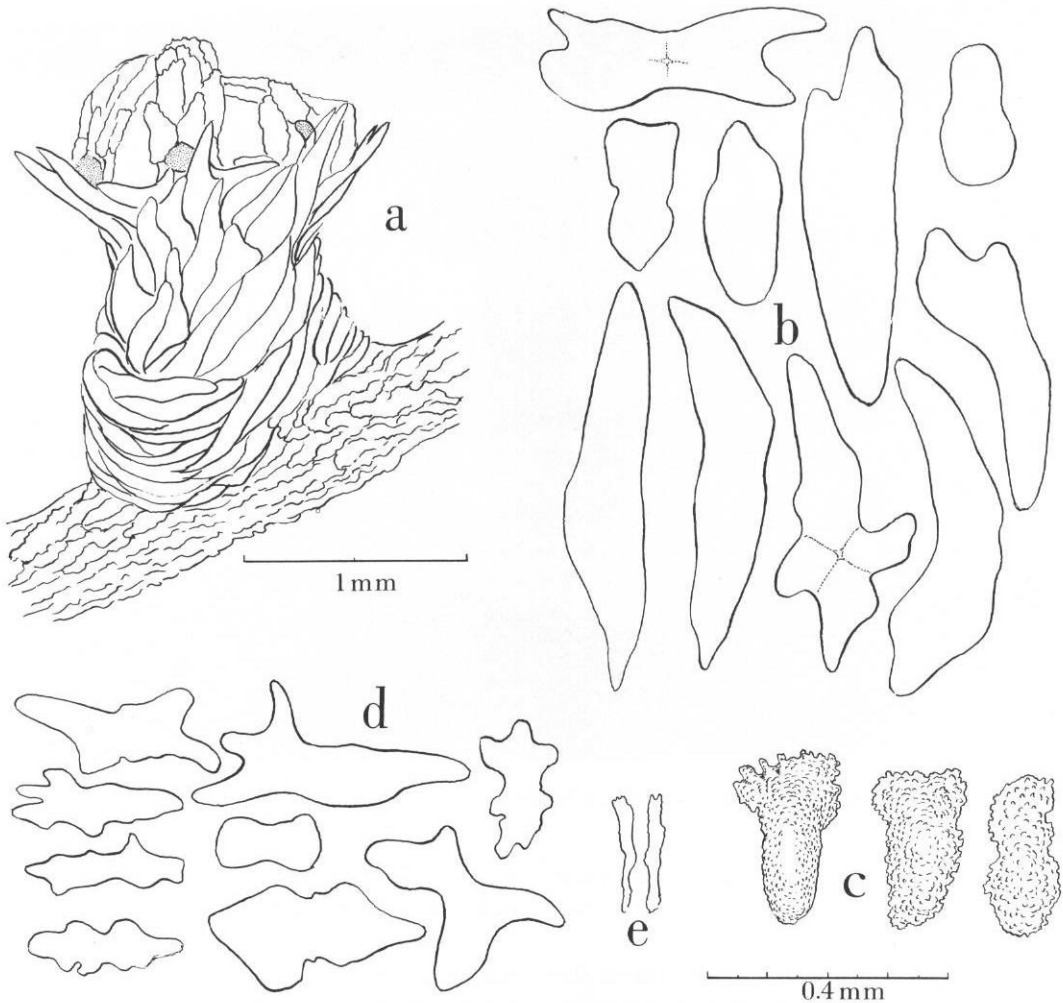


Fig. 8. *Chrysogorgia chryseis*: a, Polyp; b, Body scales; c, Sclerites from tentacle base; d, Coenenchymal scales; e, Pinnular sclerites. 0.4 mm scale applies to all sclerites.

absent. The axis is strongly calcified and smooth; the short main trunk is bronze in color, fading distad to pale gold with bright metallic luster. Usually each internode bears a single polyp except the terminal ones, which commonly have 2.

The polyps are directed generally upward and outward, so they appear uniserial on any given length of axis. They are up to 2 mm tall, with 8 projecting points below the base of the tentacles. The body of the polyps is covered by a layer of overlapping, obliquely or transversely placed, elongate,

narrow scales that reach a length of about 0.7 mm, tapered to a blunt point at each end and with at most only weak marginal lobes. Numerous smaller, oval scales with a median waist lie mostly beneath the large scales, forming with them a multiple layer of sclerites. The distalmost large body scales converge to form the 8 projecting points beneath the tentacles. The tentacles have an inconspicuous naked area at the base, above which they are armed with thick, blunt, coarsely granulate rods up to 0.3 mm long, many of which are broader and more or less

lobed at one end. Thin, narrow scales about 0.2 mm long extend into the pinnules, usually in pairs.

The coenenchyme contains many elongate, marginally lobed scales of diverse shape, up to about 0.5 mm in length.

Etymology.—*Chryseis*, one of the oceanids, descendant of *Oceanus*.

Discussion.—The growth form of *C. chryseis* corresponds closely with that of *C. stellata* Nutting, and probably also with those of *C. scintillans* and *electra*. Its polyps are smaller than those of *stellata* and the proximal sclerites of its tentacles are quite different; its body scales and proximal sclerites of its tentacles are different from those of *scintillans*; and its polyps have much stronger points below the tentacles than do those of *electra*.

Chrysogorgia electra, new species

Figs. 9, 10

Material.—Paumotu Islands: NW face Hao Atoll, E 2 miles, 812 fathoms; bottom temperature 37.6°F; USFC steamer *Albatross* sta. 3690, 29 Oct 1899. One incomplete colony in alcohol, USNM 49632 (holotype).

Diagnosis.—*Chrysogorgia* (group *Squamosae aberrantes*) with planar branching; polyps with weak projections beneath the tentacles, bases of tentacles with naked area followed by flat scales pointed at one end and broadly lobed at the other; some body scales narrow and terete, others wide, blunt and lobate.

Description.—Branching of the complete colony unknown. The specimen consists of one major branch that bifurcates twice in planes approximately at right angles and thereafter in one plane. This results in 2 approximately parallel planar branches dichotomously subdivided at angles of roughly 60°–65°, with always the same half of each bifurcation dominating so that each branch has a regularly curved principal axis from the convex side of which the subor-

dinate dichotomous branchings originate; branchlets whose courses intersect may anastomose. The complete colony therefore probably had a form similar to that of *C. stellata*. The internodes are commonly 8–10 mm long, but a few are as short as 6 mm and as long as 12 mm. Each internode has a single polyp except for the terminal ones, some of which have 2; in a few cases the polyp occurs so near the distal end of the internode that it approaches the point of bifurcation and may even be directly on the node.

