

OCTOCORALLIA COLLECTED BY TRAWLING IN THE WESTERN AUSTRALIA¹⁾

(A BIOLOGICAL RESULT OF I.I.O.E.—COLLECTIONS)

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With Text-figures 1-15 and Plates I-IV

Abstract

Trawl collections made along the offshore shoals of the northwestern coast of Australia during the Japanese program of the International Indian Ocean Expedition in December 1963 revealed 21 octocoral species comprising 1 Telestacea, 3 Alcyonacea, 16 Gorgonacea and 1 Pennatulacea (including a new species of *Mopsea*). These less-known deep-water octocorals are described and figured. The appendix records the station sites and the lists of all octocorallian species and antipatharian species collected at each.

Introduction

During the Japanese program participating in the International Indian Ocean Expedition, "Umitaka-Maru", T/S of the Tokyo University of Fisheries carried out 14 otter trawlings off Broome and Sharks Bay, of Western Australia on the 1963-64 cruise under the leadership of Dr. Jiro Senô, head scientist on board the ship (cf. Rec. Oceanogr. Works in Japan, New Series, Vol. 8, No. 2, February 1966: 12-14, 104-106).

Among the benthic invertebrate samples thus collected, the Octocorallia and Antipatharia, together with their commensal Cirripedia, were placed at my disposal for identification and detailed study by Professor Senô after returning home.

A preliminary brief report based only on a tentative identification for the general prompt report to the Ministry of Education in support was already published in 1966 with other co-workers under the name of the representative J. Senô.

The present paper deals only with the Octocorallian material after a further detailed re-examination made in recent years.

All the specimens here treated are deposited in the Science Museum, Tokyo University of Fisheries, Minato-ku, Tokyo, together with other benthic samples obtained by the T/S "Umitaka-maru" on every cruise.

This study was made at the Seto Marine Biological Laboratory and supported by a grant of Scientific Research Fund from the Ministry of Education in 1966 (Synthetic Research Grant 6048), for which I wish here to express my sincere thanks.

1) Contributions from the Seto Marine Biological Laboratory, No. 604.

I am indebted to Dr. J. Senô, then of the Tokyo University of Fisheries and his cadet students for taking a trouble to sort the pertinent samples fitted for particular research and entrusting them to me for study. Furthermore I am specially grateful to my colleagues Mr. Chuichi Araga (Seto M. B. L.) and Mr. Yoshihisa Koyama (Gakushu Kenkyusha Co. Ltd.) for preparing many photographs of the studied material. My thanks are also due to Dr. Saburo Nishimura (Seto M.B.L.) for editing the manuscript.

List of the Species Taken by Trawling

I. Telestacea

Fam. Telestidae Milne Edwards & Haime

1. *Telesto multiflora* Laackmann

II. Alcyonacea

Fam. Nephtheidae Gray

2. *Nephthea granulata* Kükenthal
3. *Umbellulifera striata* (Thomson & Henderson)

Fam. Nidaliidae Gray (emend. Utinomi)

4. *Siphonogorgia obspiculata* Chalmers

IIIa. Gorgonacea—Scleraxonia

Fam. Anthothelidae Broch

5. *Solenocaulon tortuosum* Gray
6. *Solenocaulon ramosum* Hickson

Fam. Subergorgiidae Studer

7. *Subergorgia suberosa* (Pallas)
8. *Subergorgia reticulata* (Ellis & Solander)

Fam. Melithaeidae Gray

9. *Melithaea modesta* (Nutting)
10. *Acabaria formosa* Nutting

IIIb. Gorgonacea—Holaxonia

Fam. Acanthogorgiidae Gray

11. *Acanthogorgia turgida* Nutting
12. *Anthogorgia glomerata* Thomson & Simpson

Fam. Paramuriceidae Bayer

13. *Muriceides dubia* Nutting
14. *Discogorgia dentata* (Nutting)

Fam. Plexauridae Gray

15. *Euplexaura robusta* Kükenthal

Fam. Ellisellidae Gray

16. *Viminella gracilis* (Wright & Studer)
17. *Junceella gemmacea* (Valenciennes) Milne Edwards & Haime

Fam. Primnoidae Gray

18. *Thouarella (Amphilaphis) plumacea* (Thomson & Mackinnon)

Fam. Isididae Lamouroux

19. *Mopsea squamosa* Kükenthal

20. *Mopsea alternata* nov. spec.

IV. Pennatulacea—Subselliflorae

Fam. Virgulariidae Verrill

21. *Virgularia hexangularis* Kölliker

Taxonomic Account

I. Order TELESTACEA Hickson, 1930

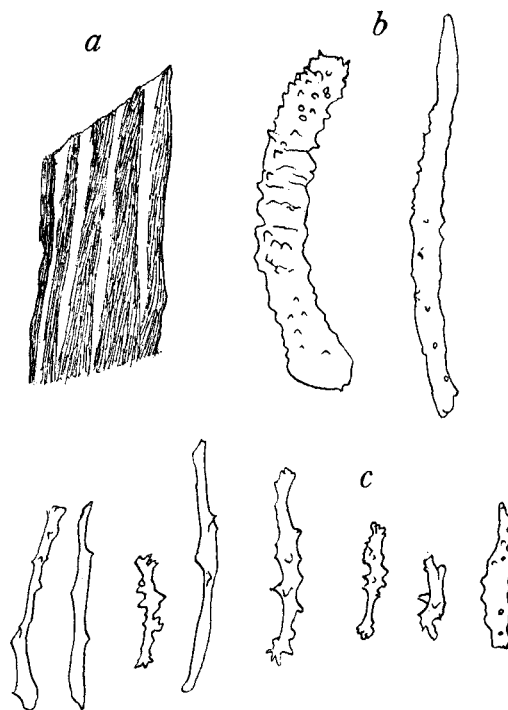
Family Telestidae Milne Edwards & Haime, 1857

Genus *Telesto* Lamouroux, 1812

1. *Telesto multiflora* Laackmann, 1909

(Text-fig. 1; Pl. I, fig. 1)

Telesto multiflora Laackmann, 1909, p. 91, fig. H; ——— Kükenthal, 1910, p. 36, pl. I fig. 6, pl. II fig. 12; ——— Kükenthal, 1913, p. 235 (distribution).



Text-fig. 1. *Telesto multiflora* Laackmann.

a, Lateral polyp viewed from side, anthocodial part completely retracted; *b*, septal spicules lying in deeper layer beneath longitudinal furrows illustrated in *a*; *c*, interseptal spicules lying on periphery of longitudinal ridges in lateral polyyps, illustrated in *a*. [*a*, $\times 28$; *b*, *c*, $\times 96$]

Material examined.—5 fragments from Station 13 (3rd haul), depth 110–120 m (19. 12. '63).

Description.—All samples, measuring up to 6.8 cm in total length and 2–3 mm in diameter, are represented by almost straight single stem or branch, covered thickly with lateral polyps all around the length throughout.

The axial polyp is truncately ended. The lateral polyps, which are rather more numerous than in the related *Telestoa arborea* Wright & Studer, are alternately placed around the wall of the axial polyp. They are about 4–5 mm long and 1.5 mm wide, and somewhat labiate in form, their tip being obliquely truncated in lateral view. Their walls are formed of 8 distinct longitudinal grooves and broader spiculated interseptal ridges.

The outer layer of the interseptal ridges in the lateral polyps is closely packed with less spinose rod-like spicules (0.015–0.03 mm long and 0.01–0.018 mm wide in size) arranging longitudinally, but there is no sign of fusion between these spicules whatever. In addition, there are found a few much larger needle- or rod-like bluntly ended spinose spicules (about 0.4–0.5 mm long), lying in deeper layer of septal area.

Color in alcohol.—The body walls are grayish white, while the anthocodiae partly extended are rosy brown, somewhat darker than the body walls.

Distribution.—Bass Strait, south-eastern Australia and Sharks Bay, western Australia.

II. Order ALCYONACEA Lamouroux, 1816

Family Nephtheidae Gray, 1862 (emend. Utinomi, 1954)

Genus *Nephthea* Audouin, 1828

2. *Nephthea granulata* Kükenthal, 1910

(Text-fig. 2; Pl. I, fig. 2)

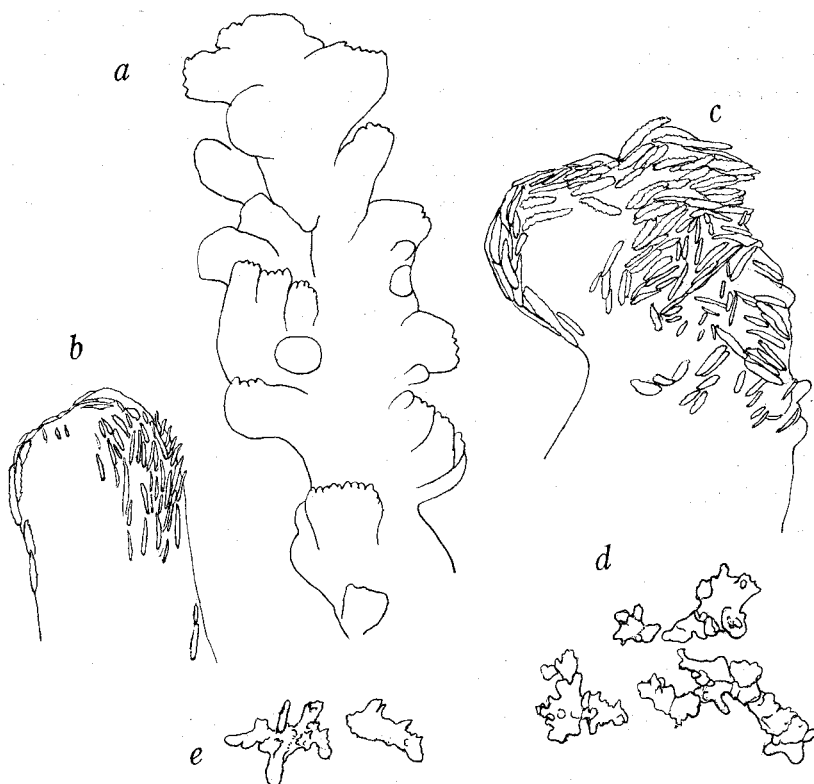
Nephthya granulata Kükenthal, 1910, p. 42, figs. V–VI, pl. II fig. 16; *Nephthea granulata*, Tixier-Durivault, 1970, p. 302 (not figured).

Material examined.—A flabby flabellate colony from Station 1 (1st haul), depth 124 m (1. 12. '63).

Description.—The main stem, of which the basal part is torn off, ramifies into 4 flattened primary branches, about 3–10 cm long, at different heights in a flabellate form. Each branch bears a number of polyp-bearing catkins around the distal part. The catkins are elongate conical, more or less bluntly tipped, measuring about 3–5 mm long and 1.5 mm wide at base.

The polyps are compactly placed on the catkins and their heads are oval in lateral view, about 1 mm long, with a stalk ca. 0.7 mm long and slightly wider toward the head without distinct demarcation.

Anthocodial armature seems to be very weak, as compared with other species of the genus. The spicules longitudinally arranged on the dorsal surface of the polyp-

Text-fig. 2. *Nephthea granulata* Kükenthal.

a, Polyp-bearing catkin; *b*, zooid, somewhat stunted; *c*, zooid, rather well-grown; *d*, spicules from surface layer of distal branches. [*a*, $\times 8.6$; *b-c*, $\times 30$; *d*, $\times 150$]

head forming a weak supporting bundle are varied in size, but generally much smaller than those illustrated in Kükenthal's type specimen, as measuring up to 0.33 mm in length. On the dorso-lateral surface, similar spinose spindles are arranged rather irregularly in innumerable rows.

In the surface layer of the distal parts of the branches there are exclusively jagged or irregular-shaped spicules, varied greatly in outline and size, approximately 0.01–0.04 mm in extent. Apparently there are no spicules in the canal-walls.

Distribution.—Sharks Bay, NE of Heirisson Proug, Western Australia, 11–12.5 m deep (Type locality); Saint-Vincent Bay, New Caledonia.

Genus *Umbellulifera* Thomson & Dean, 1931

3. *Umbellulifera striata* (Thomson & Henderson, 1905)

(Pl. II, fig. 1)

For description and synonymy, see Verseveldt (1973, pp. 165–168, fig. 42).

Material examined.—A large colony, 44 cm in total length and 3–4 cm wide at

base, from Station 2 (Rowley Shoals, west of Broome, depth 123 m) (2. 12. '63).

Remarks.—This umbellate octocoral has been well described repeatedly by many authors from various localities, so that it may be unnecessary to reiterate any detailed description on the present sample. However, some observations made on living specimens occurring in Japanese waters from time to time may be added here.

This species always inhabits on gravelly soft bottom of the deep water ranging between 30–100 m, anchoring with a few short stolons attached around the base of the large flaccid stalk which may attain up to ca. 2 meters. When growth proceeds to the extreme, the spiculation may often be obsolete, especially in the terminal branches.

