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NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

BULLETIN 185

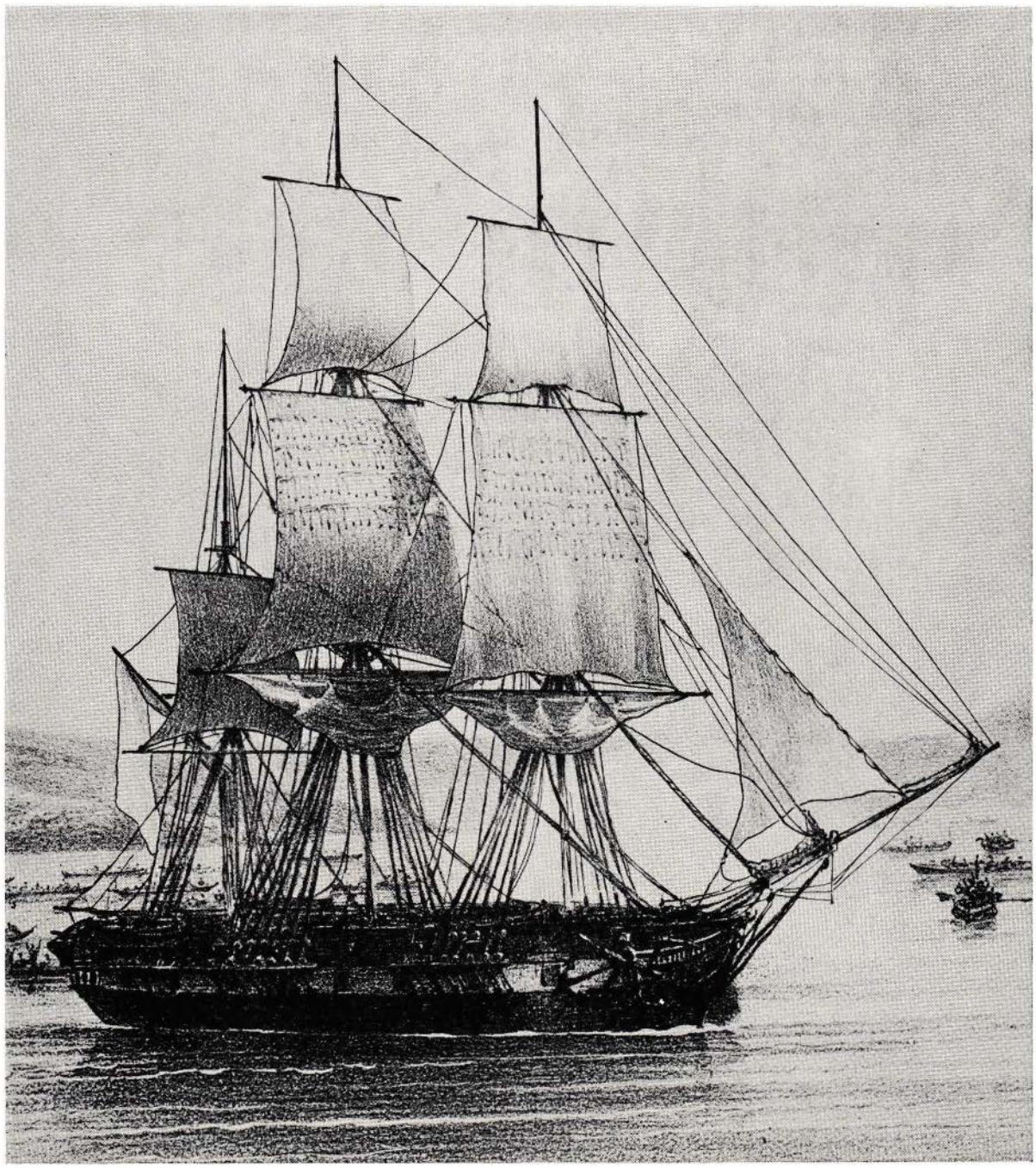
The Marine Fauna of New Zealand: Scleractinian Corals

by
DONALD F. SQUIRES
and
IAN W. KEYES

New Zealand Oceanographic Institute
Memoir No. 43

1967

THE MARINE FAUNA OF NEW ZEALAND:
SCLERACTINIAN CORALS



The corvette *Astrolabe*. In 1827 naturalists aboard the *Astrolabe*, under the command of Dumont D'Urville, became the first to collect living corals from the New Zealand continental shelf. These specimens were later described by Quoy and Gaimard in 1833 in zoological reports of the voyage. (The illustration is from Dumont D'Urville's "Voyage de l'*Astrolabe*", Atlas Histoire du Voyage, Vol. 2, pl. 3, by courtesy of the Alexander Turnbull Library: Photo by M. King, Victoria University of Wellington.)

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FOREWORD

SINCE the early nineteenth century activity in marine biological research in New Zealand has been continuous. Up to 1900, over 850 papers on the marine zoology of New Zealand had been published. Most of this and later work has appeared as discrete papers, there being relatively few monographic or serial comprehensive treatments of particular taxonomic groups. Despite some substantial contributions in this form, the lack of detailed accounts enabling the ready recognition of species in many other groups has hampered the development of ecological work dependent on such identification.

Since 1955 the N.Z. Oceanographic Institute has been developing a programme of research in benthic ecology in the New Zealand region, and the effects of the scarcity of systematic monographs of the marine fauna have been particularly evident. However, in the course of sampling programmes additional material for systematic consideration has been collected, and a number of specialists in systematic groups have interested themselves in the New Zealand fauna.

Over a number of years the coral material available for study in New Zealand collections has increased, particularly as a result of the shelf benthos survey carried out by Mr D. G. McKnight of the Institute staff. The occasion that arose for Dr Squires and Mr Keyes to work together provided the opportunity to complete the study reported in this Memoir. It follows contributions on Brachyura and Cumacea in the series of monographs on the Marine Fauna of New Zealand.

Preliminary editing of the manuscript was done by Dr D. E. Hurley.

J. W. BRODIE, Director,
New Zealand Oceanographic Institute,
Wellington

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The Marine Fauna of New Zealand: Scleractinian Corals

By Donald F. Squires, Smithsonian Institution, Washington, D.C., U.S.A.
and
Ian W. Keyes, New Zealand Geological Survey, D.S.I.R., Lower Hutt, New Zealand

Abstract

The scleractinian fauna of New Zealand is composed of 25 species in 16 genera. All species and genera are diagnosed here and an illustrated key to the fauna is presented. Three new species, belonging to the genera *Madrepora*, *Flabellum*, and *Dendrophyllia*, are described. Two species, *Balanophyllia alta* and *Dendrophyllia boschmai*, are synonymised under *Dendrophyllia japonica*. Depth ranges and distribution of the species are discussed and illustrated, and representative specimens figured. Two appendices list all known stations about New Zealand at which corals have been collected, with species identified from each, and give the geographic grouping of the stations.

INTRODUCTION

For the last decade the Scleractinia of the New Zealand region have received considerable attention, largely as a result of collecting by the New Zealand Oceanographic Institute. Although these collections are probably accurate in reflecting the gross picture of diversity and distribution of the fauna, additional species will be found, but as the coral fauna is now largely known, it is an appropriate time for an illustrated key to facilitate their identification in future collections.

The stony corals are not a major faunal element of the New Zealand shelf, even so they appear in about 10 per cent of previous shelf collections. They are not evenly distributed about New Zealand, for some regions of the shelf apparently have a fauna limited in both diversity and abundance of individuals, but this distributional picture is undoubtedly affected by the distribution of sampling points.

A systematic list of species is presented in this paper, with a glossary of the morphological terminology used in descriptions. An illustrated key to the species precedes a full systematic treatment of all species. It should be possible for persons without special training to make identifications using the key. Many species appear more than once in the key wherever some ambiguity could arise.

Synonymies give the original reference, list subsequent significant papers dealing with the species, and cite the most recent paper that gives a full description and illustration of the species. Generic and specific diagnoses provide the morphological information necessary to identify taxa; not all data bearing on the classification of the species are given.

An appendix lists all stations from which corals were identified; virtually all specimens have been examined by the authors in the museums and universities of New Zealand, as well as in the large collections of the New Zealand Oceanographic Institute. On this appendix are based the authors' conclusions about the distribution of the coral fauna.

PREVIOUS STUDIES

It is over 130 years since the first published record of corals in New Zealand waters appeared (Quoy and Gaimard, 1833), but the amount of study during the next 100 years was minimal. No attempt will be made to review the early literature on the corals of New Zealand, for the subject is adequately treated in Squires (1958) and Ralph and Squires (1962).

Ralph and Squires (1962) summarised existing knowledge of New Zealand corals, and reported on miscellaneous museum collections and early collections of the New Zealand Oceanographic Institute. Before that study perhaps the only systematic collecting effort was that of Dr A. W. B. Powell, Auckland Museum, from the Marine Department Fisheries Research Vessel *Ikatere*.

Various collections from the *Alert* and by expeditions such as those of the *New Golden Hind*, *Discovery II*, and *Terra Nova* were largely adventitious. The Chatham Islands 1954 Expedition was one of the first deliberate attempts to fill a gap in our knowledge of faunal distribution; the corals from this cruise were recorded in Ralph and Squires (1962) and Squires (1964a). Following these earlier studies, the New Zealand Oceanographic Institute has made a series of surveys of the New Zealand shelf led by Mr D. G. McKnight and, as a result, many gaps in the knowledge of distribution of species have been filled. Isolated collecting efforts, however, continue to find additional fauna. Collections from *Ikatere* by Dr A. W. B. Powell in 1961 off the north-eastern New Zealand coast include three new species and some important new records (Squires, 1964b). Other papers on New Zealand corals since Ralph and Squires (1962) are: Squires (1963) on *Flabellum rubrum* and Squires and Ralph (1965) which describes two new species collected by the Marine Department Fisheries Laboratory.

ACKNOWLEDGMENTS

This study is part of a research programme on Southern Ocean corals supported by the National Science Foundation, U.S.A. Funds from this grant (GB–353) were used for travel to New Zealand and to support one of us (I.W.K.) at the Smithsonian Institution. An additional research grant from the New Zealand Department of Scientific and Industrial Research made possible the study of the New Zealand Oceanographic Institute collections.

It is with sincere gratitude that we thank the Directors of the Auckland Institute and Museum, Auckland; the Dominion Museum, Wellington; the Canterbury Museum, Christchurch; the Otago Museum, Dunedin; the New Zealand Geological Survey, Lower Hutt; and the New Zealand Oceanographic Institute, Wellington, for kind permission to borrow or study specimens. Our thanks go to our many colleagues and friends in New Zealand whose encouragement and cooperation made possible this study.

Photographs and drawings reproduced in this paper, except where otherwise indicated, are by Mr Jack Scott and Miss Carolyn Bartlett respectively, Natural History Museum, Smithsonian Institution.

SYSTEMATIC LISTING OF SCLERACTINIA

Order **SCLERACTINIA**
Suborder **FUNGIINA**
Superfamily FUNGIICAE
Family MICRABACIIDAE
Genus LETEPSAMMIA
Letepsammia sp.

Suborder **FAVIINA**
Superfamily FAVIICAE
Family RHIZANGIIDAE
Genus CULICIA
Culicia rubeola
Culicia smithii

Family OCULINIDAE
Subfamily OCULININAE
Genus OCULINA
Oculina virgosa
Genus MADREPORA
Madrepora vitiae n. sp.

Suborder **CARYOPHYLLIINA**
Superfamily CARYOPHYLLIICAE
Family CARYOPHYLLIIDAE
Subfamily CARYOPHYLLIINAE
Genus CARYOPHYLLIA
Caryophyllia profunda
Caryophyllia cf. *C. maculata*
Genus PARACYATHUS
Paracyathus conceptus
Genus CERATOTROCHUS
Ceratotrochus (*Ceratotrochus*) *limatulus*
Genus STEPHANOCYATHUS
Stephanocyathus sp.

Genus NOTOCYATHUS
Notocyathus (*Paradeltocyathus*) *orientalis*
Genus SPHENOTROCHUS
Sphenotrochus ralphae
Genus KIONOTROCHUS
Kionotrochus (*Kionotrochus*) *suteri*

Subfamily DESMOPHYLLINAE
Genus DESMOPHYLLUM
Desmophyllum cristagalli

Subfamily PARASMILIINAE
Genus GONIOCORELLA
Goniocorella dumosa

Superfamily FLABELLICAE
Family FLABELLIDAE
Genus FLABELLUM
Flabellum aotearoa
Flabellum apertum
Flabellum gracile
Flabellum knoxi
Flabellum raukawaensis n. sp.
Flabellum rubrum
Flabellum lowekeyesi

Family GUYNIIDAE
Genus STENOCYATHUS
Stenocyathus decamera

Suborder DENDROPHYLLIINA
Family DENDROPHYLLIIDAE
Genus DENDROPHYLLIA
Dendrophyllia japonica
Dendrophyllia palita n. sp.

GLOSSARY OF MORPHOLOGICAL TERMS

Budding (buds): sexual reproductive process by which juvenile branches are formed from parent stock.

Calice: opening of corallite in which polyp is situated; usually cup-shaped.

Coenosarc: soft tissue between polyps of a colony uniting them externally to skeleton.

Columella: internal axial skeletal structure, which may or may not be solid, projecting upward in centre of a calice; usually united with septa, but may be free.

Corallite: that portion of calcareous exoskeleton which encases an individual coral polyp.

Corallum: exoskeleton of a coral colony or of a solitary coral.

Costae (costate): ridges on exterior of a corallite; usually corresponding in position to septa.

Dendroid: branched in irregular tree- or shrub-like pattern (found in the coralla of colonial corals).

Endotheca: internal transverse partitions of certain corallites which seal off earlier portions from later ones.

Epitheca (epithecate): wall of corallite formed by a polyp which does not have a fleshy extension on outer side of corallum.

Exsert: condition of corallite when septa extend upward above edge of the wall.

Extrathecal: collective term for skeletal deposits formed outside corallite wall.

Mural pores: small holes which perforate the wall of corallites and are usually arranged in horizontal or vertical rows.

Pali: vertical lamellae or pillars which form a cyclet along inner margin of certain septa. These are remnants of once joined pairs of septa and are often difficult to distinguish from columella.

Paliform lobes: extensions of septa which project inwards from inner edge of septa and appear in one or more crowns between columella and septa.

Papillae (papillose): small rod- or nipple-like protrusions, forming, or mounted on, a surface.

Peritheca: a collective term for extrathecal skeletal deposits which unite corallites into a colony.

Pourtalès plan: an arrangement of septa in which younger cycles bend towards or away from higher cycles, after being united at depth in the corallum.

Reptoid: corallite with encrusting habit in which polyps proliferate in random directions.

Rugose: roughened; usually used in reference to a wall.

Septa: radial internal partitions of a corallite, with regularly arranged longitudinal plates.

Septal cycles: grouping of septa according to their successive cyclic appearance and arrangement during morphological development of corallum.

Stereome: dense calcareous skeletal deposit, covering, filling, or thickening part of a corallite, either internally or externally.

Trochoid: horn-shaped corallite, with sides which expand regularly at an angle of about 40° from the base.

Trophozoid: fixed portion of a corallum which buds successive individuals by transverse asexual reproduction.

Tubercle: rod-like projection formed by fine skeletal elements, which are usually disposed vertically.

KEY TO NEW ZEALAND SHELF CORALS

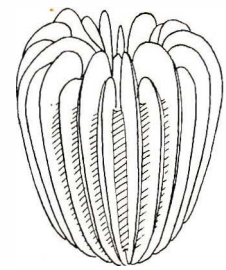
I. SOLITARY CORALS

A. Corallum small, corallite diameter less than 1 cm.

1. Corallum conical, base rounded.

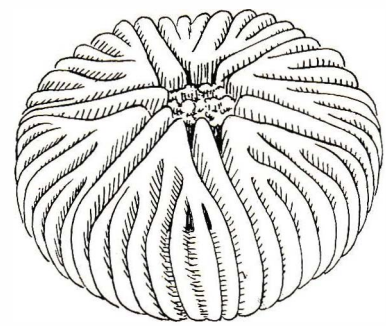
a. Less than 5 mm in diameter. Corallum completely ribbed, calice circular, septa 24 or less.

Kionotrochus (K.) suteri



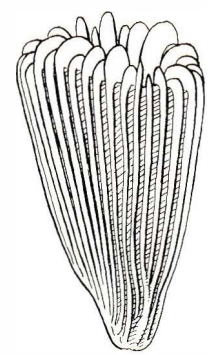
b. More than 5 mm in diameter. Corallum completely ribbed, calice circular, septa more than 24.

Notocyathus (Paradeltocyathus) orientalis



2. Corallum cuneiform, corallum completely ribbed, calice oval.

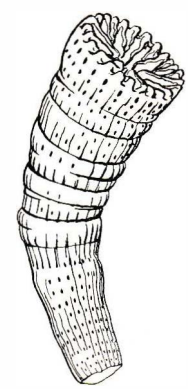
Sphenotrochus ralphae



3. Corallum subcylindrical.

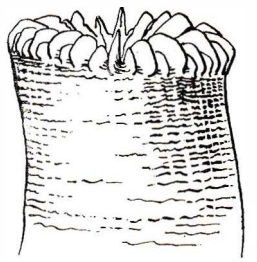
a. Corallum tall, often bent. Wall may be ribbed, porous. Pali present.

Stenocyathus decamera



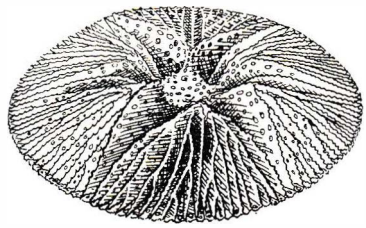
b. Corallum short. Wall nearly smooth, columella large, conspicuous.

Ceratotrochus (C.) limatulus



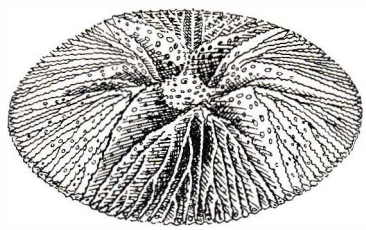
4. Corallum discoidal. Corallum porous on both base and septa.

Letepsammia sp.



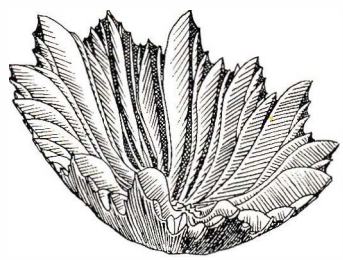
B. Corallum large, corallite diameter greater than 1 cm.
1. Calice circular.
a. Corallum discoidal. Corallum porous on both base and septa.

Letepsammia sp.



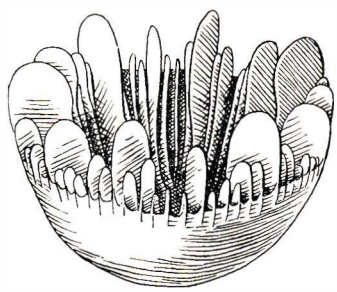
b. Corallum bowl-shaped.
(1) Wall extends to top of septa. Upper edge of wall uneven.

Flabellum raukawaensis



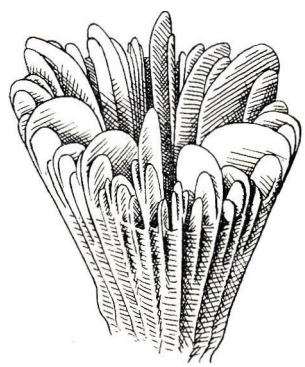
(2) Septa exsert. Upper edge of wall almost even.

Stephanocyathus sp.



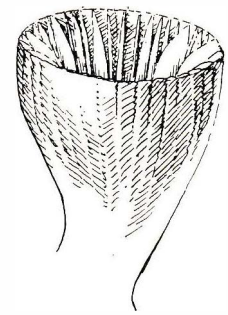
c. Corallum trochoid.
(1) Columella absent.
(a) Corallum coarsely ribbed, septa closely spaced.

Desmophyllum cristagalli



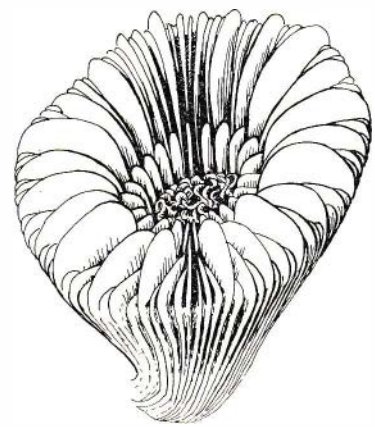
(b) Corallum smooth externally, septa not closely spaced.

Flabellum gracile



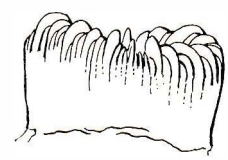
(2) Columella present.
(a) Columella of curled laths with one crown of pali.

Caryophyllia



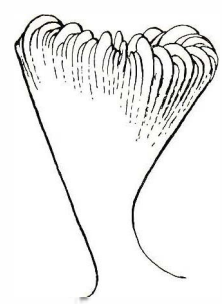
(i) Corallum low, squat.

Caryophyllia maculata



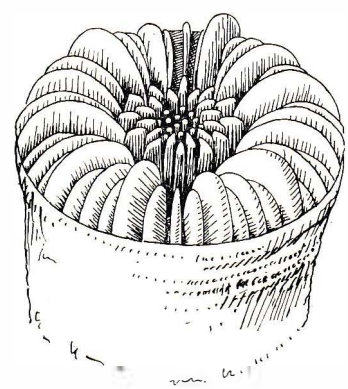
(ii) Corallum tall, flaring.