The polyps are generally 1.75–2.0 mm tall and 1 mm in diameter at the narrowest point below the flared distal part of the body. The body of the polyps has a dense covering of obliquely or transversely placed, elongate smooth scales with finely serrate edges, many of them irregularly lobed, reaching a length of about 0.6 mm. Beneath each tentacle the uppermost body scales form an inconspicuous shelf-like projection, above which the tentacle bases are devoid of sclerites in a rather narrow oval tract. Proximally the backs of the tentacles contain flat scales pointed at one end and broad at the other, the wide end with several marginal lobes; distally the scales are shorter and squarish or polygonal. The pinnules contain slightly bent, narrow gutter-like scales often slightly expanded at the ends.

The coenenchyme contains elongate scales, many of them irregularly lobed, slightly exceeding 0.6 mm in length. Nematozooids are not present.

Etymology.—*Elektra*, one of the oceanids, descendant of *Oceanus*.

Discussion.—In growth form, this species resembles most closely *Chrysogorgia scintillans*, *C. stellata* Nutting, and *C. chryseis*. From the first of these it differs in the shape of the sclerites of the tentacle backs as well as those of the polyp body and coenenchyme. From *stellata* and *chryseis* it differs not only in the shape of the sclerites of the polyps but also in the minimal development of the subtentacular projections formed by

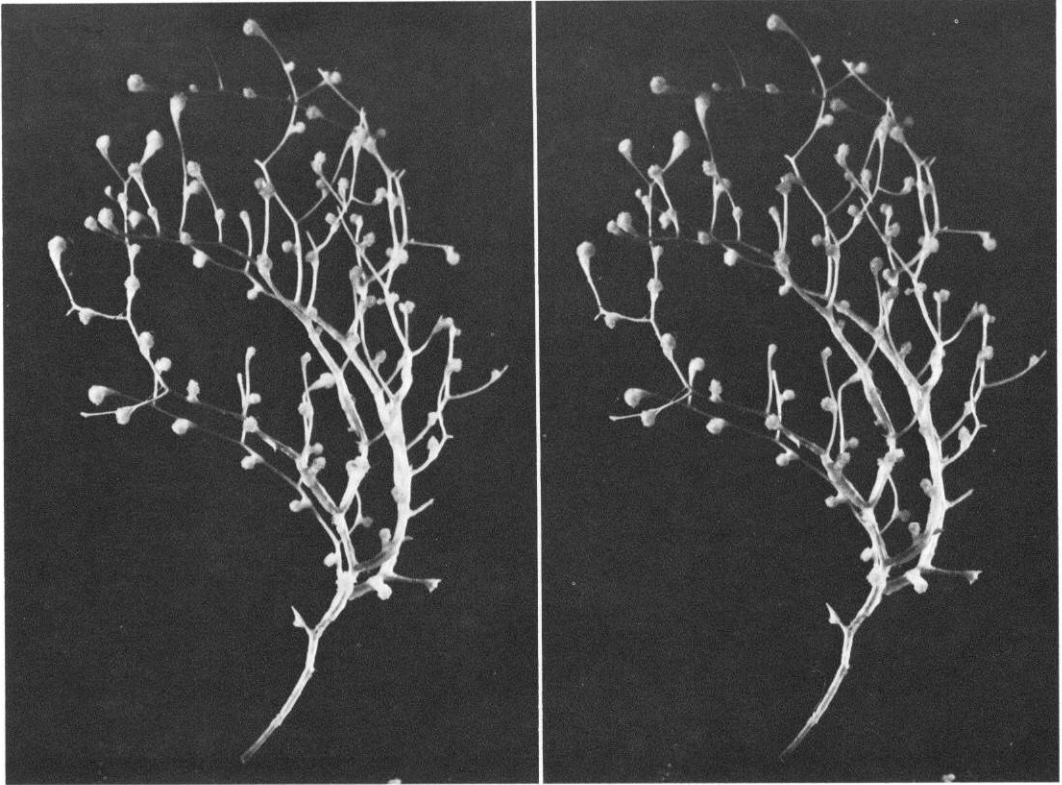


Fig. 9. *Chrysogorgia electra*, holotype branch; height 9 cm. Stereoscopic pair.

the body scales; from *chryseis* it differs further in the form of sclerites of the tentacle backs and the much larger sclerite free area at the base of each tentacle.

Like *C. scintillans* and *C. stellata*, 49632 is infested with parasitic copepods that form conspicuous blister-like tunnels along the coenenchyme of the larger branches.

Chrysogorgia scintillans,
new species
Figs. 11, 12

Chrysogorgia curvata.—Nutting, 1908:591,
pl. 45, fig. 9.

Not *Chrysogorgia curvata* Versluys, 1902:
67, figs. 104–108.

Material.—Hawaiian Islands, between
Kauai and Moku Manu (Bird Island): center
of Moku Manu S 12°W, 9.7 miles, 962–

1059 fath., bottom temp. 37°F; U.S.F.C.
steamer *Albatross* sta. 4153, 5 Aug 1902.
One specimen in alcohol, USNM 25371.

Diagnosis.—*Chrysogorgia* (group Squamose aberrantes) with planar branching; polyps up to 2.75 mm tall, body scales broadly lobed, thin, up to 0.6 mm long; proximal sclerites of tentacles flat, often wider and lobed at one end.