In living state, the ramifying terminal branches, bearing a number of relatively small umbellate twigs, are usually bright reddish, darker basalwards, and the cylindrical sterile stalk is very plump, yellowish brown and often overgrown with epizooic hydroids (such as *Hydrichthella*).

Distribution.—Widespread in the Indian Ocean to West Pacific Ocean, as far north as Sagami Bay, Japan.

Family Nidaliidae Gray, 1869 (emend. Utinomi, 1958)

Subfamily Siphonogorgiinae Kölliker, 1875

Genus *Siphonogorgia* Kölliker, 1874

4. *Siphonogorgia obspiculata* Chalmers, 1929

(Pl. I, fig. 3)

Siphonogorgia obspiculata Chalmers, 1929, p. 164; ——— Thomson and Dean, 1931, p. 172, pl. IV fig. 5, pl. XXV fig. 1.

Material examined.—4 young colonies from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, Western Australia, depth 110–120 m (3rd haul).

Description.—One of the specimens is 27 mm in total length and 6 mm thick at base, with a single short lobate branch. Other specimens consist of 3 or 4 short branches. All are small for the genus and with a flat basal attachment, so that they may be assumed to be young forms. Color in alcohol is yellowish white. The texture is rigid and brittle.

Cortical spicules arranged longitudinally on the stem are all blunt-ended tuberculate spindles, mostly 2–3 mm long. Polyps are crowded around the tip of branches and completely retractile.

Anthocodial formula: Completely retractile = (3–4)p + (4–5)Cr + 0M

Distribution.—Malay Archipelago (Siboga-Stations 260, 289, 90–112 m), Western Australia.

III. Order GORGONACEA Lamouroux, 1816

Suborder SCLERAXONIA Studer, 1887

Family Anthothelidae Broch, 1916

Subfamily Anthothelinae Broch, 1916

Genus *Solenocaulon* Gray, 18625. *Solenocaulon tortuosum* Gray, 1862

(Pl. II, fig. 5)

Solenocaulon tortuosum Gray, 1862, p. 34, p. 36—woodcut; ——— Kükenenthal, 1924, p. 24; ——— Thomson & Mackinnon, 1910, p. 196; ——— Thomson & Simpson, 1909, p. 154; ——— Thomson & Dean, 1931, p. 192; ——— Stiasny, 1937, p. 54, fig. Q; ——— Tixier-Durivault, 1966, p. 379; ——— Verseveldt, 1971, p. 67.

Material examined.—An incomplete colony (40 cm long), lacking the basal and distal parts, entangled by egg-sacs of unknown squid from Station 7 (West of Dirk Hartog Is. off Sharks Bay, depth 118 m) (18. 12. '63).

Distribution.—Hitherto recorded from North Australia, Maldives, Singapore, Ceylon, Bay of Bengal, Persian Gulf, Malay Archipelago, East Africa. But so far as explored, it extends northwards to Kii coast, western Japan.

6. *Solenocaulon ramosum* Hickson, 1903

(Text-fig. 3; Pl. II, figs. 3–4)

Solenocaulon ramosa Hickson, 1903, p. 498, pl. XXVII figs. 14–17; ——— Stiasny, 1937, p. 49, text-fig. 0.
Solenocaulon ramosum, Hickson, 1940, p. 269, text-fig. 1; ——— Verseveldt, 1971, p. 68, pl. 12 fig. 2.

Material examined.—A magnificent large colony (42 cm long) from Station 1 (Rowley Shoals, west of Broome, 124 m) (1. 12. '63).

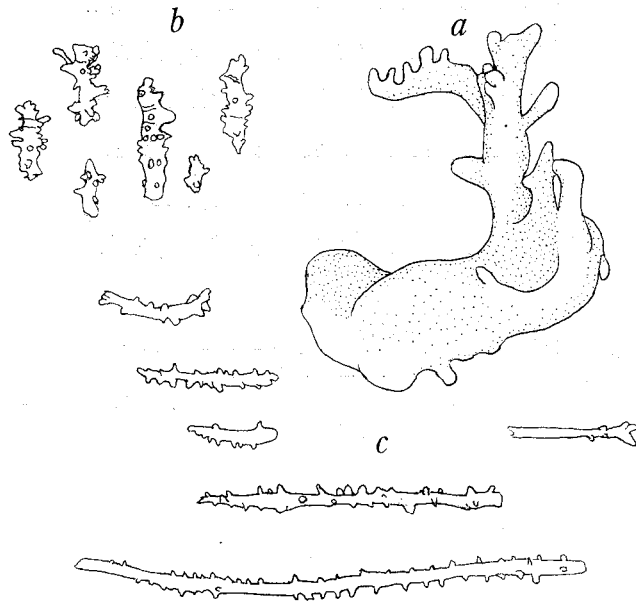
Description.—The specimen examined here has been divided into two stems with a diameter of 2 cm, and the basal and distal parts have been cut off.

Due to the fragility in dry condition most of the ramified twigs have been broken off, but some short frill-like twigs 3–26 mm long and 2 mm across, are still retained, arising from the edges of “belted” openings of the hollow stem. The polyps placed along the edges of flattened twigs serially on each side are about 2 mm long and 1.5 mm wide.

The spicules on the outer layer of the stem are short tuberclose rods, about 0.13 mm long, while those lying in the deeper layer of the coenenchyme are much longer slender needles covered with high warts, about 0.5–0.75 mm long.

The color of the stem is dirty brown, with lighter grey twigs.

Distribution.—Hitherto recorded from the Maldives (Hickson), the Bay of Bengal (Harrison; Thomson & Simpson), Cape Guardafui, Indian Ocean (Hickson) and



Text-fig. 3. *Solenocaulon ramosum* Hickson.

a, A short polyp-bearing twig, arisen from upper margin of the so-called "belt"; *b*, spicules from surface layer of hollowed stem; *c*, spicules from deeper layer of hollowed stem. [*a*, $\times 12$; *b-c*, $\times 150$]

from Nosy Bé, Madagascar (Verseveldt).

Family Melithaeidae Gray, 1870

Genus *Melithaea* Milne Edwards & Haime, 1857

7. *Melithaea modesta* (Nutting, 1911)

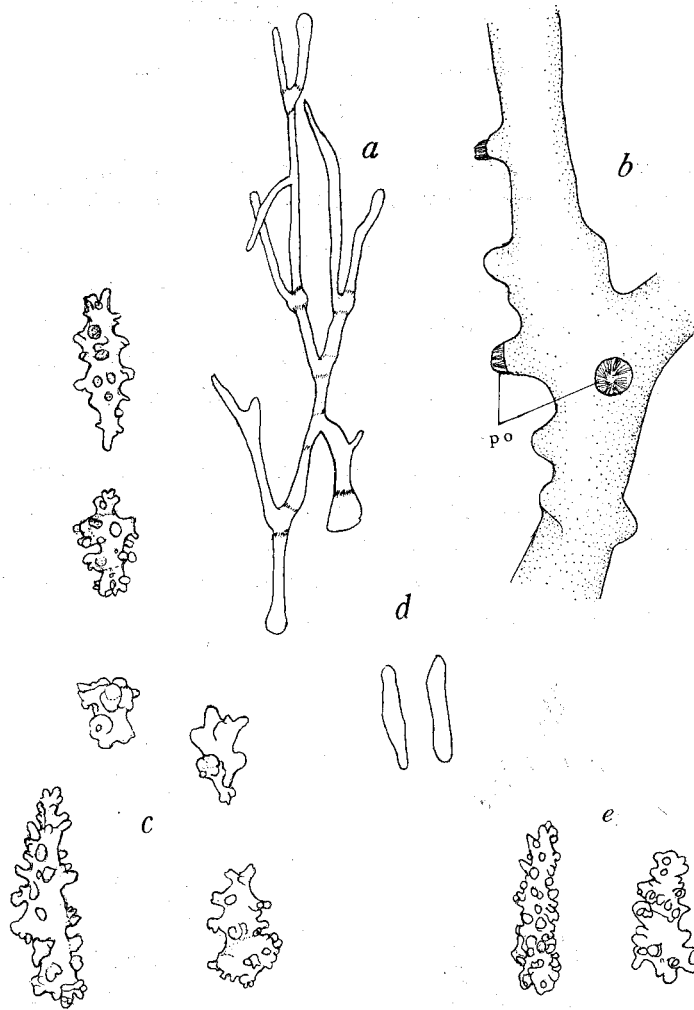
(Text-fig. 4; Pl. I, fig. 4)

Melitodes modesta Nutting, 1911, Siboga-Exped., 13b⁵, p. 42, pl. VII figs. 2-2a, pl. XII fig. 2; ———
Kükenthal, 1924, Das Tierreich, 47, p. 58.

Material examined.—A number of fragments branched in one plane and reticulate, from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, depth 110-120 m.

Description.—A number of fragments may be of one flabellate colony probably broken when obtained.

The colony is dichotomously branched at an angle of about 20°-30° in one plane and reticulates, forming narrow, longitudinally elongate meshes. The nodes are moderately plump, about 3-5 mm long and so wide. The internodes are 5-20 mm long and 1.5-3 mm wide. The calyces scatteredly placed on the internodes



Text-fig. 4. *Melithaea modesta* (Nutting).

a, Part of reticulated branches, showing elongate meshes between long calcareous internodes; *b*, part of branch, showing arrangement of conical polyps (*po*) on surface; *c*, spicules from cortex of internodes; *d*, spicules from interior of nodes; *e*, spicules from anthocodiae. [*a*, $\times 2$; *b*, $\times 12$; *c-e*, $\times 206$]

are very low rounded domes, about 0.3 mm in diameter.

The color of the colony in alcohol is light yellowish brown, but when dried, it is quite lemon yellow.

Coenenchymal spicules are mainly rather large spiny spindles, lemon-yellow-colored, measuring 0.045–0.09 mm long and 0.026–0.06 mm wide. Spicules in the axial nodes are as usual smooth rods, pink-colored, about 0.053 mm~0.01 mm.

Distribution.—Hitherto known only from Malay Archipelago (Siboga Stations 164, 273, in 32–57 m deep).

Genus *Acabaria* Gray, 18598. *Acabaria formosa* Nutting, 1911

(Text-fig. 5; Pl. I, fig. 5)

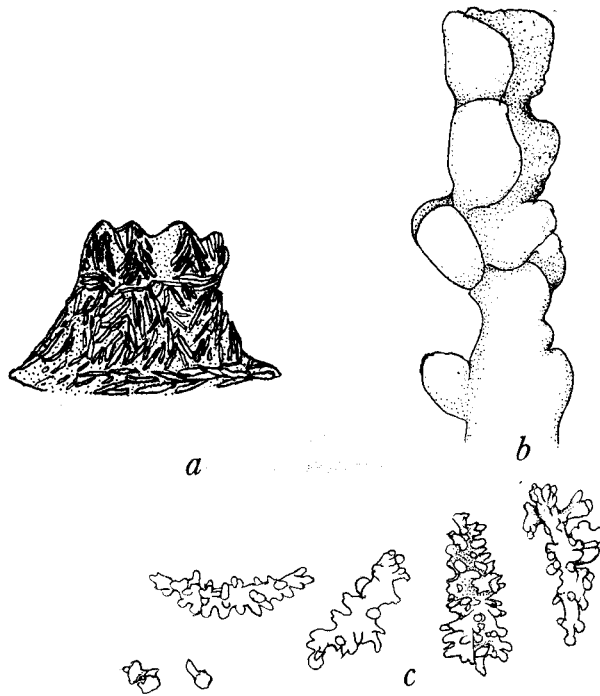
Acabaria formosa Nutting, 1911, Siboga-Expeditie, 13b⁵, p. 46, pl. VII figs. 3–3a, pl. XII fig. 3; ——— Küenthal, 1924, p. 77; ——— Stiasny, 1940, p. 227, text-fig. G, pl. XI fig. 20.

Material examined.—10 fragments of bright vermillion color from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Description.—The colony represented by fragments only is poorly branched at right angles in one plane. The branches are slender and apparently moniliform, low conical calyces (about 0.5 mm wide) being biserially arranged rather alternately and closely, leaving a longitudinal groove along the axis.

The denuded axis is vermillion red and fragile. The coenenchyme is thin and wholly white in alcohol. The prevailing coenenchymal spicules are thorny clubs or spindles slightly bent, about 0.08–0.10 mm long.

Distribution.—Hitherto known only from Malay Archipelago (Siboga Stations 60, 240, in 9–80 m deep) and Sulu Archipelago.

Text-fig. 5. *Acabaria formosa* Nutting.

a, Details of polyp, side view; *b*, part of branch, showing bilinear arrangement of polyps; *c*, spicules from cortex. [*a*, $\times 10.6$; *b*, $\times 12$; *c*, $\times 96$]

Family Subergorgiidae Gray, 1859

Genus *Subergorgia* Gray, 18579. *Subergorgia suberosa* (Pallas, 1766)

(Pl. IV, fig. 5)

For synonymy and description refer to Stiasny, 1937, Siboga-Expeditie, Suppl. II, monogr. 13b⁸, p. 87, text-fig. CC, pl. VI fig. 46; Tixier-Durivault, 1966, Faune de Madagascar, 21, p. 382, fig. 342.

