ISSN 2538-1016; 19

NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

BULLETIN 147

The Fauna of the Ross Sea

PART 2

Scleractinian Corals

by
DONALD F. SQUIRES

New Zealand Oceanographic Institute
Memoir No. 19

1962

Photograph: S. C. Watts

Looking north towards Tent and Inaccessible Islands, McMurdo Sound.

NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

BULLETIN 147

The Fauna of the Ross Sea

PART 2

Scleractinian Corals

by
DONALD F. SQUIRES

New Zealand Oceanographic Institute
Memoir No. 19

Price 3s. 6d.

1962

Inset 1

This publication should be referred to as:

N.Z. Dep. sci. industr. Res. Bull. 147

R. E. OWEN, GOVERNMENT PRINTER, WELLINGTON, NEW ZEALAND

FOREWORD

Each summer season, since 1956–57, the New Zealand Oceanographic Institute has undertaken one or more research cruises in the Antarctic, initially as part of the International Geophysical Year programmes and their extensions, and latterly as part of the New Zealand Antarctic Research Programme.

The major efforts of the 1958–59 and 1959–60 seasons were devoted to an oceanographic survey of the Ross Sea in which, as well as associated hydrological information, sediment samples, plankton and fish, substantial collections of benthic animals were obtained.

Each of these expeditions was led by J. S. Bullivant. In 1958–59 he was assisted by D. G. McKnight and A. G. Macfarlane of the Institute staff; N. A. Powell of Antarctic Division, D.S.I.R., John Reseck, jun., Long Beach State College, California, and Dr R. K. Dell, Dominion Museum, Wellington, were co-workers; in 1959–60, G. A. Harlen and E. C. French of Antarctic Division, D.S.I.R. assisted.

The two expeditions were carried out from HMNZS *Endeavour* and the cooperation of the New Zealand Naval Board and of the Commanding Officer and ship's company is gratefully acknowledged. The Antarctic Division has materially assisted the field and laboratory work by the secondment of staff and provision of equipment.

The biological material has been sorted and preserved under the supervision of J. S. Bullivant.

The preliminary editing of the manuscript has been carried out by Mrs P. M. Cullen. Mr M. O'Connor (Information Bureau, D.S.I.R.) has been responsible for final editing.

Further results of examinations of these collections will be published as studies of other groups are concluded.

J. W. Brodie,
Director,
N.Z. Oceanographic Institute.

CONTENTS

FIGURES

TABLES

Inset 2

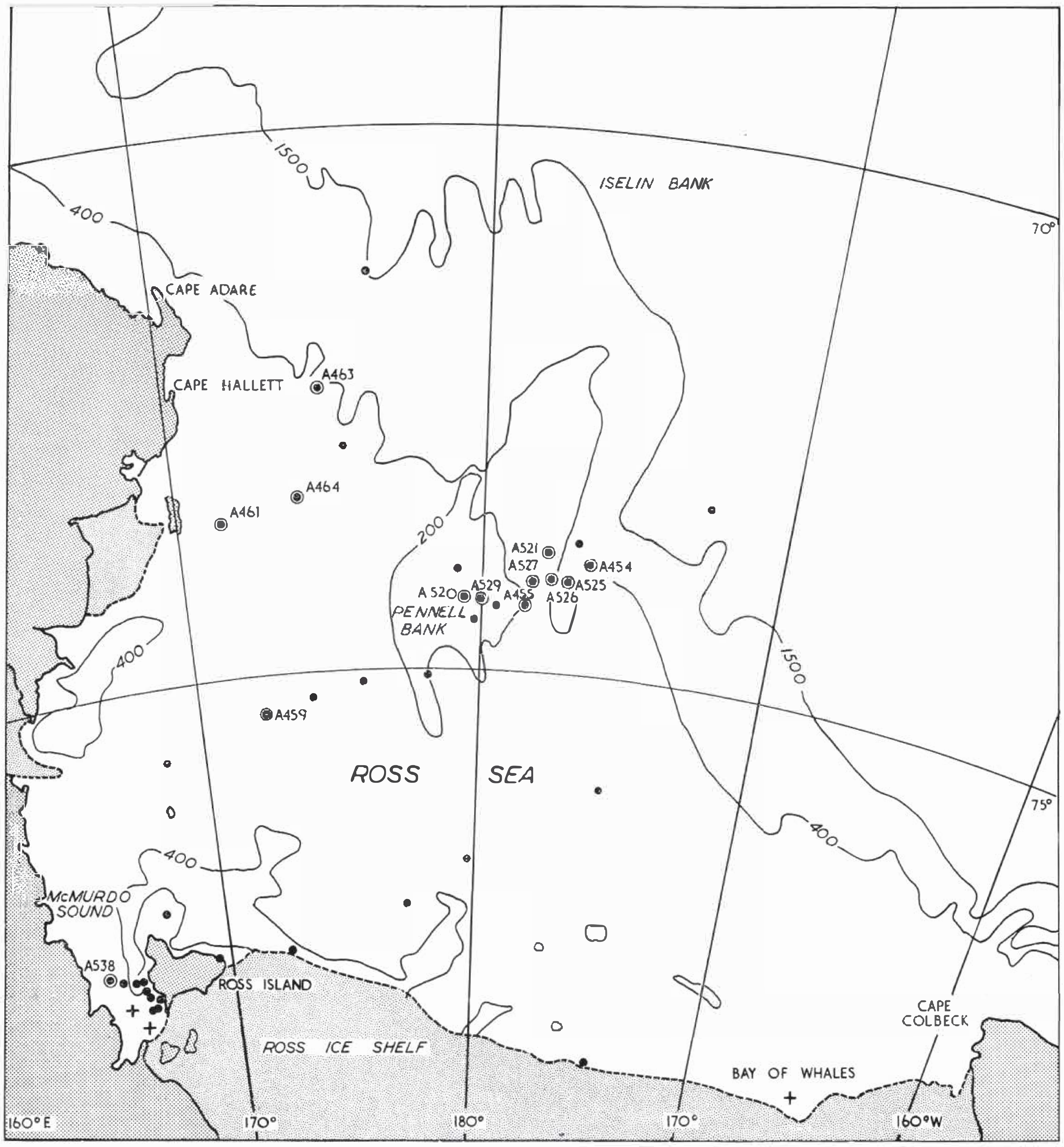

Fig. 1: Distribution of collecting stations in the Ross Sea. Those occupied by the New Zealand Oceanographic Institute, HMNZS *Endeavour* are indicated by a solid circle. Those solid circles enclosed by an open circle are stations which yielded corals and are identified by station number (see also table 1). Stations occupied by the British Museum (Natural History) *Terra Nova* Expedition are indicated by crosses.

Scleractinian Corals from the Ross Sea

DONALD F. SQUIRES
The American Museum of Natural History*

INTRODUCTION

The collections of marine invertebrates made in the course of the Ross Sea oceanographic survey during 1959–60 by the New Zealand Oceanographic Institute are of considerable importance, for they represent one of the more intensive faunal surveys to be conducted in the Antarctic. As a result of these collections, the scleractinian fauna of the Ross Sea is now known to include all but two species of described Antarctic corals, and much new information is available concerning the distribution and habitat of this circumpolar fauna of solitary corals.

Scleractinia were recovered from 13 of the 41 stations from which benthonic faunas were obtained (fig. 1). From these stations 254 specimens (96 taken alive, 158 dead) were studied and assigned to four species: *Caryophyllia antarctica* von Marenzeller, *Flabellum impensum*, n. sp., *F. antarcticum* (Gravier), and *Gardineria antarctica* Gardiner. Pertinent station data are given in table 1 for those stations from which corals were recovered. For further data see Bullivant (1959a, 1959b).