Description.—Branching pattern of the complete colony unknown; as the specimen consists of a major branch with a principal bifurcation each half of which dichotomously subdivides in an unequal manner producing 2 large, curved secondary branches that give rise to subordinate branchlets from their convex sides, forming 2 roughly parallel, almost uniplanar components, the intact colony was probably similar to that of *C. stellata*. It is probable

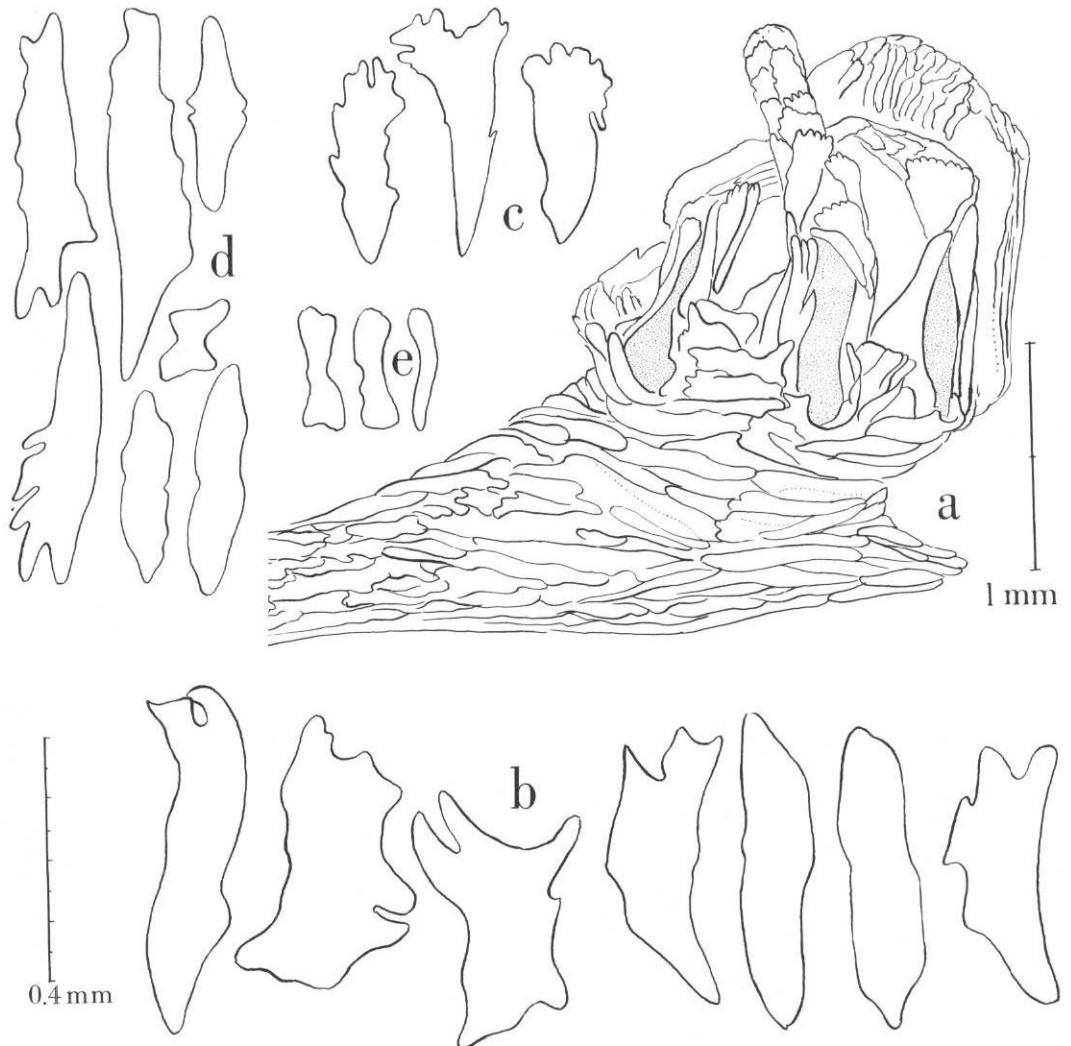


Fig. 10. *Chrysogorgia electra*: a, Polyp; b, Body scales; c, Sclerites from tentacle base; d, Coenenchymal scales; e, Pinnular sclerites. 0.4 mm scale applies to all sclerites.

that the spiral of the main axis is irregular, and the lateral branches are bifurcated practically in one plane. Lateral branches stout, the internodes about 7 mm long, each with one polyp except the last, which sometimes has 2.

The polyps are about 2.75 mm tall by 1.5 mm wide, distally flared, and have 8 blunt points below the tentacles. The body wall is filled with thin scales of various shapes: double discs, slipper shapes, elongate and

irregular forms up to 0.6 mm long, mostly arranged with their long axes transverse; the tentacle bases have elongate, twisted, flat sclerites, often lobed, arranged around an oval naked tract above each sub-tentacular point; tentacle backs with flat, bilobed or multilobed scales decreasing in size distally.

The coenenchyme is thin and has no nematozooids; it is filled with scales of predominantly slipper-shape smaller than those of the body, commonly 0.3–0.4 mm.