Material examined.—7 fragments of light grayish brown color from Station 13 (19. 12. '63), Geographe Channel, 110–120 m, one of which carries 5 specimens of an epizooic barnacle, *Acasta hirsuta* Broch, 1916.

Remarks.—Branches are much appressed, with a deep longitudinal furrow along the axis; they are branched at angles of 30°–45°. The calyces are low conical verrucae (about 1 mm high and so wide), arranged at intervals of about 1–2 mm.

Distribution.—Australia, Malay Archipelago and Indian Ocean.

10. *Subergorgia reticulata* (Ellis & Solander, 1786)

(Pl. IV, fig. 6)

For synonymy and description refer to Stiasny, 1937, Siboga-Expeditie, 13b⁸, p. 101, pl. VII fig. 48, Text-fig. GG; Tixier-Durivault, 1966, Faune de Madagascar, 21, p. 383, fig. 343.

Material examined.—2 fragments of reticulated flabellum, 2.5–7.5 cm long, all uniformly grayish brown, from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Distribution.—Indian Ocean, Australia, Malay Archipelago, Japan, Marshall Is., Samoa.

Suborder HOLAXONIA Studer, 1887

Family Acanthogorgiidae Gray, 1859

Genus *Acanthogorgia* Gray, 195711. *Acanthogorgia turgida* Nutting, 1910

(Text-fig. 6; Pl. III, fig. 1)

Acanthogorgia turgida Nutting, 1910, Siboga-Expeditie, monogr. 13b, p. 21, pl. I figs. 2–2a, pl. XIX fig. 4; ——— Kükenenthal, 1924, Das Tierreich, Lief. 47, p. 241, fig. 140; ——— Stiasny, 1947, Verhandl. Kon. Nederl. Akad. Wet. Aft. Natuurk. Tweede Sectie, 43 (2), p. 50, pl. I figs. 2–3, Text-figs. I–J.

Material examined.—16 incomplete colonies, lacking basal parts, from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Text-fig. 6. *Acanthogorgia turgida* Nutting.

a, Details of polyp; *b*, projecting distal spicules of polyps, varied in shape; *c*, spicules from polypal base and branch cortex. [*a*, $\times 29$; *b-c*, $\times 47$]

Description.—All the specimens are equally small for the genus, being less than 6 cm in total height and sparsely branched in one plane. The side branches are relatively long.

The polyps of subequal size are irregularly disposed all throughout the stem and branches, excepting near the base. They are up to 2 mm high and about 1 mm wide at the distal end. They are somewhat barrel-shaped, being not so elongate and spinose as in most of other species of *Acanthogorgia*. The calycular spicules are mostly irregularly disposed. The projecting distal spicules, up to 0.03 mm long, are placed only just below the tentacle bases, forming 8 small bundles (about 2 or 3 in each bundle).

Details of general spiculation in polyps and body walls agree with the descriptions given by Nutting (1910) and Stiasny (1947). As some are illustrated here, spiny spindles (straight or bent) and triradiates, quadriradiates or antlers are contained in varied abundance, not localizing basally.

Commensals.—7 specimens of rosy colored barnacle *Balanus venustus venustus* Darwin were found adhering to branches of a colony.

Distribution.—Malay Archipelago only, in 75–520 m depth.

Genus *Anthogorgia* Verrill, 1868 (emend. Aurivillius, 1931)12. *Anthogorgia glomerata* Thomson & Simpson, 1909

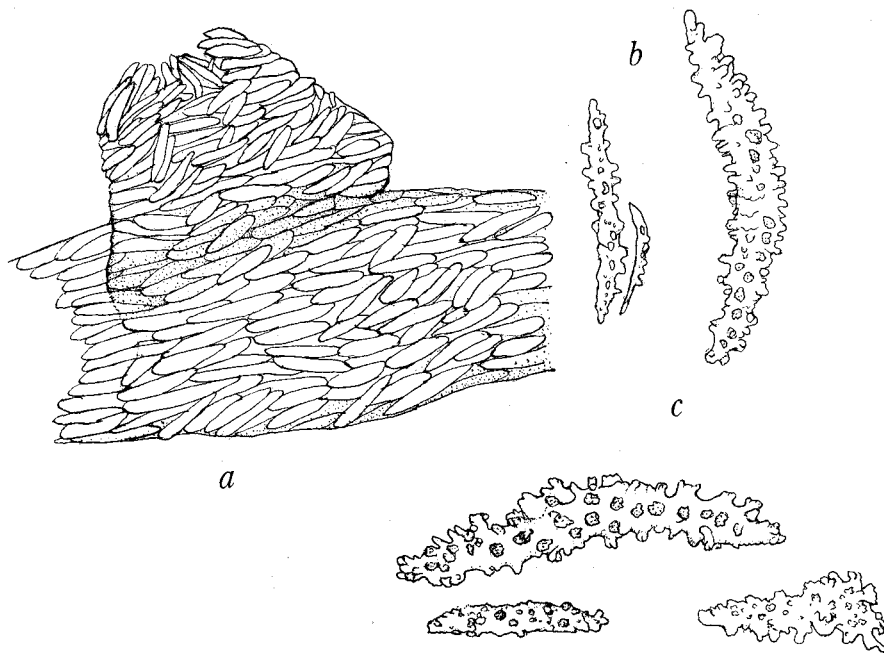
(Text-fig. 7; Pl. III, fig. 2)

Anthogorgia glomerata Thomson & Simpson, 1909, Alcyonarians of the littoral area, coll. by the roy. Indian Survey ship Investigator in the Indian Ocean, p. 194, pl. II figs. 2-3, pl. VIII fig. 14; ——— Kükenenthal, 1924, Das Tierreich, Lief. 47, p. 182 (cited only); ——— Aurivillius, 1931, K. Svenska Vetenskaps Akad. Handl., 3rd ser., 9 (4), p. 88-89 (keyed only).

Material examined.—6 flabellate fragments, lacking basal stem, from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, 110-120 m.

Description.—The colonies are of small size, being only 4 to 6 cm in total length. approximately 4 to 6 cm in total length, though incomplete, Branching in one plane, short branches issuing at right angles separating widely each other. Such an anastomosis as figured in the type specimen does not occur in the present materials.

The main stem and branches are generally slender, less than 1 mm in diameter and somewhat flattened on the branching plane. The polyps mostly occur towards the distal part of side branches, and they are placed alternately. Individual polyps are low cones, about 0.75 mm high and so across and pinkish or grayish white. The majority of calycular spicules are tuberculate spindles up to 0.7×0.3 mm and disposed

Text-fig. 7. *Anthogorgia glomerata* Thomson & Simpson.

a, A polyp seated on branch, side view; b, calycular spicules; c, cortical spicules. [a, approximately $\times 30$; b-c, $\times 150$]

in parallel with the axis of the branches, excepting 8 distal point spicules, disposed longitudinally just below the tentacle bases, which are shorter spindles, 2 or 3 per radius, without neck zone.

The coenenchyme is thin and composed of much tuberculate spindles (up to 0.31×0.07 mm) longitudinally arranged. The axis is horny, flexible and brown in color.

Distribution.—Hitherto known only from the type locality (Andamans in the Bay of Bengal).

Family Paramuriceidae Bayer, 1956

Genus *Muriceides* Studer, 1887

13. *Muriceides dubia* Nutting, 1910

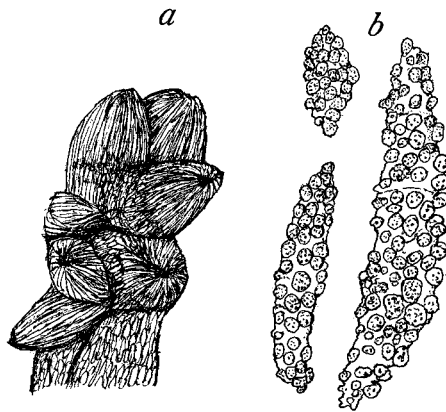
(Text-fig. 8; Pl. III, fig. 4)

Muriceides dubia Nutting, 1910, Siboga-Expeditie, 13b, p. 29, pl. IV figs. 2–2a, pl. XIX fig. 11; ——— Kükenenthal, 1924, Das Tierreich, Lief. 47, p. 163, fig. 111; ——— Tixier-Durivault, 1972, Téthys Suppl. 3, p. 41.

Material examined.—A small unbranched fragment (3 cm long) from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Description.—The coenenchyme is thick and closely packed with large tuberculate spindles only. Polyps are densely set all around the coenenchyme. The horny axis is dark brown.

Distribution.—Hitherto recorded from Malay Archipelago (Aru Islands, 57 m) and Madagascar (Tuléar, 6–9 m).



Text-fig. 8. *Muriceides dubia* Nutting.

a, Tip of a slender fragment (Branch), bearing polyps densely; *b*, cortical and calycular spicules. [*a*, $\times 2.2$; *b*, $\times 96$]

Genus **Discogorgia** Kükenthal, 1919 (emend. Bayer, 1956)

= *Placogorgia* (nec Wright & Studer, 1888) Nutting, 1910

14. *Discogorgia dentata* (Nutting, 1910)

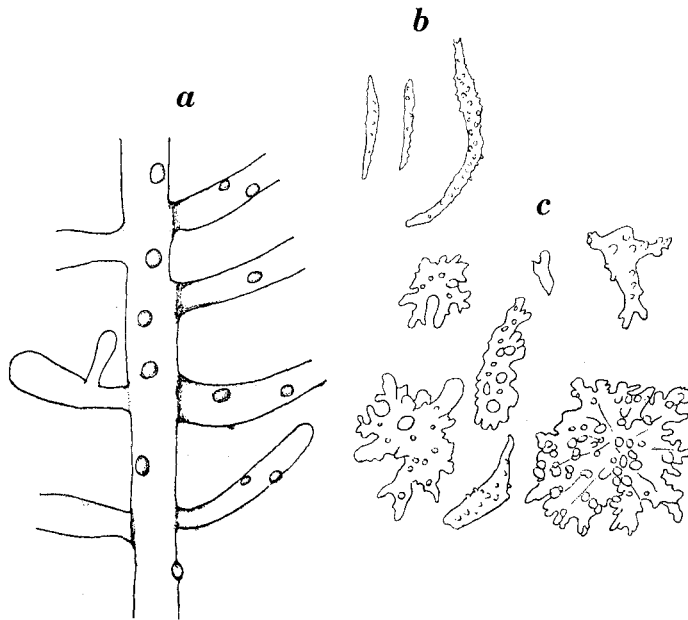
(Text-fig. 9; Pl. IV, fig. 1)

Placogorgia dentata Nutting, 1910, Siboga-Expeditie, 13b, p. 80, pl. XII figs. 4-4a, pl. XXII fig. 10; ——— Kükenthal, 1924, Das Tierreich, Lief. 47, p. 211: ——— Stiasny, 1940, Temminckia, 5, p. 241, pl. XII figs. 27-28, Text-fig. L; ——— Tixier-Durivault, 1972, Tethys Suppl. 3, p. 45, fig. 17.

Material examined.—5 fragments without basal attachment from Station 13 (19. 12. '63), Geographe Channel, entrance to Sharks Bay, 110-120 m.

Description.—The colonies are openly flabellate, alternately giving off subequal branches with wide intervals. Each branch, about 2-6 cm long and 2 mm in diameter and bluntly ended. The coenenchyme is rather thick and uniformly brown in color, and the central horny axis is dark brown. The calyces are irregularly arranged all around the coenenchyme are much depressed cones, about 1 mm across. The anthocodiae are completely retractile. Their central operculum is slightly elevated above the surrounding coenenchymal surface, and coated only with slender fusiform spicules.

Cortical spicules are exclusively irregular-shaped thorn-discs with irregularly



Text-fig. 9. *Discogorgia dentata* (Nutting).
a, Part of pinnately branched colony, showing scattered polyps and narrowed basal portion of branches; b, anthocodial spicules; c, cortical spicules. [a, $\times 4$; b-c, $\times 73$]

dentated margin or tri- or multiradiates. But there are not found such protuberant thorn-scales as seen in the related *Placogorgia*, *Echinomuricea*, etc., for protecting the calyces.

Distribution.—Hitherto recorded from Philippines (Sulu Archipelago), Malay Archipelago (Flores Sea, South of Timor) and Madagascar (Is. Europa).

Remarks.—Kükenthal (1919) established a new genus *Discogorgia* for some Indo-west Pacific paramuriceids which were referred by Nutting (1910) to Wright & Studer's *Placogorgia* (type: *P. atlantica* Wr. & S.). He transferred Nutting's *P. dendritica* to this new genus, but still retained Nutting's *P. dentata* in *Placogorgia*. This procedure was followed by most of later authors. Following Bayer's revision of *Placogorgia* and related genera (1956, 1959), however, I have thought myself justified in dealing with this species too as a member of *Discogorgia* like *D. dendritica* Nutting (cf. Utinomi, 1961, p. 203).