Caryophyllia profunda



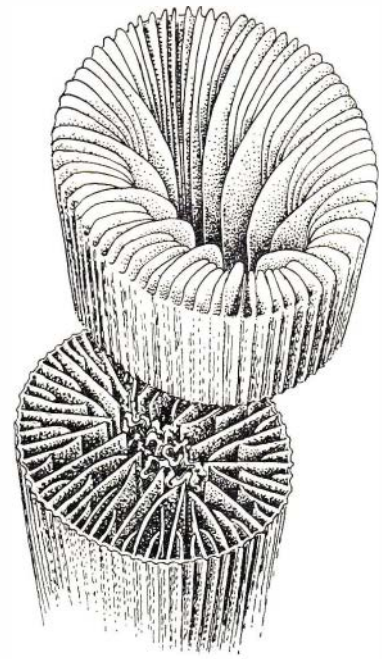
(b) Columella papillary with pali in two crowns merging with columella.

Paracyathus conceptus



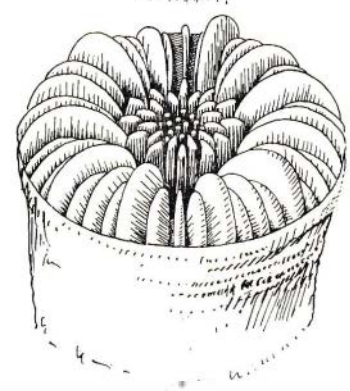
d. Corallum subcylindrical.
(1) Septa arranged in Pourtalès plan. Corallum tall, digitiform, porous, longitudinally ribbed.

Dendrophyllia japonica



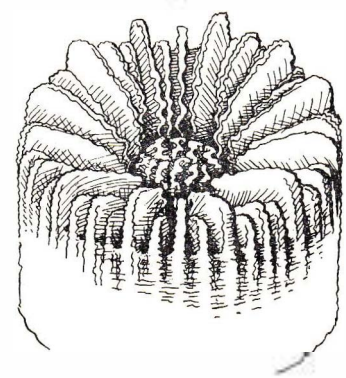
(2) Septa not arranged in Pourtalès plan.
(a) Pali present mingling with papillary columella.

Paracyathus conceptus



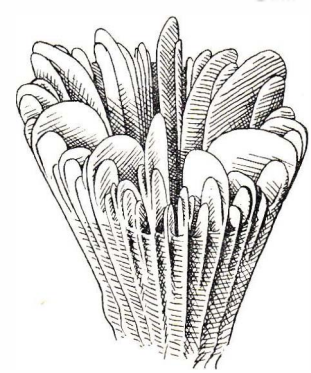
(b) Pali absent, columella massive.

Ceratotrochus (C.) limatulus



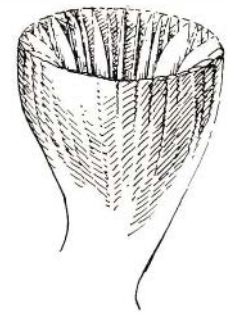
2. Calice oval.
a. Upper portion of corallum flared. Margin of calice not scalloped.
(1) Columella absent.
(a) Corallum coarsely ribbed, septa closely spaced.

Desmophyllum cristagalli



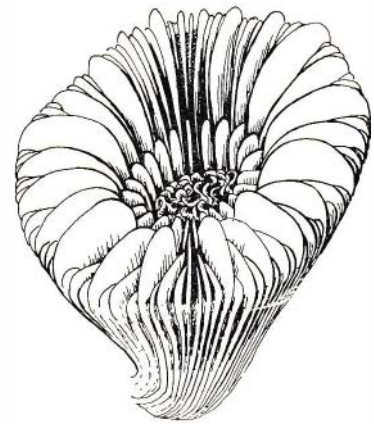
(b) Corallum smooth externally, septa not closely spaced.

Flabellum gracile



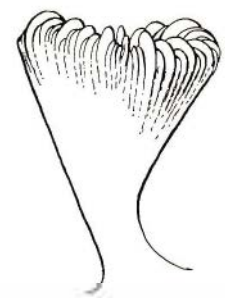
(2) Columella present, pali in one crown.
(a) Corallum low, squat.

Caryophyllia maculata



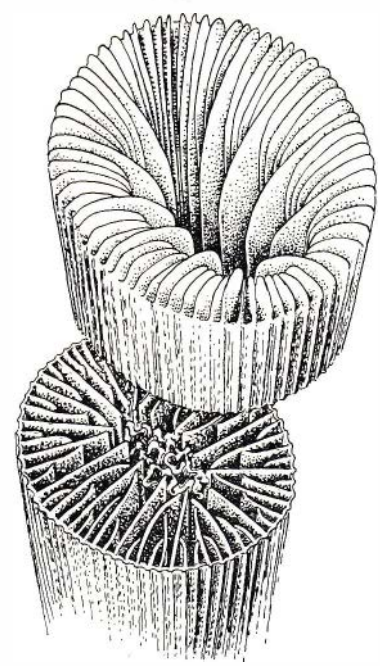
(b) Corallum tall, flaring.

Caryophyllia profunda



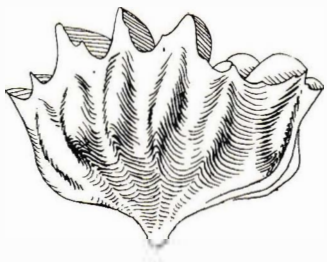
(3) Columella present, pali absent; septa arranged in Pourtalès plan.

Dendrophyllia japonica



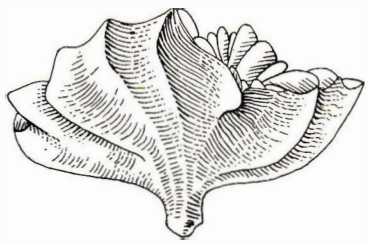
b. Margin of calice scalloped.
(1) Corallum with convex walls.
(a) Corallum white, tending towards bowl-shaped, with pronounced knobs at base of wall.

Flabellum raukawaensis



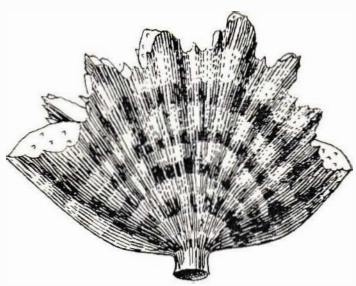
(b) Corallum with rugose exterior and a short, stout basal stalk.

Flabellum apertum



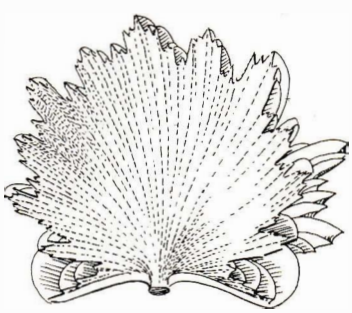
(c) Corallum maroon striped, with prominent end septa.

Flabellum aotearoa



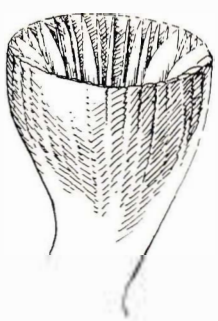
(2) Corallum with concave walls, lateral edges nearly horizontal.

Flabellum lowekeyesi



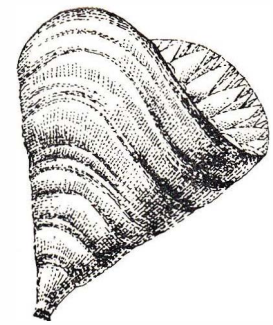
c. Margin of calice smooth.
(1) Angle formed by lateral edges less than 100°.
(a) Corallum very fragile.

Flabellum gracile



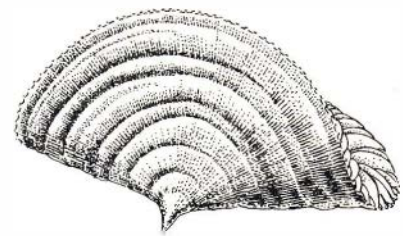
(b) Corallum sturdy.

Flabellum rubrum



(2) Angle formed by lateral edges more than 100°.

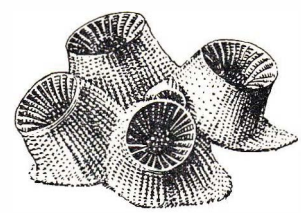
Flabellum knoxi



II. COLONIAL CORALS

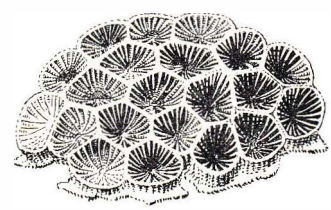
A. Corallum encrusting or reptoid
1. Corallites circular.

Culcia rubeola



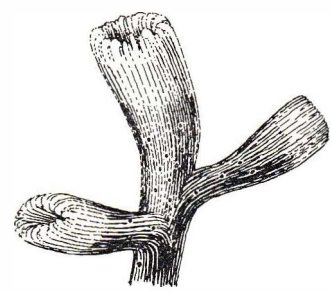
2. Corallite polygonal.

Culcia smithii



B. Corallum branched, dendroid.
1. Calices not protuberant in branches.
a. Calices large, over 5 mm in diameter, corallum porous.

Dendrophyllia japonica

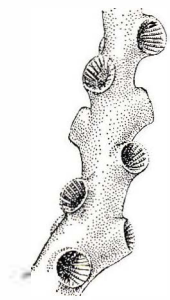


b. Calices small, 5 mm or less in diameter.
(1) Budding alternate, regular. Corallites 1–3 mm in diameter.

Madrepora vitiae

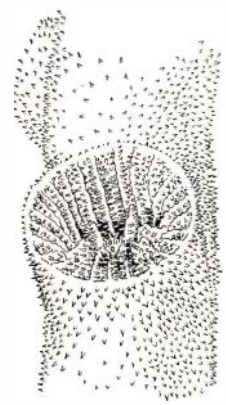
(2) Budding irregular, tending to spiral.
(a) Wall ridged or smooth. Corallites 2–4 mm in diameter.

Oculina virgosa



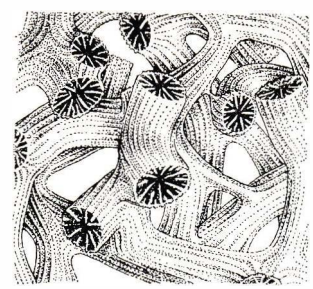
(b) Wall covered by minute spines. Corallites 2–4 mm.

Dendrophyllia palita



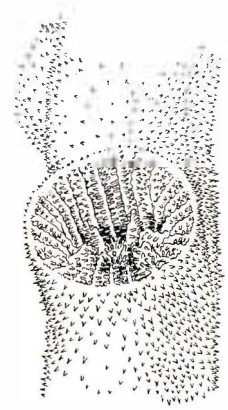
2. Calices protuberant on branches.
a. Corallum conspicuously ridged near calices.

Goniocorella dumosa



b. Corallum covered by fine spines.

Dendrophyllia palita



SYSTEMATICS

Order **SCLERACTINIA**

Suborder **FUNGIINA** Verrill, 1865

Superfamily FUNGIICAE Dana, 1846

Family MICRABACIIDAE Vaughan, 1905

Genus **Letepsammia** Yabe and Eguchi, 1932

Type Species: *Stephanophyllia formosissima* Moseley, 1881

Corallum solitary, discoidal, small, to medium size, lightly constructed. Horizontal wall and all septa very porous. Septa of all but first cycle unite in prominent deltas before papillose columella.

Letepsammia sp. (Plate 4, fig. 1)

Stephanophyllia formosissima Moseley, 1881. Wells, 1958, *Rep. B.A.N.Z. antarct. Res. Exped. 1929–1931, B, 6, II*: 263, pl. 1, figs. 1 and 2; Ralph and Squires, 1962. *Zoology Publs. Vict. Univ. Wellington, 29*: *17*.

To date only fragments of this species have been recorded from New Zealand (Squires, 1964b), although Wells (1958) located a young specimen reported to be from New Zealand in the British Museum (Natural History). Recently, one of us (D.F.S.) examined this specimen and found it to be an adult nearly identical with the Australian specimens and with fragments of coralla collected in New Zealand. The species appears to be closest to Australian specimens described as *Stephanophyllia formosissima* by Wells (1958).

Polyp not known.

OCCURRENCE: *Ikatere* – B 23, B 26, B 27. Miscellaneous – 2.

DEPTH RANGE: 143–192 m.

DISTRIBUTION: North-eastern New Zealand.

Suborder **FAVIINA** Vaughan and Wells, 1943

Superfamily FAVIICAE Gregory, 1900

Family RHIZANGIIDAE d'Orbigny, 1851

Genus **Culicia** Dana, 1846

Type Species: *Culicia stellata* Dana, 1846.

Corallum reptoid, encrusting or partially free, connected by basal extensions. Corallites cylindrical, not always in contact. Septa of first cycle obscurely dentate and lobate, remaining septa strongly dentate. Columella small.

Culicia rubeola (Quoy and Gaimard), 1833 (Plate 1, fig. 1)

Dendrophyllia rubeola Quoy and Gaimard, 1833, *Voy. de l'Astrolabe, Zool. 4*: 197, pl. 15, figs. 12–15.

?*Cylicia huttoni* Tenison-Woods, 1879, *Proc. Linn. Soc. N.S.W., 3*: 132, pl. 12, fig. 1.

Culicia rubeola (Quoy and Gaimard). Wells, 1954, *Prof. Pap. U.S. geol. Surv., 260 (I)*: 464, pl. 185, figs. 3–6; Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: pl. 1, figs. 1–5.

Corallites cylindrical, forming a twisted mass about encrusted objects, 3·5–4·5 mm in diameter. Septa in three complete cycles (24) with portions of cycle IV present. Septa I and II deeply notched near calicular margin. All septa dentate, dentations merging with septa.

Polyp a delicate shade of pink.

OCCURRENCE: *Ikatere* – 21, 30, A 2, D 33. N.Z.O.I. – C 787, C 789. Miscellaneous – 6, 12, 15, 16, 57, 58.

DEPTH RANGE: To 55 m.

DISTRIBUTION: Central and south-west Pacific, in littoral zone.

Culicia smithii (Milne-Edwards and Haime), 1849 (Plate 1, fig. 2)

Angia smithii Milne-Edwards and Haime, 1849, *Annls. sci. nat., ser. 3, 12*: 177.

Culicia smithii (Milne-Edwards and Haime). Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 5, pl. 1, fig. 6.

Corallum a flat encrusting mass. Corallites closely adpressed so as to become polygonal, large, up to 7 mm in diameter. Septa in three complete cycles (24) with portions of septa IV present. Septa I lobulate, but not notched near wall. All septa dentate, dentations merging with columella.

Polyp not known.

This species is still represented by only a single specimen in Otago Museum bearing the handwritten note "type" (Ralph and Squires, 1962). The type locality of the species is given as New Zealand. It is possible that

collections and data were confused in the original description. Ralph and Squires (1962) erroneously cited the date of publication of this species as 1850.

OCCURRENCE: New Zealand.

DEPTH: Not known.

DISTRIBUTION: New Zealand.

Family OCULINIDAE Gray, 1847
Subfamily OCULININAE Gray, 1847
Genus **Oculina** Lamarck, 1816

Type Species: *Oculina diffusa* Lamarck, 1816

Colony diffusely branching. Corallites surrounded by dense, striated peritheca to summits of calices, tend to spiral about the branches. Septa in about three cycles, narrow. Pali obscure but present in two irregular crowns. Columella small, papillose.

Oculina virgosa Squires, 1958 (Plate 1, fig. 3)

Oculina virgosa Squires, 1958, *N.Z. geol. Surv. Paleont. Bull. 29*: 39, pl. 5, figs. 8–16, text-fig. 11. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 5, pl. 1, fig. 7.

Corallum apparently laxly branching, with diameter of branches ranging from a few millimetres to several centimetres near the base. Corallites small, 2–4 mm in diameter, slightly protuberant. Septa in three cycles, often arranged septamerally (28). Septa short, spinose, with pali; columellar tubercles obscure in centre of calice.

Polyp not known.

OCCURRENCE: *Discovery II* – 933. N.Z.O.I. – A 4. Miscellaneous – 3.

DEPTH RANGE: 101 m, dead specimens to 260 m.

DISTRIBUTION: Northern New Zealand.

Genus **Madrepora** Linné, 1758

Type Species: *Madrepora oculata* Linné, 1758

Corallum colonial, loosely branching. Corallites arranged alternately on the branches, which are long and slender. Septa in three cycles without pali. Columella very small.

Madrepora vitiae n. sp. (Plate 1, figs. 4–8)

Corallum of long slender branches forming a fragile, bushy colony. Calices slightly protuberant on side of corallum. Wall nearly smooth, but having broad low costae. Columella small in young corallites, small and papillose in older ones.

HOLOTYPE: New Zealand Oceanographic Institute No. 17, N.Z.O.I. Sta. B 314. 39° 22′S, 171° 50′E, northwest of Cape Farewell, 230–251 m.

DESCRIPTION: Branches of colony long and slender, about 3–4 mm in diameter at the distal ends, but up to 1 cm in diameter near the base of the colony. Calices slightly protuberant and regularly arranged on branches in an alternate fashion. Calice diameter ranges from 3–4 mm. Wall of corallum nearly smooth, costae being broad and very low, developed only near margins of calice. Septa arranged in three cycles and appear as three distinct sizes in the calices. In young calices, the central portion is very open, the septa being narrow and falling nearly vertically to the centre of the corallite. Columella consisting of one or more very slender tubercles. In older corallites, septa slope more gently to the centre of the corallum, which is more or less completely filled with columnar tubercles. Septa I conspicuously flattened on the inner end to form a T-shaped termination. Septa II similarly formed, but less conspicuously so. The presence of these thickenings of the inner ends of the septa and of the columnar tubercles gives mature corallites the appearance of having one or more circlets of pali. Septa of older corallites are also quite spinose laterally.

Polyp not known.

DISCUSSION: In gross appearance this species is closest to *Lophelia investigatoris* in the character of its budding and form of its branches. *L. investigatoris*, however, lacks a columella, although Alcock (1898) illustrates the septa as joining in the centre of the calice. The morphology of the older corallites is not discussed by Alcock, so the generic placing of the species cannot be evaluated. *Lophelia arbuscula* Moseley (1881) is similarly inadequately described and figured. The presence of a small columella in young calices of that species is noted, but no description of mature individuals is given.

The name of the new species is derived from the Fijian word "viti", which is also the name of the vessel used by the N.Z. Oceanographic Institute during the early stages of the shelf survey.

OCCURRENCE: N.Z.O.I. – B 314, C 629, C 632, C 633, C 640, C 645.

DEPTH RANGE: 230–251 m, dead specimens to 440 m.

DISTRIBUTION: New Zealand.

Suborder **CARYOPHYLLIINA** Vaughan and Wells, 1943

Superfamily CARYOPHYLLIICAE Gray, 1847

Family CARYOPHYLLIIDAE Gray, 1847

Subfamily CARYOPHYLLIINAE Gray, 1847

Genus **Caryophyllia** Lamarck, 1801

Type Species: *Madrepora cyathus* Ellis and Solander, 1786

Corallum solitary, conical to subcylindrical, fixed or free. Septa numerous with one crown of pali formed before those of the second group. Columella conspicuous, appearing as if formed of twisted ribbons. Wall not epithecate, granular.

Caryophyllia profunda Moseley, 1881 (Plate 2, figs. 1–4)

Caryophyllia profunda Moseley, 1881, *Rep. Voy. Challenger, Zool., 2*: 138, pl. 1, figs. 6, 6a, 6b. Squires, 1960, *Rec. Auckland Inst. Mus. 5 (3–4)*: 198, pl. 34, figs. 5–7, pl. 35, figs. 9–11; Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 6, pl. 1, figs. 8–11.

Corallum attached, flaring upward towards calice. Calices large, up to 41 mm in diameter. Septa present in six cycles, up to 96 in number. As many as 24 thin pali present in a single conspicuous crown about a prominent columella. Wall clean, granular.

Polyp not described from New Zealand specimens.

OCCURRENCE: *Terra Nova* – 91. *New Golden Hind* – 11, 12, 49, 82. Chatham Exped. – 34. Victoria Univ. – 9. N.Z.O.I. – A 804, A 904, B 314, B 489, B 490, B 666, B 675. C 257, C 506, C 510, C 608, C 678, C 686, C 690, C 692. C 703, C 758, C 797, C 810, C 814, C 887, C 956. Miscellaneous – 4, 10, 17, 18, 60, 65, 66.

DEPTH RANGE: 68–1,116 m.

DISTRIBUTION: Southern Ocean, New Zealand.

Caryophyllia maculata (Pourtalès) 1874

Barhycyathus maculatus Pourtalès, 1874, *Mem. Mus. comp. Zool., Harv. 4*: 34, pl. 6, figs. 5, 6. Moseley, 1881, *Rep. Voy. Challenger, Zool., 2*: 139, pl. 4, figs. 8 and 9.

Corallum attached, short, squat, and up to 35 mm in diameter. Height of corallum less than maximum diameter of calice. Septa number up to 96 with up to 24 pali present. Columella large and conspicuous.

Caryophyllia cf. **C. maculata** (Pourtalès) 1874 (Plate 2, figs. 5, 6)

Caryophyllia cf. *C. maculata* (Pourtalès) Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 7, pl. 2, figs. 1, 2.

The only specimens of this large *Caryophyllia* recorded are the two listed by Ralph and Squires (1962). The identification of these specimens with the above name is uncertain.

Polyp not described.

OCCURRENCE: Miscellaneous – 61.

DEPTH RANGE: Not known.

DISTRIBUTION: New Zealand.

Genus **Paracyathus** Milne-Edwards and Haime, 1848

Type Species: *Paracyathus procumbens* Milne-Edwards and Haime, 1848

Corallum solitary, subconical, attached by a usually flaring base. Septa closely spaced, in more than three cycles. Pali form two irregular crowns not sharply distinct surrounding a papillose columella.

Paracyathus conceptus Gardiner, 1938 (Plate 2, figs. 7, 8)

Paracyathus conceptus Gardiner, 1938, *Scient. Rep. John Murray Exped., 5 (7)*: 184, pl. 4, figs. 8 and 9. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 7, pl. 2, figs. 3 and 4.