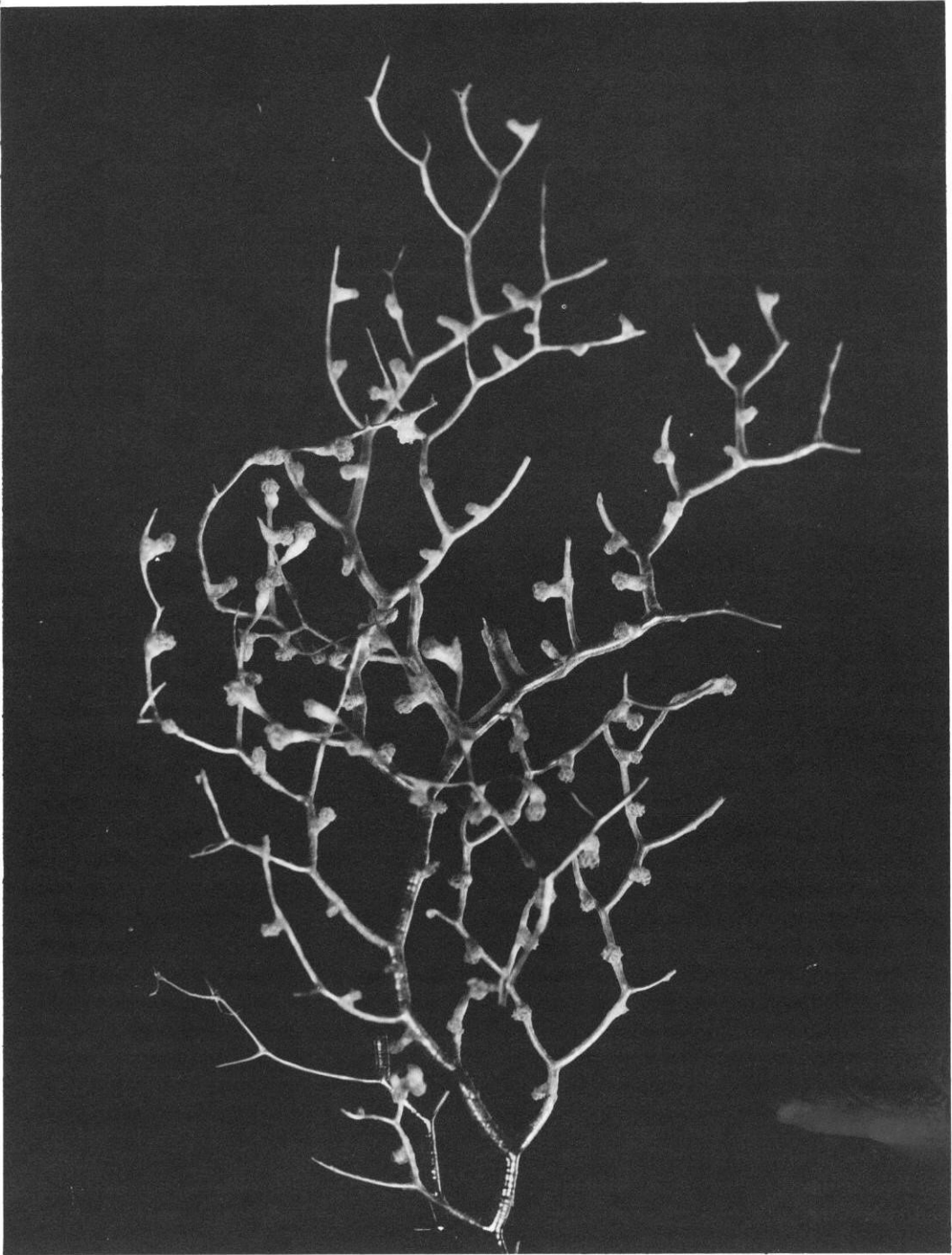


Fig. 11. *Chrysogorgia scintillans*, holotype branch; height 10 cm.

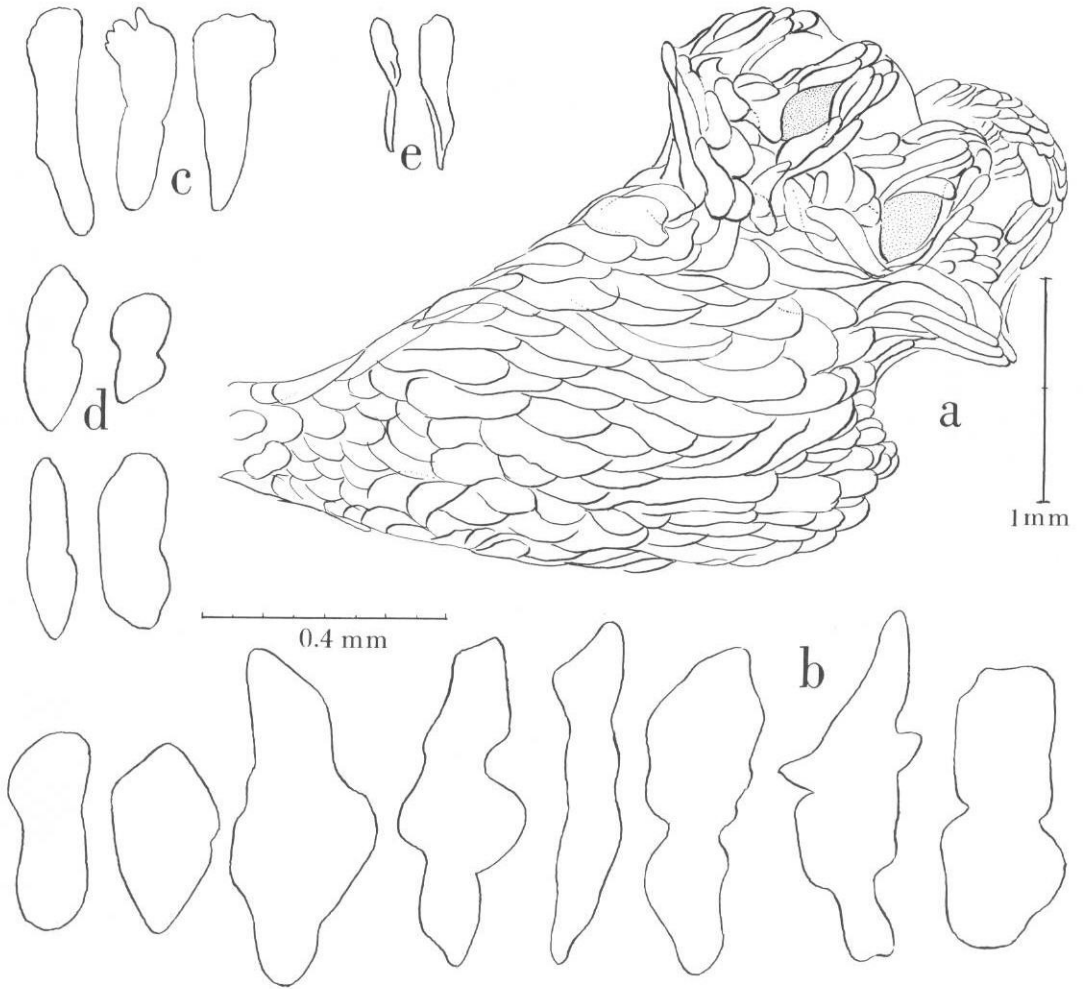


Fig. 12. *Chrysogorgia scintillans*: a, Polyp; b, Body scales; c, Sclerites from tentacle base; d, Coenenchymal scales; e, Pinnular sclerites. 0.4 mm scale applies to all sclerites.

Etymology. — From Latin *scintillo*, to sparkle or gleam, in allusion to the brilliant golden reflections of the axis.

Discussion. — The polyps of *Chrysogorgia scintillans* are similar to those of some other “Squamosae aberrantes” in having the body scales converging as a projecting process beneath each tentacle. Together with *C. stellata*, it forms a group distinct in manner of branching from *C. expansa*, *octagonos*, and *versluysi*. From *C. stellata* it is at once distinguishable by its thin, broadly lobed body

scales, shorter and blunter sub-tentacular processes, and flat, smooth sclerites of the tentacle bases.