Family Plexauridae Gray, 1859

Genus *Euplexaura* Verrill, 1865 (emend. Kükenthal, 1909)

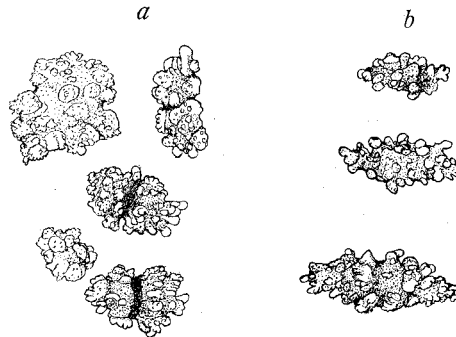
15. *Euplexaura robusta* Kükenthal, 1908

(Text-fig. 10; Pl. IV, fig. 2)

For synonymy and description refer to Kükenthal, 1924, *Das Tierreich*, Lief. 47, p. 95, fig. 67; also, Thomson & Dean, 1931, *Siboga-Expeditie*, 13b, p. 198; Stiasny, 1935, *Siboga-Expeditie*, 13b⁷, p. 21.

Material examined.—A flabellate colony (dried and somewhat shrunken) from Station 1 (1.12. '63), Rowley Shoals, west of Broome, Western Australia, 124 m taken by 2nd haul.

Description.—The colony is decidedly flabellate, but not reticulate, measuring about 20 cm in height and 11 cm in maximum expanse. The main stem and large branches are somewhat flattened in the plane of branching and about 3–5 mm in



Text-fig. 10. *Euplexaura robusta* Kükenthal.
a, Cortical spicules; b, calycular spicules. [a–b, ×150]

diameter. Many twigs subpinnately arise in the same plane between larger branches. The coenenchyme is light brown-colored. Low and small calyces are disposed, about 1.0–1.2 mm apart.

Coenenchymal spicules of the stem and branches are mostly bluntly ended tuberculate spindles, often dumbbell-shaped, ca. 0.01–0.1 mm long. Calycular ones are a little longer with narrowed ends.

Distribution.—Hitherto recorded from Japan (Kükenthal), West Australia (Broch), Great Barrier Reef (Hickson) and Malay Archipelago (Thomson & Dean; Stiasny).

Family Ellisellidae Gray, 1859

Genus *Viminella* Gray, 1870 (Revived)

Synonyms: *Viminella* Gray, 1870, Catalogue of Lithophytes or stony corals, p. 28.

Scirpearia Cuvier 1817 (emend. Studer, 1887, p. 67 (types: *S. mirabilis* Pallas and *Viminella flagellum* Gray).

Ellisella Gray, 1857, Proc. Zool. Soc. Lond. 25, p. 287 (Type: *Gorgonia elongata* Pallas), auctt. (part.)

Scirpearella Wright & Studer, 1889, Challenger Rep. Zool. 31, p. 154 (emend. Nutting, 1910, p. 23 (Type: *Sc. profunda* Wr. & St.) (part.)

Toeplitzella Deichmann, 1936, Mem. Mus. Comp. Zool. 53, p. 205 (Type: *Junceella laevis* Verrill).

Ellisella, Toeplitz, 1929, Zool. Jahrb. Suppl., 16 (2), p. 273 (part.)

Type-Species: *Viminella flagellum* (Johnson, 1863, Proc. Zool. Soc. Lond., 1863, p. 505), by subsequent designation: Studer, 1889: 67.

Emended Diagnosis: Colonies unbranched or sparingly branched, with a few long, whiplike branches; calyces prominent, biserial or in lateral tracts; spicules including short double-heads, approaching 0.2 mm in length, concentrated in calyces, but no longer double-spindles.

[Condensed after Deichmann's diagnosis for *Scirpearia* and after Bayer's diagnoses for *Ellisella* and *Toeplitzella*.]

16. *Viminella gracilis* (Wright & Studer, 1889)

(Text-fig. 11; Pl. III, fig. 5)

Scirpearella gracilis Wright & Studer, 1889, Challenger Rep., Zool., 31, p. 156, pl. 31 figs. 1–1a, pl. 34 fig. 6.

Scirpearia flagellum: Thomson & Russell, 1910, Trans. Linn. Soc. Lond., Zool., 13, p. 163, pl. 8 fig. 2 (not Johnson, 1863).

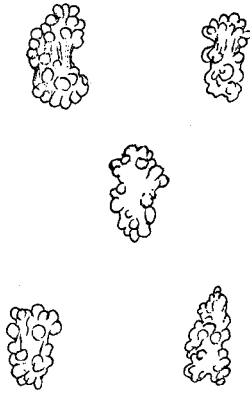
Scirpearia profunda (part.): Simpson, 1910, Proc. R. Irish Acad., 28 (Sect. B, 7), p. 312, pl. V fig. 27.

Scirpearella gracilis: Nutting, 1910, Siboga-Exped., 13b³, p. 25, pl. VII figs. 1–5; Nutting, 1912, Proc. Nat. Mus. 43, p. 98.

Scirpearia gracilis: Kükenthal, 1924, Das Tierreich, 47, p. 372; Toeplitz, 1929, Zool. Jahrb. Suppl. 16 (2), p. 310, fig. 17.

Material examined.—2 unbranched fragments from Station 13 (19.12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Description.—Either one of the material measures only 70 mm long and 2 mm wide. Its upper portion is dorsiventrally flattened and lanceolate in outline. The lower portion is short and sterile. The calcareous axis is 1 mm in diameter; pointed in its distal end but lacks basal attachment. Polyps arranged in one row on both



Text-fig. 11. *Viminella gracilis* (Wright & Studer), cortical spicules. [$\times 150$]

edges are prominent, club-shaped, up to 2 mm high and slightly incurved.

The surface of the coenenchyme is quite granular and contains within double-headed spicules with indistinct median constriction, measuring about 0.08–0.09 mm long. The colony is wholly white. Presumably it may be a young form.

Distribution.—Widely distributed in the Indian Ocean, Malay Archipelago, as far north as Japan.

Genus *Junceella* Valenciennes, 1885

17. *Junceella gemmacea* (Valenciennes, M.S.)

Milne Edwards & Haime, 1857

(Pl. III, fig. 6)

For synonymy and description refer to Kükenthal, 1924, *Das Tierreich*, 47, p. 363.

Material examined.—2 pieces of one and the same colony, one of which is dichotomously branched, 3 mm in diameter and orangish brown in color, from Station 13 (19.12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Distribution.—Widespread in the Indo-Westpacific.

Family Primnoidae Gray, 1857

Subfamily Primnoinae Gray, 1857

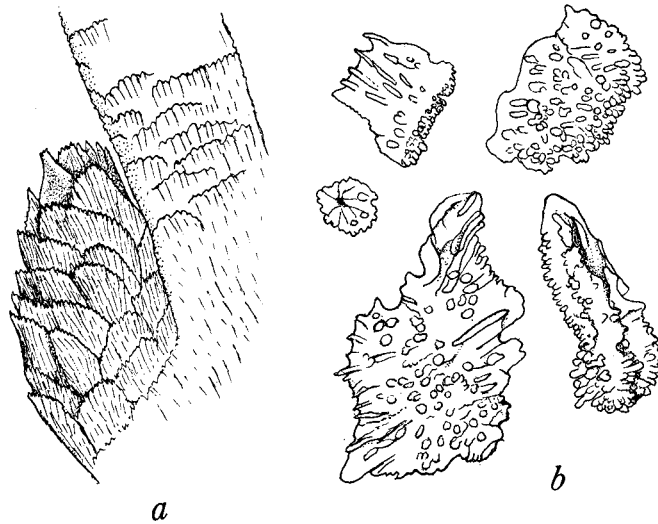
Genus *Thouarella* Gray, 1870

18. *Thouarella* (*Amphilaphis*) *plumacea* (Thomson & Mackinnon, 1911)

(Text-fig. 12; Pl. IV, fig. 3)

Amphilaphis plumacea Thomson & Mackinnon, 1911, *Mem. Austral Mus.*, 4(13), p. 680, pl. 65 fig. 3, pl. 68 fig. 3, pl. 74.

Thouarella (*A.*) *plumacea*, Kükenthal, 1919, *Ergebn. Tiefsee-Exp.*, 13 (2), p. 414; ——— Kükenthal, 1924, *Das Tierreich*, 47, p. 291, fig. 163.



Text-fig. 12. *Thouarella (Amphilaphis) plumacea* (Thomson & Mackinnon).
a, A short polyp attached to distal part of the colony, side view; *b*, cortical spicules.
 [*a*, $\times 60$; *b*, $\times 150$]

Material examined.—2 fragments without basal parts from Station 13 (19.12. '63), Geographe Channel, entrance to Sharks Bay, 110–120 m.

Description.—The specimens herein examined are represented by 2 terminal branches, measuring respectively 9.3 cm and 12 cm in length.

Both are dichotomously branched at acute angles (30° – 40°) in one plane. These terminal branches are extremely slender and elongate. They are almost white wholly in alcohol. The axis is calcareous and about 1 mm across, covering with scaly coenenchyme, about 1.5 mm across in situ. Clavate polyps, about 1.0–1.5 mm long, are distributed spirally around the coenenchyme. Usually there are 8 polyps for a length of 1 cm on the branch.

The opercular scales are isosceles triangles with a strong concavity to the outer surface. Other calycular and coenenchymal scales are greatly varied in size and outer ornamentation, though having central nucleus or median ridge, characteristic to the genus. Their upper edges are uniformly denticulate.

Distribution.—Hitherto known only from Barrenjoy, Australia, 30–40 fathoms (Type locality).

Family Isididae Lamouroux, 1812

Subfamily Mopseinae Gray, 1870 (emend. Wright & Studer, 1889)

Genus *Mopsea* Lamouroux, 1816

19. *Mopsea squamosa* Kükenthal, 1919

(Text-fig. 13; Pl. III, fig. 3)

Mopsea flabellum Thomson & Mackinnon, 1911, Mem. Austral. Mus., 4, p. 676, pl. 63 figs. 1–3, pl. 67

fig. 6, pl. 71.

Mopsea squamosa Kükenthal, 1919, *Ergeb. Tiefsee-Exp.*, 13 (2), p. 625, 926; ——— Kükenthal, 1924, *Das Tierreich*, 47, p. 441 (Substitute name).

Non *Acanthoisis flabellum* Wright & Studer, 1889, *Challenger Rep.*, Zool., p. 45, pl. 8 figs. 1-1b, pl. 9 fig. 12; ——— Thomson & Mackinnon, 1911, *Mem. Austral. Mus.*, 4, p. 679, pl. 62 figs. 1-2.

Non *Mopsea flabellum*: Kükenthal, 1924, *Das Tierreich*, 47, p. 439.

Material examined.—Fragments of broken branches from Station 13 (19.12. '63), Geographe Channel, entrance to Sharks Bay, 110-120 m.

Description.—As shown in the photograph (Pl. III, fig. 3), all the material available to me are only fragments of fragile texture, so that their intact condition cannot be deduced. But, their brick-red colored thick bark and their mode of branching clearly suggest a closest affinity to Thomson & Mackinnon's '*Mopsea flabellum*' as illustrated in colored figures.

A few branches retained are rather robust and short. The branches are arisen from the stem approximately at an angle of 40° and all terminate to blunt end. The coenenchymal spicules are all irregular-formed discs tuberculated on surface and serrate on edges; their shape is mostly oval, never elongated.

Distribution.—Hitherto recorded from Australian waters (type locality not designated).



Text-fig. 13. *Mopsea squamosa* Kükenthal, cortical spicules. [$\times 80$]

20. *Mopsea alternata*, Utinomi, n. sp.

