The Extant Scleractinian Corals of New Zealand

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Introduction

The Scleractinian corals of New Zealand have received so little attention that they have remained one of the larger unknown quantities of modern coral faunas. Knowledge of the diversity and content of the fauna has in the past been based upon an assortment of miscellaneous notes and records, many erroneous, which account for the known faunal records of about 18 species. On the basis of these records, Vaughan and Wells (1943, p. 88) more or less correctly assessed the zoogeographical relationships as being with the Indo-Pacific faunas while noting that most of the species were endemic and traceable in antecedents to the Tertiary faunas. The New Zealand fauna warrants more recognition as it is the most southerly outpost of the western Indo-Pacific, also being in reach of the faunas of the great Southern Ocean. In contrast, the scleractinian faunas of southern Australia are of a highly local flavour coloured by many autochthonous endemic taxa.

Distributional and quantitative studies of the living Scleractinia of New Zealand are impossible at the present time because of the inadequate sampling of the shelf faunas. It may be seen from the distribution chart (Text–figure 1) that collecting has been highly centralised in the Cook Strait and Bay of Plenty–Hauraki Gulf regions, with only scattered records from other areas. If the sampling of the shelf fauna has been inadequate, knowledge of the slope and deep water faunas is almost non-existent. Most of the specimens recorded here have been obtained either as the result of accidental bottom trawling, or by isolated, highly localised collecting efforts. Many of the specimens obtained by such earlier naturalists as Captains Suter and Bollons have been carefully preserved in museums although locality and depth data, if ever present, have been misplaced. Perhaps the largest single effort in the collecting of Scleractinia was that of the late William Foster, Engineer in the Post and Telegraph Department, whose gleanings from cables during their lifting for repairs may be found in every museum in New Zealand. Collections such as these, in so far as they are representative, are enough to develop only the rudiments of the distribution of the modern fauna. The known propensity of the scleractinians for "plastic" response to environmental factors (cf. Gardiner, 1939) must lead to conservatism when examining collections of small size in which variability cannot be assessed.

The coral faunas of New Zealand as would be expected, are entirely of the ahermatypic facies. Not since the mid-Tertiary have there been reef building corals present in the fauna, although the northern tip of the North Island is barely within the limits tolerable by some of the more hardy hermatypic forms. The absence of the rich and diversified reef corals does not mean that the coral fauna is limited or restricted, for the erroneously termed "simple" ahermatypic corals may be present in considerable array. Certainly when the geographic net of collecting stations

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has been expanded and the great diversity of substrate conditions sampled, it may be expected that the numbers of species will be greatly increased. It would appear that the bulk of collections at hand represent the hard substrate environment, the mud or sand bottoms having been dredged only in the northern regions. It need not be thought that the coral fauna is accessible only through dredging operations for at least two species, *Flabellum rubrum* and *Culicia rubeola,* are known to occur just below the intertidal zone. It is to be hoped that these corals, if not those occurring in deeper waters, may be the subject of ecological and physiological studies in the future.

The present study was commenced several years ago by one of us (P.M.R.) when available specimens at the several museums in New Zealand were assembled at Victoria University. These were preliminarily described and photographed. Renewed interest has been taken in investigation of the deeper water marine bottom faunas, resulting in increased numbers of corals represented in collections and in 1959, under the auspices of the Fulbright Program, the other (D.F.S.) was able to visit universities and museums throughout New Zealand to observe more recently acquired material.

Acknowledgments

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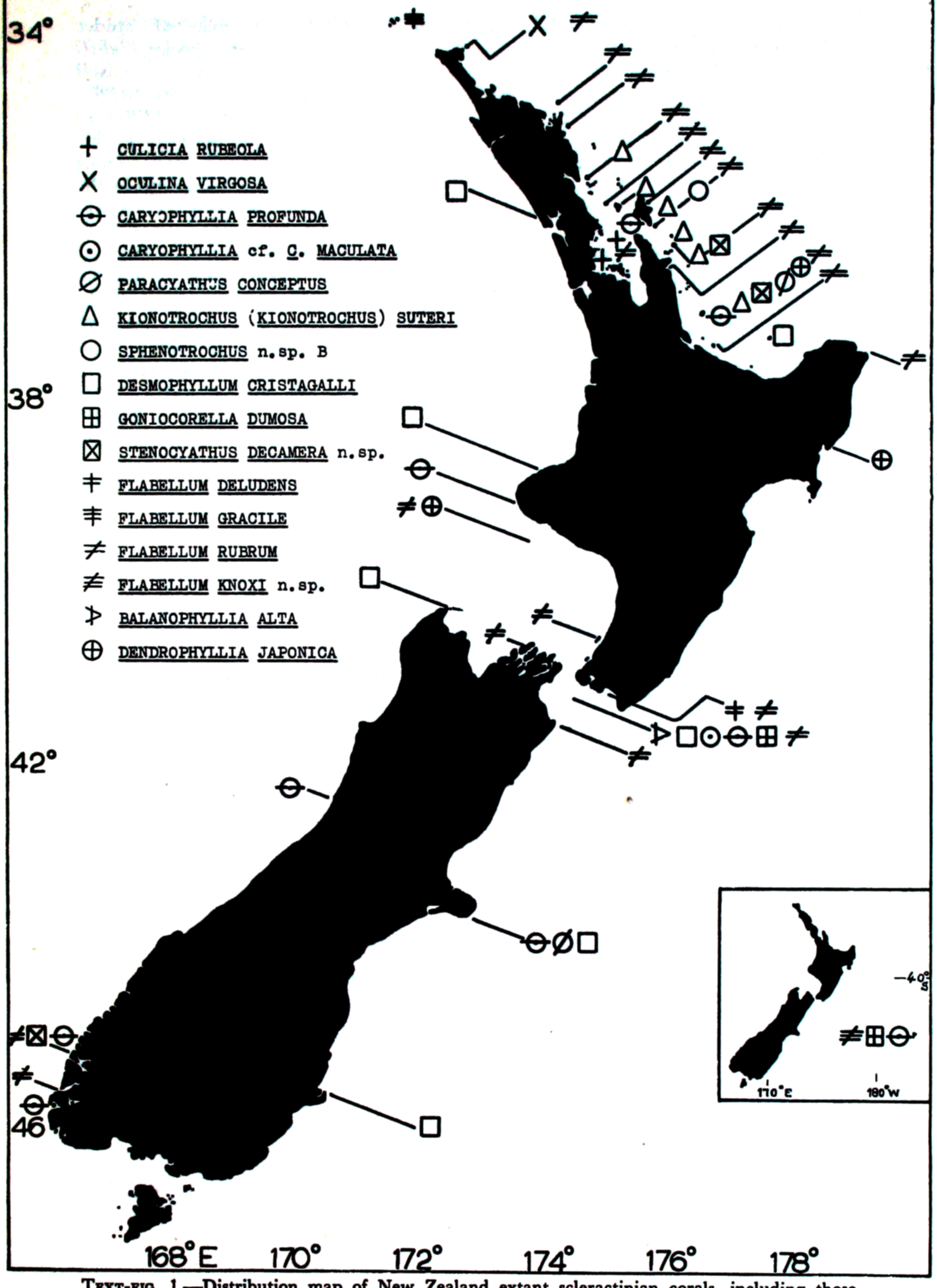
Historical Resume

Although the majority of the major oceanographic and marine biologic expeditions have visited New Zealand, there has been a general absence of reports on the corals collected by them. This absence is most probably a reflection of the relatively small scope of the fauna which makes unlikely the collection of a numerous or diversified fauna in a few efforts. It is unfortunate that these collections have not been centrally housed, for their present widely disseminated condition has made any attempt at a comprehensive treatment of the fauna rather difficult.

Quoy and Gaimard (1833, pp. 188, 197, 277) were the first to record corals from New Zealand waters, reporting on the collections made during the cruise of the *Astrolabe* in 1826-27. Two species of corals, *Dendrophyllia* [=*Culicia*] *rubeola* and *Turbinolia* [=*Flabellum*] *rubrum* were described. Milne-Edwards and Haime, then engaged in the preparation of a series of monographs of comprehensive nature, (1848) described *Cyclicia* [=*Culicia*] smithii. Holdsworth (1862) described *Flabellum nobile* based on a single specimen collected by Sir E. Howe, who resided in Australia and New Zealand, the corals "probably obtained from the same part of the world" (1862, p. 199). Duncan (1876) recorded *Conocyathus zelandiae* from



TEXT-FIG. 1.—Distribution map of New Zealand extant scleractinian corals, including those known from the Chatham Islands area (inset map).

Cook Strait, a species that to our knowledge has not been re-collected. Studer (1878) reported on the collections made by the *Gazelle*, adding the species *Flabellum latum* and *Desmophyllum* [=*Flabellum*] *gracile*. The following year, the well known Australian Jesuit naturalist, the Rev J. E. Tenison-Woods (1879a 1879b) described *Cylicia huttoni* and *C. vacua* from the Wellington region and *Millepora undulosa* from Stewart Island (the latter has been identified as the polyzoan *Heteropora neozelandica* Busk by Dr D. A. Brown in Squires, 1958, p. 8.) Tenison-Woods (1880) attempted a review of the fossil corals of New Zealand, making known the bare essentials of the extent of that fauna. Dennant (1906) described *Kionotrochus suteri*, a new genus and species, from off Great Barrier Island. J. Stanley Gardiner (1929) recorded perhaps the single richest dredge haul of corals from New Zealand waters from a single station made by the *Terra Nova* off Three Kings Islands, six species were recorded: *Flabellum harmeri* Gardiner, *Dendrophyllia japonica* Rehberg, *Gardineria* sp., *Trochocyathus (Thecocyathus)* sp., *Desmophyllum cristagalli*, and *Caryophyllia profunda*. Squires (1958) treated the Cretaceous and Tertiary corals of New Zealand, considerably enlarging the known fossil fauna and including discussions of the systematic relationships of several of the modern forms. Wells (1958, p. 263) in discussing the Antarctic fauna, mentioned the presence of a single young specimen of *Stephanophyllia formosissima* Moseley from New Zealand in the British Museum.

Many "lists" of modern corals from New Zealand have appeared, the majority of the earlier ones marked by their high degree of inexactitude. Duncan (1870, p. 311) recorded without citation of source *Trochocyathus mantelli, T. hexagonalis, Flabellum rubrum, Culicia rubeola, C. smithii, Polyphyllia pelvis, Coenopsammia coccinea, C. gaimardi* and *C. urvillei*. The first two listed are fossil species not recorded from rocks younger than Miocene and the last four of these species are reef-forming corals common on the Great Barrier Reef of Australia. Tenison-Woods (1878) similarly erroneously quoted *Porites gaimardii* and *Polyphyllia pelvis* [*sic*] from New Zealand. Hutton (1904) listed nine species of Madreporaria, two of which, *Caryophyllia maculata* and *C. lamellifera* are from the Kermadec Islands, as well as *Placotrochus pedicellatus*, which is known only from north-eastern Australia. Studer (1906) recorded *Flabellum rugulosum* Tenison-Woods from the modern fauna. Ralph (1948) discussed the occurrence of several species in the modern fauna. The known extant species, including those from the Chatham Islands, recognised here as being part of the New Zealand faunal region, are described below according to the following scheme:

Suborder FAVIIDAE Vaughan and Wells, 1943

Family RHIZANGIIDAE d'Orbigny, 1851

Genus CULICIA Dana, 1846

There is considerable confusion in the identity of the many described species of this genus, and many authors have called for a revision. Wells (1954) suggested a synonymy of the two species of the genus discussed here: *C. smithii* and *C. rubeola*. They are, however, treated as separate "species," because, with only small amounts of material available, the distinctions between them seem clear. It is interesting that specimens of these relatively shallow water corals are remarkably few, one (*C. smithii*) being represented by a single specimen.

Culicia rubeola (Quoy and Gaimard), 1833, Plate 1, figures 1-5. Map symbol +

1833. *Dendrophyllia rubeola* Quoy and Gaimard, p. 197, Pl. 15, figs. 12-15.
1879. ? *Cylicia huttoni* Tenison-Woods, p. 132, Pl. 12, fig. 1.