Corallum small and compact. Height to 15 mm with calicular diameter 12 mm. Wall rugose and epithecate. Septa present in up to four cycles. Pali cuneiform in profile, thus well separated from columella papillae.

Polyp not described from New Zealand specimens.

OCCURRENCE: Victoria University – 8. N.Z.O.I. – A 804, C 627, C 648, C 814. Miscellaneous – 65.

DEPTH RANGE: 146–2,000 m.

DISTRIBUTION: Indian Ocean, Great Barrier Reef, New Zealand.

Genus **Ceratotrochus** Milne-Edwards and Haime, 1848

Type Species: *Turbinolia multiserialis* Michelotti, 1838

Corallum solitary, subcylindrical, attached or free. Pali absent, columella large.

Subgenus **Ceratotrochus** Milne-Edwards and Haime, 1848

Septa slightly exsert, stereome present thickening wall which is non-epithecate.

Type Species: *Ceratotrochus* (*Ceratotrochus*) *multispinosus* Milne-Edwards and Haime, 1848

Ceratotrochus (Ceratotrochus) limatulus Squires (Plate 2, figs. 9, 10)

Ceratotrochus (Ceratotrochus) limatulus Squires (1964) *Rec. Auckland Inst. Mus., 6 (1)*: 3, pl. 1, figs. 5–9.

Corallum solitary, attached subcylindrical to cylindrical, generally short. Diameter not exceeding 1 cm. Wall granular, clean. Septa very slightly exsert, arranged in four cycles about 48 in number. Columella massive and conspicuous.

Polyp not known.

OCCURRENCE: *Ikatere* – Rock.

DEPTH RANGE: 102 m.

DISTRIBUTION: North-eastern New Zealand.

Genus **Stephanocyathus** Sequenza, 1864

Type Species: *Stephanocyathus elegans* Sequenza, 1864

Corallum solitary, broad, open, free. Costae present, epitheca absent. Paliform lobes may be present before septa of first and second cycles, or absent. Columella parietal or absent.

Subgenus **Stephanocyathus** Sequenza, 1864

Type Species: *Stephanocyathus elegans* Sequenza, 1864

Corallum bowl-shaped or patellate. Spines or basal protrusions absent. Costae may be serrate.

Stephanocyathus (Stephanocyathus) sp. (Plate 2, figs. 11, 12)

Stephanocyathus sp. Squires and Ralph, 1965, *Proc. biol. Soc. Washington 78*: 262, figs. 3 and 4.

Corallum large, bowl-shaped. Septa highly exsert, present in up to six cycles. Septa thickened near columella. Paliform lobes absent. Columella absent. Wall costate, but not spined.

Polyp unknown.

OCCURRENCE: Miscellaneous – 69.

DEPTH RANGE: 585–622 m, known only from a dead specimen.

DISTRIBUTION: North-eastern New Zealand.

Genus **Notocyathus** Tenison-Woods, 1880

Type Species: *Caryophyllia viola* Duncan, 1864

Corallum solitary, trochoid conical to cuneiform. Septa with later cycles joining the first to form conspicuous deltas. Paliform lobes before all but last cycle of septa. Columella papillose.

Subgenus **Paradeltocyathus** Yabe and Eguchi, 1937

Type Species: *Deltocyathus orientalis* Duncan, 1876

Corallum bowl-shaped.

Notocyathus (Paradeltocyathus) orientalis Duncan, 1876 (Plate 3, figs 1–7)

Deltocyathus orientalis Duncan, 1876, *Proc. zool. Soc. London*: 431, pl. 38, figs. 4–7.

Deltocyathus (Paradeltocyathus) orientalis Duncan. Yabe and Eguchi, 1937, *Sci. Repts. Tôhoku Imperial Univ. Sendai, ser. 2 (Geol.), 19*: 131, pl. 20, figs. 1–10.

Corallum small, not over 1 cm in diameter, about 0·75 cm tall. Corallum costate, costae narrow and bearing beads arranged in chevrons on summits. Septa in four complete cycles. Septa I free, other cycles joining to form a delta. Paliform lobes before all septa but last cycle. Columella papillose.

Polyp not known.

OCCURRENCE: N.Z.O.I. – A 910, C 510.

DEPTH RANGE: 384–549 m, known only from dead specimens.

DISTRIBUTION: Japan, Indian Ocean, Coral Sea, New Zealand.

Subfamily TURBINOLIINAE Milne-Edwards and Haime, 1848

Genus **Sphenotrochus** Milne-Edwards and Haime, 1848

Type Species: *Turbinolia crispa* Lamarck, 1816

Corallum solitary, small, cuneiform. Septa few, coarse, joining columella. Columella lamellar or composed of a few granulations.

Sphenotrochus ralphae Squires, 1964 (Plate 3, figs. 8, 9)

?*Sphenotrochus intermedius* (Munster). Gardiner, 1939, *Discovery Rep. 18*: 333.

Sphenotrochus n.sp. B. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 9, pl. 2, figs. 7 and 8.

Sphenotrochus ralphae Squires, 1964, *Rec. Auckland Inst. and Mus. 6 (1)*: 5, pl. 1, figs. 1–4.

Corallum small, not over 1 cm tall with strongly compressed calice 5 × 3·5 mm in diameter. Base of corallum usually terminates in a short spine. Costae broad, continuous. Septa in two complete cycles with portions of third present. Surface of columella tuberculate.

Polyp not known.

OCCURRENCE: *Discovery II* – 929, 930, 931, 933, 934. *Ikatere* – 13, 30, A 4. N.Z.O.I. – C 325.

DEPTH RANGE: 44–95 m, dead specimens from 29–260 m.

DISTRIBUTION: Northern New Zealand.

Genus **Kionotrochus** Dennant, 1906

Type Species: *Kionotrochus suteri* Dennant, 1906

Corallum solitary, small, completely ribbed. Septa arranged in three cycles with obscure pali before last cycle.

Subgenus **Kionotrochus** Dennant, 1906

Corallum subconical, base of adult corallum pointed. Columella a solid rod or a cluster of closely adpressed rods.

Kionotrochus (Kionotrochus) suteri Dennant, 1906 (Plate 3, figs. 10, 11)

Kionotrochus suteri Dennant, 1906, *Trans. R. Soc. S. Aust., 30*: 155, pl. 5, figs. 5a and 5b.

Kionotrochus (Kionotrochus) suteri Dennant: Squires, 1960, *Rec. Dom. Mus. 3 (4)*: 283, figs. 1–11. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 8, pl. 2, figs. 5 and 6.

Corallum small, rarely over 5 mm high. Usually conical, but young specimens may be tympaniform. Septa in three cycles with pali before the septa II, mingling with columella. Trophozoid small attached, often epithecate.

Polyp not described.

OCCURRENCE: *Alert* – BS 208. *Ikatere* – 3, 5, 8, B 3, B 5, B 6, B 22, B 23, B 24, B 25, B 26, B 27, B 41, B 42, B 43, D 28. N.Z.O.I. – C 770, C 781, C 783, C 789, C 792, C 797, C 798, C 800, C 801, C 814. Miscellaneous – 2, 20, 22, 23, 24, 25, 62, 63.

DEPTH RANGE: 48–241 m, dead specimens from 44 m.

DISTRIBUTION: North-eastern New Zealand.

Subfamily DESMOPHYLLINAE Vaughan and Wells, 1943

Genus **Desmophyllum** Ehrenberg, 1834

Type Species: *Desmophyllum cristagalli* Milne-Edwards and Haime, 1848

Corallum solitary, attached, flaring upward from cylindrical base. Costae strong near calice. Septa numerous and closely spaced. Columella and pali absent.

Desmophyllum cristagalli Milne-Edwards and Haime, 1848 (Plate 3, figs. 12–14)

Desmophyllum cristagalli Milne-Edwards and Haime, 1848, *Annls. sci. nat., ser. 3, 9*: 253, pl. 7, figs. 10, 10a. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington 29*: 9, pl. 3, figs. 1–10.

Corallum solitary, but may be attached in clusters basally or form vertical series through budding from calicular lip. Corallum large, up to 10 cm high and 5 cm in calicular diameter. Septa of adult strongly exsert, closely spaced, reaching to centre of corallite. Exterior coarsely flanged or ridged.

Polyp bright orange with tentacles, coenosarc, and oral surface also orange. Tentacles not conspicuously knobbed.

OCCURRENCE: *Terra Nova* – 91. N.Z.O.I. – A 910, B 319, C 618, C 623, C 678, C 686, C 690, C 896. Miscellaneous – 5, 7, 9, 10, 11, 53, 54, 55, 65.

DEPTH RANGE: 91–1,463 m.

DISTRIBUTION: Cosmopolitan.

Subfamily PARASMILIINAE Vaughan and Wells, 1943

Genus **Goniocorella** Yabe and Eguchi, 1932

Type Species: *Goniocorella dumosa* (Alcock) 1902

Corallum colonial, dendroid, forming bushy clumps. Buds arise at right angles to parent. Corallites cylindrical, costate. Septa not uniting, columella absent. Endotheca present.

Goniocorella dumosa (Alcock), 1902 (Plate 3, figs. 15,16)

Pourtalosmilia dumosa Alcock, 1902, *Siboga Exped. Monogr. 16a*: 36, pl. 5, figs. 33–33a.

Goniocorella dumosa (Alcock). Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 11, pl. 4, fig. I.

Corallites 3–4 mm in diameter, up to 1 cm in length. Corallum costate. Septa short, in two cycles with columella and pali absent. Corallite with abundant tabular endotheca.

Polyp orange with 24 tentacles arranged in two alternating circlets. Tentacles and oral surface also orange, with no conspicuous terminal knobs.

OCCURRENCE: Chatham Exped. – 34. Victoria Univ. – 51. N.Z.O.I. – A 429, A 908, A 910, B 314, B 319, B 675, C 410, C 510, C 618, C 627, C 629, C 632, C 633, C 634, C 642, C 645, C 683, C 690, D 90.

DEPTH RANGE: 180–690 m.

DISTRIBUTION: Indian Ocean, New Zealand.

Superfamily FLABELLICAE Bourne, 1905

Family FLABELLIDAE Bourne, 1905

Genus **Flabellum** Lesson, 1831

Type Species: *Flabellum pavoninum* Lesson, 1831

Corallum solitary, free or attached. Cuneiform to highly compressed in form. Septa numerous. Columella deep in calice, formed by intermingling of septal ends. Pali absent.

Flabellum aotearoa Squires, 1964 (Plate 4, figs. 2, 3)

Flabellum aotearoa Squires, 1964, *Rec. Auck. Inst. and Mus., 6 (1)*: 7, pl. 2, figs. 15–18.

Corallum usually free. Lateral edges sharp with crest. Upper margin of wall scalloped. Wall formed of minute beads, usually clean and shiny. Wall with brown to purple bands parallel to upper margin.

Polyp not known.

OCCURRENCE: *Ikatere* – B 26, B 27. N.Z.O.I. – C 770, C 801.

DEPTH RANGE: 130–184 m.

DISTRIBUTION: North-eastern New Zealand.

Flabellum apertum Moseley, 1881 (Plate 4, figs. 4, 5)

Flabellum apertum Moseley, 1881, *Rep. Challenger, Zool., 2*: 167, pl. 6, figs. 7, 7a–7c.

Corallum attached, pedicel stout. Wall flaring sharply outward from pedicel to form a broadly open calice. Corallum very fragile, up to 20 mm high, 30 mm in greatest diameter. Upper margin of calice lacerate.

Polyp not known.

DISCUSSION: The two New Zealand specimens are very similar to that illustrated by Moseley (1881: 168) from Portugal. In all probability, his record is erroneous, having been based upon "much decomposed specimens". Records in the New Zealand Tertiary (Squires, 1958) are incorrect; those forms are close to, but not identical with, typical *Flabellum apertum.*

OCCURRENCE: N.Z.O.I. – A 831.

DEPTH RANGE: 717 m, known only from dead specimens.

DISTRIBUTION: Southern Indian Ocean, southern New Zealand.

Flabellum gracile (Studer), 1877 (Plate 4, figs. 6, 7)

Desmophyllum gracile Studer, 1877, *Mber. preuss. Akad. Wiss. 1877*: 629, pl. 1, figs. 2a and 2b.

Flabellum gracile (Studer), 1877. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 12, pl. 4, figs. 9 and 10.

Corallum solitary, very lightly constructed, up to 29 mm high, 11 mm in diameter. The calicular profile is circular.

Polyp not known.

OCCURRENCE: *Discovery II* – 932. N.Z.O.I. – C 758, C 810.

DEPTH RANGE: 185 m, dead specimens known from 96–196 m.

DISTRIBUTION: New Zealand.

Flabellum knoxi Ralph and Squires, 1962 (Plate 5, figs 1, 2)

Flabellum knoxi Ralph and Squires, 1962 *Zoology Publs. Vict. Univ. Wellington, 29*: 14, pl. 7, figs. 1 and 2.

Corallum usually large and free. Wall with ridged epitheca, usually free of attached organisms. Septa lightly constructed. Columella wide and conspicuous in the open calice.

Polyp deep red to sulphur yellow. Four or more radial red bands extending through the tentacular circlets may be present.

DISCUSSION: Small to intermediate-sized corals assigned to this species have coralla with deep red radial stripes on the corallum. This colour is not superficial and is preserved through extended periods of alcohol storage. It is possible that these specimens represent an undescribed species, for typical *F. knoxi* lacks these stripes. However, morphologically they are not distinct. Red-striped forms generally have a less well developed columella, but this is directly related to the height of the corallum, the columella becoming more conspicuous with increasing height and width of the calice. The largest red-striped coralla are about the size of the smaller white coralla, although there is some overlap. Large coralla are almost invariably white or dull red, the latter being a combination of some tinting of the corallum and of the polyp colouration showing through the translucent wall. The corallum of the red-striped forms does not seem as wide as in the white specimens, but no statistical discrimination based on this characteristic is possible.

Colouration of corals has long been troublesome, for it is apparently not constant in many species. If our interpretation of the present situation is correct, then striping of the corallum is correlated with age, the younger corals being red-striped, the middle-aged specimens reddish or white, and the oldest and largest coralla completely white. This leaves unexplained the occurrence of both white and red-striped coralla of the same size range in a single sample. Originally it was thought that polyp colour would correlate with colour of corallum; however, the range from red-striped polyps (most prevalent in red-striped coralla) to sulphur

yellow polyps in white coralla merges so that red stripes appear on sulphur yellow polyps in varying combinations.

OCCURRENCE: Chatham Exped. – 6, 7, 52, 59. N.Z.O.I. – A 898, A 912, A 914, A 917, C 605.

DEPTH RANGE: 402–914 m, dead specimens known from 201 m.

DISTRIBUTION: New Zealand.

Flabellum raukawaensis n. sp. (Plate 4, figs. 8, 9)

Flabellum deludens von Marenzeller, Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington. 29*: 12, pl. 4, figs. 7 and 8.

Corallum bowl-shaped, with short spike-like pedicel. Margin of wall marked by narrow, flange-like projections. Epitheca formed of minute granules, deeply scalloped at upper margin. Septa in four cycles.

HOLOTYPE: Deposited in the Dominion Museum, Wellington. The specimen figured by Ralph and Squires (1962) in plate 4, figs. 7 and 8. Off Palliser Bay, 41° 33′ S, 174° 55′ E. Depth 695 m.

DESCRIPTION: Coralla roughly bowl-shaped, but with a short spike-like pedicel projecting from the base, and 10–12 short, narrow flange-like projections from the lower margin of the vertical portion of the wall. Largest specimen about 35 mm high, but broken. The specimen figured by Ralph and Squires is broader, but not as high (maximum diameter of calice 55 mm, height 27 mm). Lower portion of coralla usually corroded and worn, but upper portion glistening clean. Epitheca formed of minute granules, much finer than those of *Flabellum aotearoa*. Upper margin of wall deeply scalloped, wall being highest adjacent to septa of lower cycles. Septa arranged in four complete cycles, with portions of the fifth present in largest coralla. Septa of first two cycles reach centre of the corallum, those of third and fourth cycles do not and are progressively shorter. Septa of first two cycles about the same thickness and height, and slightly thickened on the proximal edge. Where they meet in the centre of the corallum they are greatly thickened, particularly in older specimens. Laterally, septa sparsely granular, granules being arranged in widely spaced lines paralleling front edge of septum.

DISCUSSION: The present species is closely related to *Flabellum patagonichum* Moseley, described from off the coast of Chile. That species, as originally described and figured, does not have the conspicuous flange-like protrusions near the base of the corallum. A series of specimens in the collections of the Smithsonian Institution shows that these structures are very commonly present on the corallum of *F. patagonichum*. The distinctive differences between the two species lie in the more spinose character of the septa of the new species and the less lacerate wall, the margin, and the smaller size of *F. patagonichum*. The validity of the last-named character and of the apparent difference in the degree to which the base of the corallum is flanged (in about half of the specimens of *F. patagonichum*; in all specimens of *F. raukawaensis*) can be questioned because of the small sample on which the new species is based. Of the three known specimens of the present species, one large specimen is badly decorticated about the base and is broken on the upper portion of the corallum. The specimen figured by Ralph and Squires has abnormalities in the nature of the juncture of the septa in the centre of the calice.

The specific name is derived from the Maori name for Cook Strait, where the type specimens were collected.

OCCURRENCE: Victoria Univ. – Sta. 96.

DEPTH RANGE: 695 m.

DISTRIBUTION: New Zealand.

Flabellum lowekeyesi Squires and Ralph, 1965 (Plate 6, figs. 1, 2)

Flabellum lowekeysi Squires and Ralph, 1965, *Proc. biol. Soc. Washington, 78*: 259, figs. 1 and 2.

Corallum solitary, free, may be large, up to 55 mm in height. Wall of corallum free from adhering material, roughened, upper margin of corallum lacerate. Wall deeply incised immediately adjacent to the flange-like, protruding end septa.

Polyp only generally known, cream-coloured, with light-yellow tentacles when retracted. Stomadeum apparently ridged, but not coloured.

OCCURRENCE: Miscellaneous – 68. N.Z.O.I. – B 683.

DEPTH RANGE: 378–732 m.

DISTRIBUTION: Campbell Plateau to north-eastern New Zealand.

Flabellum rubrum (Quoy and Gaimard), 1833 (Plate 5, figs. 3–8)

Turbinolia rubra Quoy and Gaimard, 1833, *Voy. de l'Astrolabe, Zool., vol. 4*: 188, pl. 14, figs. 5–9.
Flabellum rubrum (Quoy and Gaimard) Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 13, pl. 5, figs. 1–18; Squires, 1963, *Bull. N.Z. Dep. scient. ind. Res. 154*: 44 pp, 2 pls.

Corallum usually attached. Base may be greatly thickened by extrathecal deposits. Calice compressed, with septal ends broadly rounded.

Polyp salmon-coloured to white with numerous red stripes radially arranged on the oral disc. Tentacles short with terminal nematocyst batteries.

DISCUSSION: Squires (1963), using the data then available, was unable to assess the southernmost extent of

F. rubrum. However, with collections available from additional work by N.Z.O.I., living specimens have been positively identified from the Southland fiords, Foveaux Strait, west of South Cape, and Stewart Island, and dead material from west of the Bounty Islands. The species now appears to be a common constituent of inner shelf faunas all round New Zealand.

Living specimens are recorded from a maximum depth of 201 m at N.Z.O.I. Sta. C 197, thus extending the previously known depth range of the species. Ralph and Squires (1962, p. 14) refer to a locality off Wellington Harbour (41° 28·5′ S, 174° 50′ E) at 150 fathoms (274 m) from which three living and 14 dead specimens were recovered; but the record of living specimens from this locality is incorrect.

OCCURRENCE: *Terra Nova* – 91. *New Golden Hind* – 67. *Alert* – BS 129, BS 163, BS 166, BS 173, BS 180, BS 207. *Ikatere* – 3, 7, 15, 21, 30, A 5, Rock. Victoria Univ. – 9, 83, 113. N.Z.O.I. – A 4, A 431, A 432, A 439, A 489, A 491, A 821, A 843, B 200, B 205, B 323, B 524, B 556, B 560, B 605, B 616, B 621, B 642, B 646, B 648, B 653, B 686, B 783, B 784, B 797, B 808, B 824, C 89, C 190, C 194, C 197, C 202, C 248, C 272, C 291, C 357, C 438, C 439, C 504, C 506, C 520, C 524, C 706, C 758, C 770, C 783, C 787, C 789, C 790, C 796, C 797, C 800, C 801, C 812, C 814, C 844, C 850, C 851, C 852, C 957. Miscellaneous – 1, 3, 8, 12, 13, 14, 18, 19, 21, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 45, 46, 47, 48, 49, 50, 51, 52, 64, 67.

DEPTH RANGE: Intertidal to 201 m, dead specimens to 1,006 m.

DISTRIBUTION: New Zealand.

Family GUYNIIDAE Hickson, 1910

Genus **Stenocyathus** Pourtalès, 1871

Type Species: *Coenocyathus vermiformis* Pourtalès, 1868

Corallum solitary, tall, subcylindrical. Wall epithecate, with mural pores, may be imbricate. Pali form a single crown about a few columnar processes.

Stenocyathus decamera Ralph and Squires, 1962 (Plate 6, figs. 3–5)

Stenocyathus decamera Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 11, pl. 4, figs. 2–6.

Corallum solitary, up to 15 mm in height, with a calice 4·5 mm in diameter. Septa arranged in three cycles with a single circlet of pali present. Columella a small tubercule. Septa and pali commonly arranged in circlets of five. Wall and costae slightly imbricated with mural pores present.

Polyp not described.

OCCURRENCE: *New Golden Hind* – 82. Victoria Univ. – 8. N.Z.O.I. – B 319. Miscellaneous – 20.

DEPTH RANGE: 110–134 m, dead specimens to 638 m.

DISTRIBUTION: New Zealand.