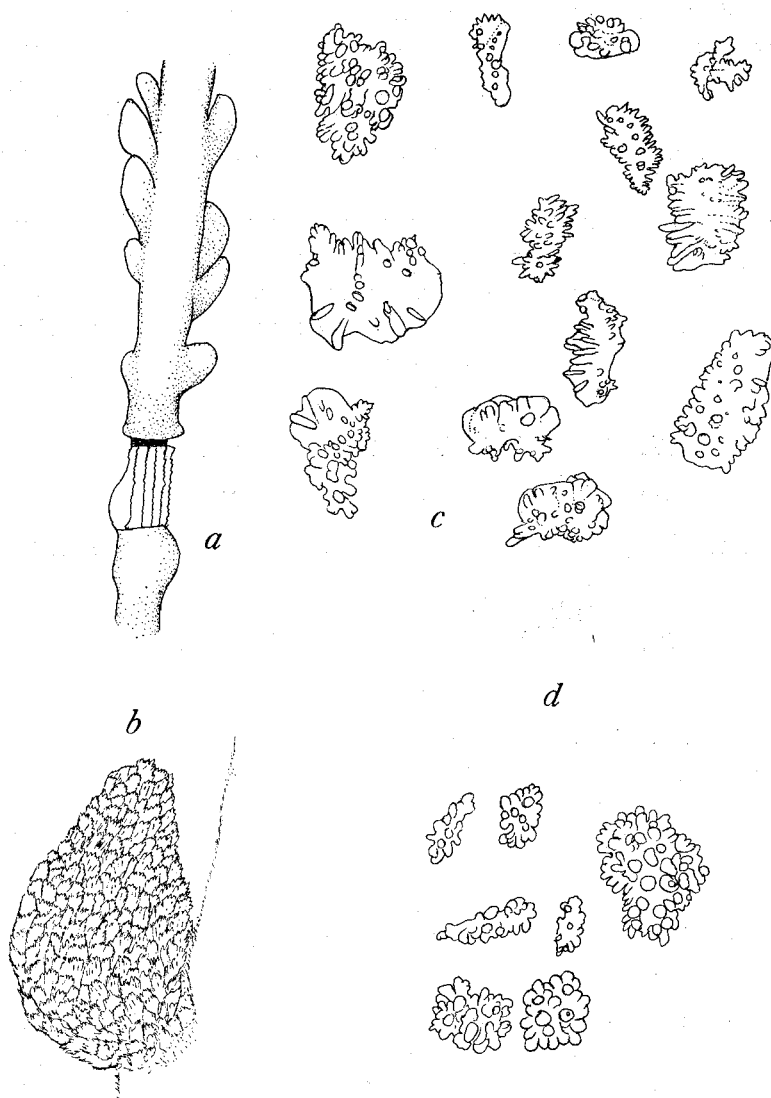
(Text-fig. 14; Pl. IV, fig. 4)

Holotype.—A flabellate colony lacking the basal portion from Station 13 (19.12. '63), Geographe Channel, entrance to Sharks Bay, Western Australia, 110-120 m.

Description.—The colony is rather robust and alternately branched in one plane, forming the main stem a zigzag course; thus the main branching is sympodial against that the majority of other known species of *Mopsea* show a monopodial or bifurcate branching as usual.

The total length is about 10 cm and the maximum expanse in the upper flabellate portion is about 4 cm. The diameter of the main stem is about 1.5 mm in the lowest end and about 0.5 mm in the distal ends, which are mostly truncatedly cut off.

Terminal branches are arisen at acute angles (ca. 20°~30°) at different levels, and they run on both sides of the main stem in parallel to one another, keeping a wide interval between. These branches are similarly long, measuring as 2.5 cm, 3 cm, 5 cm in each length and about 1.5 mm in width.

Text-fig. 14. *Mopsea alternata* Utinomi (n. sp.).

a, Part of branch, partly denuded to show central axis (longitudinally striated) and narrow horny node (transversely constricted); *b*, polyp, side view; *c*, calycular spicules; *d*, cortical spicules. [*a*, $\times 12$; *b*, $\times 45$; *c-d*, $\times 150$]

The color of the colony in alcohol is ivory white all throughout.

The coenenchyme is very thin. The polyps are rather ovoid, about 1 mm long and 0.5 mm wide. They occur densely along the lateral sides of branches on opposite sides, directing upwards. The axis is as usual composed of calcareous internodes (2 mm long) with indented fluting surface and narrowed horny nodes (1 mm long) of yellowish brown colors alternately jointed together.

The superficial spicules of polyps are flat, tuberculate scales, greatly varying in

outline and size; mostly are oval or oblong, scales eccentric without nucleus but scattered with many small warts on upper surface. In larger ones among them the overlapping margin is often entire and studded with short ridges radially arranged on its outer surface, while another margin is more or less indented and warted on its outer surface. The coenenchymal spicules are flat, oval to oblong, multituberculate scales, about 0.04~0.1 mm long.

Remarks.—This specimen obtained with the preceding species *Mopsea squamosa*, is apparently most closely related to *Mopsea elegans* Thomson & Mackinnon (1911) recorded from Australia, but easily distinguishable from all of the known species of the genus by its unique mode of branching, as well as the shape of colorless spicules.

Distribution.—Type locality only, given above.

IV. Order PENNATULACEA Verrill, 1865

Suborder SUBSELLIFLORAE Kükenthal, 1915

Family Virgulariidae Verrill, 1868 (emend. Jungersen, 1904)

Genus *Virgularia* Lamarck, 1816

21. *Virgularia hexangularis* Kölliker, 1872

(Text-fig. 15; Pl. II, fig. 2)

Virgularia elegans var. *hexangularis* Gray, 1870, Catalogue of sea-pens, in the collection of the British Museum, p. 15 (Sharks Bay, Australia).

Virgularia hexangularis Kölliker, 1872, Anatom.-system. Beschr. Alcyonarien. I, Die Pennatuliden (Abhandl. Senckenb. Naturf. Ges., Bd. 7 & 8), p. 214, pl. XV, fig. 143 (1, 2); ——— Kükenthal, 1915, Das Tierreich, 43, p. 79.

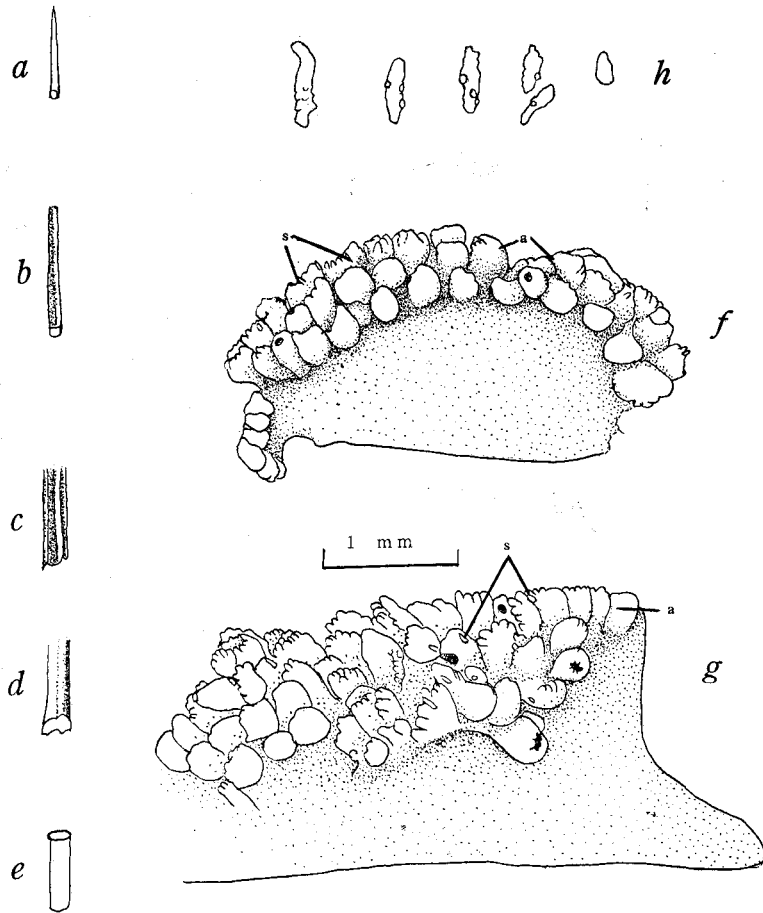
Virgularia ornata (non Fisher, 1874) Thomson & Simpson, 1909, Alcyonarians of the littoral area, Indian Ocean, p. 281 (Andamans, not figured).

Virgularia andamanensis Kükenthal, 1915, Das Tierreich, 43, p. 78 (Substitute name for Thomson & Simnson's *V. ornata*).

Material examined.—One complete specimen, 47 cm in total length and six naked axes, with fleshy stalk only, as dried intact condition, ranging from 39 cm to 48 cm in total length, taken by the first haul of Otter trawling at Station 1 (1.12. '63), Rowley Shoals, west of Broome, western Australia, 124 m in depth.

Description.—A complete specimen and other six dry specimens are quite large-sized slender, elongate virgulariid.

A single complete specimen bears a number of small fleshy polyp-leaves closely placed biserially on the ventral side of the rhachis, leaving free a shallow longitudinal furrow. The exact number of the polyp-leaves on the rhachis closely set from base to tip is practically innumerable. The shape of polyp-leaves is gradually varied from transversely elongated trapezoid to semicircular, about 6–7 mm in width and lower in height. The lower attaching part of each leaf is thin and smooth on surface, whereas the curved marginal part is thickened, bearing a number of autozooids crowded (apparently formed of 2–3 transverse rows).



Text-fig. 15. *Virgularia hexangularis* Kölliker.

a, Distal end of calcareous axis; *b*, penultimate part of axis, ventral side; *c*, widest part of axis at level of upper swollen part of fleshy stalk, ventral side; *d*, the same part, dorsal side; *e*, basal end of axis, dorsal side; *f*, polyp-leaf in upper part of rhachis, inner view; *g*, polyp-leaf in lower part of rhachis, inner view; *h*, small spicules from tip of autozooids of polyp-leaves. *a*—autozooid, *s*—polypal spicules. [*a*–*e*, magnified free-hand sketch; *f*–*g*, ×12; *h*, ×150]

By a detailed examination under high-power lens on polyp-leaves, unexpectedly enough, a few minute calcareous spicules (measuring ca. 2–5 μ in length) could be detected around the distal end of autozooids, slightly projecting. No siphonozooids could be seen between polyp-leaves, though Kölliker noted only as “Zooide lateral”, but not seen also in his Fig. 143.

The fleshy stalk, which occupies approximately the lower 1/6~1/5 of the total length of the colony, is as usual orangish or brownish in living state and tapers downward from a slight swelling beneath the uniformly slender rhachis.

The calcareous axis is quite stout, white and tapers upward to an elastic flagellum. Its distalmost part (Fig. 20a) is rather cylindrical, less than 1 mm in diameter and sharply ended. The penultimate whip-like part (Fig. 20b) is quite quadrangular in

section, about 1.2–2.0 mm wide (ventral side slightly concave, while dorsal side flat). Going downward to the stalk, the widest part (Fig. 20c), where the fleshy bark is swollen near the base of the rhachis, is about 3 mm wide, its ventral surface is longitudinally furrowed by 2 prominent ridges into one wide axial furrow and one narrow lateral furrow on each side; while its dorsal surface (Fig. 20d) is convex with a narrow central furrow; thus the transverse section of the axis at the upper level of the stalk looks apparently hexangular, as indicated by the specific name. The basal end (Fig. 20e) of the axis is dorsiventrally flattened and truncated distally with a width of about 2 mm, and when dried, its basal end often bent dorsad.

Measurements (in cm).

	Total length		Rhachis		Stalk
Complete one	47	=	37	+	10
Naked one	48	=	36	+	12
"	44	=	34	+	10
<i>V. hexangularis</i> (after Kölliker)	67	=	52.7	+	14.3
<i>V. ornata</i> (after Thomson and Simpson)	?		2.3		?

Remarks.—This large-sized virgulariid is referable to a less known *Virgularia hexangularis* Kölliker, which was first described and figured as a valid species of the genus *Virgularia*, basing upon a fragment deposited in the British Museum and formerly designated by Gray (1870, Catalogue of sea-pens in the British Museum, p. 15) only as a mere variety of *V. elegans* Gray, obtained together from Sharks Bay, western Australia, both without giving any figures and detailed notes. In general appearance, particularly on account of peculiar polyp-leaves and axis, as described above, '*Virgularia ornata*' Thomson & Simpson, 1909), recorded only once from Andamans (not far from Sharks Bay, western Australia), seems to be conspecific to *V. hexangularis*. Inferring from Thomson & Shimpson's original description without figures and Kükenthal's emended diagnosis, Andamans specimen consisting of a short fragment of a colony, merely "23 mm long, with 13 leaves on each side" and "with quadrilateral axis", which bears 2 longitudinal furrows on the lateral sides", and on each polypleaf ('pinnule') about 12–45 autozooids arranged in four rows", may represent a distal part of the present *V. hexangularis* Kölliker (1870).

More noteworthy of special interest is the occurrence of a few tuberculate rodlets (not biscuit-like nor needle-like) on tentacles of autozooids of polyp-leaves, against the generally recognized diagnostic characteristics of *Virgularia*. This fact too suggests a closest relationship with *Stylatula* of Verrill (1864) in which the autozooidal small spicules are either present or absent, although not supported beneath by such a 'Kalkplatte' peculiar to *Stylatula*, of larger needles.

Distribution.—Hitherto known only from the Eastern Indian Ocean (Sharks Bay, Rowley Shoals herein recorded) and the Sea of Bengal (Andamans), in rather deep waters.