Culicia rubeola has a typical rhizangiid corallum composed of twisted cylindrical corallites which form a rather irregular mass often found growing about some other object. The corallites are 3.5 to 4.5 mm in diameter and are cylindrical for the last 5 mm before which point they may taper slightly. More than 24 septa are present, arranged in three complete cycles, with portions of the fourth cycle often present. Septa of the first two cycles are not entire but are deeply notched near the rim of the calice. When the calice is deep, the dentations on the upper margin of the septa may merge imperceptibly with the columella.

As illustrated by Quoy and Gaimard, the species has polyps of a delicate shade of pink.

There is, in the collections of the Otago Museum, a specimen (here shown in Plate 1, figure 5) which is reputed to be the type specimen of this species. Although the authenticity of this claim cannot be established (most of the *Astrolabe* collection is housed in Paris), the specimen is not unlike that illustrated by Quoy and Gaimard.

OCCURRENCE: Hauraki Gulf. Littoral. Group of specimens attached to a block of sandstone, taken alive: Kaitai Beach, Gisborne. Beach specimen, worn and dead: Off Little Barrier Island, Hauraki Gulf. Dredged specimen, taken alive: Long Bay, Auckland. Taken alive from under stones at low tide: Narrow Neck Reef, Auckland. Shallow water, taken alive (Dominion Museum, Coral Collection.)

South Taranaki Bight. Dredged specimen, taken dead and worn. (Geological Survey, Coral Collection.)

Milford Reef, Auckland. One specimen taken alive from shallow water. (Auckland Museum, Coral Collection.)

DISTRIBUTION: Central and Southwestern Pacific, in littoral zone.

Culicia smithii (Milne-Edwards and Haime), 1850. Pl. 1, fig. 6.

1850. *Angia smithii* Milne-Edwards and Haime, p. 177.

The corallum is a flat, encrusting mass with the corallites so closely adpressed that they are polygonal. The diameters of the calices are large, up to 7 mm. Septa are present in numbers greater than 24, the fourth cycle incomplete in most calices. Septa of the first two cycles are long and meet the columella, where they merge with the papillae of the columella. All septa are dentate on their lower portions, near the floor of the shallow calice, with the exception of those of the first cycle, which are lobulate but are not notched near the wall of the calice. Septa of the second cycle are longer and more dentate than those of the third cycle. Fourth cycle septa, where present, are very short and quite spinose.

In his review of the species of the genus *Culicia*, Wells (1954) stated that in *C. smithii* septa of the first two cycles are lobulate and equal in size. In the specimen we have examined, only the septa of the first cycle are truly lobulate. The absence of a notch in the septa adjacent to the calicular rim is a distinctive character, setting the specimen apart from those of *C. rubeola*.

The only specimen available to us is one from the Otago Museum which is reputed to be the type specimen. Unfortunately, the type was not illustrated, so no comparison can be made. The locality given in the original description is simply "New Zealand."

OCCURRENCE: New Zealand.

DISTRIBUTION: New Zealand.

Family OCULINIDAE Gray, 1847

Genus OCULINA Lamarck, 1816

Oculina virgosa Squires, 1958. Plate 1, figure 7. Map symbol ×

1958. *Oculina virgosa* Squires, p. 39, Pl. 5, figs. 8-16, text-fig. 11.

A diffusely branching coral with branches of varying diameter, ranging from a few millemeters near the tips to many centimeters near the base. Corallites are slightly protuberent and are ringed by costae corresponding in position to the septa. The surface of the coral between branches is delicately granular, the granules arranged in loose spirals about the branch. The corallites are circular, two to four millimeters in diameter and have a variable number of septa, usually 28. The septa are short and reach less than one quarter the distance to the centre of the corallite. The centre of the calice is filled by short papilli formed of seven pali and columellar rods.

The genus *Oculina* is generally considered to be Atlantic in distribution although several fossil species are recorded from the Australasian region. *Oculina virgosa* is first recorded in Miocene (Altonian) sediments and has a more or less complete record in the later Tertiary of New Zealand. It is characterised, and differs from other species of *Oculina* by the peculiar arrangement of septa in cycles of seven rather than the customary six. Despite its extensive fossil history, the species is known from only a single locality in modern seas.

Occurrence: Two miles south of North Cape, Northland. 55 fathoms. Fragments of specimens taken alive (Victoria University, Zoology Department.)

Distribution: New Zealand.

Suborder CARYOPHYLLIIDA Vaughan & Wells, 1943

Family CARYOPHYLLIIDAE Gray, 1847

Genus Caryophyllia Lamarck, 1801

Among the solitary corals, variation in morphology is an accepted thing, and the *Caryophyllia* are no exception. Gardiner (1939) has discussed some of the problems involved in species discrimination in this genus and his words of caution need not be repeated here. It is significant to note that in both species recorded here, the original description is deficient and the sample on which it was based is exceedingly small. Further, it is more than probable that the name is being applied too broadly in the case of *Caryophyllia maculata*.

Caryophyllia profunda Moseley, 1881. Plate 1, figures 8-11. Map symbol ⊖

1881. *Caryophyllia profunda* Moseley, p. 138, Pl. 1, figs. 6, 6a, 6b.

Coralla are attached to the substrate, a rock, stem of another organism, or cables, by a broad flaring base. Coralla are usually bent, a reflection of upwardly directed growth. Specimens observed from New Zealand have a wide range in size, many juveniles being present. The largest specimens are about 25 millimeters in diameter across the calice and up to 50 millimeters high. Fully grown specimens have less than 96 septa and seldom more than 24 pali arranged in a single crown about the columella. The pali may be single, or in older specimens lobate. The columella is elongate and consists of a variable number of twisted ribbons.

A large number of small *Caryophyllia* were found in collections from Cook Strait and the southern fiords. As would be expected, the septal and palar numbers are much less and the form is less conspicuously that of *Caryophyllia profunda*. However, as in each instance these small specimens were associated with adult specimens it seems more than likely that they are immature forms.

Caryophyllia profunda is a member of the attached caryophyllids and is characterised by the possession of a tall expanding corallum, with the arrangement of septa in five complete or nearly complete cycles. Other similar growth forms are characterised by the possession of four or less cycles of septa. Relationships of some Indo-Pacific species within these groups was discussed by Squires (1958.)

Moseley described *Caryophyllia profunda* from Nightingale Island, Tristan da Cunha Group, and it has been subsequently recorded from New Zealand (off Three Kings Islands) by Gardiner (1929). The species is also recorded from the Pleistocene of New Zealand.

OCCURRENCE: Off Banks Peninsula, 44° 15′ S., 173° 13′ E. 80 fathoms. A single live specimen from a sandstone block.

Seventy yards from Parrot Island, Dusky Sound, Westland, 40 fathoms. Single live specimen.

Cook Strait, 40 fathoms, Single specimen, taken alive.

Off Mayor Island, 37° 20′ S., 176° 18′ E., 50 to 110 fathoms. One specimen taken alive, now badly smashed.

Colville Channell, Hauraki Gulf, 37 fathoms. Single specimen, taken alive.

Cook Strait. No depth. Single live specimen. (Auckland Museum.)

Cook Strait, 40-80 fathoms. Immature specimen.

Off Shelter Island, Doubtful Sound, Westland, 43 fathoms. Immature specimens, both live and dead.

Around Goal Island, Doubtful Sound, Westland, 50 fathoms. Six immature specimens both live and dead (Victoria University, Zoology Department Coral Collection.)

One hundred miles southwest of Cape Egmont, 170 fathoms. One live specimen taken from cable. (Auckland Museum, Coral Collection.)

Island Bay, Cook Strait, 100 fathoms. Many immature specimens both live and dead: Cook Strait. Deep water. One specimen taken alive from cable (Dominion Museum, Coral Collection.)

East of 44′ S., 130 fathoms. Chatham Island Expedition. Station 34. Immature specimens (Canterbury Museum, Coral Collection.)

Off Greymouth, Tasman Sea, 140 fathoms. Two live specimens (private collections.)

DISTRIBUTION: Southern Ocean, New Zealand.

Caryophyllia cf. **C. maculata** (Pourtalès, 1874). Plate II, figures 1 & 2. Map symbol ⊙

1874. *Bathycyathus maculatus* Pourtalès, p. 34, Pl. VI, figs. 5 & 6.

The corallum is a short squat column arising from a broad base of attachment. The calice is nearly circular and may be up to 35 millimeters in diameter. The height of the corallum is usually less than the maximum diameter of the calice. Septa number nearly 96 with about 24 pali present, arranged in a single conspicuous crown about the columella. The columella is much more conspicuous than in *Caryophyllia profunda.*

Caryophyllia maculata is poorly known, having been based upon specimens from Brazil which differ greatly from the specimens at hand, but seem to be quite similar to the specimens assigned to that species recorded, but poorly described, from the Kermadec Islands by Moseley (1881.) Probabilities are high that the identity of the New Zealand specimens with those from Brazilian waters is incorrect, but the materials at hand are not sufficent for the establishment of a new species.

The difference between these specimens and *Caryophyllia profunda* are demonstrated by the shape of the corallum and the character of the ornamentation of the exterior of *C. maculata,* which is much coarser than that of *C. profunda.*

OCCURRENCE: Cook Strait. No depth. Two specimens taken alive. (Dominion Museum, Coral Collection.)

Genus PARACYATHUS Milne-Edwards and Haime, 1848

Paracyathus conceptus Gardiner, 1938. Plate II, figures 3 & 4. Map symbol ∅

1938. *Paracyathus conceptus* Gardiner, p. 184, Pl. IV, figs. 8 & 9.

The corallum is small, compact and dense, and attached to the substrate in life. The largest specimen before us is 14.5 millimeters high, with a calice diameter of 11.5 millimeters. The corallum is nearly cylindrical, the wall is epithecate and rugose. Septa are in four cycles, numbering 48 in mature specimens, with pali arranged in several crowns before all cycles but the last, and are distinct from the columella.

The specimens from New Zealand differ from those discussed by Gardiner (1938) by their solitary habit, although a few immature scolecoid coralla are attached basally to each other. The other characters of the corallum closely resemble Gardiner's species, particularly in the heaviness of the septa and the cuneiform pali.

OCCURRENCE: Off Mayor Island, Bay of Plenty, 37° 15′ S., 176° 12′ E., 80 to 120 fathoms. Three mature specimens taken both alive and dead, and six immature specimens alive. Off Banks Peninsula, 44° 15′ S., 173° 13′ E., 80 fathoms. Two specimens, immature, taken alive (Victoria University, Coral Collection.)

N.Z. Waters. No depth. One live specimen (Dominion Museum, Coral Collection.)

DISTRIBUTION: Indian Ocean and New Zealand.

Subfamily TURBINOLIINAE Milne-Edwards and Haime, 1857

Genus KIONOTROCHUS Dennant, 1906

Kionotrochus (Kionotrochus) suteri Dennant. 1906. Plate II, figures 5 & 6. Map symbol △

1906. *Kionotrochus suteri* Dennant, p. 155, Pl. V, figs. 5a & 5b.
1960. *K. (Kionotrochus) suteri* Dennant, Squires, p. 285, figs. 1-11.

Specimens of this handsome turbinoliid coral range in size from a few millimeters to up to 5 millimeters in height. Shape is variable from conical to nearly tympaniform. Three cycles of septa, delicately spinose laterally, extend towards the columella. Third cycle septa join the second cycle before the columella, giving rise to a circlet of rod-like pali which are situated very close to, and may not be distinguished from the columella. The columella may be narrowly rod-like and exsert, or may be broad, stout and prominent within the calice.

Although numerous specimens of this species have been distributed throughout the major museums of the world, the absence of pali noted by Dennant in his original description, and shown in his illustration, has not been challenged although incorrect. The genus has not been recorded with certainty from outside New Zealand. Fossil specimens referred to *Kionotrochus* by Wells (1937) are better placed in *Cylindrophyllia*. Durham and Barnard (1952) have described several species from the Eastern Pacific which are quite doubtfully placed in the genus.