Although originally identified by Nutting (1908:591) as *Chrysogorgia curvata* Ver-sluyts, this species has rather thin, smooth scales in the tentacle bases rather than the “dickere Scleriten, welche an den Enden zahnartige Höcker tragen” reported by Ver-sluyts (1902:68, fig. 108a) for *curvata*, as well as regular slipper-shaped scales in the coenenchyme rather than the irregularly lobed

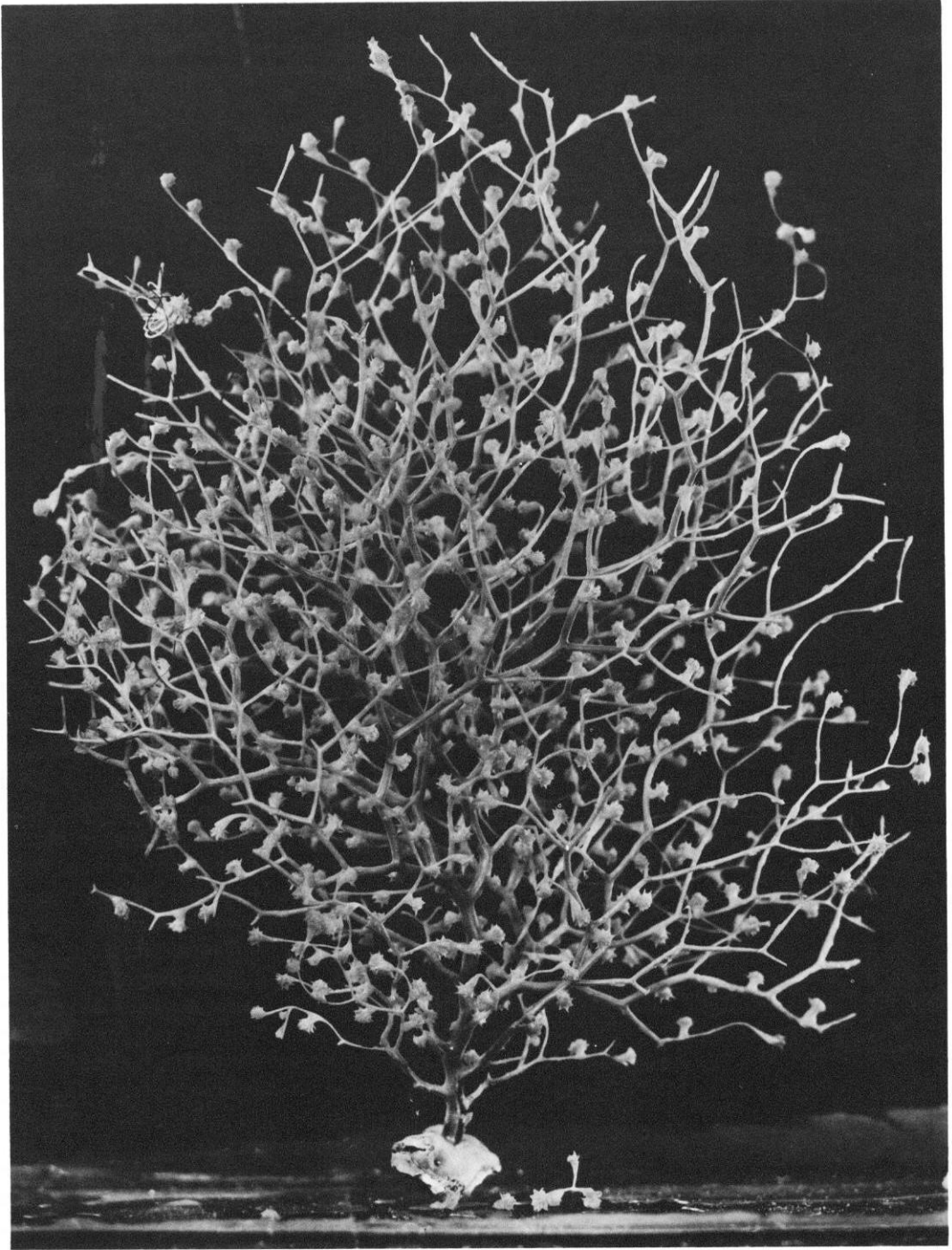


Fig. 13. *Chrysogorgia stellata*, holotype colony; height 13.5 cm.