Suborder **DENDROPHYLLIINA** Vaughan and Wells, 1943

Family DENDROPHYLLIIDAE Gray, 1847

Genus **Dendrophyllia** Blainville, 1830

Type Species: *Madrepora ramea* Linné, 1758

Corallum colonial, forming dendroid colonies by random budding. Wall porous. Costae may be well developed or partially covered by epitheca. Septa arranged according to Pourtalès plan. Columella spongy.

Dendrophyllia japonica Rehberg, 1892 (Plate 6, figs. 6–8)

Dendrophyllia japonica Rehberg 1892, *Abh. naturw. Ver. Hamburg, 12*: 28, pl. 4, fig. 4. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 15, pl. 8, figs. 4 and 5.

Balanophyllia alta Tenison-Woods. Ralph and Squires, 1962, *Zoology Publs. Vict. Univ. Wellington, 29*: 15, pl. 8, figs. 1–3.

Corallum large, dendroid, with protuberent corallites up to 14 cm long spreading almost at right angles from the parent corallite. Corallite diameter up to 16 mm. Septa of higher cycles bend conspicuously away from those of lower cycles.

Polyp not described from New Zealand.

DISCUSSION: *Balanophyllia alta*, as identified in Ralph and Squires (1962), is based on branches broken from *Dendrophyllia japonica*. Fossil *Balanophyllia alta* may be correctly identified, but will be considered in detail elsewhere. "Solitary" dendrophyllid corals should be examined with care to determine if they are fragments of *Dendrophyllia japonica*.

OCCURRENCE: *Terra Nova* – 91. N.Z.O.I. – A 910, B 490, C 627, C 629, C 632, C 634, C 640, C 645, C 814. Miscellaneous – 44, 56.

DEPTH RANGE: 114–549 m.

DISTRIBUTION: Japan, New Zealand.

Dendrophyllia palita n. sp. (Plate 6, figs. 9, 10)

Coralla branching, with protuberent corallites in alternate positions along branches. Wall obscurely porous, covered by small delicate spines not simulating costae in their arrangement. Septa in three cycles with prominent crown of pali before septa II.

HOLOTYPE: N.Z.O.I. No. 18, N.Z.O.I. Sta. B. 490. 45° 44·3′ S, 166° 44·8′ E, Dusky Sound. 114–118 m.

DESCRIPTION: Coralla apparently large and loosely branching and fragile, so that only fragments are known. Largest specimen in the present collection 8 cm tall, but basal portions among dead fragments indicate that much larger specimens exist. Corallites budded alternately and aligned vertically along branches. Corallites prominent, up to 5 mm in diameter on basal portion of colony, but 3·5 mm near tips of branches. Branch diameter as great as 1 cm. Surface of coralla not costate, but covered by fine spines up to 1 mm in height, generally arranged in fine lines spiralling slowly about the branch not coincident with septa. Away from corallites the pattern breaks down and the arrangement is random. Septa arranged in three complete cycles. First cycle straight and extending to columella. Septa III unite with II about two-thirds of the way to columella and form a prominent palus. Columella large, prominent, about one-third diameter of calice in length and formed of independent trabeculae covered with small spines. Lateral edges of septa strongly spined, but proximal edges smooth except for those of septa III which are spinose.

DISCUSSION: The most conspicuous feature of this species is the strong development of pali, but the nature of the wall also seems significant. Alcock (1898, p. 26, pl. 3, figs. 2, 2a) described *?Cyathohelia formosa* from off the Maldives Islands. As illustrated and described, that species seems to have more than a single circlet of pali, but this does not seem to be correctly interpreted. The septa of *?C. formosa* as illustrated by Alcock do not appear to be as spinose as the present form, and the columella is described and illustrated as being much smaller than that of *D. palita*. It is not clear from the description if the wall is porous or not. Wells (1956) included *?C. formosa* in *Sclerhelia*, an oculinid.

Dendrophyllia (*Coenopsammia*) *pusilla* Alcock (1902, p. 44, pl. 5, figs. 38, 38a) is another similar form, having the hispid surface of the corallum, but pali are absent. Septa of the third cycle of this species join the second septa and could potentially form pali.

The specific name has been based on the fundamental characteristic of the new species, the presence of a crown of small pali.

OCCURRENCE: N.Z.O.I. – B 490, C 627, C 629, C 632, C 633, C 642, C 645.

DEPTH RANGE: 114–118 m, dead specimens to 440 m.

DISTRIBUTION: West New Zealand.

NOMINA INQUIRENDA

The following names have been applied to New Zealand shelf corals but are of doubtful authenticity or are inadequately described and figured.

Trochocyathus (Thecocyathus) sp. ? Gardiner 1929

A single specimen from off Three Kings Islands. Until this specimen is re-examined the description is inadequate for recognition.

OCCURRENCE: *Terra Nova* – 91.

DEPTH: 549 m.

DISTRIBUTION: Northern New Zealand.

Gardineria sp. Gardiner 1929

Four specimens from off Three Kings Islands were mentioned by Gardiner. Re-examination of specimens will be required for recognition.

OCCURRENCE: *Terra Nova* – 90, 96.

DEPTH RANGE: 128–183 m.

DISTRIBUTION: Northern New Zealand.

Conocyathus zelandiae Duncan 1876

This species is reputedly from Cook Strait, but has not been re-collected. Its presence in the New Zealand fauna is doubtful at present.

OCCURRENCE: Miscellaneous – 59.

DEPTH: Unknown.

DISTRIBUTION: Cook Strait (type locality), New Zealand. Uncertain.

ZOOGEOGRAPHY

FAUNAL HISTORY

In 1943, Vaughan and Wells (p. 88) wrote:

> "The ahermatypic corals of New Zealand are related to those of the South Pacific, although most (10) of the known species (18) are endemic, and many of them autochthonous, and traceable to forms of the New Zealand Neogene."

This statement was based on the fragmentary evidence presented in the 18 papers then published dealing with New Zealand fossil and extant corals. Since 1943, 12 additional papers by Squires have appeared. Although new species continue to be found, their numbers decrease and they are largely the result of closer study of poorly understood forms. The statement of Vaughan and Wells (1943) can now be rephrased:

> The ahermatypic corals of New Zealand are related to those of the South Pacific and Antarctic, and show little relationship to those of Australian waters. Less than half (12) of the known species (25) are endemic, while (7) are autochthonous, and traceable to forms of the New Zealand Neogene.

The last part of that statement is the key to the structure of New Zealand's coral fauna, for it is not an old fauna but a new one, despite an apparent high level of endemism. Although the coral fauna to the south of New Zealand is well known, as is the ahermatypic fauna to the north, that of Australia in the region of the Great Barrier Reef is virtually unknown – Wells (1964) has given the most recent and comprehensive study of this fauna. It must be recognised that certain species are of doubtful status and will remain so until comprehensively reviewed. These include the cosmopolitan "form" species *Desmophyllum cristagalli* (see Ralph and Squires, 1962), *Caryophyllia profunda*, and *Notocyathus* (*Paradeltocyathus*) *orientalis*. *Goniocorella dumosa* may well belong in this group, for a critical comparison between New Zealand and Campbell Plateau forms and those from northern areas has yet to be made.

Of the autochthonous species, *Notocyathus* (*Paradeltocyathus*) *orientalis* is the oldest, having first appeared during the Whaingaroan or Duntroonian (Oligocene). Because this name has been broadly applied, there is some doubt whether it is correctly used for New Zealand specimens; it is best said that a species of *Notocyathus* (*Paradeltocyathus*) was present in New Zealand during the Oligocene. *Oculina virgosa* and *Sphenotrochus ralphae* appear to be remnants of the great invasion of New Zealand by northern corals during the Otaian (Lower Miocene). While most of these invading species disappeared during the late Tertiary in cooling seas, these two were able to survive; it is interesting that the later Tertiary record of both is missing in New Zealand. On the other hand, *Culicia rubeola*, *Caryophyllia profunda*, *Desmophyllum cristagalli*, and *Flabellum rubrum* are all late Tertiary immigrants which arrived when the diversity of the coral fauna of New Zealand was undergoing sharp reduction. *Caryophyllia profunda* and *Desmophyllum cristagalli* are almost certainly both of southern origin, while *Flabellum rubrum* shows close affinities with Antarctic species (Squires, 1963). Several of the remaining species which have no apparent fossil history in New Zealand are closely related to fossil forms. *Kionotrochus*, a genus endemic to New Zealand, has a fossil history in New Zealand, Japan, and Europe as *Kionotrochus* (*Cylindrophyllia*), and *K.* (*K.*) *suteri* is possibly a recent derivative of *K.* (*C.*) *minima* (Squires, 1960b).

Of the 25 species of coral recognised from New Zealand, only two show affinities with Australian species: these are *Paracyathus conceptus* and *Letepsammia* sp. Four species are of southern derivation, or as now conceived are members of the Southern Ocean fauna: *Caryophyllia profunda*, *Flabellum apertum*, *Stenocyathus decamera*, *Flabellum lowekeyesi*, and *Flabellum knoxi*. The first two listed species are known from outside New Zealand and its Subantarctic Islands. *Caryophyllia profunda*, pending closer study, apparently has a circum-Antarctic distribution, while *Flabellum apertum* is also known from the southern Indian Ocean. *Flabellum lowekeyesi*, *F. knoxi*, and *Stenocyathus decamera* occur widely on the Campbell Plateau, forming a part of the Southern Ocean fauna endemic to that region, and on the New Zealand shelf. Species occurring north of New Zealand include: *Dendrophyllia japonica*, *Notocyathus* (*Paradeltocyathus*) *orientalis*, *Culicia rubeola*, *Caryophyllia maculata*, and *Flabellum aotearoa*. *Desmophyllum cristagalli* as presently defined is too widely distributed to have any zoogeographic meaning. *Goniocorella dumosa* occurs on the Campbell Plateau and is also known from waters north of New Zealand.

The New Zealand coral fauna shows a pattern described for many other groups of marine invertebrates – an older fauna has had superimposed on it a late Tertiary cold-water element and is now being modified by immigration from the north.

DISTRIBUTION IN NEW ZEALAND

Powell (1961) has discussed the development of the faunal province concept in New Zealand. Dell (1962), however, has taken issue with this concept, arguing that effort can better be spent on listing ranges of the faunas. It has been well demonstrated that the fauna of the northern region of New Zealand is dominated by species with northern affinities and that there is a second fauna in the very south with southern affinities. Between these lies a region of faunal mixing. Defining boundaries of this mixed region is and will continue to be difficult and highly subjective. Applying faunal province names to the distribution of the corals has even less meaning, for few species of New Zealand corals are stenobathic, but rather are found through a considerable depth range above and below the shelf break and cannot therefore be considered strictly as "shelf fauna." The following discussion of distribution patterns does not use faunal province terminology, but attempts to relate the patterns observed to the same mechanisms which affect the distribution of more stenobathic organisms.

Five general patterns of distribution may be discerned among the corals of the New Zealand shelf. These patterns, somewhat arbitrary in their selection, are meaningless unless interpreted in the light of the broader extent of the distribution of the species concerned.

No other species so well characterises the modern New Zealand coral fauna as *Flabellum rubrum* (Fig. 1) which is selected as the index species. Thus far the species is unknown elsewhere (Squires, 1963), although it is common on the New Zealand shelf. There are, however, four main areas of New Zealand from which the species is absent: on the east coast from Castle Point to East Cape; between Stewart Island and Timaru; between North Cape and Raglan; and from the Karamea Bight to Jackson's Head, northern Fiordland. Its nearest relatives are to be found to the south in the Antarctic region, and although some dead and worn

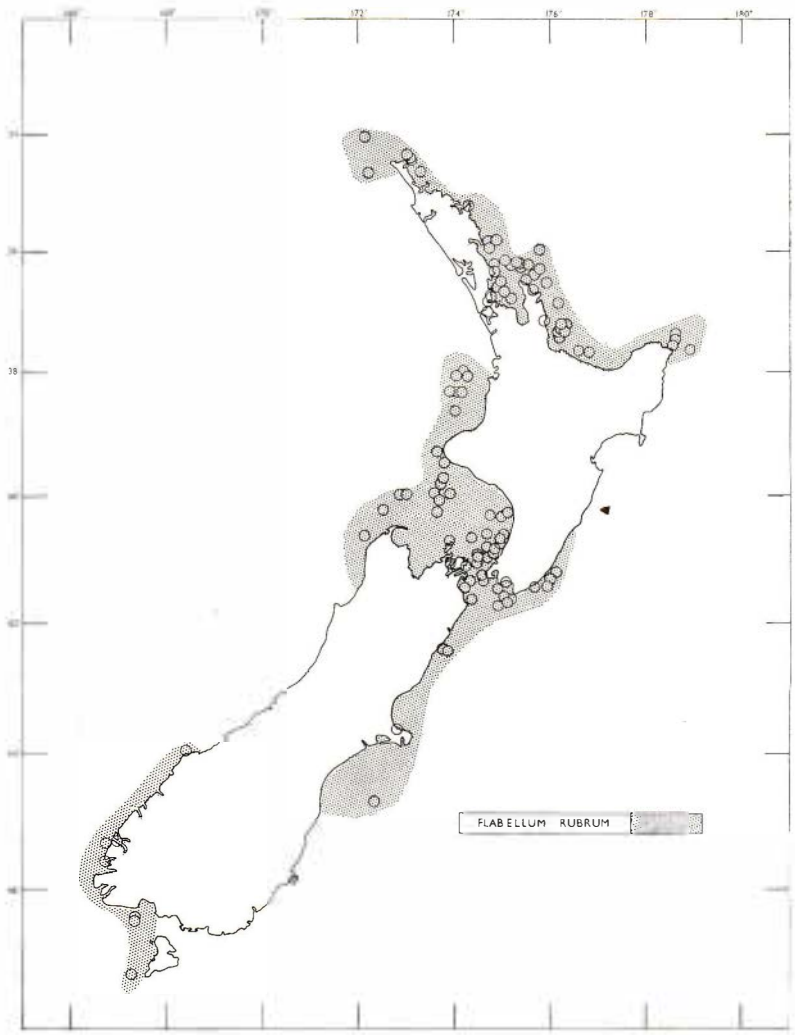


Fig. 1. Distribution of *Flabellum rubrum* on the New Zealand shelf. Because of this species restricted occurrence, its presence is a primary indicator of the New Zealand coral fauna.

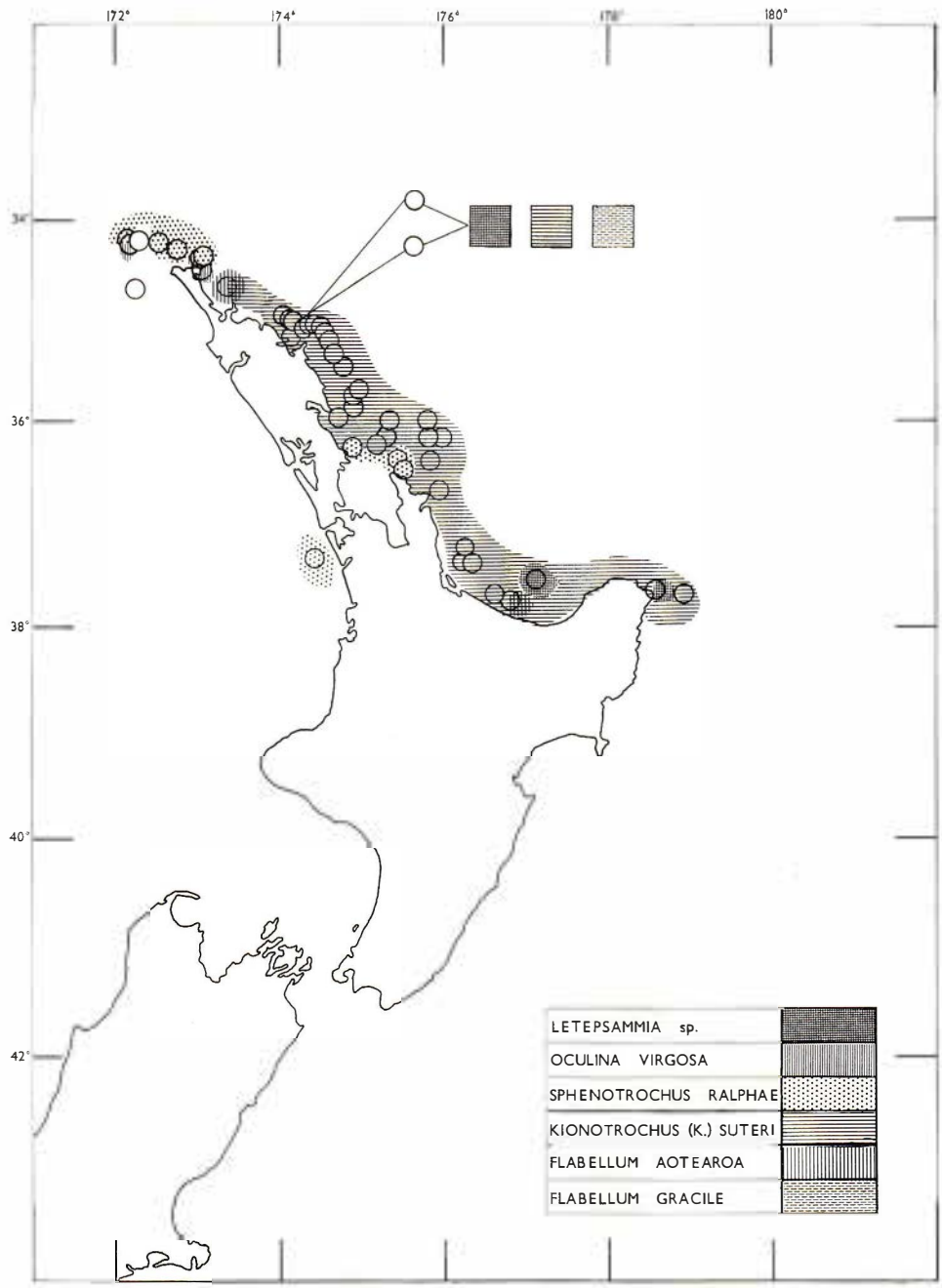


Fig. 2. Distribution of the north-eastern New Zealand coral fauna, comprising the species *Letepsammia* sp., *Oculina virgosa*, *Sphenotrochus ralphae*, *Kionotrochus (K.) suteri*, *Flabellum aotearoa*, and *F. gracile*.

specimens from west of the Bounty Islands have been referred to this species, no living examples have been taken from further south than Stewart Island.

More restricted in distribution is a group of six species comprising the distinctive coral fauna of north-eastern New Zealand (Fig. 2). Between East Cape and North Cape these corals are abundant and are characteristic of the shelf area. *Kionotrochus* (*Kionotrochus*) *suteri* is the most characteristic and wide ranging, both species and subgenus being endemic. The remaining species in this faunule are not so widely distributed. *Letepsammia* sp. is known only from fragments of dead coralla, and *Oculina virgosa* is recorded from only a few localities in the North Cape region, although Nutting (1924) records "*Oculina* (?)" from off Colville Island. *Flabellum aotearoa* and *Flabellum gracile* are known only from isolated localities, insufficient to indicate complete distribution. *F. aotearoa* has close relatives to the north. *Sphenotrochus ralphae* has a distribution centred about North Cape and the northern portion of the Hauraki Gulf, but several dead specimens in a sample from off Manukau Harbour indicate a wider range.

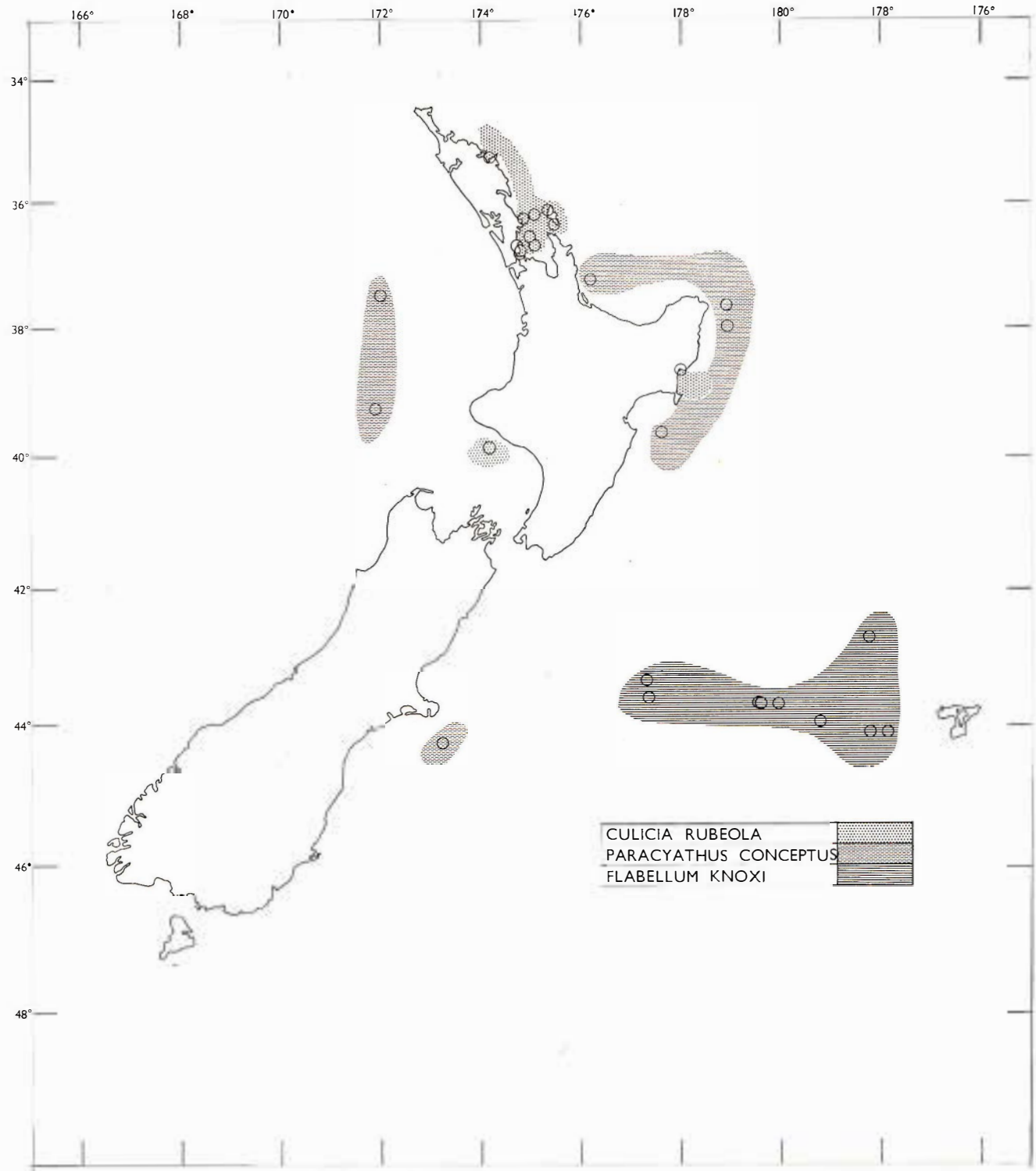


Fig. 3. Distribution of *Culicia rubeola*, *Paracyathus conceptus*, and *Flabellum knoxi*.