Within its range of distribution, the genus is often exceedingly abundant. Mud bottoms are its most favoured habitat and dredge hauls from 30 to 110 fathoms on these bottoms may yield hundreds of specimens.

OCCURRENCE: Off Great Barrier Island, 36° 08′ S., 176° 00′ E., 109 fathoms. Many specimens, taken alive. One and a half miles northeast of Mayor Island, Bay of Plenty, 84 fathoms. Many specimens taken alive. Halfway between Outer Chicken Island and Mokihinau Island, 62 fathoms. Abundant live specimens. Two miles east of Little Barrier Island towards Flat Island, Great Barrier Island, 24 fathoms. Many dead specimens. Off Poor Knights Island, 60 fathoms. Abundant live specimens. Hen and Chicken Islands, 30 fathoms. Abundant live specimens (Auckland Museum, Coral Collection.)

Off Hen and Chicken Islands, 26-30 fathoms. Many specimens, taken alive. (Victoria University, Zoology Department Coral Collection.) Off Mayor Island,

Bay of Plenty, 37° 22.5′ S., 176° 22′ E., 113-120 fathoms. Abundant live specimens. One and a half to two miles south of Hen and Chicken Islands, 26-30 fathoms. Numerous live specimens (Dominion Museum, Coral Collection.)

Off Great Barrier Island, 110 fathoms. Topotypes. Numerous specimens. Off Cuvier Island, 38 fathoms. Topotypes. Numerous specimens (Geological Survey, Coral Collection.)

DISTRIBUTION: New Zealand.

Genus SPHENOTROCHUS Milne-Edwards & Haime, 1848

Sphenotrochus n.sp. B. Plate II, figures 7 & 8. Map symbol ○

1939. ? *Sphenotrochus intermedius* (Munster) Gardiner, p. 333.

A small coral distinctly flattened laterally so that broad, and narrow sides are clearly recognisable. Corallum 8.5 mm high, and with an elongate oval calice 5.0 mm by 3.5 mm in diameter. The base of the corallum terminates in a tiny sharp spine. The angle formed by the lateral edges of the corallum is approximately 45°. Costae are very well-developed; a few costae particularly on the broad sides possess a slight median ridge, costae bordered laterally by well-formed more or less evenly spaced dome-shaped granules. Some costae on both narrow and broad sides discontinuous and not reaching the base of the corallum. Septa 32 in number, exert, arranged in four cycles, the first two only reaching the columella, and the fourth cycle incomplete. Lateral and marginal surfaces of septa sparsely covered with tiny spines. Columella lamellar, and with a row of six tubercular pieces at the surface.

Specimens of living *Sphenotrochus* are separable into two great groups based upon the character of the upper surface of the columella. The first group, that in which the upper surface of the columella appears to be lamellar, includes *Sphenotrochus intermedius* Duncan, *S. auranticus* Marenzeller, *S. auritus* Pourtalès, and *S. excavatus* Tenison-Woods. The second group, composed of species having the upper surface of the columella composed of discrete trabeculae includes *Sphenotrochus rubescens* (Moseley), *S. gardineri* Squires and the present species. The first group shows little geographic separation, having representatives from both the North and South Atlantic as well as Australia included in it. The latter, much more restricted in content, is known from the Patagonian region, the Kei Islands, and now New Zealand. As noted by Squires (1961), *S. gardineri* and the specimens described by Gardiner from New Zealand, and the present species are quite similar except that *S. n.sp.* B is larger than *S. gardineri.*

A fossil species, *S. aschistus* Squires, 1958, of generally similar flattened wedge-shape has been described from the Kapitean in New Zealand. The corallum of the present specimen, however, taken alive from off Great Barrier Island has a much more acute angle of divergence from base to margin, the columella has two more surface pieces, and a greater number of costae are continuous from the margin to the base than in *S. aschistus.*

OCCURRENCE: Off Cape Barrier, Great Barrier Island, 30 fathoms. One specimen, alive (Auckland Museum, Coral Collection.)

Subfamily DESMOPHYLLINAE Vaughan & Wells, 1943

Genus DESMOPHYLLUM Ehrenberg, 1834

from a relatively narrow stalk and is surmounted by high, closely spaced, greatly

Desmophyllum cristagalli Milne-Edwards and Haime, 1848. Plate III, figures 1-10. Map symbol □

1848. *Desmophyllum cristagalli* Milne-Edwards and Haime, p. 253, Pl. 7, fig. 10.

Corallum medium to large in size, often quite tall. The calice expands rapidly

exsert septa, frequently expanded laterally many millimeters beyond the edge of the wall. The septa are smooth, often porcellaneous, on both the lateral and proximal margins. No columella is formed, the edges of the septa descending nearly vertically into the central pit of the calice. The outside of the corallum is usually smooth and ornamented by small granules. Flange-like costae may be developed in older specimens, and these are often discontinuous vertically.

Perhaps no other species of solitary coral has been as broadly conceived as this, for it is considered world-wide in distribution and long-ranging as a fossil. Until most of the specimens are redescribed, there is little hope of monographing the genus. The name is applied, with some misgivings, to occurrences of *Desmophyllum* in New Zealand. It is interesting to note that, in the scanty collections now available, there are distinct differences between the specimens from northern and southern New Zealand. Northern forms are small and delicate, more nearly resembling the usual concept of *D. cristagalli,* while those from southern waters, particularly from off the coast of Otago, are much larger and more massively constructed.

Moseley (1881) described *Desmophyllum ingens,* from the fiords of western Patagonia, which, although adjudged by Moseley to be closely related to *D. cristagalli,* was separated from that species because of its larger size. Later authors (e.g., Hoffmeister, 1933) have tended to minimise the difference and to confuse the two species. The distinction between the two species, if there is a distinction, is important zoogeographically. *D. ingens* may be taken as characteristic of the southerly, cold subantarctic region, while *D. cristagalli* may well be more equatorial in distribution.

In view of the problems of identification of the two species, one of us (D.F.S.) has examined the collections of *Desmophyllum* made by the *Endeavour,* described by Hoffmeister (1933) in the Australian Museum, and of specimens of *D. ingens* collected by the *Albatross,* now housed in the United States National Museum. While many individuals in the latter collection may be assigned readily to one or the other species, others demonstrate that the characters used in the identification of the species are subject to great ontogenetic variation. Long, slender, rather massive corallites possessing continuous costae may, suddenly, and without organic discontinuity, become corallites having no costae and expanded calices with highly exsert septa. The same phenomena have been observed in the collections of the *Endeavour* (cf. Hoffmeister, 1933, Pl. 2, fig. 2). Until the ontogeny is completely understood, no appropriate definition or set of distinguishing characters can be offered for these two species.

OCCURRENCE: West of New Plymouth, 700-800 fathoms. One specimen taken alive from a cable. Cook Strait. Deep water. One specimen taken alive from a cable. (Auckland Museum, Coral Collection.)

Off Banks Peninsula, 44° 15′ S., 173° 13′ E., 80 fathoms. Three specimens taken alive from a sandstone block, associated with numerous young specimens. Island Bay, Cook Strait, 100 fathoms. One young specimen taken alive. White Island, Bay of Plenty, 60 fathoms. One specimen, immature. Island Bay, Cook Strait, 120 fathoms. Two specimens alive. 60 miles west of Farewell Spit, 350 fathoms. One specimen alive taken from a cable. Off Muriwai Beach, Auckland. 36° 42.4′ S., 173° 53′ 35″ E., 300 fathoms. One large specimen taken alive. (Dominion Museum, Coral Collection.) East north east of Otago Heads, 275 fathoms. Four specimens taken dead and worn. (Portobello Marine Biological Station, Dunedin.)

DISTRIBUTION: Cosmopolitan.

Subfamily PARASMILIINAE Vaughan and Wells, 1943

Genus GONIOCORELLA Yabe and Eguchi, 1932

Goniocorella dumosa (Alcock), 1902. Pl. IV, fig. 1. Map symbol ⊞

1902. *Pourtalosmilia dumosa* Alcock, p. 36, Pl. 5, figs. 33-33a.

Coralla of this species form a very dense thicket composed of elongate, profusely budding corallites, secured and bound together by scalariform processes. Corallites are 3 to 4 mm in diameter and are nearly cylindrical. Septa are short, non-exsert, and do not extend all the way to the columella. The exterior of the corallites is covered by fine granulations, which often form slightly raised costal ridges.

Although previously recorded only from the Indian Ocean and Japan, Squires (1960) has described the species from shallow waters off Norfolk Island. The occurrence of the species in deep water in Cook Strait is of great interest. It is apparently not uncommon there, for at least two occurrences are noted. But perhaps more significant is the great number of corallum fragments which are brought up in the dredge. The great bulk of the coral is dead, but this is the usual instance in colonial forms of this sort.

OCCURRENCE: Cook Strait, 41° 35′ S., 174° 53′ E., 200 to 300 fathoms. Numerous specimens and fragments taken both living and dead. (Zoology Department, Victoria University.)

Cook Strait, 41° 33.7′ S., 174° 37′ E., 260 fathoms. Stat.C410. (N.Z. Oceanographic Institute.)

East of 44's Chatham Island, 30 fathoms. Station 34, Chatham Island Expedition, 1954. (Canterbury Museum, Coral Collection.)

DISTRIBUTION: Indian Ocean, New Zealand.

Family GUYNIIDAE Hickson, 1910

Genus STENOCYATHUS Pourtalès, 1871

Stenocyathus decamera n.sp. Pl. IV, figs. 2-6. Map symbol ⊠

TYPES: Figured Holotype (Pl. 4, figs. 2, 3) deposited N.Z. Geological Survey, Wellington.

This is a small conical solitary coral, up to approximately 10 mm in height. The walls of the corallum and the costae are slightly imbricated. (Pl. IV. fig. 3.) A central columella of 1 or 2 curly (crispate) processes is present as well as six crispate pali which form a single crown.

There are five specimens in the present collection recognised here as belonging to this species. Three of them come from southern fiord waters and the remainder from east coast North Island waters. The largest specimen from the southern fiord is 9.0 mm in height with a calice 3.5 mm in diameter; the second specimen is slightly smaller and the third is tiny, only 3.0 mm in height and with a calice 1.5 mm in diameter. This tiny specimen, however, shows clearly the characteristic features of the species. It has a columella of a single process and 6 pali. The others show regeneration of a portion of the calice and a strong tendency for the pali and septa to be arranged in cycles of five, not six. The wall and costae are, however, similar to that described for the species.

One of the specimens from North Island waters is even smaller in size (2.5 mm in height) than the smallest southern fiord specimen, but it is easily recognisable as *Stenocyathus decamera*. The other specimen shows a series of three corallites each growing out of the one below. (Pl. IV, fig 6.) The proximal corallite attached by a slightly flaring base has a perpendicular height of 7.0 mm and a calice 5.0 mm in diameter; the medial is 9.0 mm in perpendicular height and has a calice 6.0 mm in diameter, and the distal corallite is approximately 1.0 mm above the rim of the medial corallite and has a calice diameter of 4.0 mm. All show an imbricated wall

and costae, but only a single very small columella process can be seen deep in the calice of the distal corallite and no pali. The septa number approximately 30 and do not correspond in number or completely match in position those of the medial corallite.

OCCURRENCE: Off Shelter Island, Doubtful Sound, Westland, 73 fathoms. Three specimens taken alive (N.Z. Geological Survey). Off Mayor Island, Bay of Plenty, 80-120 fathoms. Taken alive. (Zoology Department, Victoria Univ.) Off Poor Knights Islands, 60 fathoms. Two specimens taken alive. (Auckland Museum, Coral Collection.)

Family FLABELLIDAE Bourne, 1905

Genus FLABELLUM Lesson, 1831

Flabellum deludens von Marenzeller, 1904. Pl. IV, figs. 7 and 8. Map symbol ⫩

1904. *Flabellum deludens* von Marenzeller. p. 269, Pl. 17, fig. 10.