REFERENCES (SELECTED)

- Aurivillius, M. 1931. The gorgonarians from Dr. Sixten Bock's Expedition to Japan and Bonin Islands 1914. K. Svensk. Vetensk.-Akad. Handl., 3rd Ser., 9 (4): 1-337, pls. 1-6.
- Bayer, Frederick M. 1949. The Alcyonaria of Bikini and other atolls in the Marshall group. Part I: The Gorgonacea. Pacific Sci., 3 (3): 195-210, pls. 1-4.
- 1956. Octocorallia. Moore, R.C. (ed.), Treatise on Invertebrate Paleontology, Part F: 166-231.
- 1959. A review of the gorgonacean genus *Placogorgia* Studer, with a description of *Placogorgia tribuloides*, a new species from the Straits of Florida. J. Wash. Acad. Sci., 49 (2): 54-61.
- 1973. A new gorgonacean octocoral from Jamaica. Bull. Mar. Sci., 33 (2): 387-398.
- Broch, Hj. 1916. Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia 1910-1913. XI. Alcyonarien. K. Svensk. Vetensk.-Akad. Handl., 52 (11): 1-48, pls. 1-4.
- Brundin, J.A.F. 1896. Alcyonarien aus der Sammlung des zoologischen Museums in Uppsala. Bih. Svenska Akad., 22 (Afd. 4, no. 3): 1-22, pls. 1-2.
- Chalmers, D. 1929. The Alcyonarian genus *Siphonogorgia*, with descriptions of new species. Proc. roy. Phys. Soc. Edinb., 21 (4): 159-216.
- Deichmann, E. 1936. The Alcyonaria of the western part of the Atlantic Ocean. Mem. Mus. Comp. Zool. Harvard Coll., 53: 1-317, pls. 1-37.
- Ellis, J. & D. Solander 1786. The natural history of many curious and uncommon zoophytes collected from various parts of the globe. London. xii+208 pp., 63 pls.
- Grasshoff, M. 1972. Die Gorgonaria des östlichen Nordatlantik und des Mittel Meeres. I. Die Familie Ellisellidae (Cnidaria: Anthozoa). Auswertung der "Atlantischen Kuppenfahrten 1967" von F.S. "Meteor". "Meteor" Forsch.-Ergeb., D, 10: 73-87.
- Gray, J.E. 1862. Description of two new genera of Zoophytes (*Solenocaulon* and *Bellonella*) discovered on the north coast of Australia by Mr. Rayner. Proc. Zool. Soc. Lond., 1862: 34-37.
- 1870a. Catalogue of Lithophytes or stony corals in the collection of the British Museum, London. 51 pp.
- 1870b. Catalogue of sea-pens or Pennatulariidae in the collections of the British Museum, London. 40 pp.
- Hentschel, Ernst 1903. Gorgonacea von Amboina und Thursday Island. Denkschr. Med. naturw. Ges. Jena, 8: 643-652, pls. 52-53; Semons Zool. Forschungen, V (Reproduced).
- Hickson, S.J. 1903. The Alcyonaria of the Maldives. Part I. The genera *Xenia*, *Telesto*, *Spongodes*, *Nephthya*, *Paraspongodes*, *Chironephthya*, *Siphonogorgea*, *Solenocaulon*, and *Melitodes*. In Gardinert (ed.), The Fauna and Geography of the Maldivian and Laccadive Archipelagoes, vol. II, part 1: 473-502, pls. 26-27.
- 1905. Ditto. Part III, The families Muriceidae, Gorgonellidae, Melitodidae, and the genera *Pennatula*, *Eunephthya*. Ibid., vol. II, part 4: 807-826, pl. 67.
- 1916. The Pennatulacea of the Siboga Expedition, with a general survey of the order. Siboga-Expeditie, monogr. XIV, x+265 pp., 10 pls., map.
- 1930. On the classification of the Alcyonaria. Proc. Zool. Soc. Lond., 1930 (15): 229-252.
- 1932. Gorgonacea. Great Barr. Reef Expedition 1928-29, Sci. Rept., 4 (13): 459-512.
- 1937a. The Pennatulacea. The John Murray Expedition 1933-34, Sci. Rept., 4 (5): 101-130.
- 1937b. The Family Melitodidae. Trans. Zool. Soc. Lond., 23 (3): 73-209, pl. XIV.
- 1940a. The Gorgonacea, with notes on two species of the Pennatulacea. John Murray Exped., Sci. Rept., 6 (7): 267-317, pl. I.
- 1940b. The species of the genus *Acabaria* in the Red Sea. Publ. Mar. Biol. St. Ghardaqa (Red Sea), 2: 1-22, pls. 1-2.
- Hickson, S.J. & Isa L. Hiles 1900. The Stoloniifera and Alcyonacea collected by Dr. Willey in New Britain, etc. In Willey's Zool. Res., Part IV: 493-508, pls. 50-51.
- Johnson, J.Y. 1863. Description of a new species of *Juncella*. Proc. Zool. Soc. Lond., 1863: 505-506.
- Klunzinger, C.B. 1877. Die Korallthiere des Rothen Meeres. I Theil: Die Alcyonarien und Malacodermen. Berlin. i-vii, 20-94 pp., pls. I-V.

- Kölliker, A. 1865. *Icones histologicae*. Leipzig. iv+181 pp., 19 pls.
- 1870. Beiträge zur Kenntnis der Polypen. Verh. Phys. Med. Ges. Würzburg, N.F., 2 (1): 13-30, pls. III-IV.
- 1872. Anatomisch-systematische Beschreibung der Alcyonarien. Erste Abtheilung: Die Pennatuliden. (Abdruck a. d. Abhandl. Senckenberg. Naturf. Ges., (Bd. VII, VIII). Frankfurt a. M. 473 pp., 24 pls. Originally published in 1869-1872.
- Kükenthal, W. 1896. Alcyonaceen von Ternate. Nephthyidae Verrill und Siphonogorgiidae Kölliker. Abhandl. Senckenberg. Naturf. Ges. 23 (1): 81-144, pls. V-VIII.
- 1909. Japanische Gorgoniden. II. Teil: Die Familien der Plexauriden, Chrysogorgiiden und Melitodiden. Doflein, F. (ed), Beiträge zur Naturgeschichte Ostasiens (Abhandl. math.-phys. Klasse K. Bayer. Akad. Wiss., 1 Suppl.-Bd. 5 Abhandlg.), München. 78 pp., 7 pls.
- 1910. Alcyonaria. 1 Teil. In W. Michaelsen & R. Hartmeyer (ed.), Die Fauna Südwest-Australiens, 3 (1): 1-108, pls. I-IV.
- 1913. Ueber die Alcyonarienfauna Californiens und ihre tiergeographischen Beziehungen. Zool. Jahrb. Abt. Syst., 53 (2): 219-270, pls. 7-8.
- 1915. Pennatularia. Das Tierreich, Lief. 43. Berlin. xv+132 pp.
- 1919. Gorgonaria. Erst Hälfte: Systematischer Teil. Wiss. Ergebn. deut. Tiefsee-Exped. *Valdivia*, 13 (1): xiv+646 pp., 60 pls.
- 1924. Gorgonaria. Das Tierreich, Lief. 47. Berlin. xxviii+478 pp.
- Kükenthal, W. & Hj. Broch 1911. Pennatulacea. Wiss. Ergebn. deut. Tiefsee-Exped. *Valdivia*, 13 (2): i-iv, 113-576, 17 pls.
- Laackmann, H.L. 1909. Zur Kenntnis der Alcyonarien-Gattung *Telesto* Lmx. Zool. Jahrb., Suppl., 11 (1): 41-104, pls. 2-8.
- Macfadyen, L.M.I. 1936. Alcyonaria (Stolonifera, Alcyonacea, Telestacea and Gorgonacea). Great Barr. Reef Exped. 1928-29, Sci. Rpts., 5 (2): 19-72, pls. I-V.
- Milne Edwards, H. & J. Haime 1857. Histoire naturelle de coralliaires ou polypes proprement dits. I. Paris. viii+326 pp.
- Nutting, C.C. 1910. The Gorgonacea of the Siboga Expedition. Siboga-Expeditie, monogr. XIII b1, b2, b3, b4, b5.
- 1912. Descriptions of the Alcyonaria collected by the U.S. Fisheries steamer "Albatross", mainly in Japanese waters during 1906. Proc. U.S. Natl. Mus., 43 (1923): 1-104, pls. 1-21.
- Pallas, P.S. 1766. *Elenchus zoophytorum*. Hague. xiv+451 pp.
- Ridley, S.O. 1882a. Contributions to the knowledge of the Alcyonaria, with descriptions of new species from the Indian Ocean and the Bay of Bengal. Ann. Mag. Nat. Hist., Ser. V, 9: 184-193.
- 1882b. Contributions to the knowledge of the Alcyonaria. Part II, including descriptions of new species from Mauritius. Ibid., Ser. V, 10: 125-133, pl. V.
- 1883. The coral-fauna of Ceylon, with descriptions of new species. Ibid., Ser. V, 11: 250-262.
- 1884. Alcyonaria. Rep. Zool. Coll. made in the Indo-Pacific Ocean during the voyage of H.M.S. 'Alert' 1881-2: 327-365, 666-668, pls. 36-38. London.
- 1889. Report on the alcyoniid and gorgoniid Alcyonaria of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr. John Anderson, F.R.S. Jour. Linn. Soc., Zool., 21: 223-247, pls. 17-18.
- Roule, Louis 1908. Alcyonaires d'Amboine. Rev. Suisse Zool., 16: 161-194, pls. 6-8.
- Roxas, Hirario 1933. Philippine Alcyonaria, II. The families Alcyoniidae and Nephthyidae. Philipp. J. Sci., 50 (4): 345-470, pls. 1-5.
- Shann, E.W. 1912. Observations on some Alcyonaria from Singapore, with a brief discussion on the classification of the family Nephthyidae. Proc. Zool. Soc. Lond., 1912 (34): 505-527, pls. LXI-LXIII.
- Simpson, James J. 1910. A revision of the Gorgonellidae: 1. The Juncellid group. Proc. Roy. Irish Acad., 28 (B, 7): 247-386, pls. I-XIX.
- Stiasny, G. 1935. Gorgonacea der Siboga-Expedition. Supplement I. Revision der Plexauridae. Siboga-Expeditie, monogr. XIIIb⁷: 1-106, pls. 1-7.

- 1937. Gorgonacea der Siboga-Expedition. Supplement II. Revision der Scleraxonia, mit an Schluss der Melitodidae und Coralliidae. *Ibid.*, monogr. XIIIb³: 1–138, pls. 1–8.
- 1938. Die von Dr. C. Dawydoff in französisch Indochina gesammelten Gorgonarien. *Mem. Mus. Natl. Hist. Nat. Paris*, (N. S.) 6 (3): 355–368.
- 1940a. Alcyonaria und Gorgonaria von Südafrika aus der Sammlung des South African Museum, Capetown. *Verhandel. Nederl. Akad. Wet., Afd. Naturk., Tweede Sect.* 39 (3): 1–39, pls. I–IV.
- 1940b. Biological results of the Snellius Expedition. VII. Die Gorgonarien—Sammlung der Snellius-Expedition. *Temminckia*, 5: 191–256, pls. VI–XIV.
- 1947. De Gorgonarien-Familie Acanthogorgiidae Kükenth. & Gorz. (met bijzondere inachtneeming van het materiaal der Siboga-Expeditie). *Verhandel. Kon. Nederl. Akad. Wet. Afd. Natuurkunde, Tweede Sect.*, 43 (2): 1–93.
- 1951. Alcyonides et gorgonides des collections du Museum National d'Histoire naturelle (II). *Memoires du Museum Naturelle, Ser. A, Zool.*, 3 (1): 1–80, pls. I–XXII.
- Studer, Th. 1878. Uebersicht der Anthozoa Alcyonaria welche während der Reise S.M.S. Gazelle um die Erde gesammelt wurden. *Monatsber. K.P. Akad. Wiss. Berlin, Sitz. Phil.-hist. Kl.*, 1878: 632–688, pls. 1–5.
- 1887. Versuch eines System der Alcyonaria. *Arch. f. Naturgesch.*, 53 Jahrg., 1 (1): 1–74, pl. 1.
- 1889. Supplementary report on the Alcyonaria. *Rep. Sci. Res. Voyage H.M.S. 'Challenger'*, *Zool.*, 32, 31 pp., 6 pls.
- 1895. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck. *Mitt. Geogr. Ges. Naturh. Mus. in Lübeck*, 2te Reihe, 7/8: 103–128, pls. I–VI.
- Thomson, J.A. 1927. Alcyonaires provenant des campagnes scientifiques du Prince Albert I^{er} de Monaco. *Rés. Camp. Sci. Monaco*, 73: 1–87, pls. 1–6.
- Thomson, J.A. & L.M.I. Dean 1931. The Alcyonacea of the Siboga Expedition with an addendum to the Gorgonacea. *Siboga-Expeditie, monogr.* XIIIId, 227 pp., 28 pls.
- Thomson, J.A. & W.D. Henderson 1905. Report on the Alcyonaria collected by Professor Herdman at Ceylon in 1902. *Ceylon Pearl Oyster Fisheries 1905-Suppl. Rep.* 20: 269–328, pls. 1–6. London.
- 1906a. The marine fauna of Zanzibar and British East Africa, from collections made by Cyril Crossland, in the years 1901 and 1902. *Alcyonaria. Proc. Zool. Soc. Lond.*, 1906 (1): 393–443, pls. 26–31.
- 1906b. An account of the alcyonarians collected by the Royal Indian Marine Survey ship *Investigator* in the Indian Ocean. I. The alcyonarians of the deep sea. *Calcutta*. xvi+132 pp., 10 pls.
- Thomson, J.A. & D.L. Mackinnon 1910. Alcyonarians collected on the Percy Sladen Trust Expedition by Mr. J. Stanley Gardiner. Part II. The Stolonifera, Alcyonacea, Pseudaxonia and Stelechotokea. *Trans. Linn. Soc. Lond., Ser. II, Zool.*, 13 (8): 165–211, pls. VI–XIV; J. St. Gardiner (ed.), *The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner*, vol. II (Reproduced).
- 1911. The alcyonarians of the "Thetis" Expedition. *Mem. Austral. Mus.*, 4: 659–695, pls. XLI–LXXXII.
- Thomson, J.A. & E.S. Russell 1910. Alcyonarians collected by the Percy Sladen Trust Expedition by Mr. J. Stanley Gardiner. Part I. The Axifera. *Trans. Linn. Soc. Lond., Ser. II, Zool.*, 13 (8): 139–164, pls. 6–14; J. St. Gardiner (ed.), *The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner*, vol. II (Reproduced).
- Thomson, J.A. & J.J. Simpson 1909. An account of the alcyonarians collected in the Indian Ocean by the Royal Indian Marine Survey ship "*Investigator*". Part II. The alcyonarians of the littoral area. *Calcutta*. xviii+319 pp., 9 pls.
- Thorpe, Laura 1928. Alcyonaria of the Abrolhos Islands, Western Australia. *Jour. Linn. Soc. Lond., Zool.*, 36 (247): 479–531, pls. 30–34.
- Tixier-Durivault, A. 1965. Quelques octocoralliaires Australiens. *Bull. Mus. Natl. d'Hist. Nat. Paris, Ser. 2*, 37 (4): 705–716.
- 1966. Octocoralliaires. *Faune de Madagascar*, XXI. Paris. 456 pp.