Four previous collections of corals have been made from within the area of the Ross Dependency, from stations occupied by the British Antarctic (*Terra Nova*) Expedition of 1910. Gardiner (1929) recorded four species in his report on these collections: *G. antarctica* Gardiner, *G. lilliei* Gardiner (from off Oates Land, not properly the Ross Sea), *Thecopsammia* sp.?, *Balanophyllia* sp.? [*sic.*] Of these, only *G. antarctica* was recollected in the course of the present survey. Data for the *Terra Nova* collections are given in table 2, and the position of the stations is indicated on fig. 1. Other literature mentioning the Ross Sea Scleractinia includes a summary of coelenterate distribution by Ralph (1956) listing the species previously identified by Gardiner (1929).

Wells (1958), in his comprehensive discussion of the Antarctic fauna, gives all previous records and defines the Antarctic circumpolar coral fauna as including the following species: *Flabellum thouarsii* Milne-Edwards and Haime, *F. antarcticum* (Gravier), *C. antarctica* von Marenzeller, *G. antarctica* Gardiner, *G. lilliei* Gardiner, *Fungiacyathus symmetricus* (Pourtalès), *Balanophyllia* sp. Gardiner, *Thecopsammia* sp. Gardiner.

As a result of this and other studies of Antarctic *Flabellum*, (Squires, 1961), the Antarctic species previously referred to by authors as *F. thouarsii* is considered as a new species, *F. impensum*. The species of dendrophylliid coral referred to as *Thecopsammia* and *Balanophyllia* by Gardiner (1929) is here described as *Balanophyllia chnous*. As presently understood, the Ross Sea Scleractinia lack only *Fungiacyathus symmetricus* and *G. lilliei* of the Antarctic circumpolar fauna, but include *B. chnous* as an apparently endemic element.

KEY TO GENERA OF SCLERACTINIA FROM THE ROSS SEA

A. Corallum lacking conspicuous columella or pali . . . . **Flabellum**
  1. Corallum compressed, calice oval . . . . **F. impensum**
  2. Corallum tall, narrow, circular in section . . . . . . **F. antarcticum**

B. Corallum possessing columella with a single circlet of pali **Caryophyllia**
  1. Pali number 12-18 . . . . **C. antarctica**

C. Corallum with paliform lobes mingling to form a pseudocolumella . . . . **Gardineria**
  1. Usually with 48 septa, wall thick, corallum moderately large . . . . **G. antarctica**
  2. Usually less than 34 septa, wall thin, corallum small . . . . **G. lilliei**

D. Septa not straight, but joining before the columella.
  1. Wall porous, epitheca present or absent . . . . **Balanophyllia chnous**

---

*Present address: Division of Marine Invertebrates. Smithsonian Institute, Washington 25, D.C.

Inset 2*

ACKNOWLEDGMENTS

It is a pleasure to thank the members of the New Zealand Oceanographic Institute for their aid and cooperation during the course of this study. I am grateful to Mr James Brodie and Mr John Bullivant in particular, for permitting me to work upon the collection and for supervising the final drafting of the figures. The study was begun during the tenure of a Fulbright Research Fellowship to the New Zealand Geological Survey; I am grateful to its Director, Mr R. W. Willett, and his staff for facilities and courtesies extended.

Many of the measurements of specimens, and all of the statistical data are the result of the careful work of Miss Penelope Davis, of New York, who also prepared the preliminary drafts of the text figures. Photographs of the specimens illustrated here were made by Mr G. R. Adlington, American Museum of Natural History.

I am grateful to Dr W. J. Rees of the British Museum (Natural History) for permission to borrow specimens of caryophyllid and balanophyllid corals collected by the *Terra Nova* and *Discovery* expeditions.

TABLE 1—STATION LIST, ROSS SEA OCEANOGRAPHIC SURVEY SCLERACTINIAN COLLECTIONS

N.Z.O.I. *Station Number*	*Position* [1]	*Depth (m)*	*Nature of Bottom*	*Scleractinia Collected*	*Number of Specimens*
A 454	73° 56′ S 176° 30′ W	914–828	Rocks	*Flabellum impensum*	1 living, 2 dead.
A 455	74° 22′ S 178° 35′ W	322–340	Stones, muddy sand	*F. impensum* *F. antarcticum*	1 dead. 4 living.
A 459	75° 17′ S 172° 20′ E	534–549	Soft mud	*F. impensum*	1 living.
A 461	73° 32′ S 171° 22′ E	578–567	Sandy mud	*F. impensum*	9 living.
A 463	72° 20′ S 174° 50′ E	468–465	Barnacle plates	*F. impensum*	1 living, 16 dead.
A 464	73° 20′ S 174° 00′ E	369–384	Sand, pebbles	*F. impensum* *Caryophyllia antarctica* *F. antarcticum*	4 living, 15 dead. 1 living, 1 dead. 1 living.
A 520	74° 20′ S 179° 30′ E	201–205	Stones and sandy mud	*F. impensum*	1 living.
A 521	73° 54′ S 177° 44′ W	582–558	Stones with mud	*C. antarctica* *F. impensum* *F. antarcticum* *Gardineria antarctica* Indeterminate corals	5 living, 8 dead. 1 living, 7 dead. 1 living, 5 dead. 52 living, 89 dead. 6 dead.
A 525	74° 09′ S 177° 16′ W	591–583	Stones	*F. impensum* *G. antarctica* Fragments of coral	3 dead. 3 living, 2 dead.
A 526	74° 07′ S 177° 41′ W	461–465	Stones	*G. antarctica*	8 living.
A 527	74° 10′ S 178° 17′ W	358–337	Stones	*F. impensum* *C. antarctica*	1 living. 2 dead.
A 529	74° 20′ S 179° 55′ W	205–216	Stones	*F. impensum*	1 living.
A 538	77° 30′ 36″ S 164° 37′ E	269–348–256	Sand and stones	*C. antarctica* *G. antarctica*	1 living. 1 dead.

[1]When beginning and ending positions for trawls have been given in Station Lists (Bullivant, pers. comm.), only the beginning position has been cited here. All depths are uncorrected sonic depths based on a speed of sound in water of 1,500 m./sec.

TABLE 2—STATION DATA FOR SCLERACTINIA COLLECTED BY THE *Terra Nova* EXPEDITION FROM THE ROSS SEA

Station Number	*Locality*	*Depth (m)*	*Species*
314	Near Inaccessible Island, McMurdo Sound	405–440	*Gardineria antarctica* 4 specimens
349	McMurdo Sound	146	*G. antarctica* 3 specimens
191	Bay of Whales, Ross Sea	355–457	*Balanophyllia* ? sp. 3 specimens *Thecopsammia* ? sp. 3 specimens
194	Off Oates Land	329–366	*G. lilliei* 6 specimens

DISTRIBUTION OF SCLERACTINIA

Because of the reasonably complete sampling of the Ross Sea made by the New Zealand Oceanographic Institute, it is possible to conclude that corals occur chiefly in three general areas of the Ross Sea: (1) near the edge of the Ross Ice Shelf, particularly in McMurdo Sound; (2) the Cape Hallett region; and (3) on Pennell Bank. In the first-mentioned area, along the ice shelf, local populations of *G. antarctica* are found, but numbers of individuals are small. A single specimen of *C. antarctica* was encountered at Station A 538, together with *G. antarctica*. Further along the Ross Shelf at the Bay of Whales, the *Terra Nova* expedition dredged six specimens of *B. clinous*, the only locality from which the species is known. Although a faunule of three species of Scleractinia hardly warrants use of the term diverse, it nonetheless represents half the variety of corals present in the Antarctic. *G. antarctica* is definitely the most characteristic member of the fauna, and the significance of its occurrence along the ice front, in relation to corals in fossil associations, is discussed below.