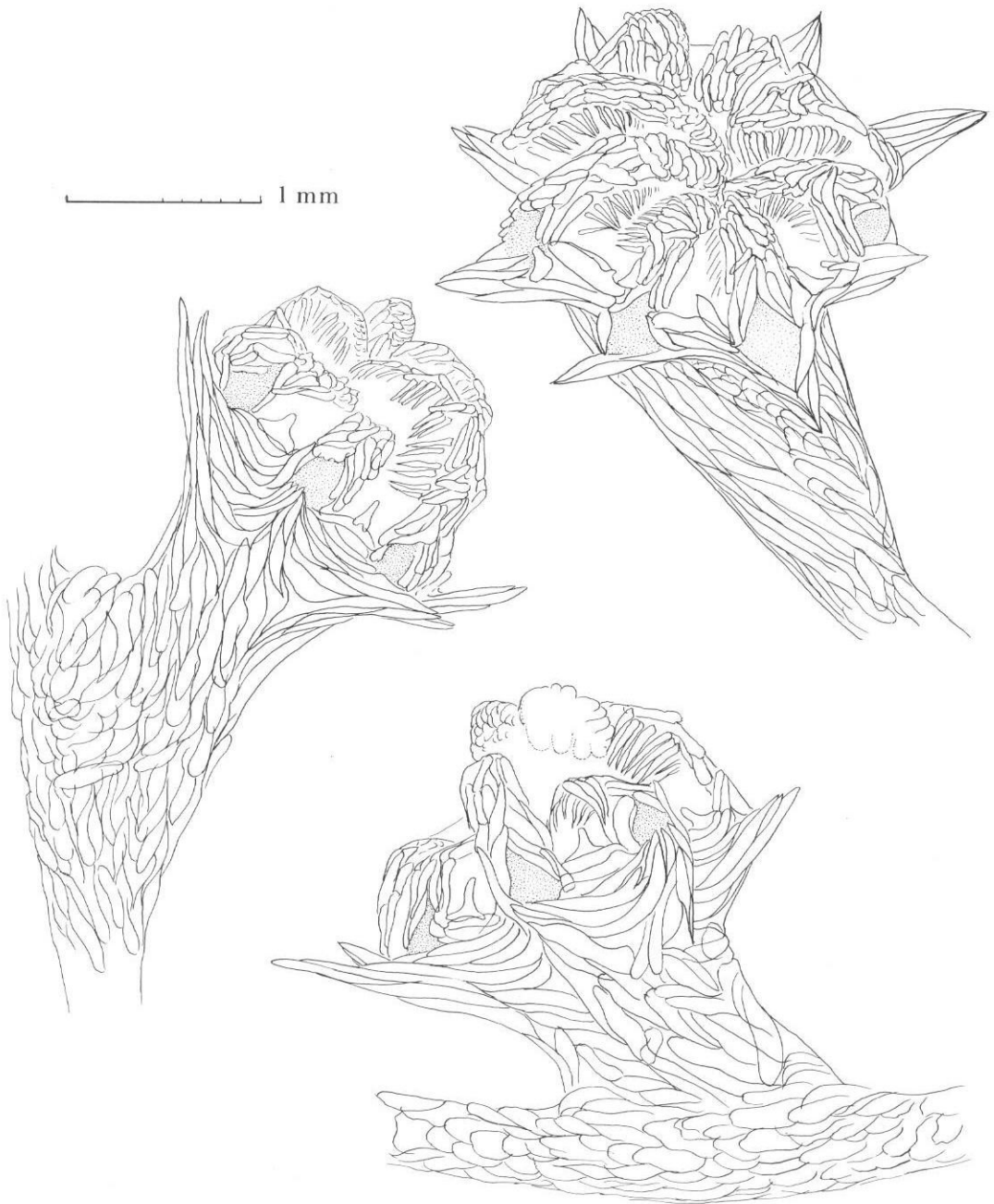


Fig. 14. *Chrysogorgia stellata*, polyps.

forms illustrated by Versluys (1902:67, fig. 105). In view of these differences it is preferable to treat the present material from Hawaii as a separate species.

This specimen is parasitized by copepods of the family Lamippidae. The coenenchyme of almost all the large branches is raised, blister-like, along one side, forming

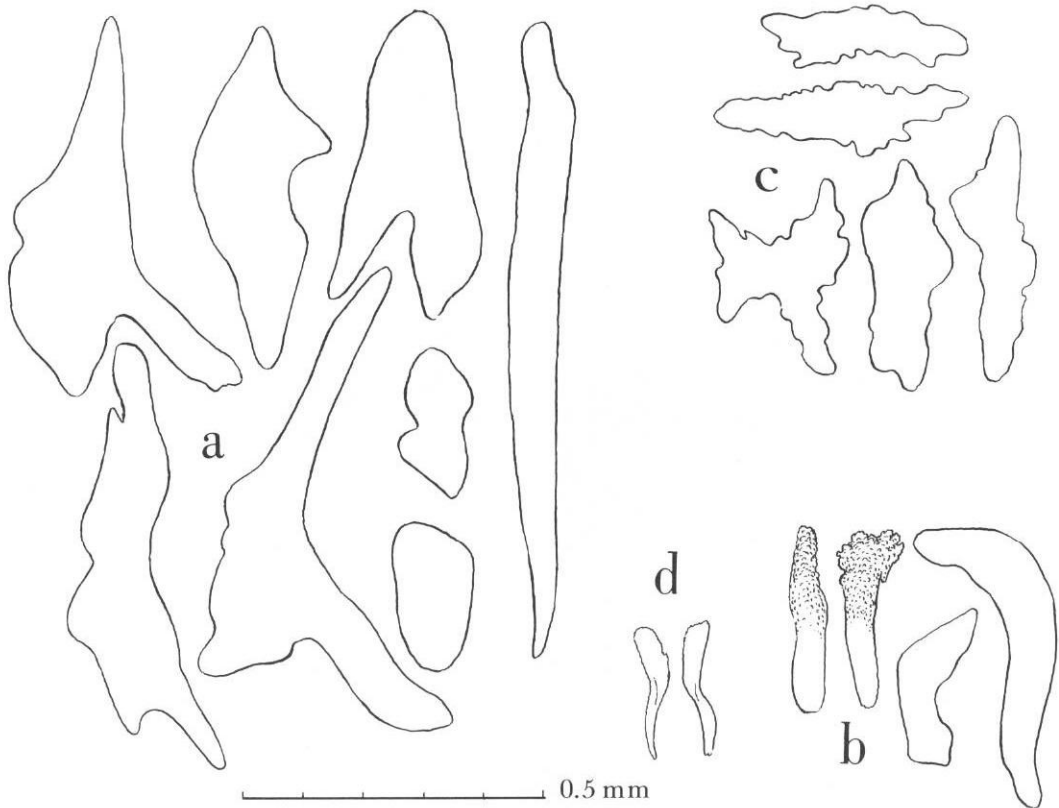


Fig. 15. *Chrysogorgia stellata*: a, Body scales; b, Sclerites from tentacle base; c, Coenenchymal scales; d, Pinnular sclerites.

long tunnels in which the copepods live. The sclerites over these tunnels are arranged crosswise, whereas elsewhere they are more or less clearly longitudinal. The type specimen of *C. stellata* is similarly parasitized.

Chrysogorgia stellata Nutting, 1908
Figs. 13–15

Chrysogorgia stellata Nutting, 1908:592, pl. 46, fig. 3; pl. 50, fig. 3.—Kükenthal, 1919: 538; 1924:408.

Material.—Hawaiian Islands, south coast of Molokai: Lae-o Ka Lau Light, N 46°, W, 9.2 miles; 371 fathoms; USFC steamer *Albatross* sta. 3826, 1 Apr 1902. Holotype, USNM 25380.

Diagnosis.—*Chrysogorgia* (group *Squamosae aberrantes*) with multiplanar flabel-

late colonies; polyps 2 mm or more in height; smooth, terete body scales exceeding 1 mm in length; proximal sclerites of tentacles in the form of coarsely granular blunt rods up to 0.5 mm long, more or less curved and sometimes with one end lobed; coenenchymal scales elongate oval with median waist and more or less lobed margins.