The corallum of this species is distinguished by its deeply lacerate calicular margin formed by the highly exsert septa between which the epitheca dips downward. The epitheca uniting the upper margins of the septa is a glistening white, while that on the lower portions of the corallum is much darker. Five cycles of septa are present, but are not complete in all systems. The columella is simple, formed of the union of the first and second cycles of septa in the centre of the calice with some trabecular curls developed above this union.

Three coralla taken off Palliser Bay are 25 mm, 35 mm, and 36 mm in height, and are quite typical in all respects for the species, showing the prominent proximal ends of the septa between which the epitheca is concave inwards so as to form a scalloped side wall. The septa of these corals is finely ridged, not conspiciously granulate.

Squires (1958) grouped the Indo-Pacific species of *Flabellum* having lacerate septal margins, recognising *F. apertum, F. deludens* and *F. japonicum*. *F. apertum* is distinguished by, among other characters, possession of only four cycles of septa. *F. deludens* and *F. japonicum* are close, but distinguished by the more solid construction of the latter, and the greater development of columellar trabeculae. The specimens from Palliser Bay show an interesting intermediate development in this respect. Most important in distinguishing between *F. deludens* and *F. japonicum* is the greater laceration of the upper margin in the former.

The distinction between the several species confused with *F. deludens* in the literature has been discussed by von Marenzeller (1904) and more recently by Squires (1960).

OCCURRENCE: Off Palliser Bay, 41° 33′ S., 174° 55′ E., 380 fathoms. Three specimens taken alive. (Victoria University, Zoology Department.)

DISTRIBUTION: Japan, Philippine Islands, Hawaiian Islands, Indian Ocean, New Zealand.

Flabellum gracile (Studer), 1877. Pl. IV, figs. 9 and 10. Map symbol ⫩

1877. *Desmophyllum gracile* Studer. p. 629, Pl. 1, figs. 2a, 2b.

This species is closely allied with the tall scolecoid *Flabellum antarcticum* (Gravier). Originally *F. gracile* was described from a single specimen, taken in 90 fathoms, from 34° 9.9′ S., 172° 35.8′ E., and has since been recollected only by the *Discovery II*. The corallum is tall, conical and very lightly constructed. The wall is formed by a glistening epitheca. Septa are very thin and relatively numerous.

The species is, apparently, not only rare, but, when found, occurs in very small numbers. It is easily distinguished from *F. rubrum* by its much lighter construction and its relatively smaller size.

OCCURRENCE: Off Three Kings Island, 90 fathoms. One specimen taken alive. (Auckland Museum, Coral Collection.)

DISTRIBUTION.: New Zealand.

Flabellum rubrum Quoy and Gaimard, 1833. Pl. V, figs. 1-18; Pl. VI, figs. 1-9. Map symbol ≠

1833. *Turbinolia rubra* Quoy and Gaimard, p. 188, Pl. 14, figs. 3-3d.
1862. *Flabellum nobile* Holdsworth, p. 198, Pl. 28, figs. 4-5.
1878. *Flabellum latum* Studer, p. 630, Pl. 1, figs. 3a-3b.
1880. *Flabellum rugulosum* Tenison-Woods, p. 12, figs. 8a, b.
1929. *Flabellum harmeri* Gardiner, p. 122, Pl. 1.
Flabellum rubrum Squires. In Press.

The concept of this species has been so altered by broad application of the name that in its present day context, *F. rubrum* is little more than a catchall. Elsewhere, one of us (D.F.S.) has presented a complete review of the systematics of the species. At the present time, it is our opinion that *Flabellum rubrum*, as interpreted from New Zealand topotype specimens, includes, apparently, only New Zealand *Flabellum*. Utilisation of the species name in other areas of the Indo-Pacific and Indian Ocean is incorrect.

As most species of *Flabellum* are quite plastic in growth form, so is *F. rubrum*. Shallow water forms, found almost intertidally in various areas in the North Island, are nearly cylindrical, short coralla, firmly cemented to the bottom. Powell (1937) noted the colour of the corallum to be salmon to dull vermillion. In deeper waters of the Hauraki Gulf and Cook Strait, the coral is commonly encountered, usually with the corallum firmly cemented to another corallum, fragments or complete shells, stones, or some other hard object. Although Powell describes the animal as scarlet, those we have observed are usually orange, with yellow tentacles. Although for years the shallow water form has been called *Flabellum rubrum* and the deeper water form *Flabellum rugulosum*, it is our opinion that they are one and the same species. Independently, both authors have attempted to arrange the cylindrical growth form of the shallow water type and the pedicellate, cuneiform corallum of the deeper water form along a morphological gradient corresponding to depth. There appears to be none. The diameter of the base of the skeleton is, apparently, a function of the support required by the animal, those living in regions of greater wave or current action having the greater basal diameter. Specimens with the characters of *F. harmeri* and *F. latum* are found growing with specimens clearly of the *F. rubrum* type. *F. latum* Studer is much longer in the greatest diameter of the calice than specimens of the other species, but, since the degree of variation in this respect is considerable, there is little reason to maintain it as a distinct species.

OCCURRENCE: Between Cuvier Island and Mokohinau Island, 50 fathoms. Two specimens taken alive. South Taranaki Bight, off Rangitikei River. No depth. Three specimens taken dead. South Taranaki Bight, 10-15 miles off Rangitikei River, 40-42 fathoms. One specimen taken alive. South Taranaki Bight. No depth. Thirty specimens. New Zealand. Intertidal. Two specimens taken alive. Hauraki Gulf, 25 fathoms. One specimen. Mercury Bay, 20 fathoms. One specimen taken alive. Off Cape Campbell, 55 fathoms. One dead and worn specimen. (Geological Survey, Coral Collection.) Gannet Island, off east end of Waiheke Island, Hauraki Gulf, 12 to 13 fathoms. Seven specimens plus young, taken alive. Off Tiri Tiri, Hauraki Gulf, 7 fathoms. Specimens taken alive. One and a half miles northeast of Leigh, Hauraki Gulf, 30 fathoms. One specimen taken alive attached to shell of *Xenophora*. Hen and Chicken Island, 30 fathoms. One dead specimen. North northeast of Mayor Island, Bay of Plenty, 46 to 82 fathoms. Two dead specimens, one taken alive. Off East Cape, 85 fathoms. One specimen taken alive, attached to *Terebratella haurakiensis* (Auckland Museum, Coral Collection.)

North of Cuvier Island. 50 fathoms. One specimen taken alive. Karewa Island, Bay of Plenty. Shallow water. Five large specimens taken alive. Off Coromandel Peninsula, 20 fathoms. Six specimens taken alive. Between Hen and Chicken Islands. No depth. One specimen taken alive. North of Kapiti Island, Tasman Sea, 30 fathoms. Two specimens taken alive. Cook Strait, 41° 28.5′ S., 174° 50′ E., 150 fathoms. Ten specimens, all dead and possibly derived. Kapiti Channel, Tasman Sea, 40° 52.2′ S., 174° 57.3′ E., 33 fathoms. Off Mayor Island, Bay of Plenty, 37° 19.5′ S., 176° 16′ E., 60 to 100 fathoms. Two dead specimens. Ten miles west, half a mile south Cuvier Island, 32 fathoms. One specimen taken alive. Pelorus Sound, South Island, 25 to 30 fathoms. One immature specimen. Off Wellington Harbour, 41° 28.5′ S., 174° 50′ E., 150 fathoms. Three specimens taken alive, 14 specimens taken dead. Cook Strait, 40° 49.6′ S., 174° 36.8′ E., 81 fathoms. Five dead specimens. Goal Passage, Doubtful Sound, Westland, 25 fathoms. Four dead specimens associated with crinoids. Cook Strait, 40° 52.6′ S., 174° 49.5′ E., 75 fathoms. Five dead specimens. Whangamumu, Northland. Shallow water. Four live specimens. Long Beach, Bay of Islands. Shallow water. Twelve specimens taken alive (Dominion Museum, Coral Collection.)

Off Palliser Bay, 41° 42′ 30″ S., 175° 9′ E., 550 fathoms. A fragment of a columella, probably a derived specimen. VUZ 113, Stat. CUD, Palliser Bay Shelf, 41° 35′ S., 175° 4′ E., 70-80 fathoms. Two dead and worn specimens. Between Little Barrier Island and Great Barrier Island. No depth record. One immature specimen, taken alive. Two miles south from North Cape, Northland, 55 fathoms. Twelve specimens, most taken alive. One specimen attached to a dead branch of *Oculina virgosa*. Off Hen and Chicken Islands, 26 to 30 fathoms. One small specimen taken alive. Cook Strait, 40 fathoms. Eleven specimens taken alive, one dead. Whangaparapara, Great Barrier Island. No depth. Two specimens mutually attached taken alive. Off Gilbert Island, Breaksea Sound, Westland, 15 fathoms. Several bases of this species. Cook Strait. No depth. Several specimens taken alive. Off Mayor Island, Bay of Plenty, 37° 20′ S., 176° 18′ E., 50-110 fathoms. One specimen taken alive. Near Leigh, Northland. Shallow water. Seven specimens taken alive. (Zoology Department, Victoria University.)

DISTRIBUTION: New Zealand.

Flabellum knoxi n.sp. Pl. 7, figs 1 and 2. Map symbol ≠

TYPES: Figured holotype (Pl. 7, figs. 1, 2) deposited in Canterbury Museum, Christchurch.

The corallum of this new species is distinguished from all other known extant New Zealand flabellids by its large size in which the width is usually greater than the height, by its extremely thin fragile skeleton, particularly in the region of the margin of the calice and by the calicular margin forming almost a half circle. The corallum ranges in height from 35 to 70 mm and from 50 to 105 mm in width. The calice is broad and open, 23 to 45 mm wide and the septa extend almost to the centre. The septa number from 130 up to 348. Every fourth septum reaches the relatively "deep" and well formed columella. The edges of the larger septa are undulated, with the undulations most readily observed on septa reaching to the columella particularly at the junction of septum and columella. The faces of the septa are slightly ridged and finely granulated. The most conspicuous ridges and granules are found on septa reaching the columella. The angle formed by the lateral edges of the corallum is 125° to 157°. The lateral edges may have small crests. The epitheca is marked by irregular, rugose concentric growth lines. The pedicel is laterally compressed and shows an attachment scar. The flesh of the polyp was deep red (Munsell's standard colour YR 3/4.)

Flabellum knoxi, n.sp. is evidently closely related to *F. magnificum* von Marenzeller (1904) described from the Indian Ocean and Japan. Both are among the

largest known *Flabellum* and are quite similar in most respects, particularly the structure of the columella and of the septa. *F. magnificum*, however, is somewhat more costate externally than *F. knoxi*.

Among the suite of specimens taken by the Chatham Islands Expedition were several large deformed specimens, in which one lateral face had been reflexed upward, and the union of the lateral faces curved back upon the pedicel (Knox, 1957, fig. 6.) This deformation has been attributed to differential growth resulting from the falling over of the corallum, so that instead of the coral being erect, it lies upon one side. Roger (1944) has discussed similar growth habits among fossil specimens and speculated upon its origins (see also Squires, 1958.) A more complete description of these specimens, together with a review of the significance of their development in the evolution of similar growth forms in the fossil record, is being prepared for publication by one of us (D.F.S.).

OCCURRENCE: Chatham Rise, 260 fathoms. 44° 04′ S., 178° 04′ E., Chatham Island Expedition, Station 52. Six specimens taken alive.

Chatham Rise, 220 fathoms. 43° 40′ S., 179° 28′ E., Chatham Island Expedition. Station 6. One specimen taken alive.

Chatham Rise, 280 fathoms. 43° 42′ S., 179° 55′ E., Chatham Island Expedition. Station 7. Three specimens taken alive (Canterbury Museum, Coral Collection.)