Three stations (A 461, A 463, A 464) off Cape Hallett yielded only *F. impensum*. Population densities there, although low, are comparatively higher than those along the ice front. Sediments off Cape Hallett are generally finer in texture than those from the other coral localities. To the south of Cape Hallett at Station A 459 a single specimen of *F. impensum* was taken alive from a soft mud substrate. Although data on distribution of corals and bottom sediment textures in the Ross Sea are all too scant for postulation of relationships, it has been shown that on the Patagonian Shelf (Squires, 1961), preference for certain sediment grades is demonstrated by species of *Flabellum*. As its larvae settle upon stones in the mud *F. impensum* may be more tolerant than other species of mud conditions, which may restrict the fauna of this region. Largest populations and greatest diversity of Scleractinia were encountered on the Pennell Bank. Station A 521 establishes some sort of record for Antarctic faunas by containing 141 specimens of *G. antarctica* plus 33 other specimens belonging to three species. This is the greatest number of corals recorded from a single station in the Antarctic. Other stations on the Pennell Bank, although without the prolific number of corals of A 521, yielded large populations.

As might be expected, depth ranges of Antarctic species are greater than those of similar species in warmer waters, as many species extend deeper than the shelf on to the slope. Ekman (1953, p. 214) noted that this was true of other Antarctic invertebrates, stating ". . . the greater part of the fauna of the shelf shows an inclination to descend also below this [200 m] depth, an inclination which is

TABLE 3—ABUNDANCE AND DIVERSITY OF SCLERACTINIA DREDGED FROM N.Z. OCEANOGRAPHIC INSTITUTE STATIONS IN THE ROSS SEA

N.Z.O.I. Stations	*Depth (m)*	*Number of Specimens* Dead	Alive	Total	*Number of Species*	*Substrate*
A 454	828–914	2	1	3	1	Rock.
A 455	322–340	1	4	5	2	Stones and sand.
A 459	534–549	0	1	1	1	Mud.
A 461	567–578	0	9	9	1	Sandy mud.
A 463	465–468	6	1	7	1	Barnacle plates.
A 464	369–384	16	6	22	3	Stones and mud.
A 520	201–205	0	1	1	1	Stones and mud.
A 521	582–588	115	57	172	4	Stones and mud.
A 525	583–591	5	3	8	2	Stones.
A 526	461–465	0	8	8	1	Stones.
A 527	337–358	2	1	3	2	Stones.
A 529	205–216	0	1	1	1	Stones.
A 538	256–348	1	1	2	2	Sand and stones.

TABLE 4—RELATIVE ABUNDANCE OF SCLERACTINIA IN VARIOUS AREAS OF THE ROSS SEA AS SHOWN BY DREDGING OPERATIONS

Area[1]	*Number of Dredgings* Total	*With Coral*	*Percentage of Dredgings Taking Coral*	*Number of Specimens* Dead	*Alive*	*Total*	*Number of Species*
Pennell Bank ..	12	8	75%	125	76	201	4
Cape Hallett ..	8	3	38%	22	16	38	3
McMurdo Sound[2] ..	9	3	33%	4	5	9	2

[1]See text for definition of areas.
[2]Includes two *Terra Nova* stations.

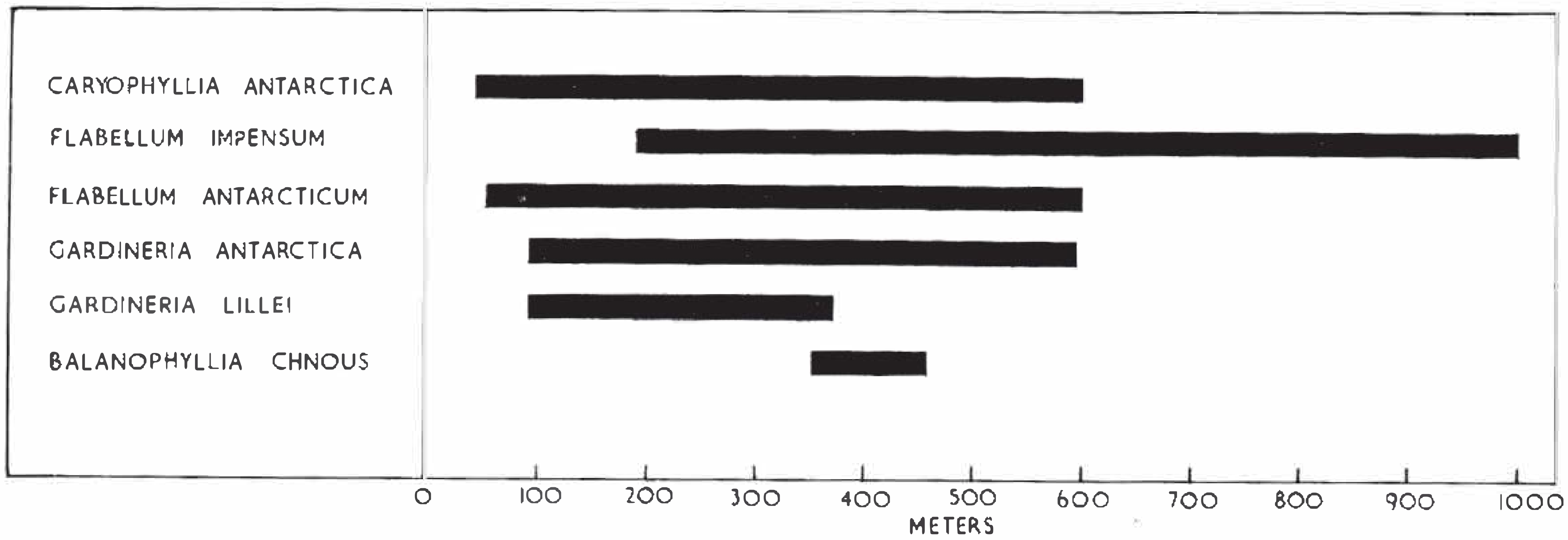

Fig. 2: Depth distribution of Ross Sea Scleractinia. Depths are cited in metres. Ranges shown are for all occurrences in the Antarctic.

more pronounced in the cold-water regions of the Southern Oceans than is usually the case". The least well known of the species have the more restricted depth range, more probably an expression of ignorance than actual fact. Depth distributions for the species of the Ross Sea are given in fig. 2.

Measurement of the abundance of benthonic faunas sampled by bottom dredgings is very difficult because of many necessary suppositions, but in a relative way can show proportions. Tables 3 and 4 show relative abundance of coral specimens from each of the dredge hauls, the latter being grouped according to the areas outlined above. Scleractinia were obtained from 13 of the 35 dredging stations occupied from the *Endeavour* for a recovery of 37%, a figure about comparable to the results of the *Terra Nova* dredgings. In a very general way, this reflects the distribution of corals in the Ross Sea.

ANTARCTIC DISTRIBUTION

Wells (1958) has summarised the distribution of Scleractinia from the Antarctic. Fig. 3 illustrates the distribution of the Antarctic corals. It is of some interest that the present collections complete a distributional picture surmised from earlier records, and strengthen concepts of a strongly cohesive circumpolar fauna. The Antarctic corals are almost totally endemic, with the single exception of the cosmopolitan species *Fungiacyathus symmetricus*, and, as a fauna, extend furthest north (55° S latitude) and meet northern faunas chiefly in the region of Grahamland (Palmer Peninsula) (Wells, 1958; Squires, 1961).