Description.—The holotype colony is 13.5 cm tall, upright and rather compressed, arising from a disk-like calcareous holdfast. The main stem irregularly gives off several small branches before undergoing a major division 16 mm from the base, where the stem divides into 2 large branches, each of which produces branchlets only from the upper side. These branchlets subdivide dichotomously almost in one plane, so that the entire colony is composed of several parallel

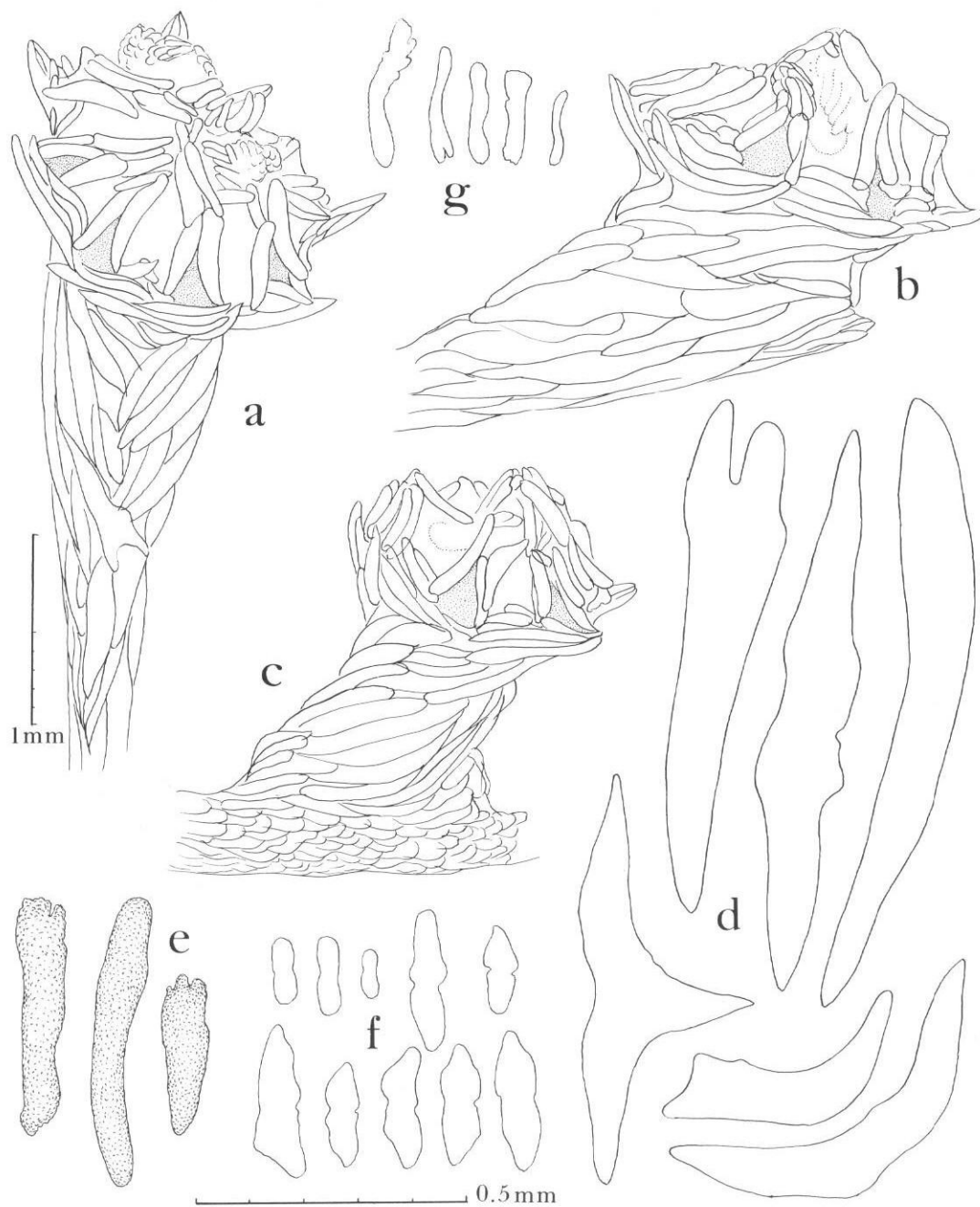


Fig. 16. *Chrysogorgia* sp. cf. *stellata*: a-c, Polyps; d, Body scales; e, Sclerites from tentacle base; f, Coenenchymal scales; g, Pinnular sclerites. 0.4 mm scale applies to all sclerites.

flabellate parts. The internodes of the stem and largest branches are unequal in length but those of the smaller branches are mostly about 8–10 mm long. Nematozooids are conspicuous on the stem and large branches but become less noticeable on the smaller branches and twigs, where they are easily overlooked. The axis is light pinkish brown with brilliant golden sheen, covered by translucent white coenenchyme.

The polyps are 2–3 mm high, sometimes perpendicular to the axis but generally inclined at a moderate angle toward the branch tips. Each internode bears a single polyp except the terminal ones, which may have 2 or 3. The polyps are covered with almost smooth, flat, lobed plates up to about 0.8 mm long arranged transversely in the basal part of the body; in the upper part, long, thick, narrow scales up to 1.1 mm long are arranged in 8 multiple rows, the uppermost of which converge beneath the tentacles to form 8 prominent points. Between the tentacle bases the distal body scales are transversely placed, the uppermost extending up into the naked intertentacular space. The tentacles have an oval area without sclerites immediately above each of the marginal points; above this naked area the backs of the tentacles contain longitudinally arranged thick, irregular rods followed distally by irregular flat scales transversely arranged. Each pinnule contains a pair of elongated, trough-like scales. The coenenchyme contains numerous elongate, smooth scales with lobed margins, up to 0.45 mm in greatest dimension.

Chrysogorgia sp. cf.

stellata Nutting

Fig. 16

Material.—Molucca Passage, Tifore Island (C.) N 40°W, 35 miles: 0°32'30"N, 126°31'30"E, 1021 fathoms; USFC steamer *Albatross* sta. D-5615, 22 Nov 1909.

Several detached branches obtained by the *Albatross* in the Molucca Passage have

much the same aspect as the branches of the type specimen of *C. stellata* and, as measurements agree in general with those of that species, we at first were inclined to consider them conspecific. However, direct visual comparison demonstrated so many inconsistencies that we cannot maintain that position. Although the polyps (1) are similar to those of *stellata* in size and form, with prominent points beneath the tentacles, they are slightly smaller and the points are not so long and sharp (Fig. 16a–c); (2) the body sclerites are of nearly the same size (up to 1.2 mm), but are of more regular terete outline (Fig. 16d); (3) the proximal sclerites of the tentacles are coarsely granular rods sometimes with lobes at one end, but are larger (Fig. 16e); and (4) the coenenchymal scales are smaller, more regular slipper shapes with little or no marginal lobing (Fig. 16f). No nematozooids were found, but this could be attributed to the small size of the branches, since those structures are obscure also on the smaller branches of *stellata*.