Fig. 3 shows the distribution of a miscellaneous group of species: *Culicia rubeola* and *Paracyathus conceptus* are northern species and their distribution shows a predilection for areas influenced by northern waters; *Flabellum knoxi*, on the other hand, although shown as restricted to the Chatham Islands, has in reality a wide distribution on the Campbell Plateau and seems to be a southern faunal element. Of these three only *Culicia rubeola* is truly a shelf dweller; *Paracyathus conceptus* and *Flabellum knoxi* both range from the outer edge of the shelf down the upper portion of the slope, and are archibenthal in the terminology of Dell (1956).

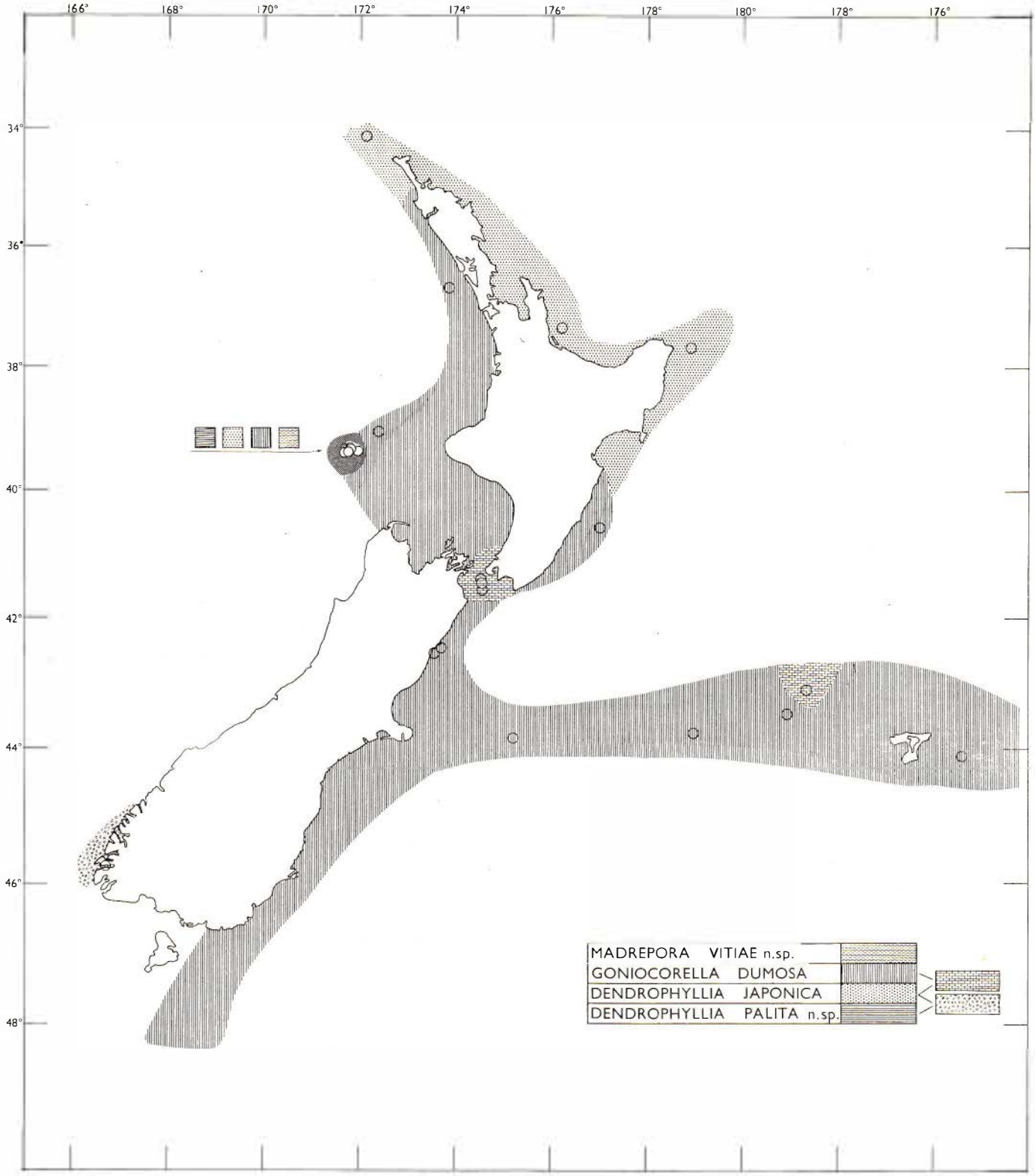


Fig. 4. Distribution of the colonial corals of New Zealand. *Madrepora vitiae*, *Goniocorella dumosa*, *Dendrophyllia japonica*, and *D. palita*.

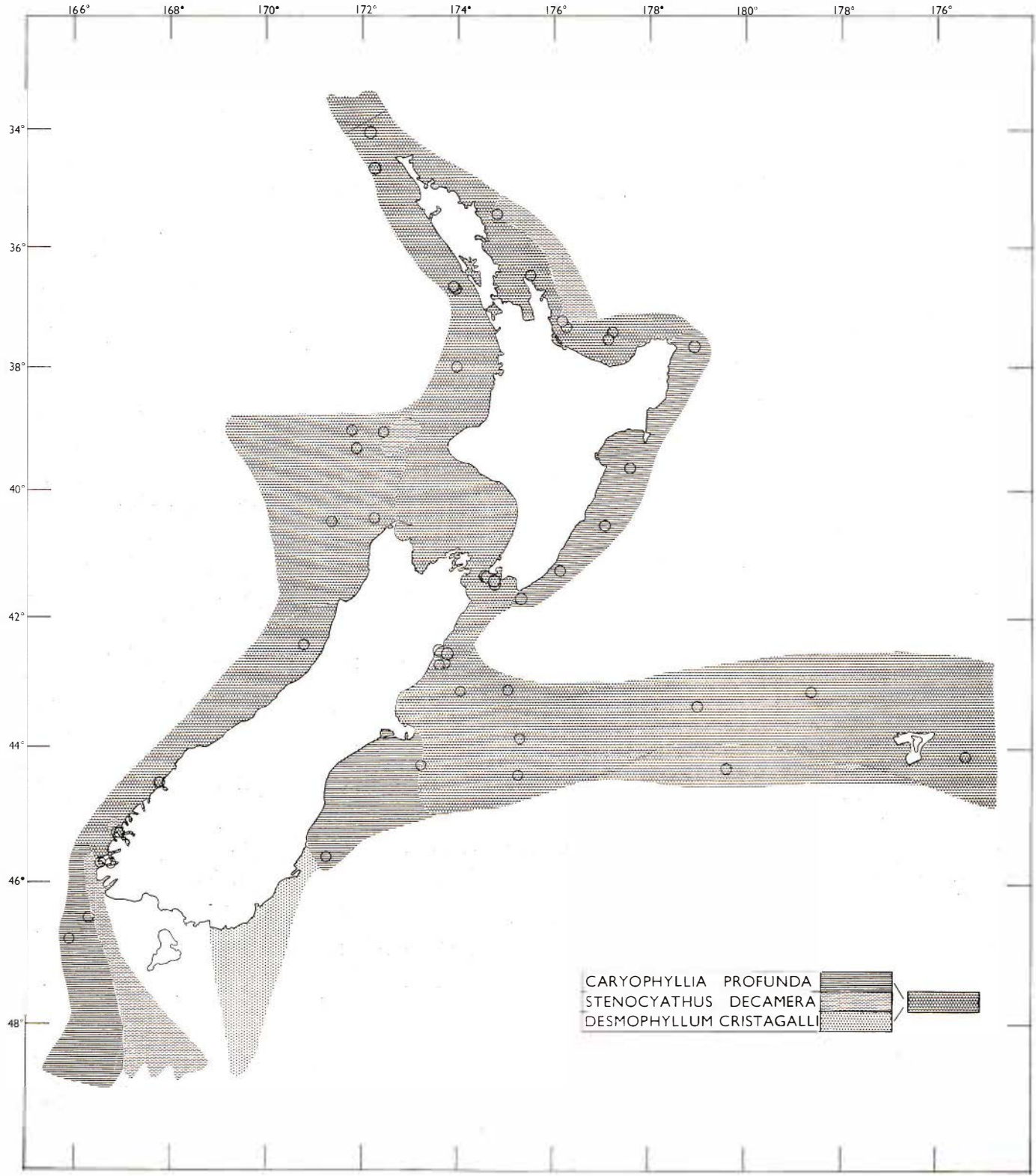


Fig. 5. Distribution of three wide-ranging species of the New Zealand coral fauna: *Caryophyllia profunda*, *Stenocyathus decamera*, and *Desmophyllum cristagalli*.

Four species comprise the fourth group (Fig. 4), characterised by all four species being colonial and all occurring together at N.Z.O.I. Sta. B 490. Two, *Madrepora vitiae* and *Dendrophyllia palita*, are known only from that station, but *D. palita* occurs to the north near Raoul Island. *Goniocorella dumosa* is known from the Malaysian region southward to the Campbell Plateau; it is not evenly dispersed through this broad region, but rather is locally abundant. In some areas this species forms deep-water coral structures (Squires, 1965). *Dendrophyllia japonica*, on the other hand, has northern affinities, although it occurs on the Chatham Rise and in Cook Strait as well as extensively along the north-eastern coast of New Zealand. All four are outer shelf and upper slope forms.

Finally presented (Fig. 5) are some of the wider ranging corals of New Zealand. *Stenocyathus decamera*, a small and easily overlooked coral, is widely distributed on the Campbell Plateau, but extends through north-eastern New Zealand, although with large intermediate gaps. *Caryophyllia profunda* and *Desmophyllum cristagalli* are broadly defined species; the former has a Southern Ocean distribution, the latter is cosmopolitan. They are distributed throughout the region covered by this report, but both species are in need of revision.

DEPTH DISTRIBUTION

The shelf break occurs at a depth of about 180 m (Brodie, 1952), and this physiographic feature is often accompanied by pronounced faunal changes. However, in the New Zealand corals a sharp difference in fauna is found to occur at approximately 100 m (Fig. 6). Above this depth is the inner shelf fauna composed of *Culicia rubeola*, *Flabellum rubrum* (which occur to 150 m), and

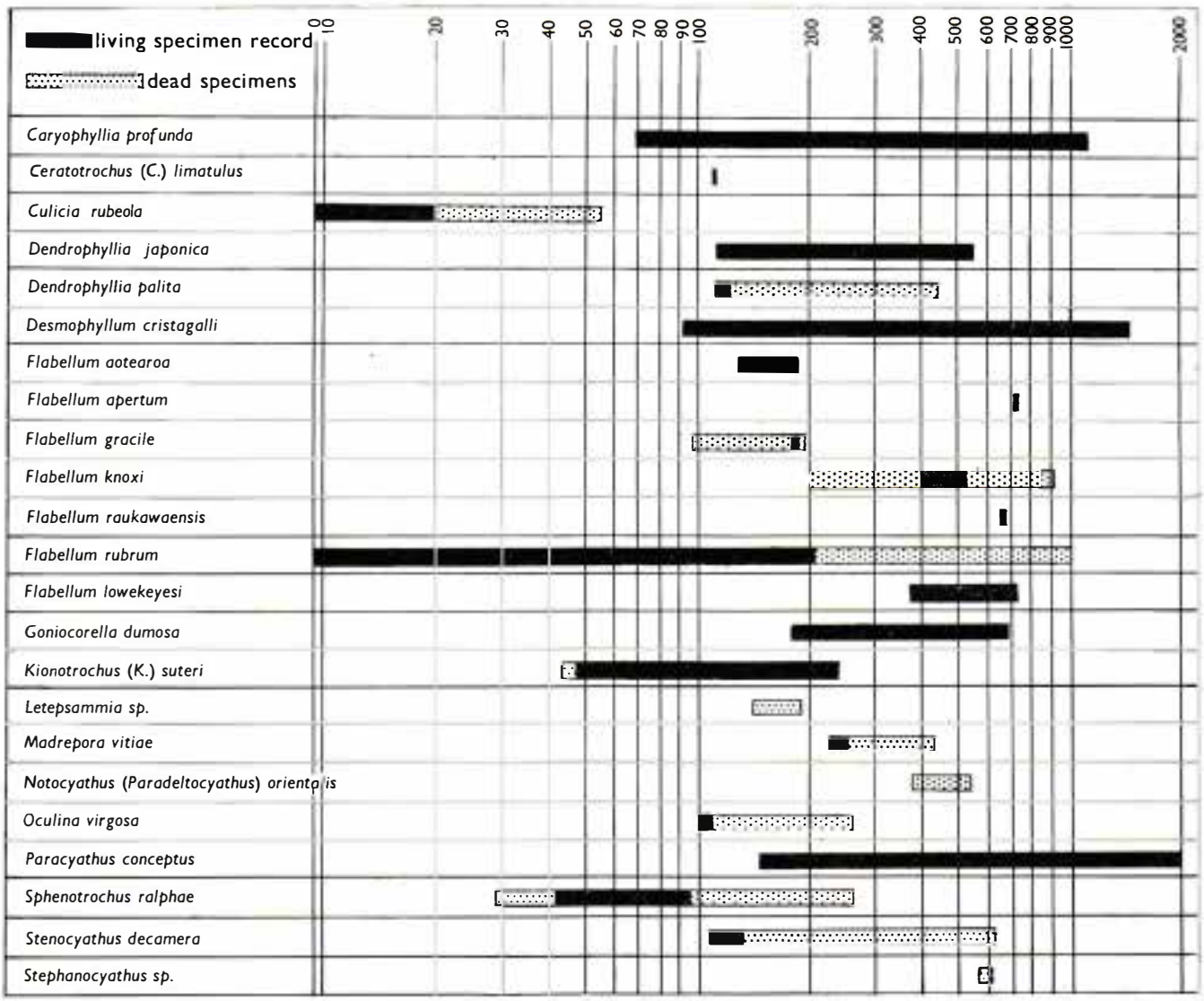


Fig. 6. Depth ranges of the New Zealand coral fauna. Depths are in metres.

Sphenotrochus ralphae – the latter is found only in the outer range of the inner shelf, although dead specimens (which are easily transported) have a greater range.

A much more subtle change in the coral fauna occurs at about 200 m. *Flabellum aotearoa*, *Ceratotrochus* (*Ceratotrochus*) *limatulus*, *Oculina virgosa*, and *Flabellum gracile* occur only between about 100 and 200 m. *Dendrophyllia japonica*, *Desmophyllum cristagalli*, *Paracyathus conceptus*, *Stenocyathus decamera*, and *Dendrophyllia palita* are found just below 100 m.

Below 200 m, off the shelf proper, *Flabellum knoxi*, *Madrepora vitiae*, and live *Goniocorella* are found; dead specimens of *Goniocorella* have been taken from a depth of only 55 m. The distribution of these species seems to be related to physical factors, perhaps the most important being temperature. Although it is tempting to conclude that occurrences of dead specimens of *G. dumosa* reflect recent physical changes, this species is known from Norfolk Island in rather shallow water. Thus, since it can live in shallow, warmer waters, the occurrence of dead specimens in shallow water in New Zealand cannot be attributed to either warming water or shallowing conditions.

Corals occurring in deeper waters are *Flabellum apertum*, *Notocyathus* (*Paradeltocyathus*) *orientalis* (both species are known only from dead specimens), and *Flabellum raukawaensis* which has been taken alive from 695 m.

Several species have a broad bathymetric range. *Caryophyllia profunda* (68–1,116 m) and *Kionotrochus* (*K.*) *suteri* (48–241m) occur continuously. Deeper occurrences are not well documented, for little collecting has been done off the shelf edge in New Zealand seas. Records of *C. profunda* at 1,000 m, *D. cristagalli* at 1,463 m, and *P. conceptus* at 2,000 m indicate extensive depth ranges.

REGIONAL AND LOCAL CONTROLS ON DISTRIBUTION

Corals can be divided into two larger groups according to their ecological preferences – hermatypic or reef-forming corals, and ahermatypic or non-reef-forming corals. Hermatypic corals generally are not found below 18°C and in colder temperatures do not form reefs. These corals are also stenobathic and are generally restricted to less than 90 m depth. Garner *et al.* (1962) show that in New Zealand waters during the summer the 18°C isotherm extends as far south as Cook Strait on the east coast and to Abut Head on the west coast of the South Island. During the winter, waters of 18°C are found about the region of North Cape, although local effects cause cooling to 17° or less. These temperatures are minimal for the hermatypic corals, but still within the range for individual members of the reef fauna (cf. Wells, 1955) and for the development of marginal reefs (cf. Squires, 1959). There are many other possible reasons for the apparent absence of reef corals in the region of North Cape, not least of which is that they may not have been looked for. The point of this discussion is, however, to show that marginal conditions exist in northern New Zealand for a true tropical coral fauna.

In addition to the true hermatypic corals, there are associated with reefs and in the deeper waters below reefs tropical faunas of ahermatypic corals. Unfortunately, little is known of this fauna from areas surrounding New Zealand; for example, the only record of corals from Norfolk Island known to us is in Squires (1960a). Vaughan (1917) recorded the hermatypic corals from the Kermadecs, but there are no other records of ahermatypic species. Wells (1964) has described the few ahermatypic corals collected off the Great Barrier Reef. From a few stations to the north of New Zealand, the Oceanographic Institute has made collections of corals as yet not reported on. These sparse records indicate that the fauna to the north and north-west of New Zealand is tropical and ahermatypic.

Distribution of the shallow-water forms by the east Australian or Notonection Current is possible and is probably how such tropical forms are arriving in New Zealand. Isolation of New Zealand is an important factor which cannot be properly assessed until more is known of the larval life and its duration in the corals. Certainly, isolation is potentially the greatest barrier to the colonisation round New Zealand by reef corals.

Local distribution of the fauna is controlled by a number of factors. It seems certain that the complex temperature regime of New Zealand waters has a major part to play, but until there is more complete information available on the bottom-temperature characteristics of the shelf, correlation between temperature and distribution patterns is difficult. Even more difficult to assess are effects of local environments such as that of the magnetite-bearing sands north of Cape Egmont (McDougall, 1961). The region between Cape Egmont and Ahipara is not rich in corals, but whether this is because of the substrate or local hydrologic conditions is not known.

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APPENDIX I

ALL known oceanographic stations in the New Zealand area from which coral collections have been taken are grouped according to their original collection source, and identified species from each station are given. The letter "(a)" indicates specimens known to have been taken alive. "Miscellaneous Stations" is a numerical list largely from Ralph and Squires, 1962, of known but extraneous data, mostly without original source reference.

BRITISH ANTARCTIC *TERRA NOVA* EXPEDITION, 1910

90 Off Three Kings Island, 183 m, *Gardineria* sp. (a).

91 Off Great King Island, 549 m, *Caryophyllia profunda*, *Trochocyathus (Thecocyathus)* sp. ?, *Desmophyllum cristagalli*, *Flabellum rubrum*, *Dendrophyllia japonica* (a).

96 Three Kings Island, 128 m, *Gardineria* sp. (a).

RRS *DISCOVERY II* EXPEDITION, 1929–33

929 34° 21′ S, 172° 48′ E, off Spirits Bay, 59 m, *Sphenotrochus ralphae*.

930 Murimotu Lighthouse bearing N 35° E, distant 1·8 miles, 29 m, *Sphenotrochus ralphae*.

931 34° 14·8′ S, 172° 30′ E, between Spirits Bay and Three Kings Is., 95 m, *Sphenotrochus ralphae* (a).

932 34° 13′ S, 172° 15·9′ E, S of Three Kings Is., 185 m, *Flabellum gracile* (a).

933 34° 13·3′ S, 172° 12′ E, off Three Kings Is., 260 m, *Oculina virgosa*, *Sphenotrochus ralphae*.

934 34° 11·6′ S, 172° 10·9′ E, off Three Kings Is., 97 m, *Sphenotrochus ralphae*.

NEW GOLDEN HIND EXPEDITION, 1946

2 Narrows, Long Sound, Preservation Inlet, 35–44 m, *Caryophyllia* sp.

11, 12 Around Goal Island, Doubtful Sound, 91 m, *Caryophyllia profunda* (a).

49 70 yd NE of Parrot Is., Dusky Sound, Westland, 73 m, *Caryophyllia profunda*.

67 Off Gilbert Island, Breaksea Sound, Westland, 27–37 m, *Flabellum rubrum*.

81 Anchorage Arm, Daggs Sound, 86 m, *Caryophyllia* sp.

82 Few chains off end Shelter Is., Doubtful Sound, 134 m, *Caryophyllia profunda* (a), *Stenocyathus decamera* (a).

CHATHAM ISLANDS EXPEDITION, 1954

6 43° 40′ S, 179° 28′ E, Chatham Rise, 402 m, *Flabellum knoxi* (a).