Relationships between species in Antarctic waters and those of the Southern Ocean are largely unknown because of the need for review of many of the species of the latter fauna. Many descriptions of the Southern Ocean corals are systematically broad and indicate little in the way of zoogeographic relationships, although it is obvious that species from both regions are closely related. However, some general comparisons can be made. *Gardineria*, probably as common as any of the Antarctic Scleractinia, is widely distributed, occurring in the Southern Ocean (Cape of Good Hope), the Indo-Pacific (Hawaii and the Philippines), and the Atlantic (West Indies). The only fossil record of the species is from the Antarctic, where it occurs in beds possibly as old as Pliocene. Its consistent occurrence in raised moraines suggests, as is discussed below, that this species may be among the first of the modern coral faunas of the Antarctic.

Flabellum impensum, n. sp., is unfortunately historically linked with *F. thouarsii* and *F. curvatum* from the Patagonian shelf, with which it was confused for many years. There are many morphological similarities within this species group, which also includes *F. rubrum* (s.s.) from New Zealand. In addition, most species of the group remain attached to the substrate throughout their life. A table of comparisons of the various members of the *F. rubrum* groups, particularly characteristic of the Southern Ocean and Antarctica, is given (table 5). It is necessary to qualify that *F. rubrum* has been used very broadly in the past and includes, as generally used, members of the *F. stokesii*

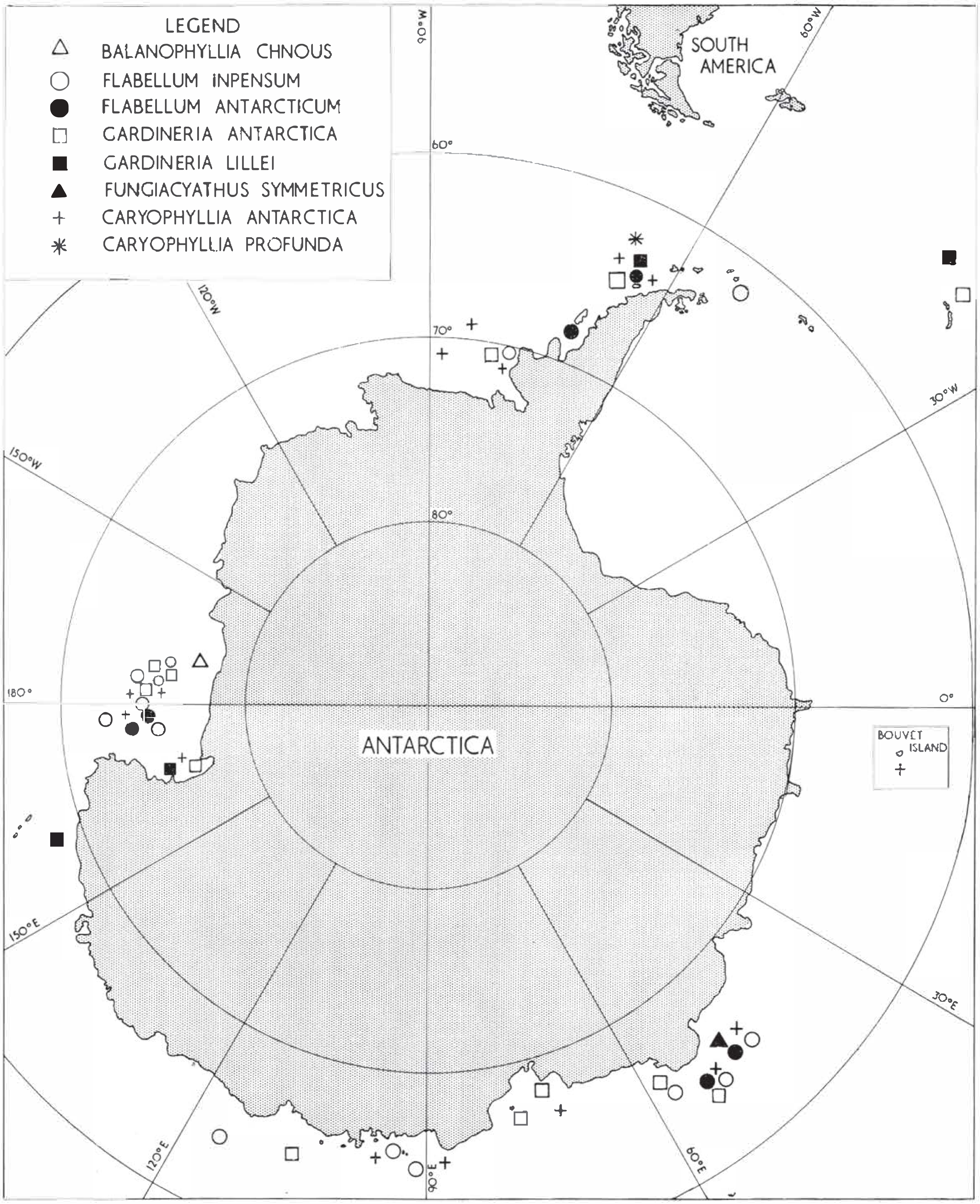

Fig. 3: Distribution of species comprising the Antarctic circumpolar fauna. Position of symbols for various species is approximate.

complex of the tropical Pacific. Wells (1958) has already called attention to the similarities between *F. antarcticum* and *F. gracile* Studer from New Zealand and *F. serpuliforme* Gravier from the North Atlantic. In addition to similarities in general form, there is concurrence in that none are very abundant where collected. The irregular serpuliform corallum is environmentally induced, but the tall, narrowly conical shape and fine, nearly smooth septa relate the forms in appearance, and possibly taxonomically.

Caryophyllia antarctica is a member of the *C. clavus* group, an artificial species group nearly world wide in distribution. Affinities and derivation of *C. antarctica* cannot be stated until a restudy of this group is made. Gardiner (1939) referred to three species of *Caryophyllia* taken from the Antarctic from off the Palmer Peninsula. Gardiner (1939, p. 332) identified as *C. mabahithi* three specimens from *Discovery* Station 182, but these are considered here to be immature *C. antarctica* because of their size relationships, septal number and palar numbers (see fig. 4, 5). Gardiner (1939, p. 331) referred to *C. arcuata* from *Discovery* Station 190, but the specimens are clearly *C. antarctica* and are discussed below in greater detail. From *Discovery* Stations 190 and 399, the latter being Gough Island, were specimens (Gardiner, 1939, p. 330) referred to *C. cyathus* (E. and S.). I would consider these to be *C. profunda* rather than *C. cyathus*, but Gardiner was following the work of von Marenzeller (1904) who recognized *C. cyathus*, *C. arcuata*, and *C. profunda* as similar but distinct species. A study of a few specimens attached to a cable off Norfolk

TABLE 5—COMPARISON OF CORALLUM MORPHOLOGY OF SEVERAL SPECIES OF *Flabellum* FROM THE SOUTHERN OCEAN AND ADJACENT SEAS

	F. impensum	*F. thouarsii*	*F. curvatum*	*F. antarcticum*	*F. rubrum*
Size	Large	Small to medium	Medium to large	Medium	Medium
Profile	Expanded	Unevenly expanded	Irregular	Nearly conical	Expanded
Height	Tall	Short	Tall	Tall	Medium
Calice cross section	Ovate	Ovate	Ovate	Subcircular	Ovate
Wall Thickness	Very thin	Thin	Thick	Thick	Thick
Pedicel Diameter	Large	Medium	Medium	Large	Small
Septal notch	Slight	Slight	Strong	None	None
Septal granulations	Dense spinose	Dense pointed	Sparse fine	Dense finely spinose	Coarse
Proximal edge of septum	Straight	Wavy	Nearly straight	Straight	Straight
Proximal Thickening	None	Strong	Slight	None	Strong
Number of Cycles	6 plus	4 plus	Nearly 5	About 4	5 plus