Suborder DENDROPHYLLIIDA Vaughan and Wells, 1943

Family DENDROPHYLLIIDAE Gray, 1847

Genus BALANOPHYLLIA Wood, 1844

Balanophyllia alta Tenison-Woods, 1880. Pl. VIII, figs. 1-3. Map symbol ⊁

1958. *Balanophyllia alta* Tenison-Woods. Squires, p. 70, Pl. 15, fig. 10-18, 21 (Synonymy.)

This is a solitary coral with a tall conical to cylindrical corallum up to 100 mm or more in length. There is a tendency for the basal third to be outwardly curved (Pl. VIII, fig. 1) from its point of attachment, which may be fixed either by a peduncle or a broad base. The calice is circular to oval, the walls thick and irregularly porous. The costae are irregularly arranged not always opposite the septa, but are readily recognisable and covered by scattered sharp granules. There are more than 80 septa, the primary and secondary septa extending to the columella, the quaternary and quinary uniting with the tertiaries. A well developed parietal columella is present which is spongy in appearance.

Approximately halfway up the largest corallum in the present series (Pl. VIII, fig. 1) there can be seen broken bases of nine smaller corallites. The characteristic granules of the costae have been worn down and show clearly the vermiculiform markings described by Tenison-Woods. Half the calice is broken away and it is not possible to give an accurate count of the septa in the present specimen. *Balanophyllia alta* is also fairly well known as a Tertiary fossil in New Zealand (Squires, 1958.)

OCCURRENCE: New Zealand waters. No depth. Two young specimens taken alive, one large dead specimen (Dominion Museum, Coral Collection.) Cook Strait. No depth. One dead worn specimen (Zoology Department, Victoria University.)

DISTRIBUTION: New Zealand.

Dendrophyllia japonica Rehberg, 1892. Pl. VIII, figs. 4 & 5. Map symbol ⊕

1929. *Dendrophyllia japonica* Rehberg. Gardiner, p. 127, Pl. 1, figs. 1, 2.

Dendrophyllia japonica is a branching coral, but the branches are irregular and not confined to any one place. Branchings occur from the outer surface of individual corallites. The corallites of the colony superficially resemble the solitary corallum of *Balanophyllia alta,* but the arrangement of the septa differs in the two species and the basal region of each corallite is usually straight not curved as in *B. alta.*

The present colony has been formed by branchings upon the outer surface of a large dead corallite with a calice 2.7 cm in diameter. Four of the corallites were living and range in height from 15.0 mm to 80.0 mm and their calices are from 6.0 mm to 30.0 mm across. The smallest corallite is 15.00 mm in height and 6.0 mm across the calice; the medium-sized corallite (broken from the main mass) is 5.0 cm high and 12.0 mm across the calice and the two large corallites are 7.5 cm and 8.0 cm in height and approximately 3.2 cm in greatest diameter. The external granular costae opposite the septa are well defined on the surface of the distal half of the corallites (fig. 4). The calices are round to oval in shape with an easily distinguishable compact columella of tightly twisted ribbon-like pieces. In the largest corallite with an oval calice the columella is elongate, flat and narrow (10 mm x 1.5 mm), in the other large corallite in which the calice is circular the columella is dome-shaped (3.5 mm x 3.5 mm approximately.) The columella is not visible in the two smaller corallites. The lateral surfaces of the septa are finely granular. In the two large corallites there are 24 septa of approximately equal size, in the medium sized corallite 12, and in the smallest 6.

The general habit of this colony, the size range of the corallites, and the arrangement of the septa is similar to that described by Gardiner (1929) for his larger colony of approximately 40 corallites taken off Three Kings Islands in 300 fathoms. The columella, however, of the present small colony is not as conspicuous or of so "spongy" an appearance as described by Gardiner and shown in his Plate 1, fig. 2.

An allied species *Dendrophyllia boschmai* van der Horst is known as a Tertiary fossil from New Zealand (Squires, 1958), but in this latter species the colony is flabellate in form and the arrangement of the septa is distinctive—the first two cycles are free and the lower cycles develop in the systems next to the secondary septa.

Occurrence: Off Mayor Island, Bay of Plenty, 200 fathoms. One specimen taken alive (Auckland Museum, Coral Collection.)

Distribution: Japan, New Zealand.

Corals Recorded from New Zealand

It is our intent here to discuss four species of coral which have been recorded from New Zealand, but are not represented in collections, seen by the present authors. Two of the records are of unnamed species, and a third is, possibly, the result of mixing of collections and, therefore, probably an erroneous record.

Family MICRABACIIDAE Vaughan, 1905

Genus Stephanophyllia Michelin, 1841

Stephanophyllia formosissima Moseley, 1881

1881. *Stephanophyllia formosissima* Moseley, p. 201, Pl. 13, figs. 6, 7; Pl. 16, figs. 8, 9.

Wells (1958, p. 263) recorded a single, young specimen of this species as existing in the British Museum (Natural History) (B.M. 52-5-10-1). The specimen is reported to have been collected by Hugh Cummings, from New Zealand, but has no data with it.

Family CARYOPHYLLIIDAE Gray, 1847

Genus TROCHOCYATHUS Edwards and Haime, 1848

Trochocyathus (Thecocyathus) sp. ?

Gardiner (1929) records "A single little cone, 10 mm high, with calicle 7.5 mm in diameter must be referred to this genus." The specimen is heavily epithecate. It was collected from *Terra Nova* station 91, Three Kings Island, 300 fathoms.

Genus CONOCYATHUS D'Orbigny, 1849

Conocyathus zelandiae Duncan, 1876

1876. *Conocyathus zelandiae* Duncan, p. 341, Pl. 38, fig. 1-3.

Duncan (1876, p. 429) records this species from Cook Strait, its type locality, where he collected two specimens. Although the species occurs in the fossil record of New Zealand (Squires, 1958), there are no additional records of its occurrence in New Zealand. It is, however, very common in several areas in Australia and has been reported from the Persian Gulf. Dredging operations in New Zealand are not yet sufficiently complete to permit a categorical statement regarding its non-occurrence, but, as Cook Strait is perhaps one of the more intensively studied areas of the shelf, it is surprising that the species has not been recollected.

Family FLABELLIDAE Bourne, 1905

Genus GARDINERIA Vaughan, 1907

Gardineria sp.

Gardiner (1928) referred three specimens collected from *Terra Nova* station 96 (Three Kings Island, 70 fathoms) and a single specimen from station 90 (Three Kings Island, 100 fathoms) to this genus. He comments that they differ from *G. lillei* Gardiner, and Antarctic species, in the more complete insertion of the fourth cycle of septa. He also notes that the edges of the septa are much twisted, and that the septa bear low, blunt spines laterally.

FAUNAL AFFINITIES

It is clear from the fossil record that the Scleractinian coral fauna of New Zealand today is of fairly recent origin and results from invasion from two areas. Faunal continuity through the Tertiary was broken by late Tertiary cooling, resulting in the extinction of all but a very few of the pre-Pliocene species. Those elements of the modern fauna which have Plio-Pleistocene antecedents: i.e., *Flabellum rubrum*, *Caryophyllia profunda*, as well as several stylasterid and alcyonarian forms, are presumed to represent an immigrant fauna derived from the Southern Ocean. Other elements of the fauna such as *Culicia rubeola*, *Paracyathus conceptus*, *Goniocorella dumosa*, and *Dendrophyllia japonica* are more probably representatives of a very recent invasion from the Indo-Pacific. Relatively few modern species including *Oculina virgosa*, *Conocyathus zelandiae* and *Balanophyllia alta*, are also recorded in middle Tertiary rocks

Obviously New Zealand has not been isolated sufficiently long under a given climatic regime to develop its own distinctive coral fauna. This presents a contrast with South Australia, which has a very characteristic fauna composed of a high percentage of endemic genera and species. The Malayasian deeper water coral fauna is perhaps the most diversified yet described (Vaughan and Wells, 1944, p. 88) and includes a number of characteristic genera, none of which is known at the present time from New Zealand waters. Despite the statement by Vaughan and Wells

(1944, p. 88) that the largest proportion of the New Zealand fauna is autochthonous, it is largely composed of more widespread forms.

It would be premature to attempt to discern any provincial divisions among the shallower water coral fauna on data now available. The concentrations of species in the Bay of Plenty-Hauraki Gulf region is presumed to reflect the great proportion of sampling in that area. Records for the Tasman Sea are almost non-existent with the exception of "Cable faunas" and the fiord faunas have been collected only by the New Golden Hind Expedition. Similarly, with the exception of the area of the Chatham Rise, the fauna of the eastern coast of the South Island is barely recorded.

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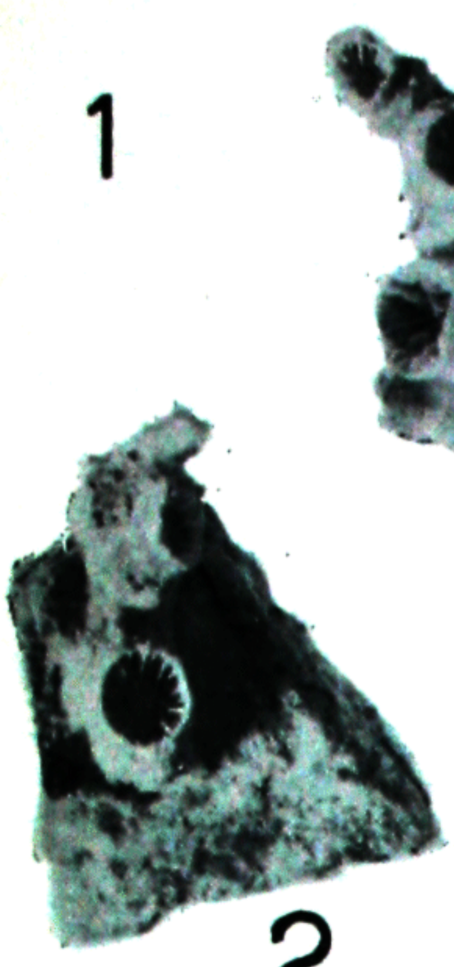

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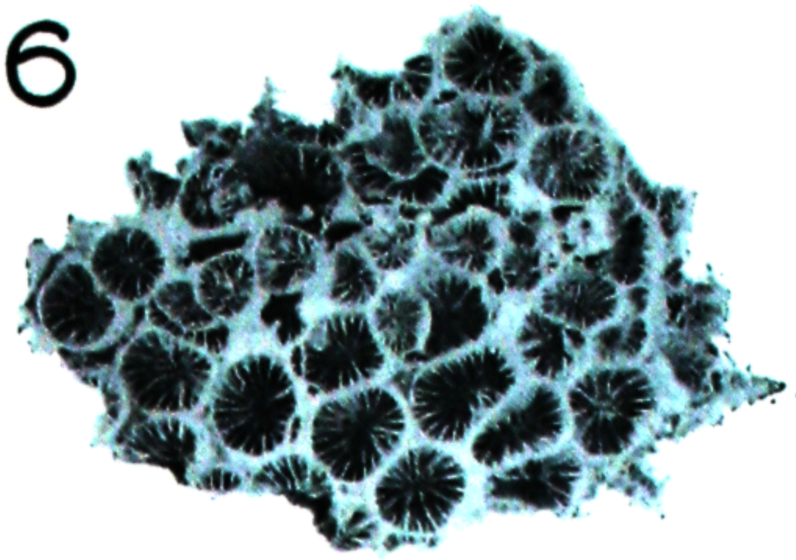