- 1970. Les Octocoralliaires de Nouvelle-Calédonie L'Expedition française sur les récifs coralliens de la Nouvelle Calédonie organ. Fond. Singer-Polignac 1960-1963, IV. Paris: 173-350.
- 1972. Nouvel apport d'Octocoralliaires de Madagascar et des îles avoisinantes. Tethys Suppl. 3 (1972): 11-68.
- Toeplitz, Ch, 1929. Die Gorgonarien Westindiens. Kap. 7. Die Familie Gorgonellidae, zugleich eine Revision. Zool. Jahrb. Suppl. 16 (2): 235-376, pls. 6-7.
- Utinomi, H. 1961. Noteworthy octocorals collected off the southwest coast of Kii Peninsula, middle Japan. Part 2, Telestacea, Gorgonacea and Pennatulacea. Publ. Seto Mar. Biol. Lab., 9 (1): 197-228, pls. VII-X.
- 1971a. Port Phillip Survey 1957-1963, Victoria, Part 2. Octocorallia. Mem. Nat. mus. Vict., 32: 7-18, pl. 7.
- 1971b. Intertidal alcyonarians in the vicinity of Darwin, Northern Territory, Australia. Rec. Aust. Mus., 28 (5): 87-110, pls. 15-16.
- 1973a. Rediscovery of an enigmatic octocoral, *Pseudogorgia geoffroyi* Kölliker, from southern Australia and a discussion on its systematic position. (with E. Harada) Publ. Seto Mar. Biol. Lab., 20 (Proc. Second Intern. Symposium on Cnidaria): 111-132.
- 1973b. Description of a new species of *Telesto* from the Inland Sea of Japan, with a review of the Telestacean octocorals. Ibid., 20: 145-154, pl. I.
- Verrill, A.E. 1865. Synopsis of the polyps and corals of the North Pacific Exploring Expedition, under Commodore C. Ringgold and Captain John Rodgers, U.S.N., from 1853 to 1856, with descriptions of some additional species from the west coast of North America, collected by Dr. Wm. Stimpson, naturalist to the Expedition. Part II. Alcyonaria. Proc. Essex Inst., 4 (10): 181-196, pls. 5-6.
- Verseveldt, J. 1971. Octocorallia from North-western Madagascar (Part II). Zool. Verh., 117: 1-73, pls. I-XV.
- 1973. Ditto (Part III). Proc. Koninkl. Nederl. Akad. van wet.-Amsterdam, Ser. C, Zool., 76 (1): 69-171, pls. 1-8.
- Versluys, J. 1906. Die Gorgoniden der Siboga-Expedition. II. Die Primnoidae. Siboga-Expeditie, monogr. XIIIa: 1-187, 10 pls.
- Whitelegge, Th. 1897a. The Alcyonaria of Funafuti. Part I. Mem. Austral Mus., 3: 211-225, pls. X-XII.
- 1897b. The Alcyonaria of Funafuti. Part II. Ibid., 3: 305-320, pls. XVI-XVII.
- Wright, E.P. & Th. Studer 1889. Report on the Alcyonaria collected by H.M.S. "Challenger" during the years 1873-76. Rep. Sci. Res. Voyage "Challenger", Zool., 31 (1). lxxvii+314 pp., 49 pls. London.

APPENDIX

1. List of Trawling Stations (UMITAKA-MARU) and Octocoral Collection

- Station 1 (1.12.1963). Rowley Shoals, west of Broome, Western Australia (18° 24.5' S, 119° 25.3' E~18° 17.7' S, 119° 40.5' E). Depth 124 m.
Nephthea granulata Kükenthal
Solenocaulon ramosum Hickson
Euplexaura robusta Kükenthal
Virgularia hexangularis Kölliker
- Station 2 (2.12.1963). Rowley Shoals, west of Broome, Western Australia (18° 10.0' S, 119° 50.6' E~18° 10.0' S, 119° 55.0' E). Depth 123 m.
Umbellulifera striata (Thomson & Henderson)
- Station 7 (18.12.1963). Northwest of Dirk Hartog Island, entrance to Sharks Bay (25° 09.5' S. 112° 34.0' E~25° 02.0' S, 112° 46.0' E). Depth 118 m.
Solenocaulon tortuosum Gray
- Station 13 (19.12.1963). Geographe Channel, entrance to Sharks Bay, Western Australia (24° 58.5' S, 112° 46.8' E~24° 46.9' S, 112° 45.7' E). Depth 110-120 m.

Telesto multiflora Laackmann
Siphonogorgia obspiculata Chalmers
Melithaea modesta (Nutting)
Acabaria formosa Nutting
Subergorgia suberosa (Pallas) (With commensal barnacle, *Acasta hirsuta* Broch)
S. reticulata (Ellis & Solander)
Acanthogorgia turgida Nutting (With commensal barnacle, *Balanus* (*B.*) *venustus* Darwin)
Anthogorgia glomerata Thomson & Simpson
Muriceides dubia Nutting
Discogorgia dentata (Nutting)
Viminella gracilis (Wright & Studer)
Junceella gemmacea (Valenciennes)
Thouarella (*Amphilaphis*) *plumacea* (Thomson & Mackinnon)
Mopsea squamosa Kükenthal
M. alternata n. sp.

2. Record of antipatharians and commensal barnacles obtained together.

Station 13 (19.12.1963). Geographe Channel, entrance to Sharks Bay, western Australia (24° 58.5' S, 112° 46.8' E~24° 46.9' S, 112° 45.7' E). Depth 110-120 m.

Antipathes sarothamnoides Brook

(With a barnacle, *Oxynaspis celata* Darwin and *Balanus* (*Conopea*) *antipathidis* (Broch))

Antipathes verticillata (Brook)

Antipathes cf. *fruticosa* Gray

EXPLANATION OF PLATES I-IV

PLATE I

- Fig. 1. *Telesto multiflora* Laackmann. $\times 1$
a, A single stem (unbranched axial polyp) with lateral polyps partially expanded;
b, a single denuded stem, lateral polyps largely retracted.
- Fig. 2. *Nephthea granulata* Kükenthal. About $\times 1$
- Fig. 3. *Siphonogorgia obspiculata* Chalmers. About $\times 1.6$
a and *b*, 2 young colonies.
- Fig. 4. *Melithaea modesta* (Nutting). About $\times 2$
a-c, 3 fragments of colonies.
- Fig. 5. *Acabaria formosa* Nutting. $\times 1$
a, 2 colonies, showing beaded branches with warty calyces; *b*, a naked axis.

PLATE II

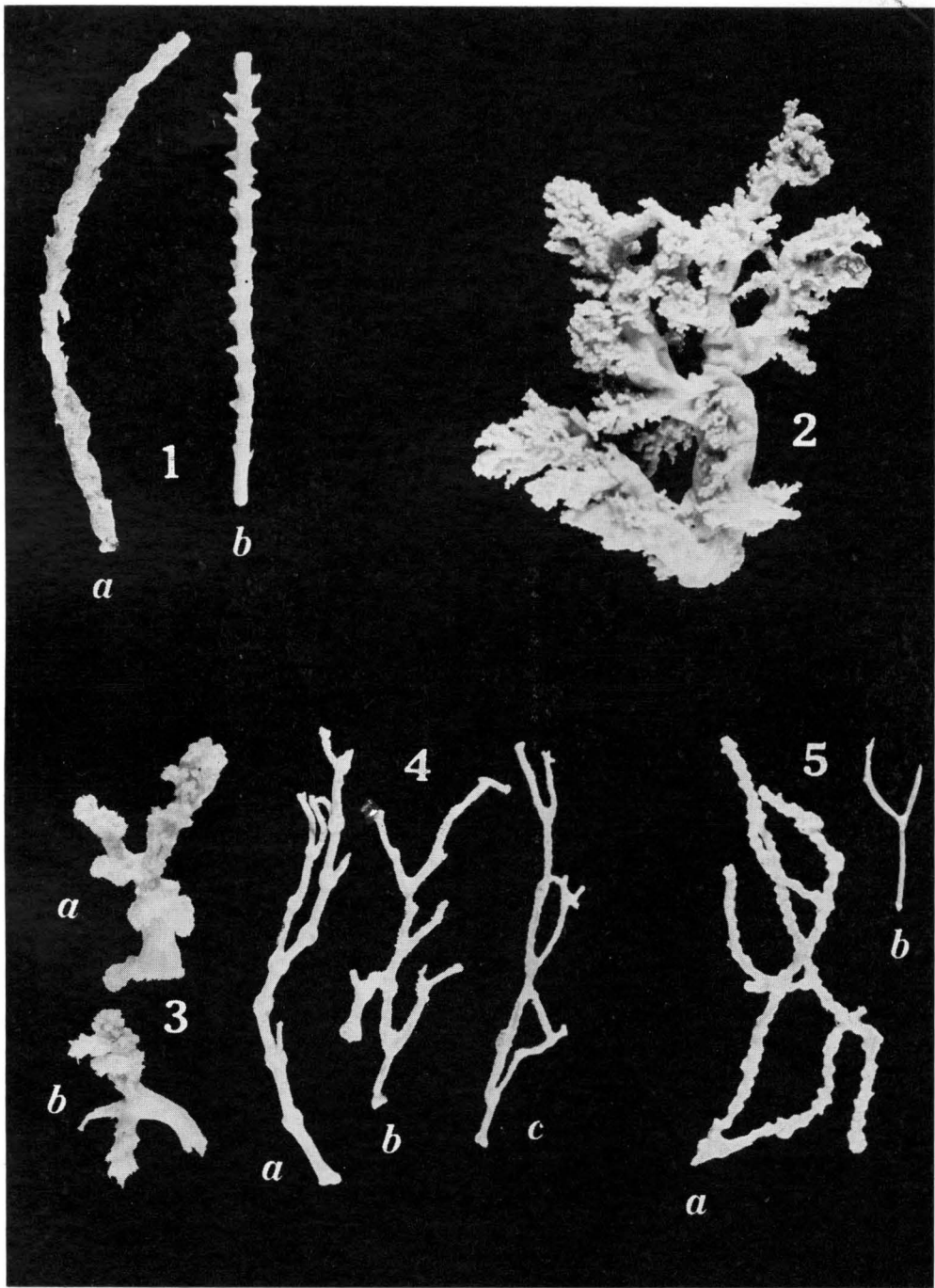
- Fig. 1. *Umbellulifera striata* (Thomson & Henderson). Approximately $\times 1/3$
- Fig. 2. *Virgularia hexangularis* Kölliker, complete specimen. Approximately $\times 1/3$
- Figs. 3-4. *Solenocaulon ramosum* Hickson, 2 fragments of a single colony. Approximately $\times 1/3$
- Fig. 5. *Solenocaulon tortuosum* Gray, 2 terminal branches with a part of hollowed stem. Approximately $\times 1/3$