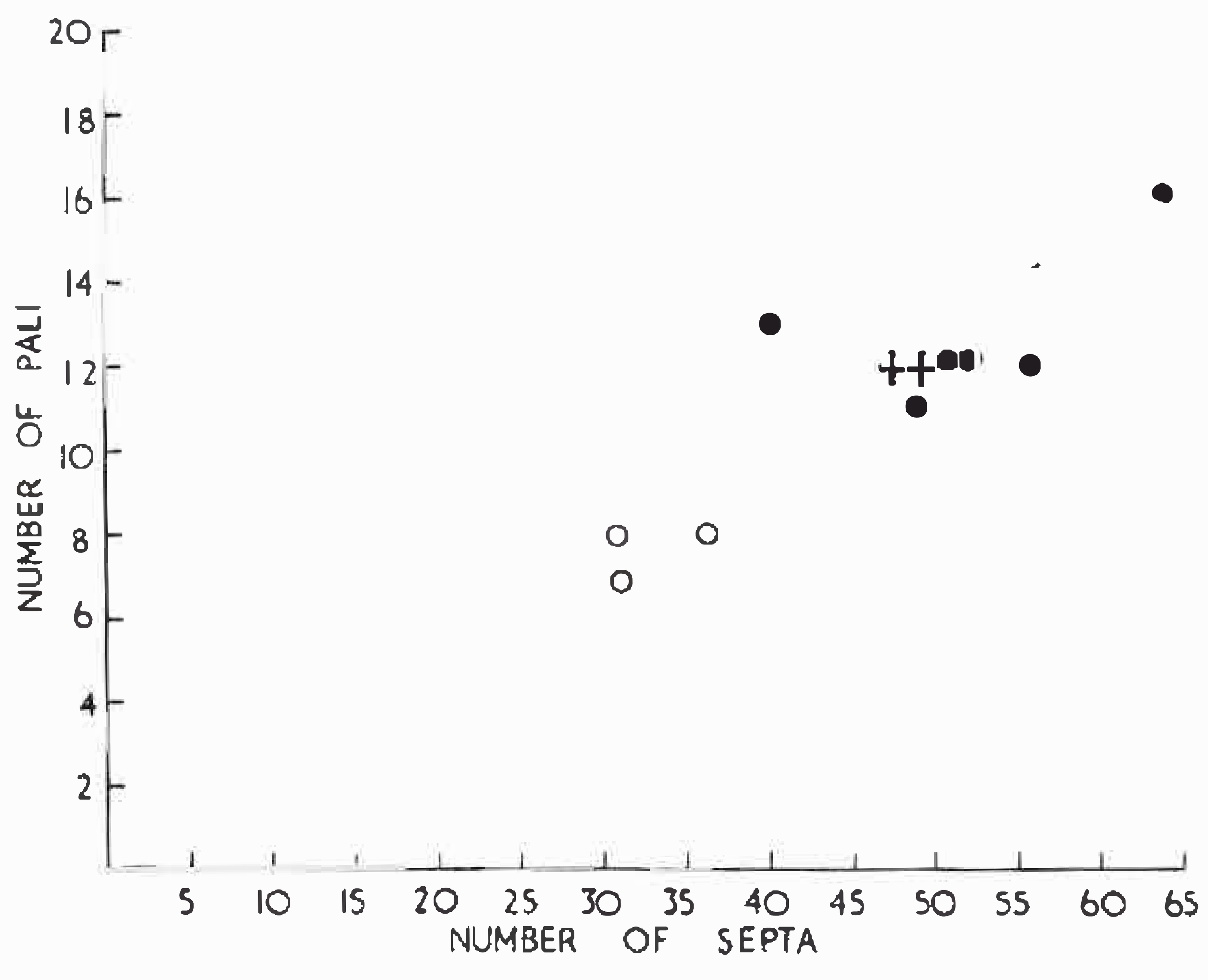

Fig. 4: Relationship between number of pali and number of septa of various Antarctic species of *Caryophyllia*. Solid circles refer to specimens of *C. antarcticum* from the Ross Sea region, open circles to specimens identified by Gardiner (1939) as *C. mabahithi*, and crosses to specimens of *C. arcuata* identified by Gardiner (1939). Measurements in millimetres.

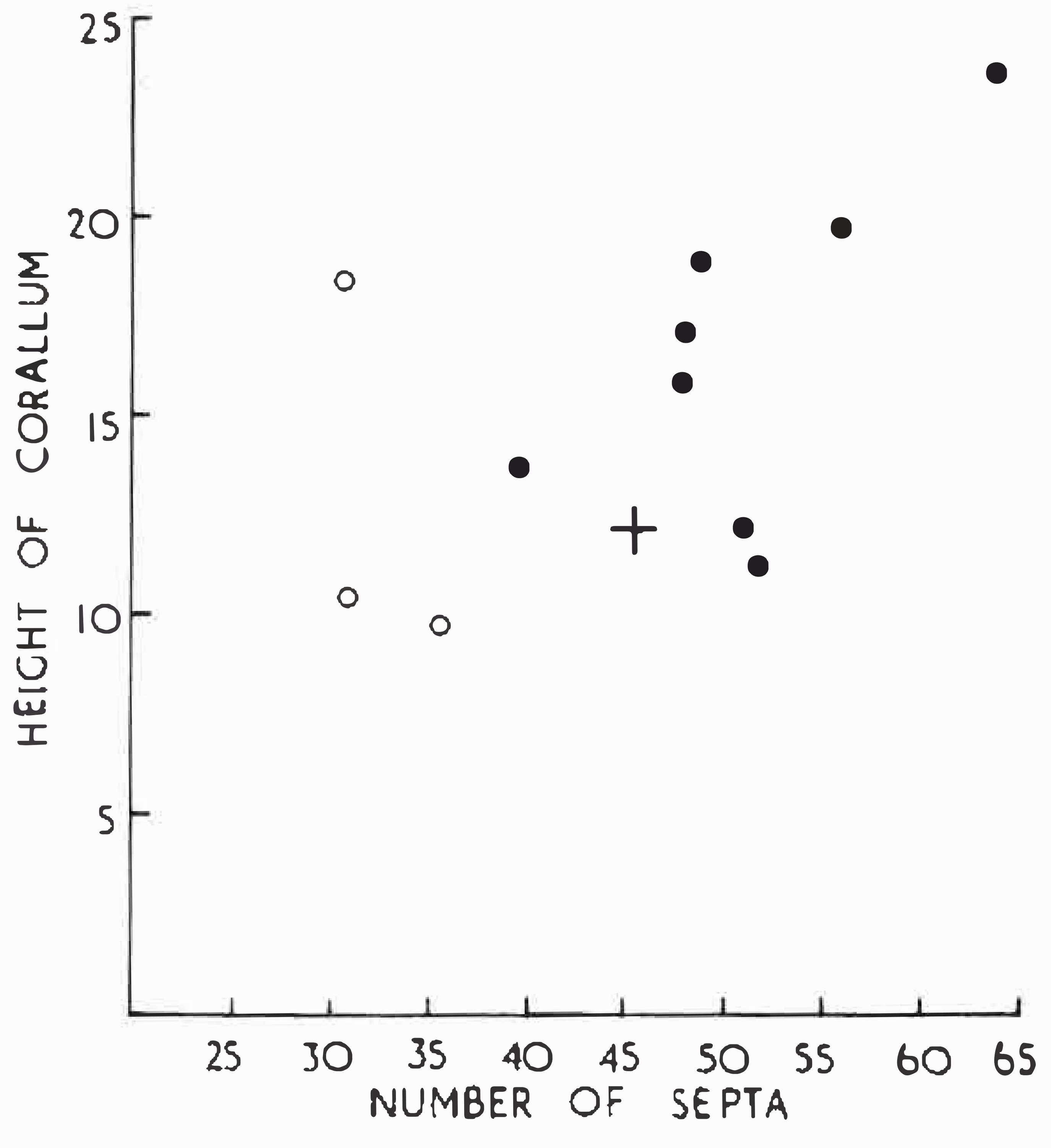

Fig. 5: Relationships between height of corallum and number of septa in various species of Antarctic *Caryophyllia*. Symbols as for fig. 4. Measurements in millimetres.