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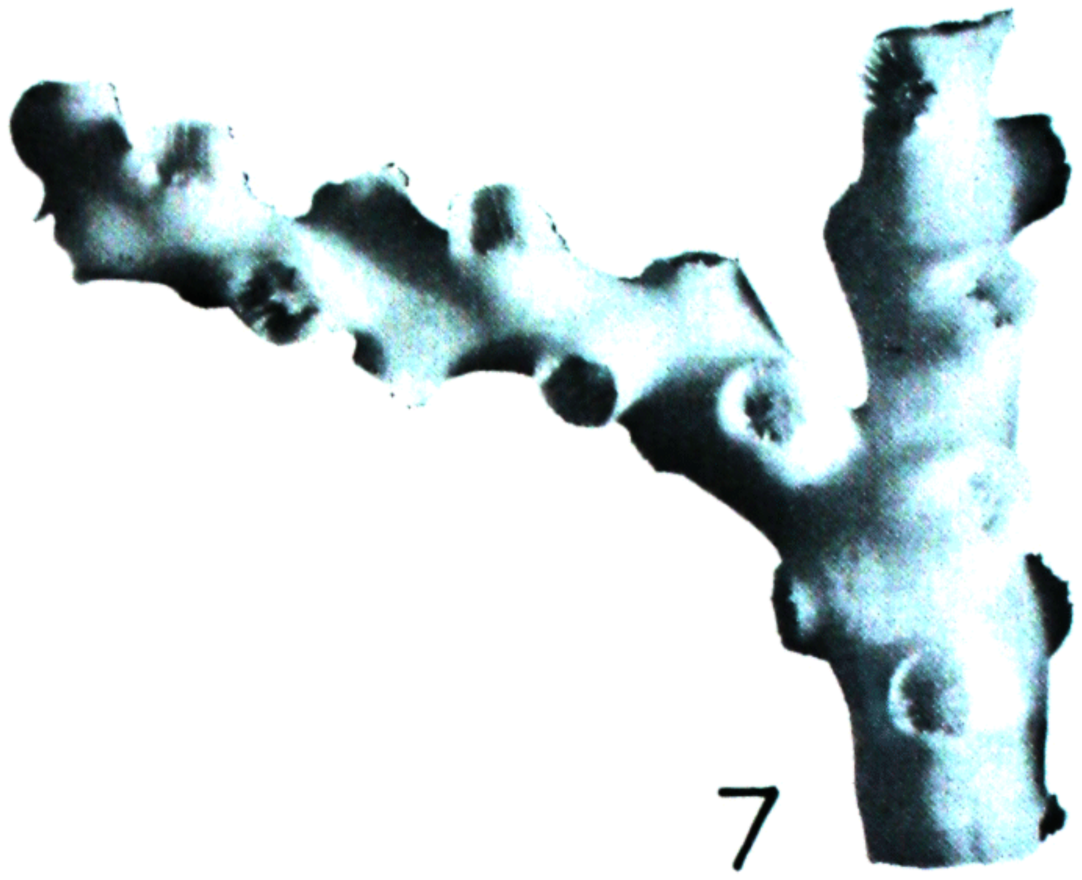

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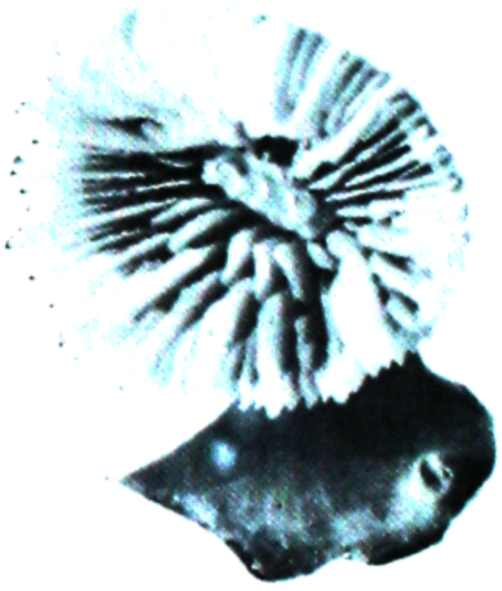

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FIGS. 1–5.—*Culicia rubeola* (Quoy & Gaimard). (Figs. 1–4 × 2; Fig. 5 nat. size).
FIG. 6.—*Culicia smithii* (Milne-Edwards and Haime), nat. size.
FIG. 7.—*Oculina virgosa* Squires, × 2.
FIGS. 8–11.—*Caryophyllia profunda* Moseley, × 2.

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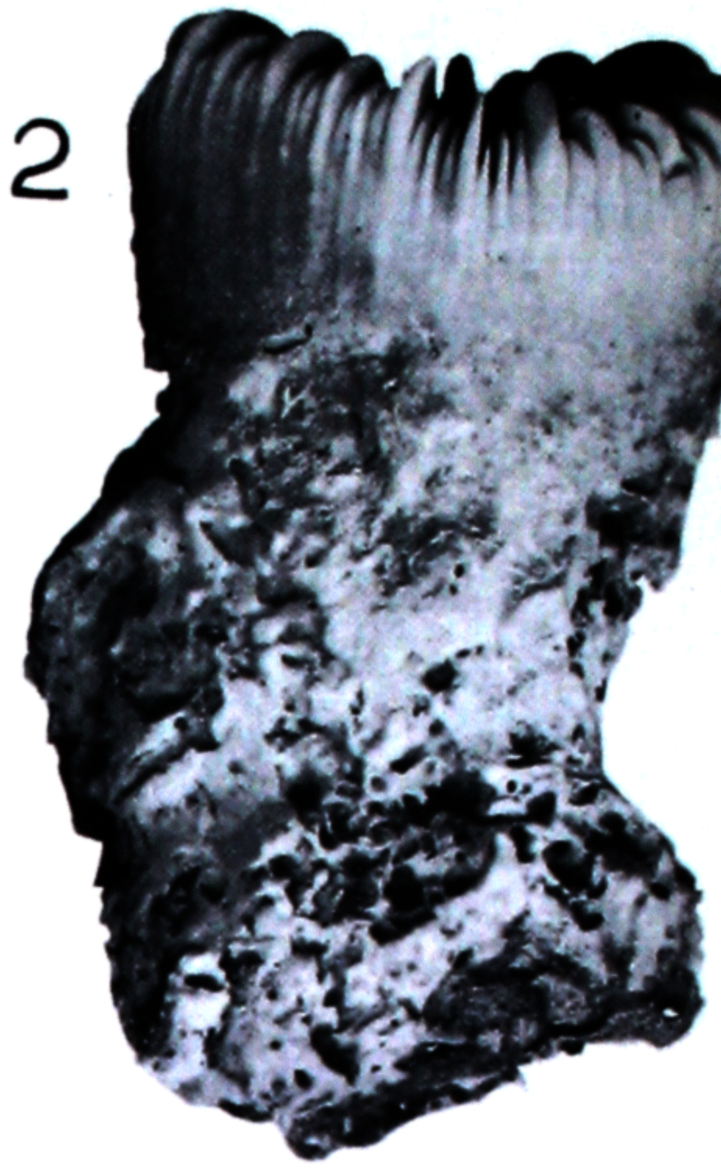

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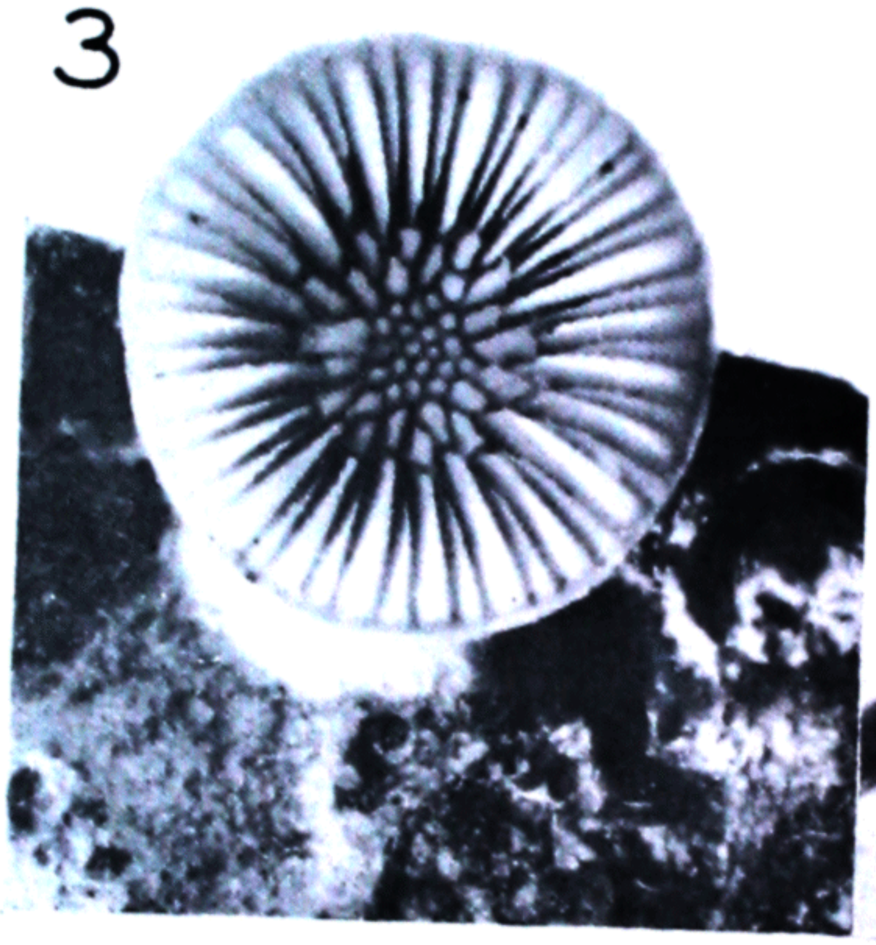

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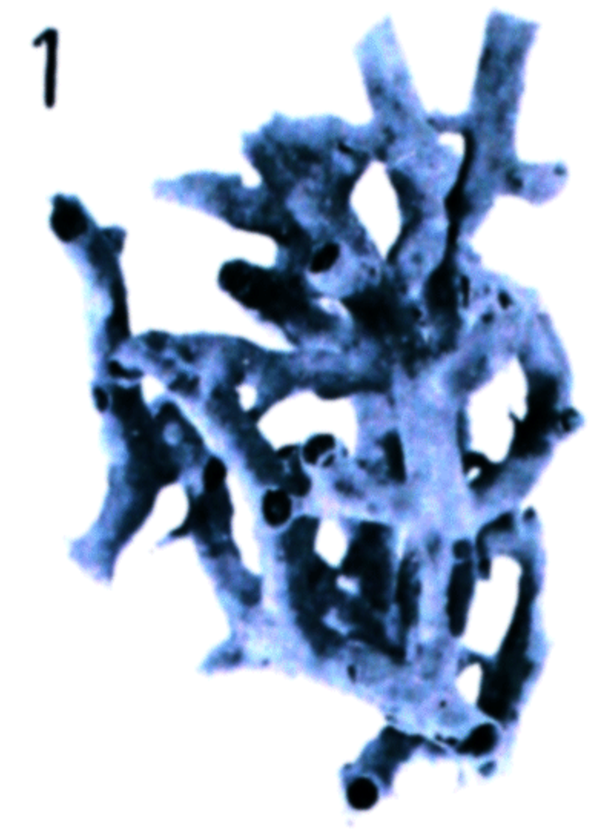
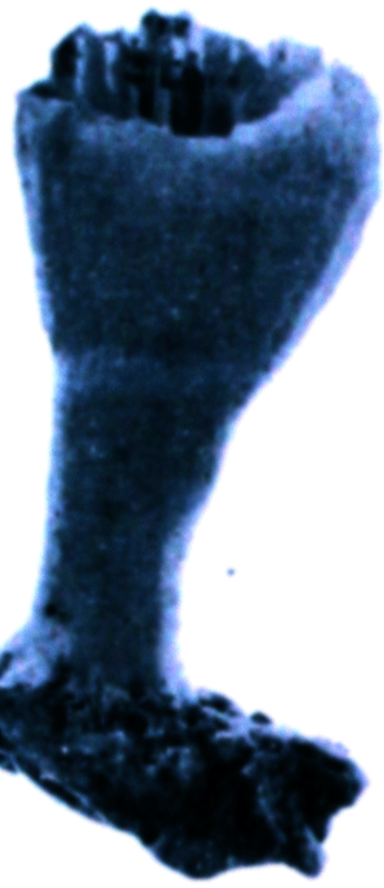
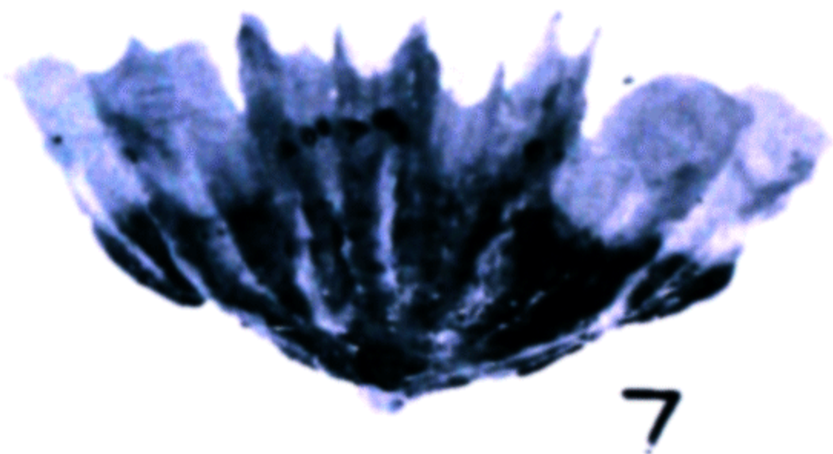
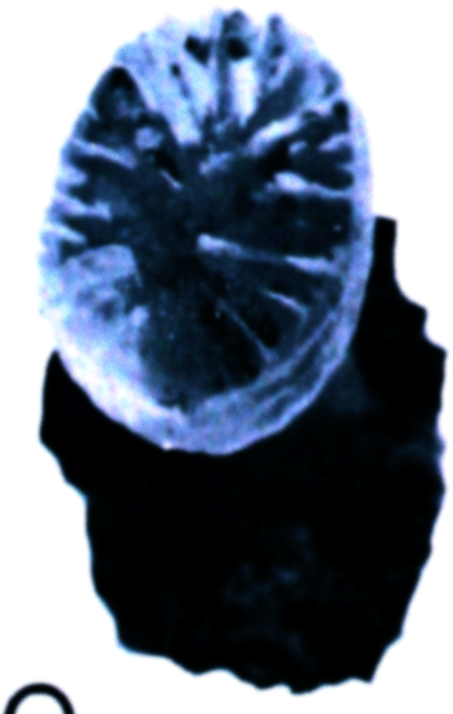
FIGS. 1 and 2.—*Caryophyllia* cf. *C. maculata* (Pourtalès), × 2.
FIGS. 3 and 4.—*Paracyathus conceptus* Gardiner, × 3.
FIGS. 5 and 6.—*Kionotrochus* (*Kionotrochus*) *suteri* Dennant, × 5.
FIGS. 7 and 8.—*Sphenotrochus* n.sp. B. (Fig. 7, × 4; Fig. 8, × 5).