The occurrence in the Moluccas of a species previously known only from Hawaii would not be surprising, as species of *Callogorgia* and *Fanellia* have been shown to have a similar distribution (Bayer, 1982). The differences between the two specimens could be attributed to either individual or geographical variation but, as nothing is known of the variation in *C. stellata*, and the growth form of the Moluccan material is unknown, we cannot consider them conspecific. Therefore, we report the occurrence of this form in the Moluccas without assigning it to any known species in order to bring it to the attention of investigators who in the future may obtain better specimens.

Acknowledgments

We are grateful to Dr. Bertrand Richer de Forges and Mr. Georges Bargibant for the opportunity to study the important collection of gorgonians assembled by the exper-

ditions conducted in New Caledonian waters by ORSTOM, which obtained one of the new species described herein. The other specimens included in this paper were taken by the U.S. Fish Commission steamer *Albatross*. This manuscript has benefitted from the helpful suggestions of Dr. Manfred Grasshoff of the Forschungsinstitut Senckenberg, Frankfurt, and Dr. Thomas E. Bowman, Department of Invertebrate Zoology, Smithsonian Institution.

Literature Cited

- Bayer, F. M. 1956. Octocorallia. Pp. 166–231, figs. 134–162 in Moore, R. C. (ed.), *Treatise on invertebrate paleontology. Part F. Coelenterata.*—Geological Society of America and University of Kansas Press.
- . 1974. A new species of *Trichogorgia* and records of two other octocorals new to the Palau Islands.—*Micronesica* 10(2):257–271, pls. 1–3.
- . 1981. Key to the genera of Octocorallia exclusive of Pennatulacea (Coelenterata: Anthozoa), with diagnoses of new taxa.—*Proceedings of the Biological Society of Washington* 94(3): 902–947, figs. 1–80.
- . 1982. Some new and old species of the primnoid genus *Callorgorgia* Gray, with revalidation of the related genus *Fanellia* Gray (Coelenterata: Anthozoa).—*Proceedings of the Biological Society of Washington* 95(1):116–160, figs. 1–29.
- , & K. M. Muzik. 1976. New genera and species of the holaxonian family Chrysogorgiidae (Octocorallia: Gorgonacea).—*Zoologische Mededelingen* 50(5):65–90, figs. 1–10, pls. 1–7.
- Deichmann, E. 1936. The Alcyonaria of the western part of the Atlantic Ocean.—*Memoirs of the Museum of Comparative Zoology at Harvard College* 53:1–317, pls. 1–37.
- Duchassaing, P. 1870. *Revue des zoophytes et des spongiaires des Antilles*. Paris, Victor Masson et Fils. Pp. 1–52, pls. 1–2.
- , & J. Michelotti. 1864. *Supplément au mémoire sur les coralliaries des Antilles.*—*Mémoires de l'Académie des Sciences de Turin* (2)23:97–206, pls. 1–11.
- Gray, J. E. 1870. *Catalogue of the lithophytes or stony corals in the collection of the British Museum*. London, British Museum. i–iv + 1–51 pp.
- Kinoshita, K. 1913. *Studien über einige Chrysogorgiiden Japans.*—*Journal of the College of Science, Imperial University of Tokyo* 33(2):1–47, pls. 1–3.
- Kükenthal, W. 1909. *Japanische Gorgoniden*. 2. Teil. Die Familien der Plexauriden, Chrysogorgiiden und Melitodiden. in Doflein, F. (ed.), *Beiträge zur Naturgeschichte Ostasiens.*—*Abhandlungen der Mathematisch-Physikalischen Klasse der K. Bayer. Akademie der Wissenschaften, Suppl.-Bd.* 1(5):1–78, pls. 1–8.
- . 1919. *Gorgonaria.*—*Wissenschaftliche Ergebnisse der deutschen Tiefsee Expedition auf dem Dampfer "Valdivia" 1898–1899*, 13(2):1–946, pls. 30–89.
- . 1924. *Gorgonaria.*—*Das Tierreich* 47:i–xxvi + 1–478, 209 figs. Walter de Gruyter & Co., Berlin and Leipzig.
- Nutting, C. C. 1908. *Descriptions of the Alcyonaria collected by the U.S. Bureau of Fisheries steamer Albatross in the vicinity of the Hawaiian Islands in 1902.*—*Proceedings of the United States National Museum* 34:543–601, pls. 41–51.
- . 1910. *The Gorgonacea of the Siboga expedition. VI. The Gorgonellidae.*—*Siboga-Expeditie Monographie* 13b¹:1–39, pls. 1–11.
- Studer, Th. [& P. Wright]. 1887. *Versuch eines Systemes der Alcyonaria.*—*Archiv für Naturgeschichte* 53(1):1–74, pl. 1.
- Thomson, J. A. 1927. *Alcyonaires provenant des campagnes scientifiques du Prince Albert I^{er} de Monaco.*—*Résultats des Campagnes Scientifiques accomplies sur son yacht par Albert I^{er} Prince Souverain de Monaco* 73:1–77[87], pls. 1–6.
- Verrill, A. E. 1883. *Report on the Anthozoa, and on some additional species dredged by the "Blake" in 1877–1879, and by the U.S. Fish Commission steamer "Fish Hawk" in 1880–82.*—*Bulletin of the Museum of Comparative Zoology at Harvard College* 11:1–72, pls. 1–8.
- Verstuys, J. 1902. *Die Gorgoniden der Siboga-Expedition. I. Die Chrysogorgiiden.*—*Siboga-Expeditie Monographie* 13:1–120, 170 figs.
- Wright, E. P., & Th. Studer. 1889. *Report on the Alcyonaria collected by H.M.S. Challenger during the years 1873–1876.*—*Report on the Scientific Results of the Voyage of H.M.S. Challenger during the Years 1873–76, Zoology* 31 (part 64):i–lxxvi + 1–314, pls. 1–43.

Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.