Island (Squires, 1960) as well as specimens from New Zealand (Ralph and Squires, 1962) has convinced me that there is considerable range in appearance of the corallum as a result of senescence. Pending a revision of the Southern Ocean *Caryophyllia*, I would prefer to include the specimens of Gardiner in *C. profunda*, rather than in some other species having a greater geographic range. *C. profunda*, which is found in many regions of the Southern Ocean (Squires, 1960) is the only element of the Southern Ocean fauna known to extend into the Antarctic.

At the present time, all evidence suggests that the Antarctic Scleractinian fauna, in addition to being circumpolar, is extremely homogenous. Too few populations of corals have been studied in this region, as most collections are too small, to permit the recognition of possible clines. The remarkable nature of the Antarctic environment would be conducive to the recognition of morphological gradients, should they exist. Great gaps in the explored areas of the Antarctic shelf, such as the Weddell Sea, will apparently not contribute greatly to known faunal diversity.

OCCURRENCES OF CORALS IN MORAINES AND RAISED DEPOSITS

Scleractinian corals are a not uncommon constituent of the fossil faunas of the Ross Sea Region. Mr I. G. Speden, New Zealand Geological Survey (Speden, 1962), graciously provided the following list of occurrences (table 6). It is particularly significant that the coral occurring in all instances is *Gardineria antarctica*, as the same species is commonly dredged from the near shore regions of the ice shelf. Little, if anything, is known of the shallow-water faunas beneath the ice shelf; that life exists there is indisputable, but collections and/or systematic lists of this fauna are not known to me. The closest approach to a statement concerning the minimum depth of occurrences of corals is that made by Murray (in Shackelton, 1909, pp. 265–6), who states that corals and other invertebrates have been collected from depths of 6 to 20 fm off Cape Royds. In all probability *Gardineria* and *Balanophyllia* constitute a portion of this fauna, accounting for the occurrence of the former in the raised deposits.

Gardineria occurs not only in the "upper Pleistocene" deposits characterised by the presence of the pecten *Adamussium colbecki* (Smith) but also in Pliocene – Lower Pleistocene conglomerates associated with *Chlamys* (*Zygochlamys*) *anderssoni* (Hennig). Speden (1962) has shown that the shells of the older fossils are massive in comparison with those of the younger fossil beds. This is well illustrated in the case of *Gardineria* (cf. Speden, 1962, fig. 11) in which the walls are approximately four times as thick as in specimens living in the Antarctic today. If one makes comparisons between presumably related species, as, say, *Flabellum rubrum*, *F. thouarsii*, and *F. impensum*, one finds that the thickness of wall, thickness of septa, and infilling of inter-trabecular spaces decrease with the lowering of temperature. On the other hand, thickness of wall and stoutness of corallum in general seem to increase from the tropics southward to the Antarctic in the case of *Gardineria*, as represented by the species *G. hawaiiensis* and *G. antarctica*. As a result of these conflicting trends, it is impossible as yet to generalise a relationship between carbonate deposition by *Gardineria* and temperature of the environment. The thickness of wall in fossil specimens of *G. antarctica*, then, remains somewhat of an anomaly.

TABLE 6—OCCURRENCE OF CORALS IN TERMINAL MORAINES OR RAISED DEPOSITS IN THE ROSS DEPENDENCY (DATA LARGELY FROM SPEDEN, 1962).

Species	
Gardineria antarctica	Backstairs Passage, south of Mount Larsen. David and Priestley (1914, p. 266, pl. 88, figs. 4, 5), Gardiner (1929, p. 124). Ident. J. S. Gardiner. Age: Upper Pleistocene-Subrecent.
Solitary coral ..	Lower Koettlitz Glacier, 1 mile from westernmost Dailey Island, McMurdo Sound. Debenham (1920, p. 57). Associated with silicious sponge spicules. Age: Upper Pleistocene-Subrecent.
G. antarctica ..	Glaciers, 30 ft above sea level, Evans Cove, Victoria Land. Gardiner (1929, p. 124). Ident. J. S. Gardiner. Age: U. Pleistocene-Subrecent.
G. antarctica ..	North-eastern end of White Island, Ross Archipelago, N.Z.G.S. Loc. GS 7512. Coll. I. G. Speden, A. C. Beck, Dec 22, 1958. Ident. D. F. Squires. Age: Pliocene-L. Pleistocene.
Gardineria sp. .. (Stem fragments)	Near Cape Bird U.S. Navy Hydrographic Office Survey Station, N.Z.G.S. Loc. GS 7516. Coll. H. J. Harrington, E. B. Fitzgerald, and C. Johnson, Jan 27, 1959: Ident. D. F. Squires. Age: Pliocene-L. Pleistocene.
G. antarctica ..	North side of Minna Bluff Saddle, at sea level, N.Z.G.S. Loc. GS 7506. Coll. H. J. Harrington, E. B. Fitzgerald, Dec 26, 1958. Ident. D. F. Squires. Age: Upper Pleistocene-Subrecent.

SYSTEMATICS

Family CARYOPHYLLIIDAE

Subfamily CARYOPHYLLIINAE

Genus **Caryophyllia** Lamarck, 1801

Caryophyllia antarctica von Marenzeller 1904 (pl. 1, figs. 11, 12, 15, 16.)

Caryophyllia antarctica von Marenzeller, 1903, Res. Voy. S. Y. *Belgica*, Zool., Madreporaria and Hydrocorallia, p. 1, (nom. nud.); von Marenzeller, 1904, Wissensch. Ergebn. deutschen Tiefsee-Exped., Bd. 1, Lf. 3, p. 293, pl. 16, figs. 7, 7a–d; Pax, 1910, Deutsche Südpolar-Exped. Bd. 12, Zool. p. 65, pl. 11, fig. 1; Gravier, 1914, Deuxième Expéd. Ant. Francaise, Madrép., p. 129, pl. 1, figs. 7, 8; Wells, 1958, B.A.N.Z. Antarctica Res. Exped. 1929–31, Repts., Ser. B, Vol. 6, Pt. 11, p. 267, pl. 2, figs. 3, 4.

Caryophyllia clavus Scacchi, Thomson and Rennet, 1931, Australasian Ant. Exped. 1914, Sci. Reps., Ser. C, Vol. 9, pt. 3, p. 40.

Caryophyllia arcuata (Milne-Edwards and Haime), Gardiner, 1939, *Discovery* Repts., Vol. 18, p. 331.

? *Caryophyllia mabahithi* Gardiner and Waugh, Gardiner, 1939, *Discovery* Repts., Vol. 18, p. 332.

Specimens of this species were taken in two trawls, A 464 and A 521. Measurements of the coralla are given in table 7. Fragments of coralla of this species can be mistaken for *F. antarcticum* in hasty sorting, but are readily differentiated from the latter by the absence of an epitheca and the presence of flat-topped spines on the septa of *C. antarctica*. The variable form of the corallum is of considerable interest and has been well portrayed by Marenzeller (1904). Particularly characteristic of the species is the ornamentation of the septa, on the sides of which are raised bars or ridges more or less parallel to the upper edge of the septum, although the raised area of third cycle septa may simply be a blister or warping of the septum. Surmounting the ridges or folding are numerous spines, erected at right angles to the surface of the septum, which are characteristically flat or square on the top, rather than pointed or rounded. This separates the species clearly from other Antarctic forms and, apparently, from other *Caryophyllia*.