FIGS. 1–10.—*Desmophyllum cristagalli* Milne-Edwards and Haime, nat. size.









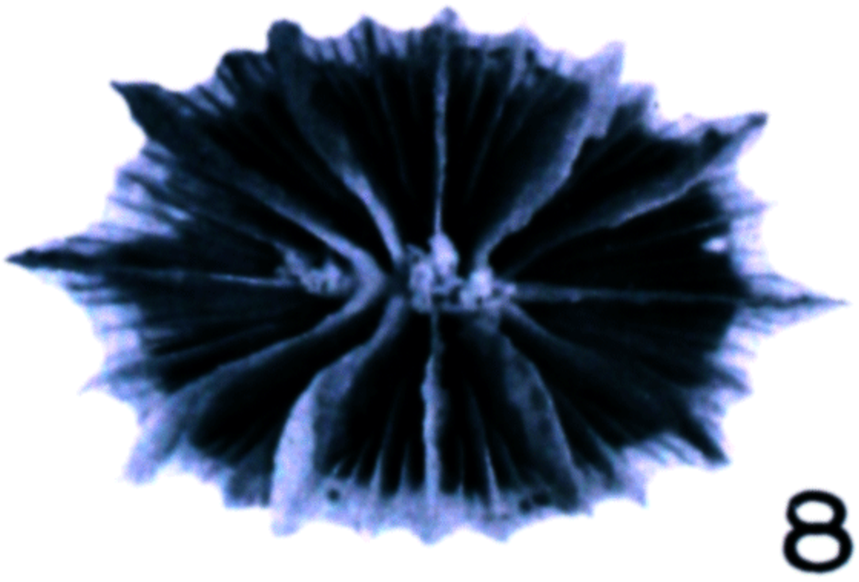
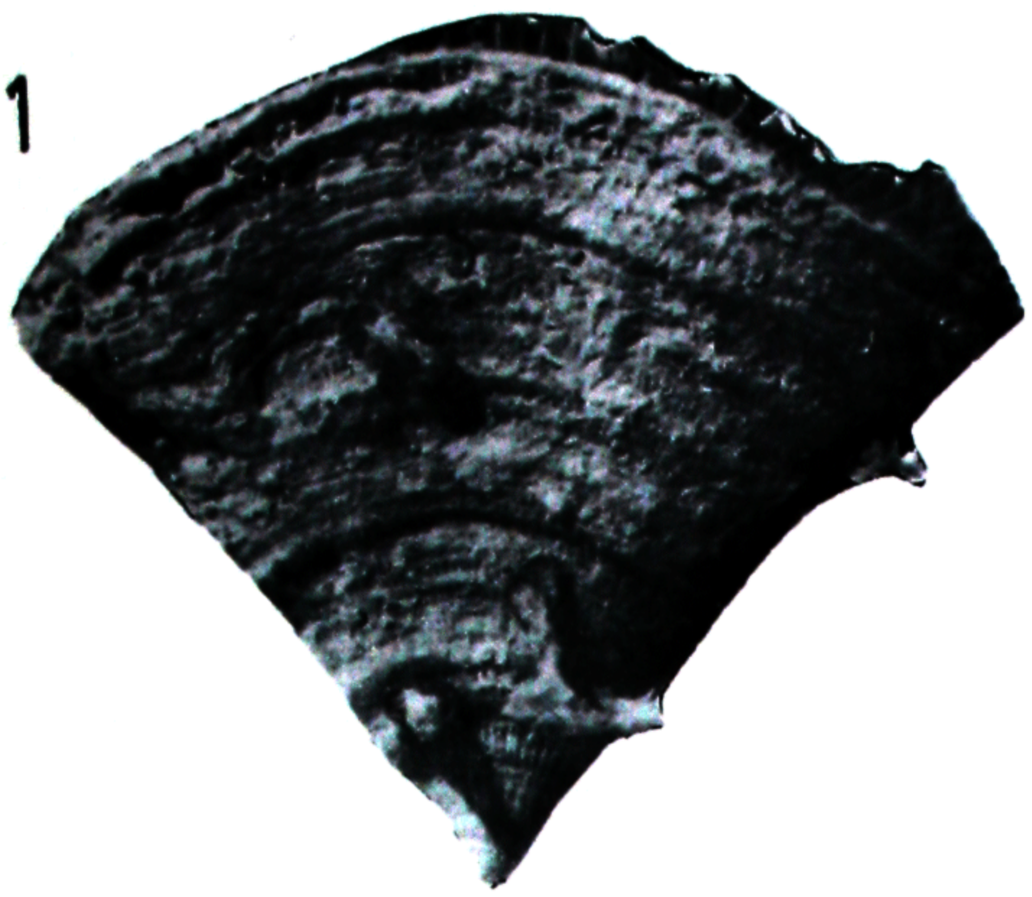
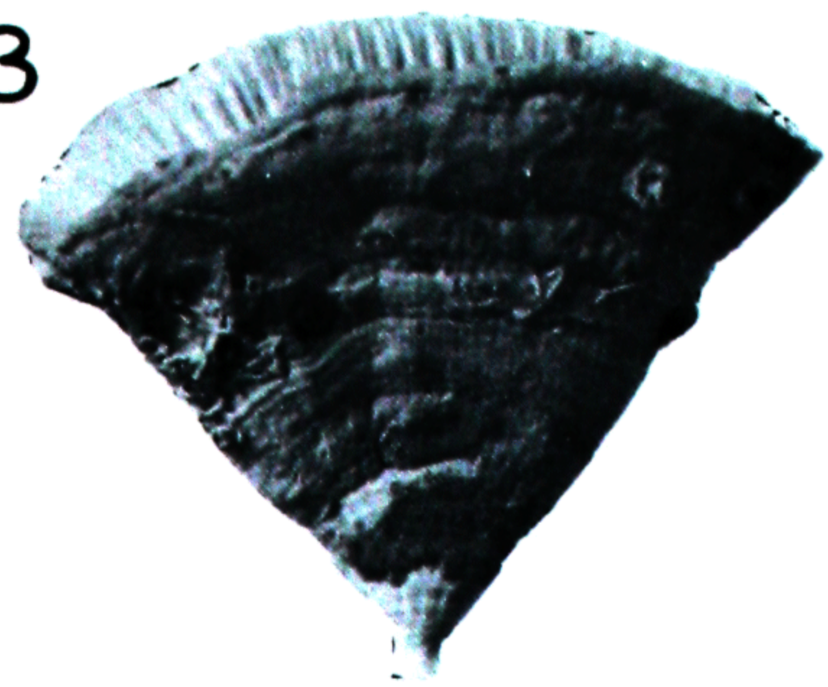


FIG. 1.—*Goniocorella dumosa* (Alcock), nat. size.
FIGS. 2–6.—*Stenocyathus decamera* n.sp. (Figs. 2 and 3 × 8; Figs. 4-6 × 4).
FIGS. 7 and 8.—*Flabellum deludens* von Marenzeller, nat. size.
FIGS. 9 and 10.—*Flabellum gracile* (Studer), × 3.





FIGS. 1–18.—*Flabellum rubrum* Quoy and Gaimard, nat. size. Lateral and surface view of coralla to show variation.

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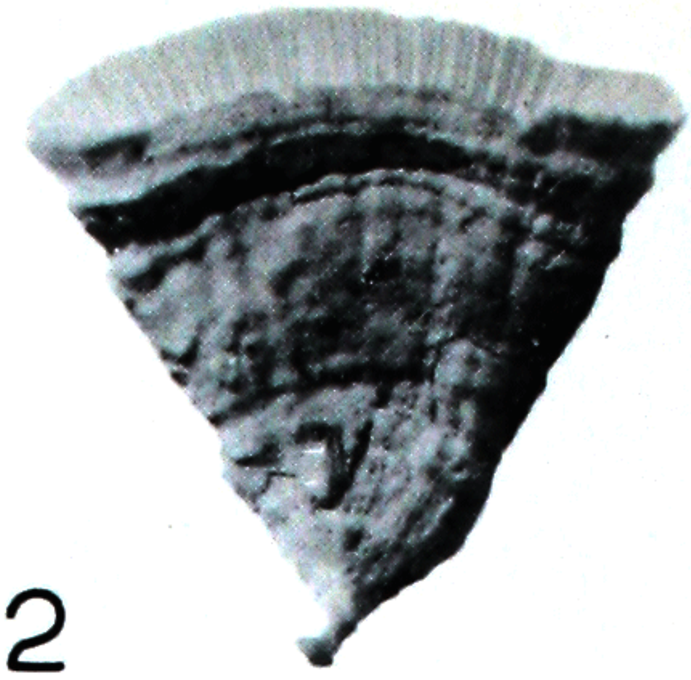