7 43° 42′ S, 179° 55′ E, Chatham Rise, 512 m, *Flabellum knoxi* (a).

34 44° 04′ S, 175° 23·5′ W, E of Forty Fours, 238 m, *Caryophyllia profunda* (a), *Goniocorella dumosa*.

52 44° 04′ S, 178° 04′ W, Chatham Rise, 475 m, *Flabellum knoxi* (a).

59 43° 38′ S, 177° 19′ E, Chatham Rise, 531 m, *Flabellum knoxi* (a).

MV *ALERT* STATIONS, 1957

BS 129* Pelorus Sound, 46–55 m, *Flabellum rubrum* (a).

BS 163 40° 52·6′ S, 174° 49·5′ E, W of Kapiti Is., 137 m, *Flabellum rubrum*.

BS 166 40° 49·6′ S, 174° 36·8′ E, W of Kapiti Is., 148 m, *Flabellum rubrum*.

BS 173 40° 52·2′ S, 174° 57·3′ E. Kapiti Channel, 60 m, *Flabellum rubrum* (a).

BS 180 41° 28·5′ S, 174° 50′ E, Cook Strait, SW Cape Turakirae, 274 m, *Flabellum rubrum*.

BS 207 37° 19·5′ S, 176° 16′ E, off Mayor Is., 110–183 m, *Flabellum rubrum*.

BS 208 37° 22·5′ S, 176° 22′ E, off Mayor Is., 207–219 m, *Kionotrochus (K.) suteri* (a).

MARINE DEPARTMENT RESEARCH VESSEL *IKATERE* STATIONS

3 Midway between largest Chicken Is. and Hen Is., 55 m, *Kionotrochus (K.) suteri* (a), *Flabellum rubrum*.

5 Half way between outer Chicken Is. and Mokihinau Is., 113 m, *Kionotrochus (K.) suteri* (a).

7 5 miles N of Little Barrier Is., 55–64 m, *Flabellum rubrum* (a).

8 2 miles E of Little Barrier Is. towards Flat Is., 44 m, *Kionotrochus (K.) suteri*.

13 Off Cape Barrier, Great Barrier Is., 55 m, *Sphenotrochus ralphae* (a).

15 1·5 miles NE of Leigh, 55 m, *Flabellum rubrum* (a).

21 5 miles NE of Tiritiri Matangi Is., 44–46 m, *Culicia rubeola*, *Flabellum rubrum*.

30 Off Cape Rodney, 48 m, *Culicia rubeola*, *Sphenotrochus ralphae* (a), *Flabellum rubrum*.

A 2 Across Tryphena Harbour, Great Barrier Is., 24–25 m, *Culicia rubeola*.

A 4 Between Tryphena Harbour and Cape Barrier, Great Barrier Is., 44 m, *Sphenotrochus ralphae* (a).

A 5 Cape Barrier to Rosalie Bay, Great Barrier Is., 55–60 m, *Flabellum rubrum*.

*Dominion Museum station numbers.

B 3 SE of Poor Knights Is., 241 m, *Kionotrochus (K.) suteri* (a).

B 5 Between Mokohinau and Poor Knights Is., 183 m, *Kionotrochus (K.) suteri* (a).

B 6 N of Poor Knights Is., 179 m, *Kionotrochus (K). suteri* (a).

B 22 35° 12·2′ S, 174° 36·2′ E, NE of Whangamumu, 183 m, *Kionotrochus (K.) suteri.*

B 23 35° 09′ S, 174° 33′ E, NE of Cape Brett Is., 192 m, *Letepsammia* sp. *Kionotrochus (K.) suteri* (a).

B 24 35° 07′ S, 174° 29·2′ E, NE of Cape Brett Is., 188 m, *Kionotrochus (K.) suteri* (a).

B 25 35° 04′ S, 174° 26·3′ E, NE of entrance to Bay of Islands, 208 m, *Kionotrochus (K.) suteri* (a).

B 26 35° 04′ S, 174° 23·2′ E, NE of entrance to Bay of Islands, 184 m, *Letepsammia* sp., *Kionotrochus (K.) suteri* (a), *Flabellum aotearoa* (a).

B 27 35° 06′ S, 174° 21·3′ E, NE of Cape Brett, 143–146 m, *Letepsammia* sp., *Kionotrochus (K.) suteri* (a), *Flabellum aotearoa*, *Flabellum* sp.

B 41 35° 01·1′ S, 174° 13·5′ E, N of Bay of Islands, E of Cavalli Is., 182 m, *Kionotrochus (K.) suteri* (a).

B 42 34° 59·3′ S, 174° 10·2′ E, E of Cavalli Is., 188 m, *Kionotrochus (K.) suteri* (a).

B 43 34° 57·1′ S, 174° 07·2′ E, E of Cavalli Is., 218 m, *Kionotrochus (K.) suteri* (a).

D 28 Bay of Islands, off N headland, Deep Water Cove, 60 m, *Kionotrochus (K.) suteri* (a).

D 33 Bay of Islands, between Mosquito Pt and Moturua Is., 18 m, *Culicia rubeola.*

Rock 4·5 miles NE of the Aldermen Is., 102 m, *Ceratotrochus (C.) limatulus* (a), *Flabellum rubrum.*

VICTORIA UNIVERSITY OF WELLINGTON

8 (Prawn investigation Sta.) 37° 15′ S, 176° 12′ E, NW of Mayor Is., 146–219 m, *Paracyathus conceptus* (a), *Stenocyathus decamera* (a).

9 (Prawn investigation Sta.) 37° 20′ S, 176° 18′ E, off Mayor Is., 91–201 m, *Caryophyllia profunda* (a), *Flabellum rubrum* (a).

51 41° 35′ S, 174° 53′ S, off Palliser Bay, 366–549 m, *Goniocorella dumosa* (a).

83 J.U.G. 41° 42′ 30″ S, 175° 9′ E, off Cape Palliser, 1,006 m. (?derived) *Flabellum rubrum.*

96 41° 33′ S, 174° 55′ E, off Palliser Bay, 695 m, *Flabellum raukawaensis* (a).

113 C.U.D. 41° 35′ S, 175° 4′ E, Palliser Bay Shelf, 128–146 m, *Flabellum rubrum.*

NEW ZEALAND OCEANOGRAPHIC INSTITUTE STATIONS

A 4 34° 23′ S, 173° 05′ E, North Cape, 209 m, *Oculina virgosa*, *Flabellum rubrum.*

A 429 41° 29·4′ S, 174° 34·3′ E, NE of Cape Campbell, 475 m, *Goniocorella dumosa.*

A 431 39° 47·5′ S, 173° 46′ E, S Taranaki Bight, *Flabellum rubrum.*

A 432 39° 53′S, 173° 43′ E, SW of S Taranaki Bight, *Flabellum rubrum.*

A 439 41° 00′ S, 174° 27·2′ E, off Queen Charlotte Sound entrance, 159 m, *Flabellum rubrum.*

A 489 41° 27′ S, 174° 50·8′ E, SW of Cape Turakirae, 101 m, *Flabellum rubrum* (a).

A 491 41° 25′ S, 175° 02′ E, Palliser Bay, *Flabellum rubrum.*

A 804 39° 38′ S, 177° 34.3′ E, E of Cape Kidnappers, 150 m, *Caryophyllia profunda*, *Paracyathus conceptus.*

A 821 46° 27·5′ S, 167° 20′ E, SW of Te Waewae Bay, 88 m, *Flabellum rubrum.*

A 831 46° 50·4′ S, 167° 04·3′ E, W of Stewart Is., 717 m, *Flabellum apertum.*

A 843 47° 13·5′ S, 167° 15′ E, W of South Cape, Stewart Is., 133 m, *Flabellum rubrum* (a).

A 898 43° 22′ S, 177° 17′ E, Chatham Rise, 230 m, *Desmophyllum* sp., *Flabellum knoxi.*

A 904 44° 15·2′ S, 179° 35·4′ E, Chatham Rise, 1,116 m, *Caryophyllia profunda* (a).

A 905 44° 8·5′ S, 179° 46′ W, Chatham Rise, 549 m, *Flabellum* sp.

A 908 43° 27·3′ S, 179° 3′ W, Chatham Rise, 439 m, *Goniocorella dumosa* (a).

A 910 43° 04′ S, 178° 39′ W, Chatham Rise, 439–549 m, *Caryophyllia* sp., *Notocyathus* (*Paradeltocyathus*) *orientalis*, *Desmophyllum cristagalli* (a), *Goniocorella dumosa* (a), *Dendrophyllia japonica.*

A 912 42° 45′ S, 178° 15′ W, NW of Chatham Is., 914 m, *Flabellum knoxi.*

A 914 44° 04′ S, 178° 11·5′ W, W of Chatham Is., 457 m, *Flabellum knoxi* (a).

A 917 43° 56′ S, 179° 15′ W, Chatham Rise, 201 m, *Flabellum knoxi.*

B 200 41° 23′ S, 174° 42′ E, S of Sinclair Head, 73 m, *Caryophyllia* sp., *Flabellum rubrum.*

B 205 41° 27·5′ S, 175° 53·5 E′, NE of Cape Palliser, 82 m, *Flabellum rubrum.*

B 314 39° 22′ S, 171° 50′ E, NW of Cape Farewell, 230–251 m, *Madrepora vitiae*, *M.* sp., *Caryophyllia profunda*, *Goniocorella dumosa.*

B 319 39° 03·5′ S, 172° 21·5′ E, WNW of Cape Egmont, 638 m, *Caryophyllia* sp., *Desmophyllum* sp., *Desmophyllum cristagalli*, *Goniocorella dumosa*, *Stenocyathus decamera.*

B 323 40° 15′ S, 173° 38′ E, NE of Cape Farewell, 84 m, *Flabellum rubrum.*

B 473 43° 20′ S, 169° 47′ E, off Gillespie Point, Westland, 206–210 m, *Caryophyllia* sp. (a), *Desmophyllum* sp.

B 488 46° 28·7′ S, 166° 14·3′ E. SW of Preservation Inlet, 160 m, *Caryophyllia* sp.

B 489 46° 39′ S, 166° 09·5′ E, SW of Preservation Point, 194 m, *Caryophyllia profunda* (a).

B 490 45° 44·3′ S, 166° 44·8′ E, Dusky Sound, 114–118 m, *Oculina* sp., *Caryophyllia profunda* (a), *Dendrophyllia japonica* (a), *D. palita.*

B 524 42° 24′ S, 173° 50′ E, E of Kaikoura Peninsula, 91 m, *Caryophyllia* sp., *Flabellum rubrum.*

B 544 42° 40′ S, 173° 39′ E, SE of Amuri Bluff, 132 m, *Caryophyllia* sp.

B 554 44° 00′ S, 172° 58·2′ E, S of Banks Peninsula, 79–80 m, *Caryophyllia* sp.

B 556 44° 00·5′ S, 173° 47·5′ E, ESE of Banks Peninsula, 179–183 m, *Flabellum rubrum.*

B 560 44° 40′ S, 172° 24′ E, Canterbury Bight, 236 m, *Flabellum rubrum.*

B 602 47° 09·7′ S, 167° 42·8′ E, off W coast Stewart Is., 22 m, *Caryophyllia* sp.

B 605 46° 23·5′ S, 167° 22′ E, S of Te Waewae Bay, 73–75 m, *Flabellum rubrum* (a).

B 616 45° 20′ S, 166° 47′ E, off Dagg Sound, 132–135 m, *Flabellum rubrum* (a).

B 619 44° 42′ S, 167° 33·25′ E, N of George Sound, 93–95 m, *Desmophyllum* sp.

B 621 43° 59′ S, 168° 20·4′ E, NW of Cascade Pt, 89–117 m, *Flabellum rubrum.*

B 642 40° 40′ S, 172° 09′ E, SW of Cape Farewell, 42–43·5 m, *Flabellum rubrum.*

B 646 40° 00′ S, 173° 00′ E, NNE of Cape Farewell, 117 m, *Flabellum rubrum.*

B 648 40° 00′ S, 173° 52′ E, S Taranaki Bight, 97 m, *Flabellum rubrum.*

B 653 39° 20′ S, 173° 42′ E, off Cape Egmont, 75–79 m, *Flabellum rubrum.*

B 666 38° 00′ S, 173° 58·2′ E, W of Kawhia, 166–186 m, *Caryophyllia profunda.*

B 675 36° 40′ S, 173° 50′ E, SW of Kawhia Harbour, 282–384 m, *Caryophyllia profunda* (a), *Goniocorella dumosa.*

B 683 40° 00′ S, 171° 15′ E, NW of Cape Farewell, 378–381 m, *Flabellum lowekeyesi* (a).

B 686 40° 16′ S, 172° 32·3′ E, NW of Cape Farewell, 126 m, *Flabellum rubrum* (a).

B 783 38° 08′ S, 174° 17′ E, W of Kawhia Harbour, 86 m, *Flabellum rubrum.*

B 784 38° 10′ S, 174° 05′ E, W of Kawhia Harbour, 108 m, *Flabellum rubrum.*

B 797 38° 19′ S, 173° 54′ E, WSW of Kawhia Harbour, 106 m, *Flabellum rubrum.*

B 808 39° 30′ S, 173° 48′ E, off Opunake, S Taranaki, 55 m, *Flabellum rubrum.*

B 824 40° 05′ S, 173° 45′ E, SW of S Taranaki Bight, 101 m, *Flabellum rubrum.*

C 89 41° 23′ 54″ S, 174° 19′ 36″ E, off Cloudy Bay, 102 m, *Flabellum rubrum.*

C 190 40° 56′ S, 174° 29·5′ E, off Queen Charlotte Sound, 154 m, *Flabellum rubrum.*

C 194 40° 56′ S, 174° 46′ E, SW of Kapiti Is., 113 m, *Flabellum rubrum.*

C 197 41° 00′ S, 174° 39′ E, NW of Porirua Harbour, 201 m, *Flabellum rubrum* (a).

C 202 41° 04·25′ S, 174° 28′ E, off Queen Charlotte Sound, 115 m, *Flabellum rubrum.*

C 248 41° 28·8′ S, 175° 41′ E, NE of Cape Palliser, 219 m, *Flabellum rubrum.*

C 257 41° 39·5′ S, 175° 15·7′ E, S of Cape Palliser, 274 m, *Caryophyllia profunda.*

C 272 38° 20·3′ S, 174° 11·8′ E, SW of Kawhia Harbour, 91 m, *Flabellum rubrum.*

C 273 38° 20·3′ S, 174° 05·2′ E, SW of Kawhia Harbour, 97 m, *Flabellum* sp.

C 291 38° 01′ S, 174° 13′ E, W of Kawhia Harbour, 68·5 m, *Flabellum rubrum.*

C 325 37° 20′ S, 174° 24·2′ E, W of Waikato River mouth, 55 m, *Sphenotrochus ralphae* (a).

C 357 38° 40′ S, 174° 00·2′ E, N of New Plymouth, 95 m, *Flabellum rubrum.*

C 410 41° 33·7′ S, 174° 37′ E, NE of Cape Campbell, 475 m, *Goniocorella dumosa* (a).

C 438 40° 00′ S, 173° 36·5′ E, NE of Cape Farewell, 84 m, *Flabellum rubrum* (a).

C 439 40° 00′ S, 172° 49′ E, N of Cape Farewell, 88 m, *Flabellum rubrum* (a).

C 504 41° 21·5′ S, 176° 00·3′ E, S of Flat Point, 146 m, *Flabellum rubrum.*

C 506 41° 14·4′ S, 176° 9·2′ E, off Flat Point, 146 m, *Caryophyllia profunda, Flabellum rubrum.*

C 510 40° 36′ S, 177° 02′ E, SE of Cape Turnagain, 384 m, *Caryophyllia profunda, Notocyathus (Paradeltocyathus) orientalis, Goniocorella dumosa* (a).

C 520 41° 39·4′ S, 175° 09·6′ E, SW of Cape Palliser, 112 m, *Flabellum rubrum.*

C 524 41° 17·5′ S, 174° 37·7′ E, NW of Cape Terawhiti, Cook Strait, *Flabellum rubrum.*

C 601 44° 18′ S, 176° 16′ E, Chatham Rise, 140 m, *Caryophyllia* sp.

C 605 43° 40′ S, 179° 30′ E, Chatham Rise, 440–460 m, *Flabellum knoxi* (a).

C 608 43° 19′ S, 179° 00′ E, Chatham Rise, 450–465 m, *Caryophyllia profunda.*

C 617 43° 58·4 S, 175° 22·9′ E, Chatham Rise, 286–300 m, *Flabellum* sp.

C 618 43° 52′ S, 175° 20′ E, Chatham Rise, 625–690 m, *Desmophyllum cristagalli, Goniocorella dumosa.*

C 623 44° 25·5′ S, 175° 16′ E, Chatham Rise, 400–702 m, *Desmophyllum cristagalli* (a).

C 627 39° 13′ S, 171° 54′ E, NW of Cape Farewell, 393 m, *Madrepora* sp., *Caryophyllia* sp., *Cyathoceras* sp., *Paracyathus conceptus, Goniocorella dumosa* (a), *Dendrophyllia japonica* (a), *D. palita.*

C 629 39° 15′ S, 171° 54′ E, NW of Cape Farewell, 294 m, *Madrepora vitiae, Goniocorella dumosa, Dendrophyllia japonica, D. palita.*

C 632 39° 14′ S, 172° 01′ E, NW of Cape Farewell, 402 m, *Madrepora vitiae, Caryophyllia* sp., *Goniocorella dumosa, Dendrophyllia japonica* (a), *D. palita.*

C 633 39° 16′ S, 171° 54′ E, NW of Cape Farewell, 340 m, *Madrepora vitiae, Goniocorella dumosa* (a), *Dendrophyllia palita.*

C 634 39° 18′ S, 171° 48′ E, NW of Cape Farewell, 362 m, *Goniocorella dumosa, Dendrophyllia japonica.*

C 640 39° 17′ S, 171° 53′ E, NW of Cape Farewell, 330–360 m, *Madrepora vitiae, Flabellum* sp., *Dendrophyllia japonica.*

C 642 39° 15·5′ S, 171° 52·5′ E, NW of Cape Farewell, 350–400 m, *Madrepora* sp., *Caryophyllia* sp., *Goniocorella dumosa, Dendrophyllia palita, D.* sp.

C 645 39° 18′ S, 172° 00′ E, NW of Cape Farewell, 440 m, *Madrepora vitiae, Goniocorella dumosa, Dendrophyllia japonica, D. palita.*

C 648 37° 29′ S, 172° 00′ E, NW of Cape Egmont, 2,000 m, *Paracyathus conceptus* (a).

C 678 42° 43·3′ S, 173° 38·2′ E, SE of Amuri Bluff, 120 m, *Caryophyllia profunda* (a), *Desmophyllum cristagalli.*

C 683 42° 28·1′ S, 173° 40·7′ E, S of Kaikoura Peninsula, 180–230 m, *Goniocorella dumosa.*

C 686 42° 32·5′ S, 173° 45·1′ E, S of Kaikoura, 820 m, *Caryophyllia profunda* (a), *Desmophyllum cristagalli* (a).

C 690 42° 33·2′ S, 173° 33·8′ E, off Kaikoura Peninsula, 180–400 m, *Caryophyllia profunda* (a), *Desmophyllum cristagalli* (a), *Goniocorella dumosa* (a).

C 692 42° 31·2′ S, 173° 38·7′ E, S of Kaikoura, 420–500 m, *Caryophyllia profunda.*

C 703 42° 42′ S, 173° 37·8′ E, off Amuri Bluff, 140–180 m, *Caryophyllia profunda* (a).

C 706 42° 26·3′ S, 173° 45·6′ E, off Kaikoura, 100 m, *Flabellum rubrum* (a).

C 758 34° 40′ S, 172° 14·5′ E, SW Cape Maria Van Diemen, 196 m, *Caryophyllia profunda* (a), *Flabellum gracile, F. rubrum* (a).

C 770 34° 39·9′ S, 173° 20·5′ E, SE Parengarenga Harbour, 130 m, *Kionotrochus (K.) suteri, Flabellum aotearoa* (a), *F. rubrum.*

C 781 36° 00′ S, 175° 20·6′ E, N of Great Barrier Is., 90 m, *Kionotrochus (K.) suteri.*

C 783 36° 00′ S, 175° 45·8′ E, NE of Great Barrier Is., 185 m, *Kionotrochus (K.) suteri, Flabellum rubrum.*

C 787 36° 40′ S, 175° 06·1′ E, NW of Waiheke Is., 39 m, *Culicia rubeola, Flabellum rubrum.*

C 789 36° 13·7′ S, 175° 17·5′ E, W coast Great Barrier Is., 55 m, *Kionotrochus (K.) suteri* (a), *Flabellum rubrum.*

C 790 36° 10·9′ S, 175° 21·4′ E, Kararo Bay, Port Fitzroy, Great Barrier Is., 16 m, *Flabellum rubrum.*

C 792 36° 40′ S, 175° 57·1′ E, E of Great Mercury Is., 69 m, *Kionotrochus (K). suteri.*

C 796 37° 20′ S, 176° 11·2′ E, SW of Mayor Is., 70 m, *Flabellum rubrum.*

C 797 37° 20′ S, 176° 18·2′ E, S of Mayor Is., 137–143 m, *Carophyllia profunda, Kionotrochus (K.) suteri, Flabellum rubrum.*

C 798 37° 20·1′ S, 176° 19′ E. SE of Mayor Is., 198 m, *Kionotrochus (K.) suteri.*

C 800 37° 40′ S, 176° 36·2′ E, ESE of Motiti Is., 73 m, *Kionotrochus (K.) suteri, Flabellum rubrum.*

C 801 37° 40·3′ S, 176° 48·1′ E, NW of Whale Is., 130 m, *Kionotrochus (K.) suteri, Flabellum aotearoa, F. rubrum.*

C 810 37° 31·3′ S, 177° 11·6′ E, SW of White Is., 95–104 m, *Caryophyllia profunda* (a), *Flabellum gracile.*

C 812 37° 39·5′ S, 178° 37·6′ E, NE off East Cape, 71 m, *Culicia* sp., *Flabellum rubrum* (a).