PLATE III

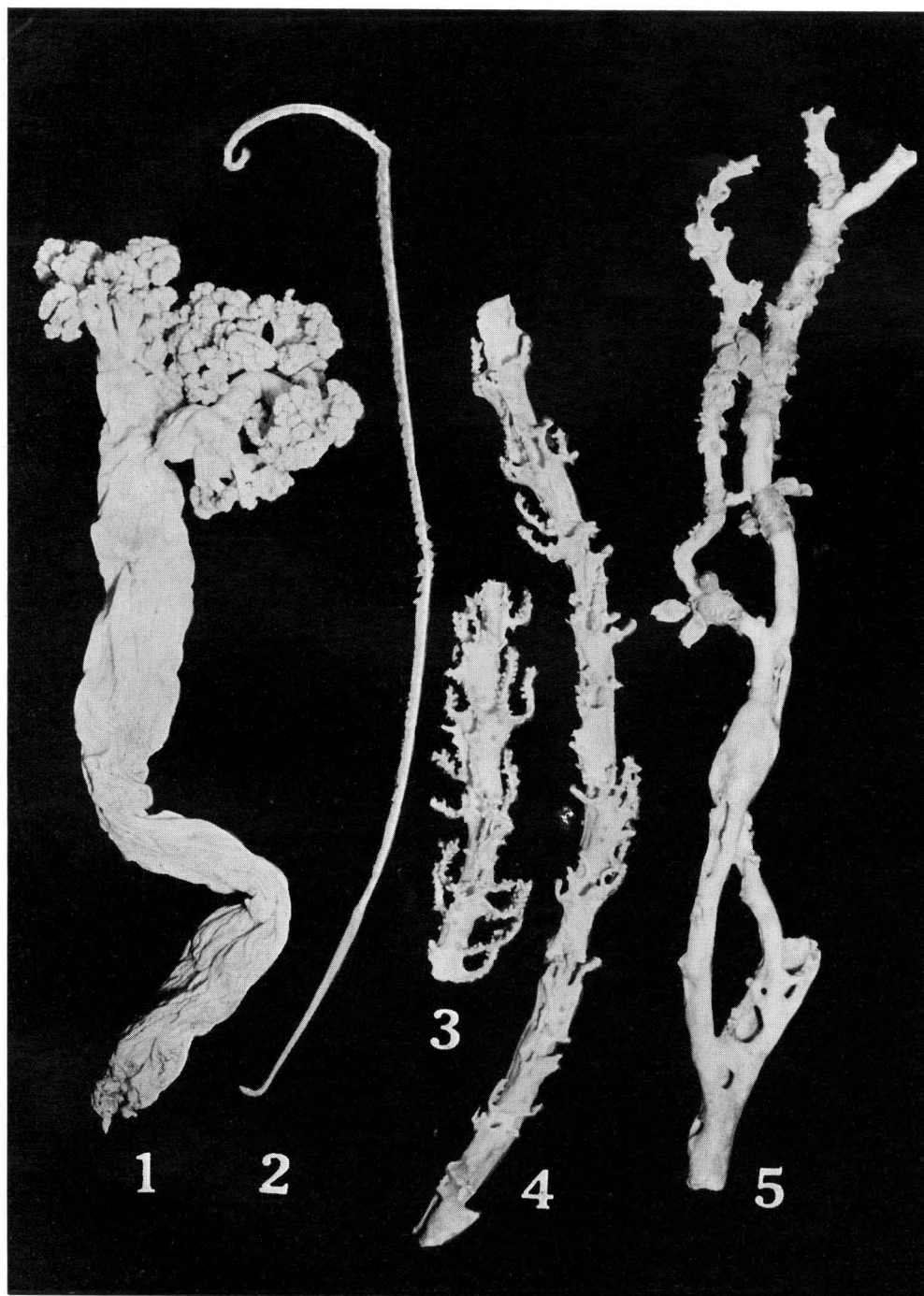
- Fig. 1. *Acanthogorgia turgida* Nutting, 4 colonies. $\times 0.8$
- Fig. 2. *Anthogorgia glomerata* Thomson & Simpson, 2 flabellate colonies. $\times 2/3$
- Fig. 3. *Mopsea squamosa* Kükenthal, 4 fragments one of which shows a naked axis. $\times 1.3$
- Fig. 4. *Muriceides dubia* Nutting, polyp-bearing unbranched fragment. $\times 1$
- Fig. 5. *Viminella gracilis* (Wright & Studer), young colony with prominent polyps biserially arranged. $\times 2/3$
- Fig. 6. *Junceella gemmacea* (Valenciennes M.S.) Milne Edwards & Haime, 2 fragments of a single colony. $\times 1$

PLATE IV

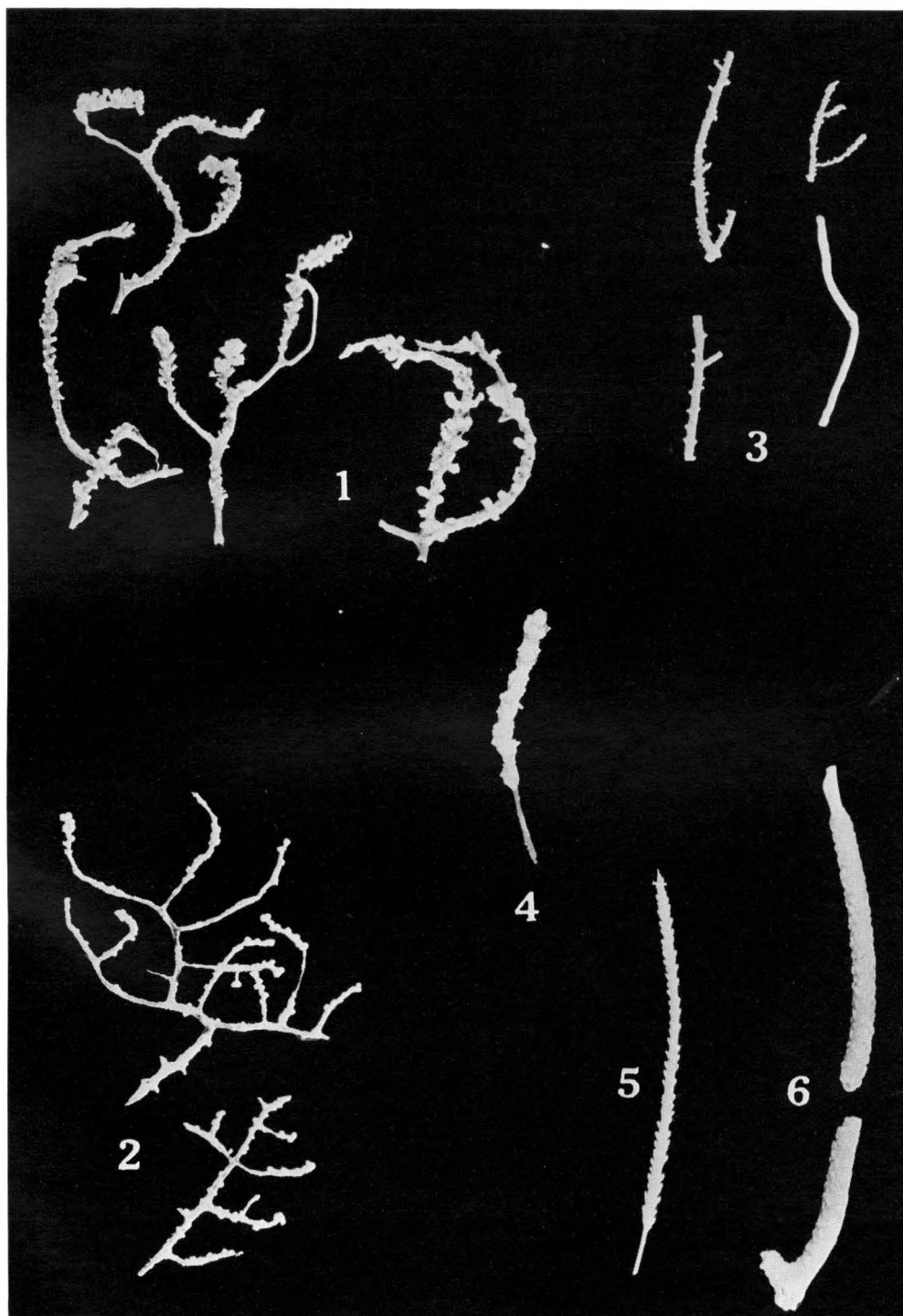
- Fig. 1. *Discogorgia dentata* (Nutting), 2 colonies without basal attachment. $\times 1/3$
- Fig. 2. *Euplexaura robusta* Kükenthal, mostly denuded colony (dried). Approximately $\times 4/5$
- Fig. 3. *Thouarella (Amphilaphis) plumacea* (Thomson & Mackinnon), partly broken fragment of a flabellate delicate colony. $\times 1/2$
- Fig. 4. *Mopsea alternata* Utinomi (n. sp.), holotype, lacking its lower part. $\times 2/3$
- Fig. 5. *Subergorgia suberosa* (Pallas), 3 fragments, infested with commensal barnacle *Acasta hirsuta* Broch (on stem on both sides). $\times 1/3$
- Fig. 6. *Subergorgia reticulata* (Ellis & Solander), 2 fragments. $\times 4/5$



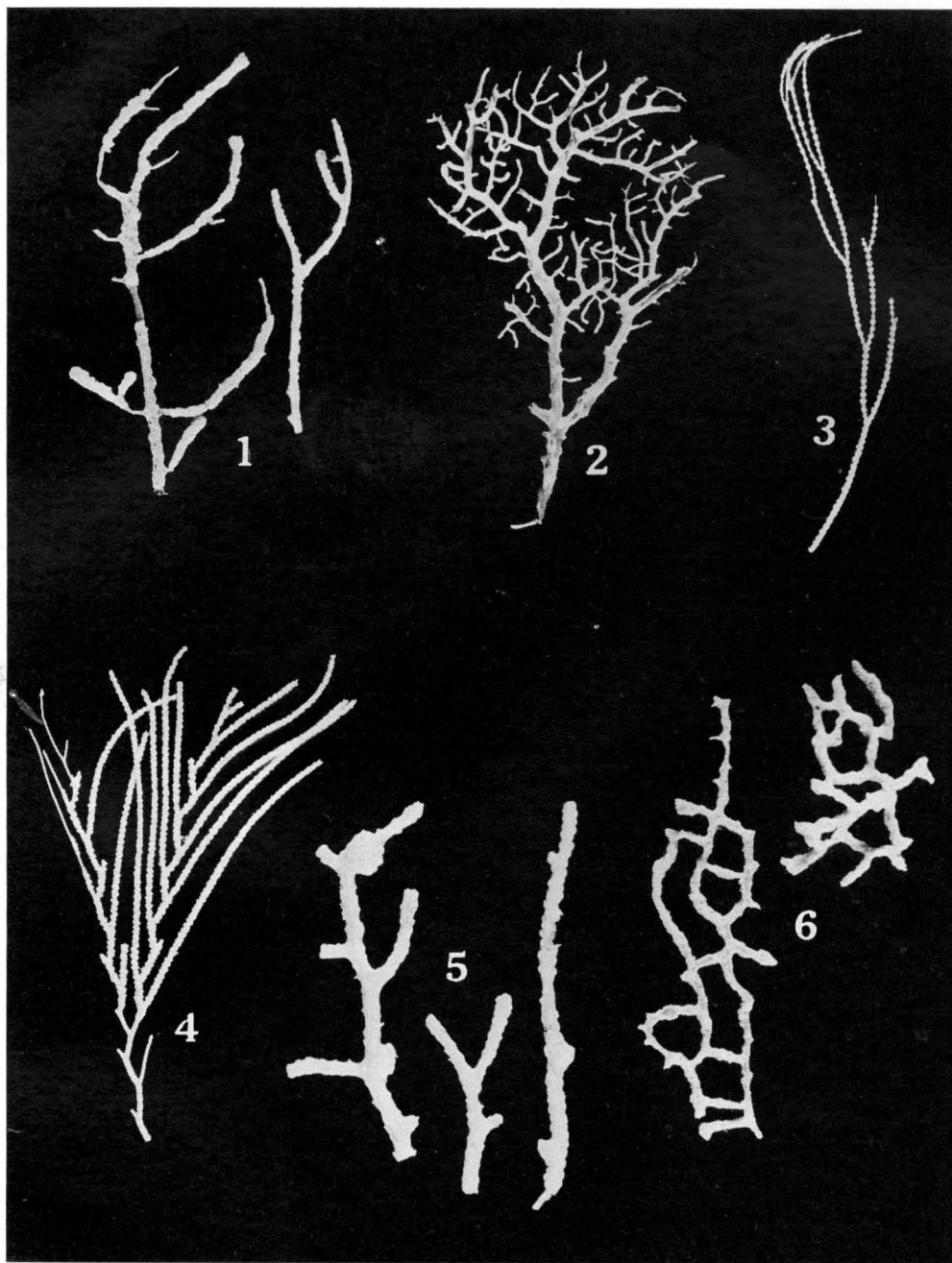
H. UTINOMI: *Octocorallia* in the Western Australia



H. UTINOMI: *Octocorallia* in the Western Australia



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H. UTINOMI: *Octocorallia in the Western Australia*