Specimens of *Caryophyllia arcuata* and *C. mabahithi* recorded from the Antarctic by Gardiner (1939) have been examined, and the opportunity is taken here to illustrate them. *C. arcuata* of Gardiner is considered by the present author to be

TABLE 7—MEASUREMENTS (IN MILLIMETRES) OF SPECIMENS OF *Caryophyllia antarctica* VON MARENZELLER

N.Z.O.I. Station	*Height*	*Maximum Diameter*	*Minimum Diameter*	*Number of Septa*	*Number of Pali*	*Pedicel Diameter*	*Condition*
A 464	17·3	11·9	11·9	48	12	–	Alive.
A 464	23·6	27·3	26·1	64	16	–	Dead.
A 521	20·0	15·1	–	56	12	4·3	Dead.
A 521	19·0	14·3	12·4	49	11	2·9	Dead.
A 521	19·4	–	–	–	–	2·8	Alive.
A 521	20·0	–	–	–	–	2·4	–
A 521	16·0	–	–	48	12	4·0	Alive.
A 521	24·1	13·4	–	–	–	3·0	Dead.
A 521	11·4	9·8	7·8	52	12	2·5	Alive.
A 521	12·4	10·2	–	51	12	3·1	Dead.
A 521	–	–	–	47	12	4·7	Dead.
A 521	13·8	10·1	–	40	–	3·2	Dead.
A 521	10·8	10·4	8·9	–	13	3·0	Alive.
A 521	11·9	9·4	8·5	–	–	3·4	Alive.
Caryophyllia arcuata Gardiner 1939 [= *C. antarcticum* von Marenzeller][1]							
1939–7–20–244	12·4	17·6	16·6	48	12	4·8	Alive.
1939–7–20–245	–	15·0	14·8	49	12	–	Alive.
Caryophyllia mabahithi Gardiner 1939 [? = *C. antarcticum* von Marenzeller][1]							
1939–7–20–246	8·6	9·3	8·3	31	7	1·6	Dead.
1939–7–20–247	9·8	11·0	9·4	36	8	1·5	Alive.
1939–7–20–248	10·6	10·3	9·4	31	8	1·4	Alive.

[1]Specimens from the British Museum (Natural History) are cited by catalogue numbers.

C. antarcticum, as the ornamentation of the septa sets the two species apart, and Gardiner's materials have flat-topped septal spines. Specimens assigned to *C. mabahithi* by Gardiner (1939, p. 332) are not so easily disposed of. They appear not to be *C. mabahithi* Gardiner and Waugh, except for a general correspondence in size of corallum and in palar number. Gardiner and Waugh (1939, p. 178) state that the septa of *C. mabahithi* are studded with low spines or granules, while septal spines of specimens from the Antarctic are long and rather sharply pointed. Septa of the first and second cycles are evenly exsert in the specimens from the Antarctic, not differentially, as in the original description. Antarctic specimens referred to *C. mabahithi* differ from typical *C. antarctica* in having a smaller pedicel, a smaller cornute corallum, and the pointed, unwarped character of the septa. In regard to pedicel size, the pedicel of *C. antarctica* is usually greatly thickened by addition of stereome, but broken specimens show an original diameter of 2·5 mm or more. The form of the corallum can, of course, be greatly altered by local factors of the environment, but may in this instance, when it is coupled with other morphological characters, be of significance. I have provisionally considered these specimens to be immature *C. antarcticum*, but they may actually represent a new species. Relationships between these specimens and *C. antarcticum* in certain characters are shown in fig. 4, 5 and are suggestive of the specimens being immature *C. antarcticum*.

Occurrence

Bellingshausen Sea, 450–500 m (*Belgica*); off Bouvet Island, 567 m (*Valdivia*); off Gaussberg, 46–170 m (*Gauss*); Bellingshausen Sea, 460 m (*Pourquoi-Pas?*); off Queen Mary Coast, 600 m (Australasian Antarct.); Palmer Archipelago, 315 m (*Discovery*); Ross Sea, 256–582 m (*Endeavour*); ? Palmer Archipelago, 278 m (*Discovery*) [*C. mabahithi*]; Valdivia Sea, 193–300 m (*Discovery*).

Family FLABELLIDAE

Subfamily FLABELLINAE

Genus **Flabellum** Lesson 1831

Flabellum impensum n. sp. (pl. 2, fig. 4–7)

Flabellum inconstans von Marenzeller, Pax, 1910, Deutsche Südpolar-Exped. Bd. 12, Zool., p. 66, pl. 11, figs. 3–9, pl. 12, figs. 1–6.
Flabellum thouarsii Milne-Edwards and Haime, Gravier, 1914, Deuxième Expéd. Ant. Francaise, p. 125, pl. 1, figs. 5, 6. Wells, 1958, B.A.N.Z. Antarctic Res. Exped. 1929–1931, Repts. Ser. B., Vol. 6, pt. 11, p. 268, pl. 2, figs. 5–10.
Flabellum curvatum Moseley, Gardiner, 1939, *Discovery* Repts., Vol. 1 18, p. 327, [part].
?*Flabellum harmeri* Gardiner, Gardiner, 1939, *Discovery* Repts., Vol. 18, p. 326.
?*Flabellum transversale* Moseley, Thomson and Rennet 1931, Australasian Ant. Exped., Vol. 9, Pt. 3, p. 41

Description

Corallum large, compressed, with numerous closely spaced septa. Largest specimens have coralla up to 78 mm in height, with calicular dimensions of 100 by 52 mm. Septa may number in excess of 275. The flabelliform corallum arises from a cylindrical pedicel of relatively large diameter. The corallum is usually attached to the substrate throughout the longer portion of the life of the coral. The calice is broadly open, with the septa very slightly notched or concave near the calicular rim in older specimens, then falling convexly and evenly to the columella. Septa of younger specimens are convex from the distal portion at the wall to the columella. Septa are densely granulose laterally, the granules being spinose on septa of the higher cycles, while on lower cycles they tend to coalesce laterally, forming pronounced ridges. Septa are thickened on the proximal margin. When septa are notched, the notch contains a series of sharp-pointed spines on the proximal edge. The columella is deep, poorly formed, often absent, the major septa merely meeting in the center of the calice. The wall is thin, the epitheca being thinly developed, with a chevronate appearance.

TABLE 8—MEASUREMENTS (IN MILLIMETRES) OF TWO POPULATIONS OF *Flabellum impensum*, n. sp., FROM N.Z. OCEANOGRAPHIC INSTITUTE STATIONS A 463, A 464, ROSS SEA

	Height of Corallum	*Maximum Diameter Calice*	*Minimum Diameter Calice*	*Diameter Pedicel*
Station A 463				
Number	15	6	6	13
Range	3·8–71·9	4·3–36·0	4·3–16·4	3·2–4·5
Mean	32·80	21·33	11·08	3·95
Standard deviation	17·06	12·37	4·04	0·44
Station A 464				
Number	14	9	9	16
Range	1·6–91·6	5·0–70·9	5·0–44·0	3·4–6·0
Mean	42·29	31·00	19·67	4·36
Standard deviation	24·78	19·84	11·51	0·77

Measurements of the coralla are given in table 8 and relationships between height of corallum, and maximum diameter of calice, and between maximum and minimum diameters of calice are shown in fig. 6 and 7.

Material Examined

Holotype: New Zealand Oceanographic Institute number 3. Sta. A 464. Ross Sea. 73° 20′ South. 174° 00′ East. Depth 369–384 m. Bottom sediment, sand and pebbles. Collected J. S. Bullivant. January 22, 1959. *Other material:* Three specimens taken alive, 15 dead, from the same station. Forty-three additional specimens from other stations.