C 814 37° 40′ S, 178° 56·4′ E, NE of East Cape, 187 m, *Caryophyllia profunda, Paracyathus conceptus, Kionotrochus (K.) suteri, Flabellum rubrum, Dendrophyllia japonica.*

C 844 41° 38·3′ S, 175° 11·2′ E, S off Cape Palliser, 86 m, *Flabellum rubrum* (a).

C 850 40° 40·2′ S, 175° 1·4′ E, NE of Kapiti Is., 69 m, *Flabellum rubrum.*

C 851 40° 40·4′ S, 174° 43·6′ E, NW of Kapiti Is., 124 m, *Flabellum rubrum* (a).

C 852 40° 41·3′ S, 174° 20·3′ E, E of Stephens Is., 128 m, *Flabellum rubrum.*

C 887 46° 45′ S, 165° 52·5′ E, SSW of Cape Providence, 229 m, *Caryophyllia profunda.*

C 896 3·3 miles at 298° from St. Anne Point, Milford Sd., 91 m, *Desmophyllum cristagalli* (a).

C 956 43° 07′ S, 175° 03′ E, E of Kaikoura, 227 m, *Caryophyllia profunda* (a).

C 957 43° 09′ S, 175° 15′ E, E of Kaikoura, 113–126 m, *Flabellum rubrum.*

D 90 43° 50′ S, 179° 00′ E, Chatham Rise, 393 m, *Goniocorella dumosa.*

MISCELLANEOUS STATIONS

(Principally localities as cited in Ralph and Squires, 1962)

1 NNE of Mayor Is. (SM *Hovell* Sta. 12) 84–150 m' *Flabellum rubrum* (a).

2 37° 39′ S, 178° 34′ E, off East Cape (HMNZS *Lachlan*) 183 m, *Letepsammia* sp., *Kionotrochus (K.) suteri* (a), *Flabellum* sp.

3 2 miles S of North Cape, 101 m, *Oculina virgosa* (a), *Flabellum rubrum* (a).

4 Off Greymouth, 256 m, *Caryophyllia profunda* (a).

5 ENE of Otago Heads, 503 m, *Desmophyllum cristagalli.*

6 South Taranaki Bight, *Culicia rubeola.*

7 W of New Plymouth, 1,280–1,463 m, taken from cable, *Desmophyllum cristagalli* (a).

8 Off East Cape, 146–155 m, *Flabellum rubrum* (a).

9 60 miles W of Farewell Spit, 640 m, taken from cable, *Desmophyllum cristagalli* (a).

10 Island Bay, Cook Strait, 183 m, *Caryophyllia profunda* (a), *Desmophyllum cristagalli* (a).

11 Island Bay, Cook Strait, 219 m, *Desmophyllum cristagalli* (a).

12 Milford Reef, Auckland, shallow, *Culicia rubeola* (a), *Flabellum rubrum.*

13 Underside of stones, Rangitoto Is., shallow, *Flabellum rubrum.*

14 Off North Cape, 82 m, *Flabellum rubrum.*

15 Narrow Neck Reef, Auckland, shallow, *Culicia rubeola* (a).

16 Long Bay, Auckland, under stones, low tide, *Culicia rubeola* (a).

17 100 miles SW of Cape Egmont, taken from cable, 311 m, *Caryophyllia profunda* (a).

18 Cook Strait, 73 m, *Caryophyllia profunda* (a), *Flabellum rubrum* (a).

19 Near Leigh, Northland, shallow, *Flabellum rubrum* (a).

20 Off Poor Knights Is., 110 m, *Kionotrochus (K.) suteri* (a), *Stenocyathus decamera* (a).

21 Cook Strait, 46 m, *Flabellum rubrum.* (D'Urville, 1829, specimens figd. by Quoy and Gaimard, 1833.)

22 Off Cuvier Is., 69 m, *Kionotrochus (K.) suteri* (a).

23 1·5 miles NE of Mayor Is., 154 m, *Kionotrochus (K.) suteri* (a).

24 Off Hen and Chicken Is., 48–55 m, *Kionotrochus (K.) suteri* (a), *Flabellum rubrum* (a).

25 1·5–2 miles off Hen and Chicken Is., 48–55 m, *Kionotrochus (K.) suteri* (a).

26 Between Hen and Chicken Is., *Flabellum rubrum* (a).

27 N of Kapiti Is., 55 m, *Flabellum rubrum* (a).

28 Whangaparapara, Great Barrier Is., *Flabellum rubrum* (a).

29 Auckland and Manakau Harbours, *Flabellum rubrum* (a).

30 Takapuna North Head, Auckland, shallow, *Flabellum rubrum* (a).

31 Between Wade Heads and Arkles Bay, S side Whangapararoa Peninsula, shallow, *Flabellum rubrum* (a).

32 Whangamata, Bay of Plenty, shallow, *Flabellum rubrum* (a).

33 Vicinity of D'Urville Is., *Flabellum rubrum* (a).

34 Port Lyttelton settling plates, shallow, *Flabellum rubrum* (a).

35 Queen Charlotte Sound, *Flabellum rubrum.*

36 Between Little Barrier and Great Barrier Is., *Flabellum rubrum* (a).

37 Long Beach, Bay of Islands, shallow, *Flabellum rubrum* (a).

38 Whangamumu, Northland, shallow, *Flabellum rubrum.* (a).

39 10 miles W, 0·5 mile S of Cuvier Is., 59 m, *Flabellum rubrum* (a).

40 Off Coromandel Peninsula, 37 m, *Flabellum rubrum* (a).

41 Karewa Is., Bay of Plenty, shallow, *Flabellum rubrum* (a).

42 N of Cuvier Is., 91 m, *Flabellum rubrum* (a).

43 Off East Cape, 155 m, *Flabellum rubrum* (a).

44 Off Mayor Is., 366 m, *Dendrophyllia japonica* (a).

45 Between Cuvier Is. and Mokohinau Is., 91 m, *Flabellum rubrum* (a).

46 South Taranaki Bight, *Flabellum rubrum* (a).

47 South Taranaki Bight, off Rangitiki River, *Flabellum rubrum.*

48 South Taranaki Bight, 10–15 miles off Rangitikei River, 73–77 m, *Flabellum rubrum* (a).

49 Mercury Bay, 37 m, *Flabellum rubrum* (a).

50 Off Cape Campbell, 101 m, *Flabellum rubrum.*

51 Gannet Is., off E end of Waiheke Is., 22–24 m, *Flabellum rubrum* (a).

52 Off Tiritiri Matangi Is., Hauraki Gulf, 13 m, *Flabellum rubrum* (a).

53 Cook Strait, taken from cable, "deep water" *Desmophyllum cristagalli* (a).

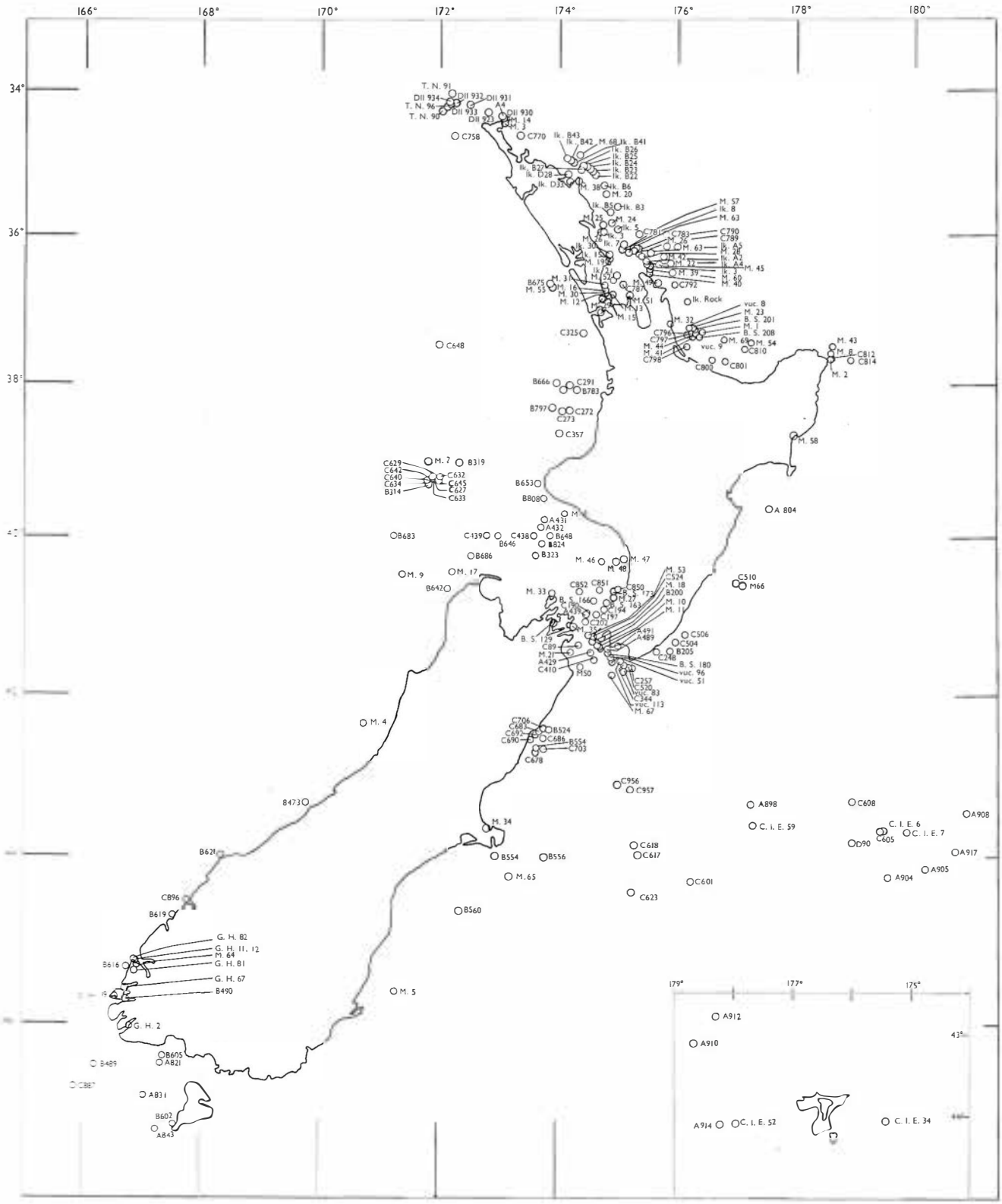

Fig. 7. Distribution of all stations that have yielded corals and provided the data for this Memoir. (Plotted from Appendix I.)

54 White Is., Bay of Plenty, 110 m, *Desmophyllum cristagalli* (a).

55 36° 42·4′ S, 173° 53′ 35″ E, off Muriwai Beach, 549 m, *Desmophyllum cristagalli* (a).

56 Cook Strait, *Dendrophyllia japonica.*

57 Off Little Barrier Is., *Culicia rubeola* (a).

58 Kaiti Beach, Gisborne, *Culicia rubeola.*

59 Cook Strait, *Conocyathus zelandiae* (a). (Duncan 1876).

60 Colville Channel, Hauraki Gulf, 68 m, *Caryophyllia profunda* (a).

61 Cook Strait, *Caryophyllia* cf. *C. maculata* (a).

62 15 miles outside Great Barrier Is., 201 m, *Kionotrochus (K.) suteri* (a).

63 36° 08′ S, 176° 00′ E, ENE of Great Barrier Is., 199 m, *Kionotrochus (K.) suteri* (a).

64 Goal Passage, Doubtful Sound, 46 m, *Flabellum rubrum.*

65 44° 15′ S, 173° 13′ E, SE off Banks Peninsula, 146 m, *Caryophyllia profunda* (a), *Paracyathus conceptus* (a), *Desmophyllum cristagalli* (a).

66 40° 38′ S, 177° 10′ E, E of Cape Turnagain, 155–165 m, *Caryophyllia profunda.*

67 41° 45′ S, 174° 55′ E, Cook Strait, *Flabellum rubrum* (a).

68 20 miles N of Cape Brett, Bay of Islands, 732 m, (Marine Dept. prawn trawl, haul 29, 30) *Flabellum lowekeyesi* (a).

69 15 miles N, 50° E Plate Is. (= Motunau Is.), 585–622 m, (Marine Dept. haul 12) *Stephanocyathus* sp.

APPENDIX II

ALL stations listed in Appendix I are arranged numerically in geographical groupings beside their abbreviated collection source names *(see also* Fig. 7*)*.

Three Kings Islands to Coromandel Peninsula

Terra Nova – 90, 91, 96.

Discovery II – 929, 930, 931, 932, 933, 934.

Ikatere – 3, 5, 7, 8, 13, 15, 21, 30, A 2, A 4, A 5, B 3, B 5, B 6, B 22, B 23, B 24, B 25, B 26, B 27, B 41, B 42, B 43, D 28, D 33, Rock.

N.Z.O.I. – A 4, C 770, C 781, C 783, C 787, C 789, C 790, C 792.

Miscellaneous – 3, 12, 13, 14, 15, 16, 19, 20, 22, 24, 25, 26, 28, 29, 30, 31, 36, 37, 38, 39, 40, 42, 45, 49, 51, 52, 57, 60, 62, 63.

Bay of Plenty

Alert – BS 207, BS 208.

Victoria Univ. – 8, 9.

N.Z.O.I. – C 796, C 797, C 798, C 800, C 801, C 810.

Miscellaneous – 1, 23, 32, 41, 44, 54.

East Cape to Cape Palliser

N.Z.O.I. – A 804, B 205, C 248, C 504, C 506, C 510, C 812, C 814.

Miscellaneous – 8, 43, 58, 66.

North Cape to Cape Egmont

N.Z.O.I. – B 319, B 653, B 666, B 675, B 783, B 784, B 797, C 272, C 273, C 291, C 325, C 357, C 648, C 758.

Miscellaneous – 7, 55.

"Cook Strait" northern sector

Alert – BS 129, BS 163, BS 166, BS 173.

N.Z.O.I. – A 431, A 432, A 439, B 314, B 323, B 646, B 648, B 683, B 686, B 808, B 824, C 190, C 194, C 197, C 202, C 438, C 439, C 524, C 627, C 629, C 632, C 633, C 634, C 640, C 642, C 645, C 850, C 851, C 852.

Miscellaneous – 6, 17, 27, 35, 46, 47, 48.

"Cook Strait" southern sector

Alert – BS 180.

Victoria Univ. – 51, 83, 96, 113.

N.Z.O.I. – A 429, A 489, A 491, B 200, C 89, C 257, C 410, C 520, C 844.

Miscellaneous – 10, 11, 18, 21, 50, 53, 56, 59, 61, 67.

Kaikoura to Foveaux Strait

N.Z.O.I. – B 524, B 544, B 554, B 556, B 560, C 678, C 683, C 686, C 690, C 692, C 703, C 706, C 956, C 957.

Miscellaneous – 5, 34, 65.

Chatham Rise and Chatham Islands

Chatham Exped. – 6, 7, 34, 52, 59.

N.Z.O.I. – A 898, A 904, A 905, A 908, A 910, A 912, A 914, A 917, C 601, C 605, C 608, C 617, C 618, C 623, D 90.

Cape Farewell to Foveaux Strait

New Golden Hind – 2, 11, 12, 49, 67, 81, 82.

N.Z.O.I. – B 473, B 488, B 489, B 490, B 616, B 619, B 621, B 642, C 896.

Miscellaneous – 4, 9, 64.

Foveaux Strait and Stewart Island

N.Z.O.I. – A 821, A 831, A 843, B 602, B 605, C 887.

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PLATES

Photographs are by Mr Jack Scott, Natural History Museum, Smithsonian Institution except as otherwise indicated.

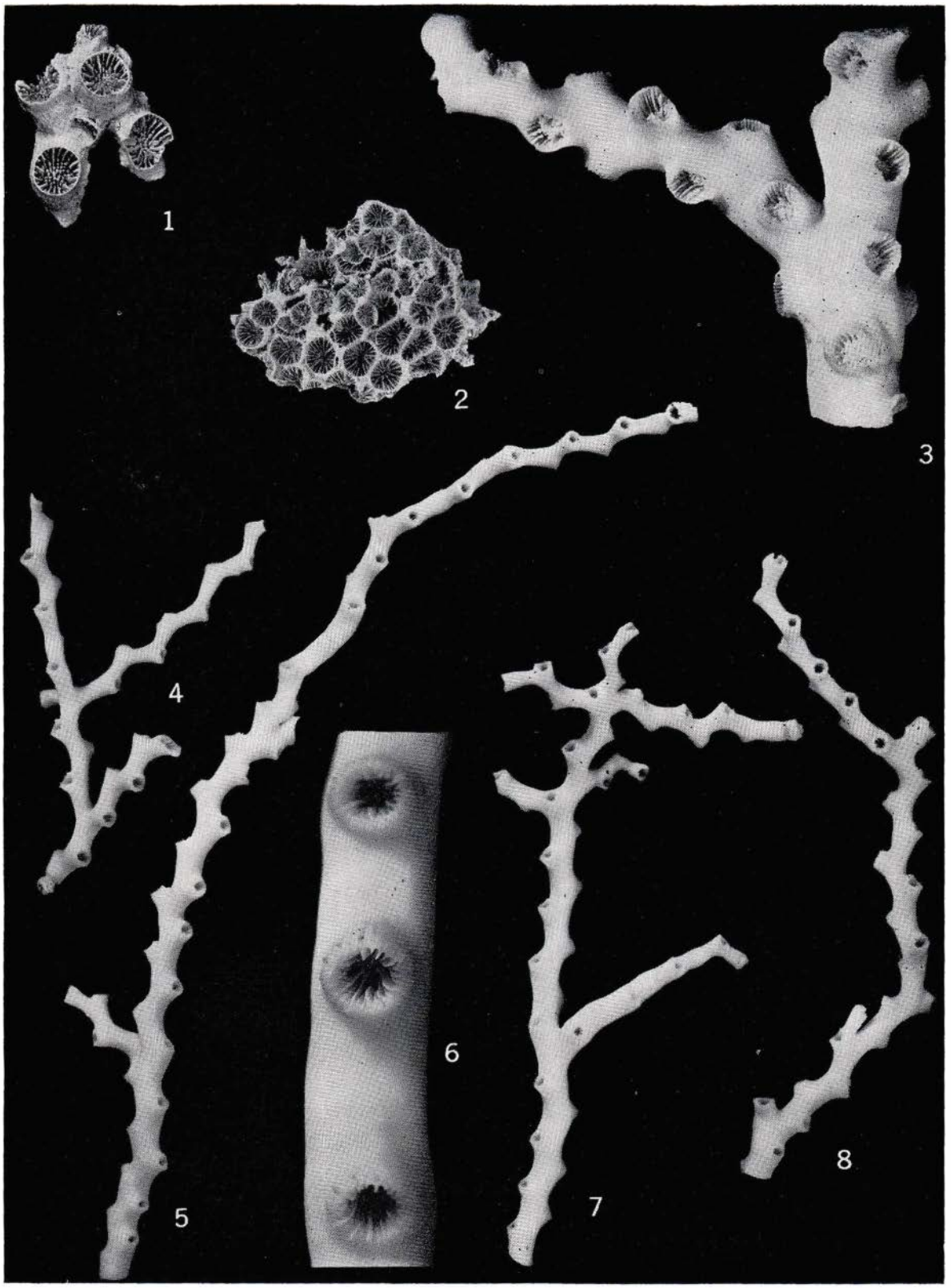
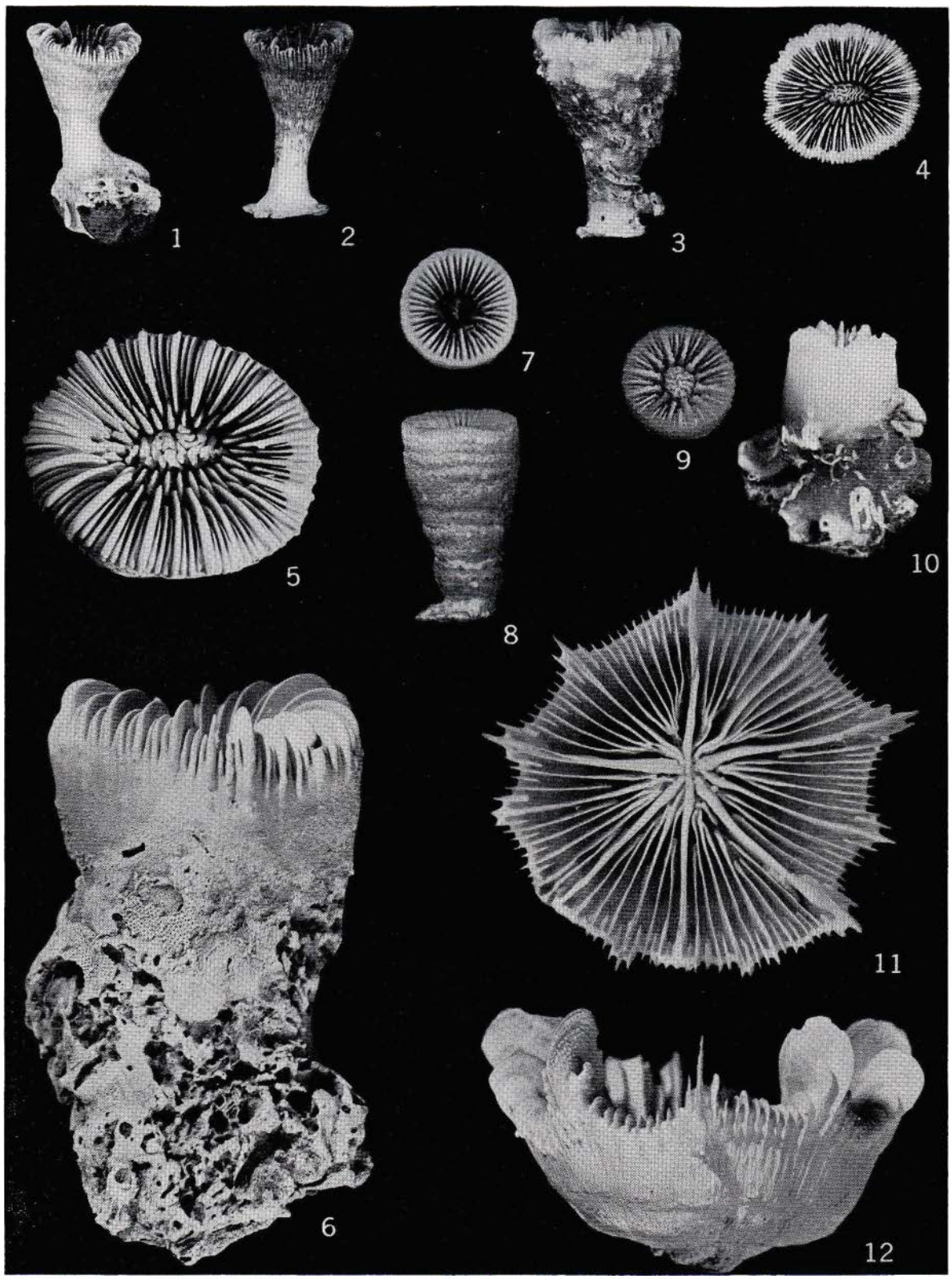


PLATE 1. 1—*Culicia rubeola* (Quoy and Gaimard) calicular view. N.Z.O.I. Sta. C 787. × 2.