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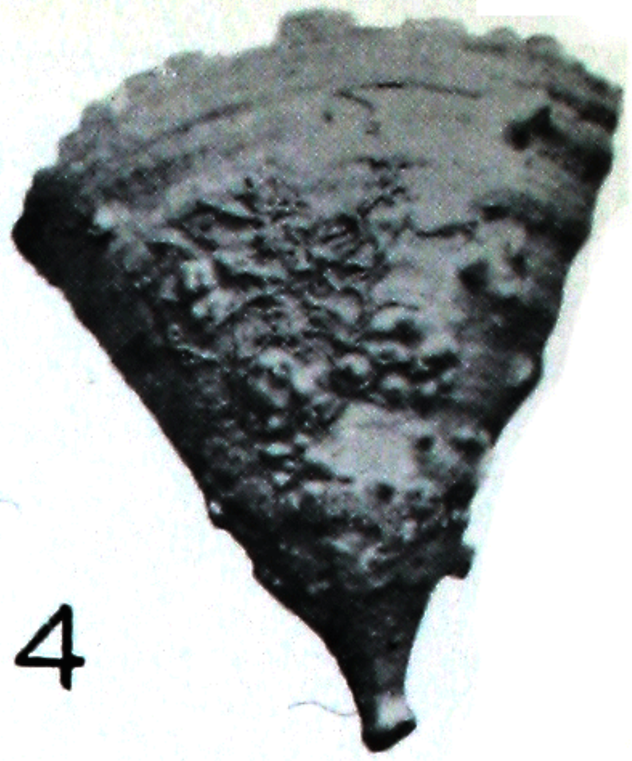

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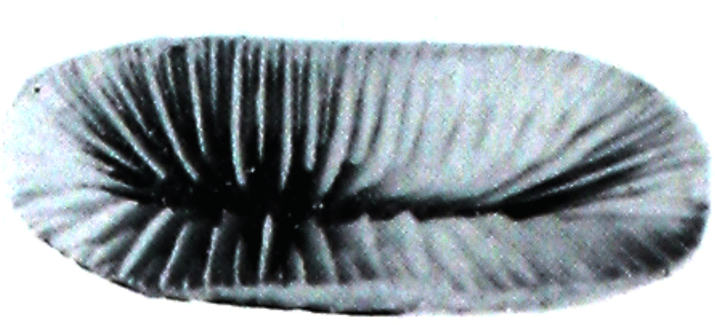

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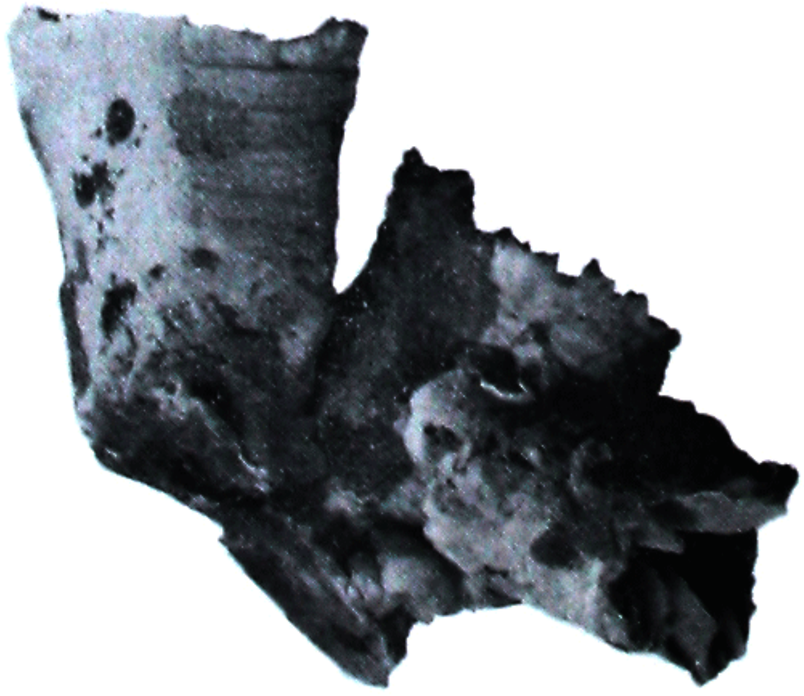

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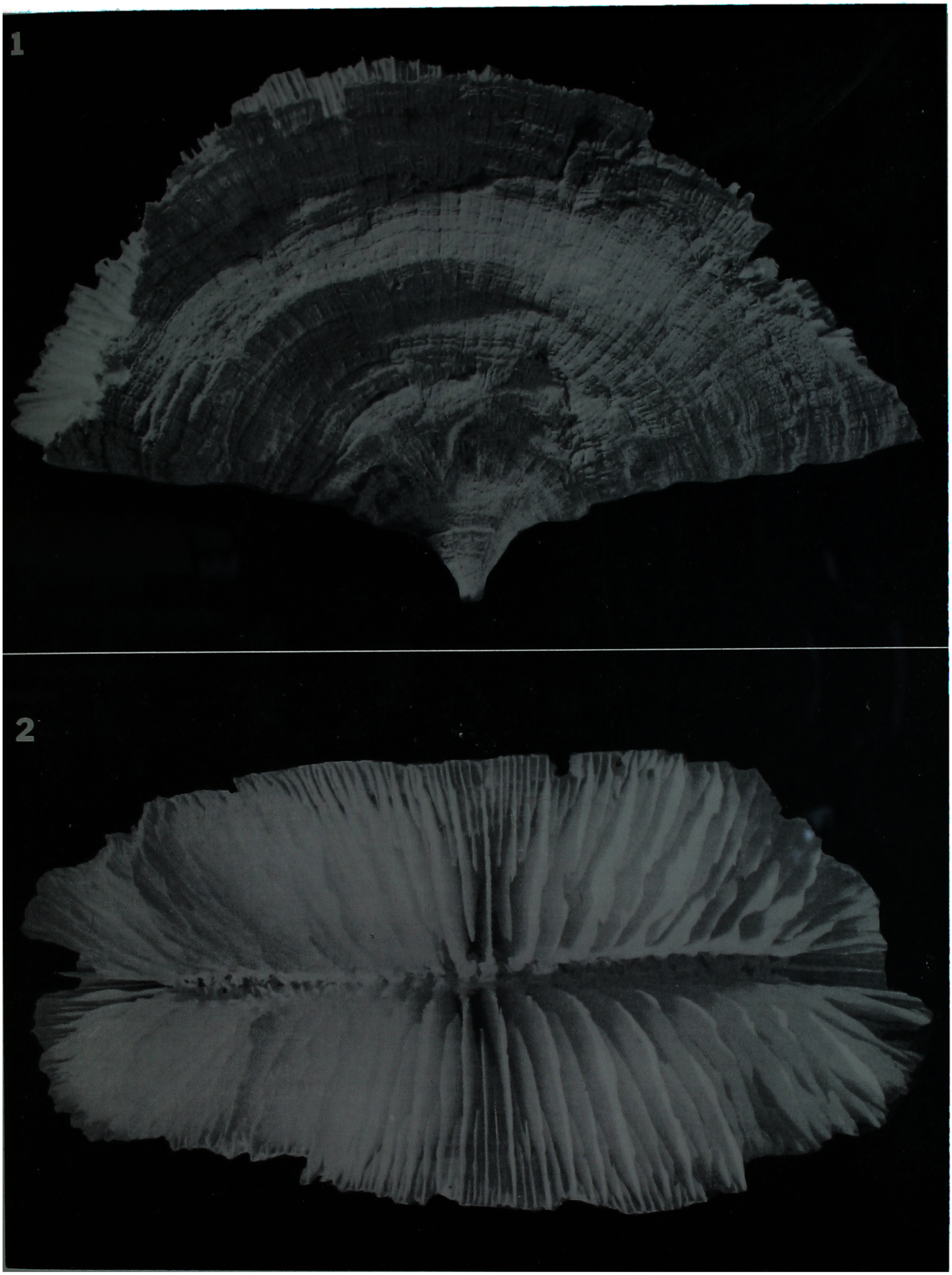
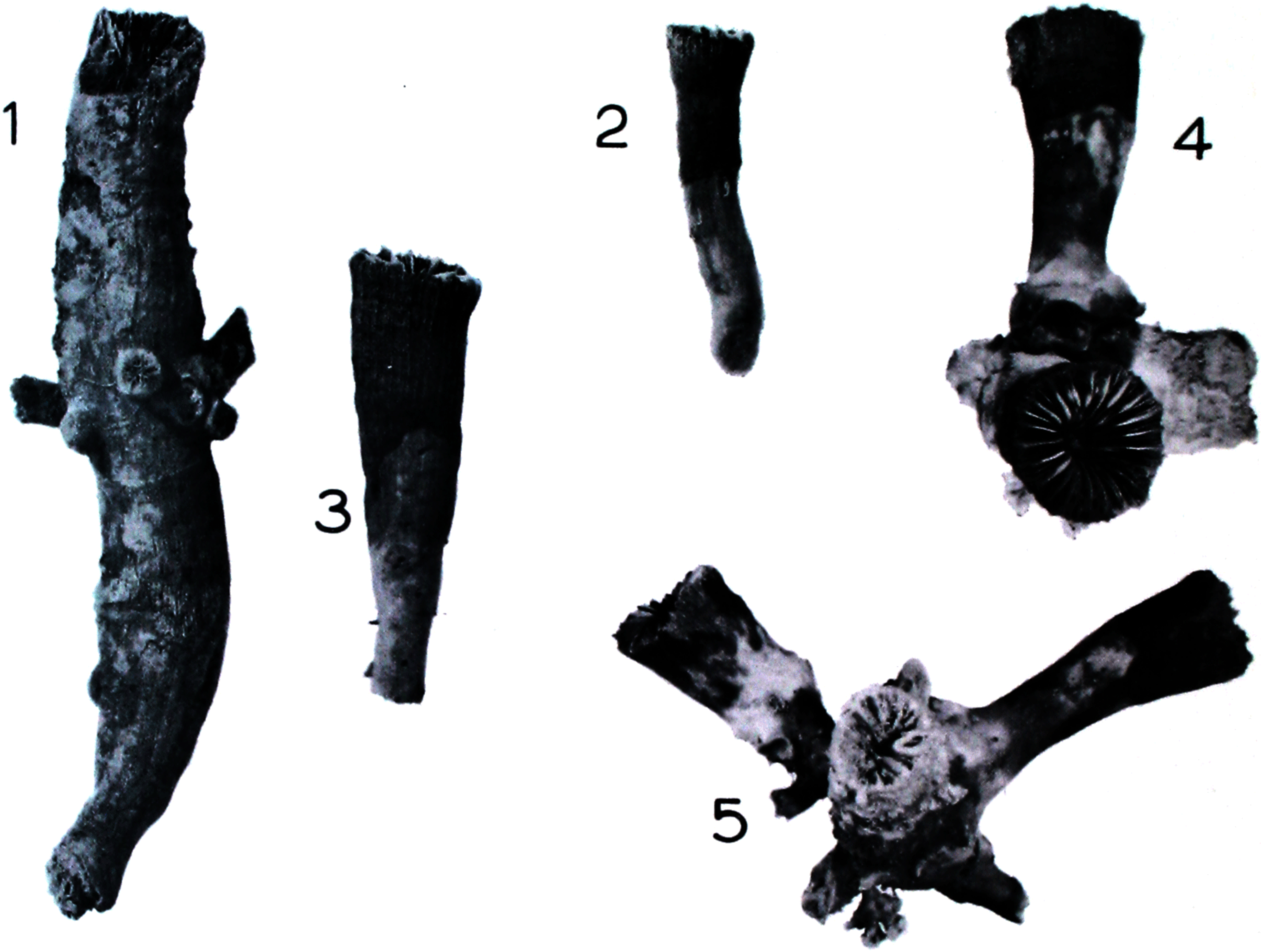
FIGS. 1–9.—*Flabellum rubrum* Quoy and Gaimard. (Fig. 1, *F.* "*rugulosum*", × 2; Figs. 2 and 3, nat. size; Figs. 4 and 5, *F.* "*harmeri*" after Gardiner (1929); Fig. 6, surface view; Fig. 7, side view of *F. rubrum* with broad attaching base, × 2; Figs. 8 and 9—*F. rubrum* surface view to show undulations of lateral walls, × 1.5).



FIGS. 1 and 2.—*Flabellum knoxi* n.sp., × 1.3.



FIGS. 1–3.—*Balanophyllia alta* Tenison-Woods, nat. size; Figs. 4 and 5—*Dendrophyllia japonica* Rehberg, half nat. size.