2—*Culicia smithii* (Milne-Edwards and Haime) calicular view. Otago Museum; reputedly type specimen. Locality "New Zealand". × 1. *(Photo: M. King, Victoria University of Wellington.)*

3—*Oculina virgosa* Squires. Miscellaneous Sta. 3 (Victoria University of Wellington Zoology Dept.) × 2·5. *(Photo: S. N. Beatus, N.Z. Geological Survey.)*

4–8—*Madrepora vitiae* n. sp. 4—Holotype (N.Z.O.I. No. 17), × 1. 6—Enlarged section of holotype showing corallites, × 4. 5, 7, 8—Paratypes (N.Z.O.I. No. P18–P20), ×1 N.Z.O.I. Sta. B 314.



(Photo: S. N. Beatus, N.Z. Geological Survey.

PLATE 2. 1, 2—*Caryophyllia profunda* Moseley, side views. N.Z.O.I. Sta. B 473. × 1.
3, 4—*Caryophyllia profunda* Moseley, side and calicular views. N.Z.O.I. Sta. C 703. × 1.
5, 6—*Caryophyllia* cf. *C. maculata* (Pourtalès), calicular and side views. Miscellaneous Sta. 61 (Dominion Museum Coral Collection). ×1·5. *(Photo: S. N. Beatus, N.Z. Geological Survey.)*
7, 8—*Paracyathus conceptus* Gardiner, calicular and side views. N.Z.O.I. Sta. C 648. × 1·5.
9, 10—*Ceratotrochus (Ceratotrochus) limatulus* Squires. Calicular and side views. *Ikatere* "Rock Cruise" (Smithsonian Institution Coral Collection). × 3.
11, 12—*Stephanocyathus* sp., calicular and side views. Miscellaneous Sta. 69 (Victoria University of Wellington Zoology Dept.). × 1. *(Photo: S. N Beatus, N.Z. Geological Survey.)*

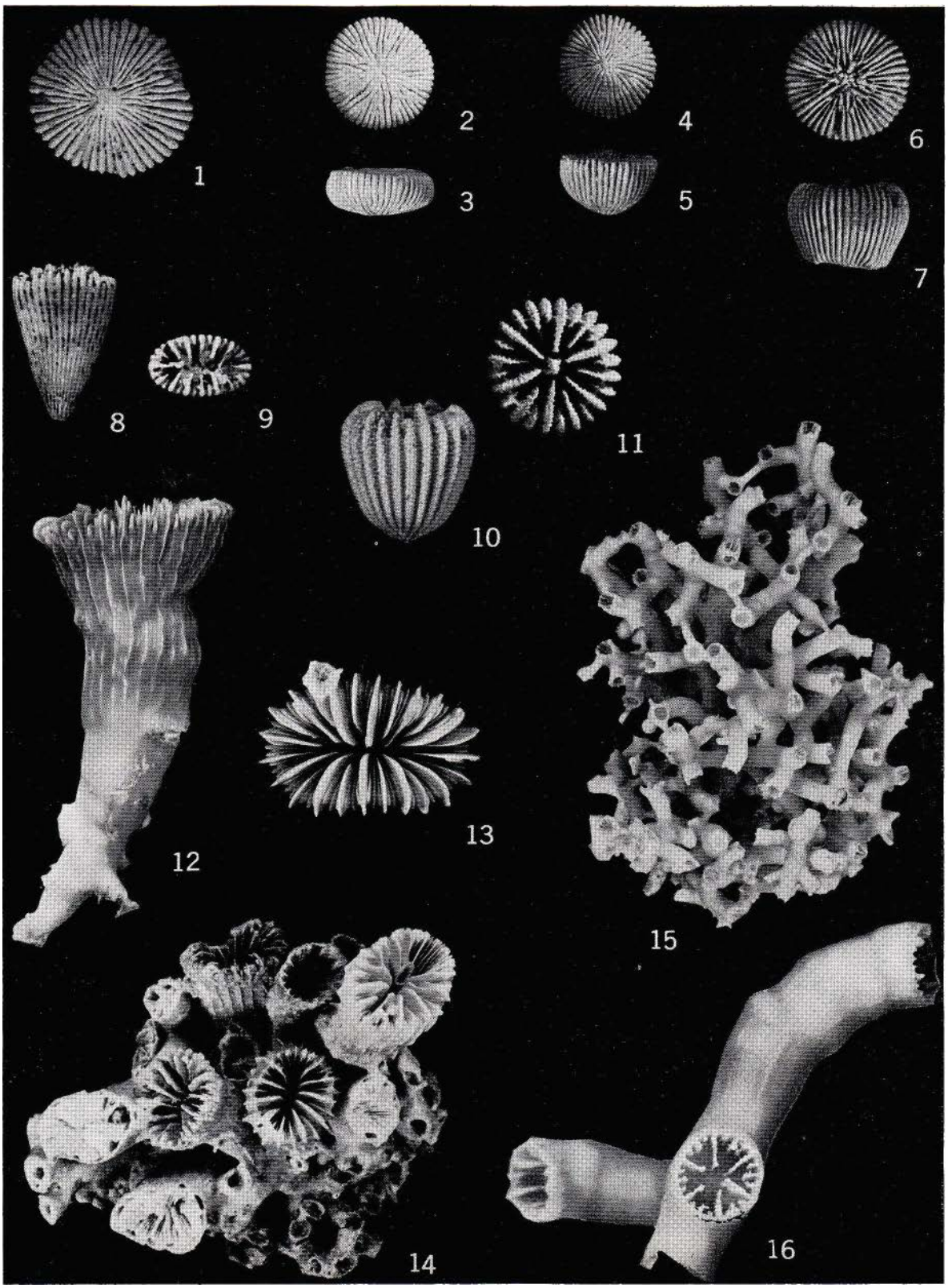


PLATE 3. 1–7—*Notocyathus (Paradeltocyathus) orientalis* Duncan, basal and side views. 1–5—N.Z.O.I. Sta. A 910 (Smithsonian Institution Coral Collection). × 3. 6, 7—N.Z.O.I. Sta. C 510. × 2·5.

8, 9—*Sphenotrochus ralphae* Squires, side and calicular views. N.Z.O.I. Sta. C 325. × 4.

10, 11—*Kionotrochus (Kionotrochus) suteri* Dennant, side and calicular views. N.Z.O.I. Sta. C 800. × 5.

12–14—*Desmophyllum cristagalli* Milne-Edwards and Haime. 12—Side view. N.Z.O.I. Sta. C 690. × 1. 13—Calicular view N.Z.O.I. Sta. C 618. × 1. 14—Calicular view of specimen cluster, N.Z.O.I. Sta. C 618. ×1.

15, 16—*Goniocorella dumosa* (Alcock). 15—General view. × 1. 16—Magnified view of single calice, × 4·0. N.Z.O.I. Sta. C 633.

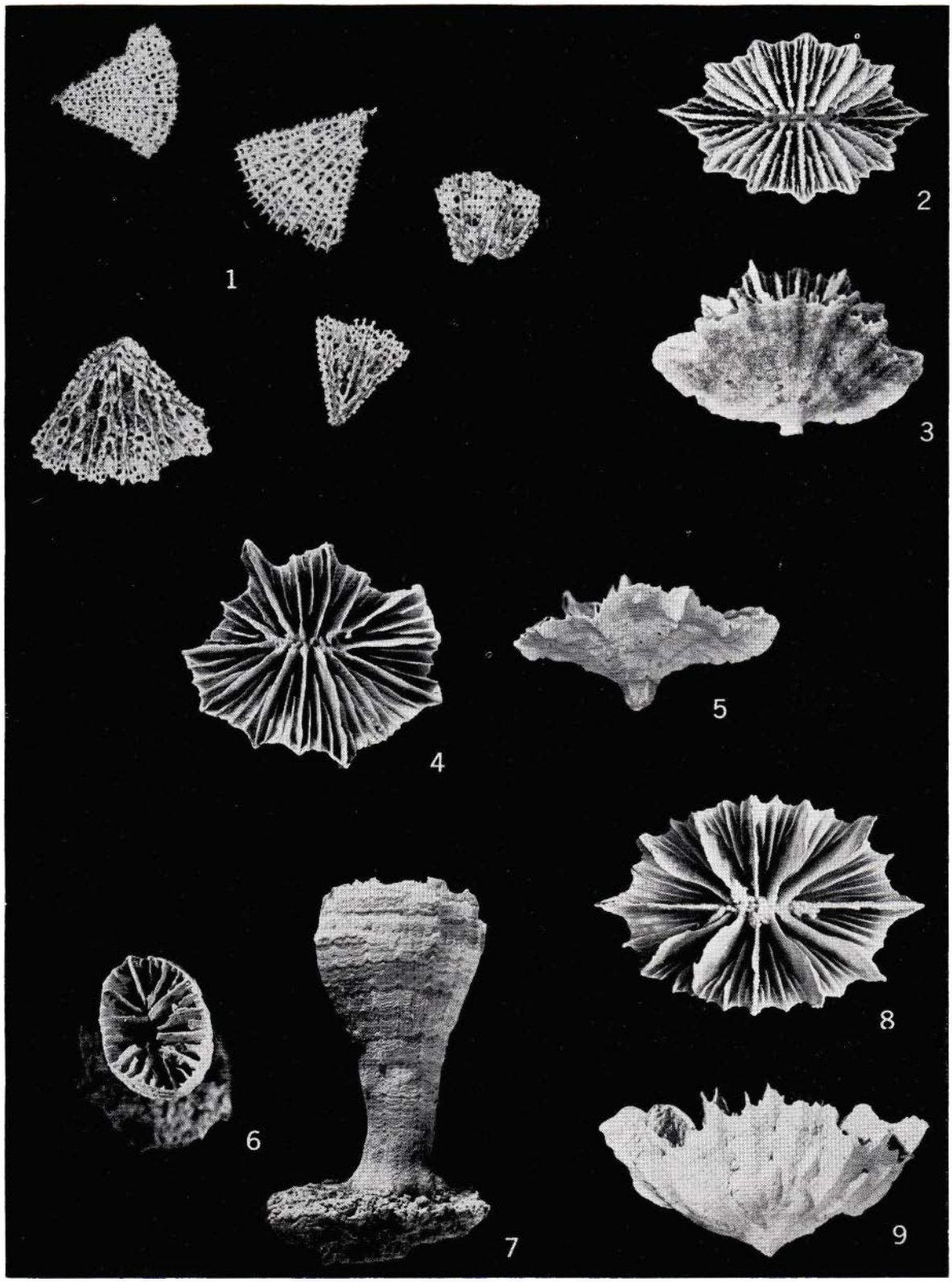


PLATE 4. 1—*Letepsammia* sp. Fragments of coralla. *Ikatere* Sta. B 27 (Auckland Museum Collection). × 2·5. *(Photo: S. N. Beatus N.Z. Geological Survey)*.

2, 3—*Flabellum aotearoa* Squires, calicular and side views. N.Z.O.I. Sta. C 801. × 2.

4, 5—*Flabellum apertum* Moseley, calicular and side views. N.Z.O.I. Sta. A 831. × 1·5.

6, 7—*Flabellum gracile* (Studer), calicular and side views. *Discovery II* Sta. 932 (Auckland Museum Collection). × 3·5. *(Photo: S. N. Beatus, N.Z. Geological Survey)*.

8, 9—*Flabellum raukawaensis* n. sp., calicular and side views. Victoria University Zoology Dept. Sta. 96. × 1. *(Photo: S. N. Beatus, N.Z. Geological Survey)*.

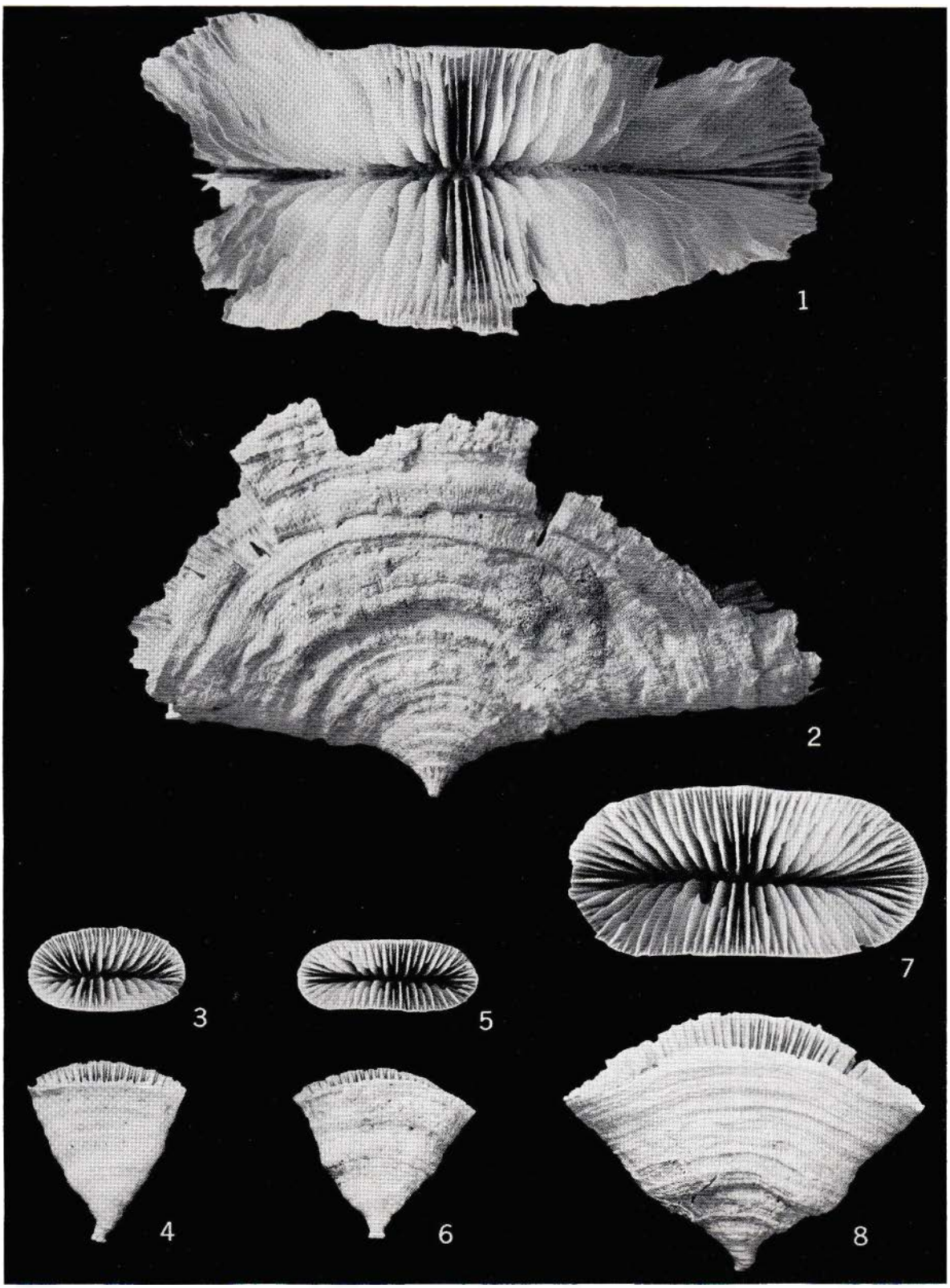


PLATE 5. 1, 2—*Flabellum knoxi* Ralph and Squires, calicular and side views. Chatham Island Expedition Sta. 52 (Smithsonian Institution Coral Collection). × 1.

3–8—*Flabellum rubrum* (Quoy and Gaimard), calicular and side views. 3, 4—N.Z.O.I. Sta. C 844; × 1. 5, 6—N.Z.O.I. Sta. C 197; × 1. 7, 8—N.Z.O.I. Sta. C 770; × 1.

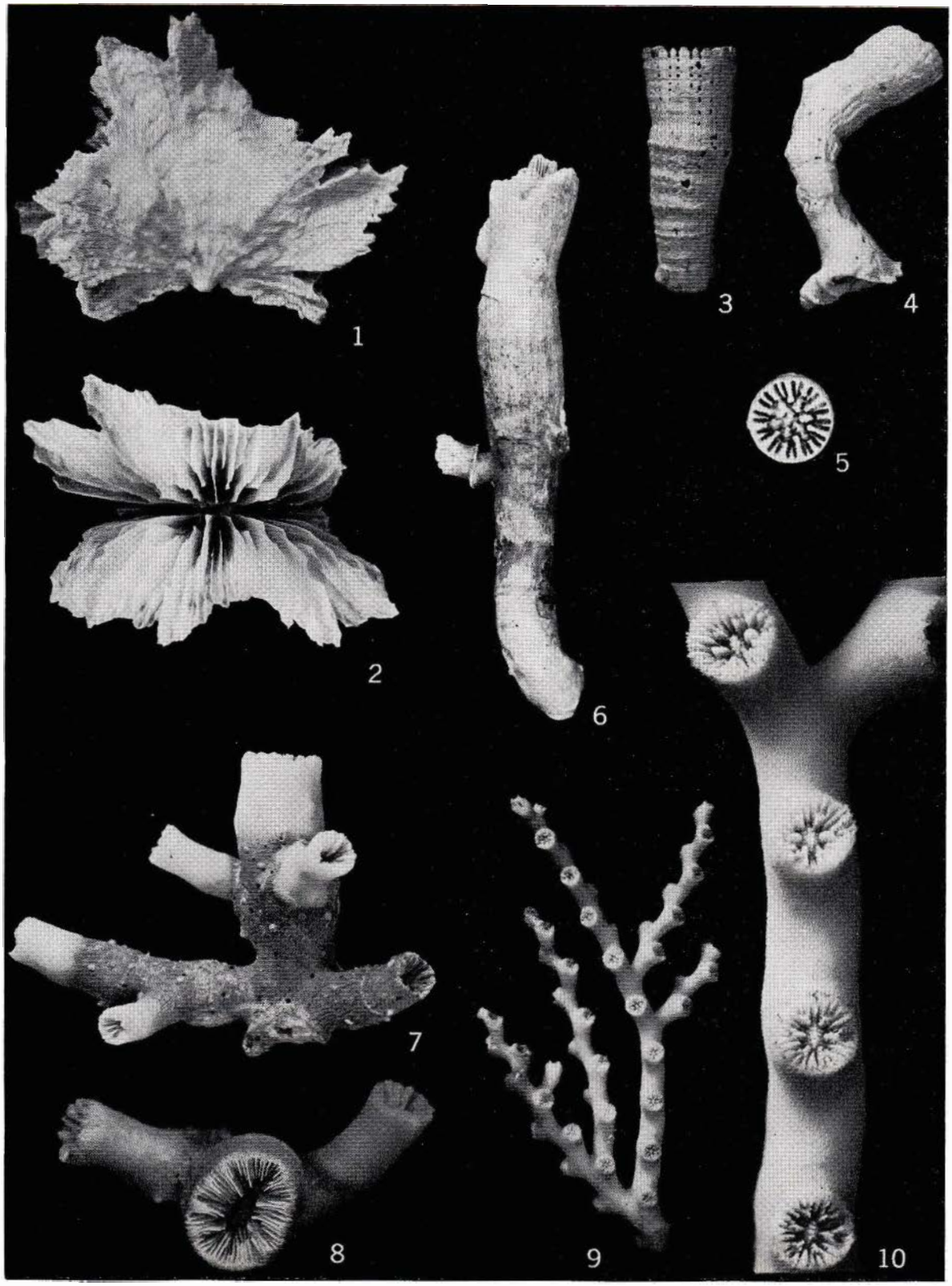


PLATE 6. 1, 2—*Flabellum lowekeyesi* Squires and Ralph, side and calicular views. Miscellaneous Sta. 68 (Smithsonian Institution Coral Collection). × 1.

3–5—*Stenocyathus decamera* Ralph and Squires, side and calicular views (three individuals). N.Z.O.I. Sta. B 319. × 3.

6–8—*Dendrophyllia japonica* Rehberg, side and calicular views. 6—N.Z.O.I. Sta. C 627. × 1. 7, 8—N.Z.O.I. Sta. B 490. × 1 and × 1·5.

9, 10—*Dendrophyllia palita* n.sp. 9—Holotype (N.Z.O.I. No. 18). N.Z.O.I. Sta. B 490. × 1. 10—Magnified view of corallites, × 4.

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