Discussion

The most striking characteristic of this species of *Flabellum* is the thinness of the septa. Not only are trabecular teeth conspicuous in the upper distal notch, where it is present, but the proximal edges of septa are, in many instances, dentate to the bottom of the calice, or until proximal thickening becomes conspicuous. In having a dentate septal notch, the species is closely related to the *Flabellum curvatum* and its closely related form, *F. thouarsii* from the Patagonian Shelf (Squires, 1961). In the former there is a well developed, dentate, septal notch, but the septa are much thicker. While *F. impensum* has an average of 19 to 22 septa per centimetre, *F. curvatum* has between 15 and 17 and *F. thouarsii* 18 to 19 septa per centimetre.

In an earlier study (Squires, 1961), I have referred to the increase in size of pedicel of *Flabellum* in waters of decreasing temperature. There is every reason to suspect that such an increase is related to larval size, probably a direct reflection of larger egg size. Features observed in *F. impensum* such as the large size, and apparent reduction of quantity of carbonate in the skeleton as reflected in thinner septa and more pronounced trabecular spines may also be related to physiologic adaptation to low temperatures.

F. impensum belongs to the closely related group of species characterised by *F. rubrum* (s.s.) (see Squires, 1961) of New Zealand which includes also *F. curvatum* and *F. thouarsii*. *F. harmeri*, considered

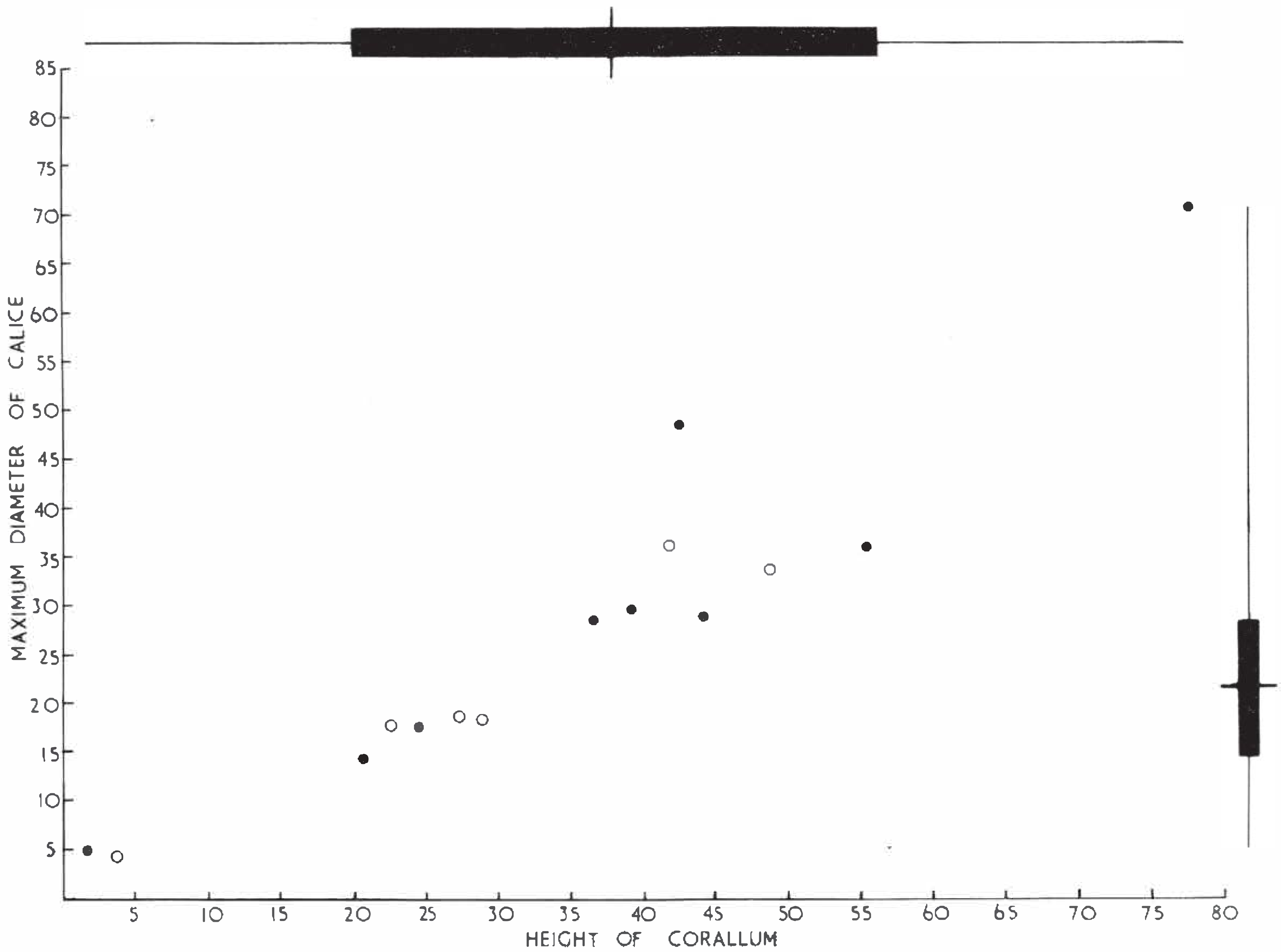

Fig. 6: Relationship between height of corallum and maximum diameter of calice of *Flabellum impensum*. Closed circles represent measurements of specimens from Sta. A 464; open circles, specimens from Sta. A 463. Bar at top illustrates range of variation in height, the mean of the population indicated by the vertical line, the solid bar being one standard deviation in length on either side of the mean. Bar at right illustrates, in the same fashion, these parameters for maximum diameter of calice. Measurements in millimetres.

by Squires (1958) to be a synonym of *F. rubrum* has been recorded by Gardiner (1939) from the Palmer Peninsula, as well as New Zealand and Australia. The specimen from Palmer Peninsula is considered as *F. impensum* tentatively, mainly because of the character of the columella, which is apparently very similar to that found in *F. impensum*.

One of the most interesting features of the species is its rather great bathymetric range. Occurrences off Gaussberg in depths of 46–70 m are countered by the find at the depth of 2,260 m, of one living specimen and fragments of coralla by the B.A.N.Z.A.R.E. (Wells, 1958). Although the range of depth is great, the temperature range encountered through these depths is relatively small.

Occurrence

Schollaert Channel, Palmer Peninsula, 278–500 m (*Discovery*); Bellingshausen Sea, 470 m (*Pourquoi-Pas?*); off Gaussberg, 46–70 m (*Gauss*); off Queen Mary Coast, 600 m (Australasian Antarc.); Valdivia Sea. 193–300 m (*Discovery*); off Queen Mary Coast, 2,260 m (*Discovery*); Ross Sea, 201–914 m (*Endeavour*).

Flabellum antarcticum (Gravier) 1914

Desmophyllum antarcticum Gravier, 1914, Bull. Mus. Hist. Nat. (Paris), Vol. 20, p. 236. Gravier, 1914, Deuxième Expéd. Ant. Francaise, p. 122, pl. 1, figs. 1–4.
Flabellum antarcticum (Gravier) Wells, 1958, B.A.N.Z. Ant. Exped. 1929–1931, Repts. Ser. B., Vol. 6, pt. 11, p. 269, pl. 2, figs. 11–15.

Form of the corallum is the principal difference between this species and the preceding *F. impensum*. Compression is much less pronounced, the septa are somewhat thinner and are fewer in number in *F. antarcticum*. As noted by Wells (1958), the species is similar in habit to *F. serpuliforme* Gravier from the North Atlantic and specimens of *F. gracile* (Studer) from off New Zealand. The latter species has been redescribed and figured by Ralph and Squires (1962). None of the species are common at any locality, usually being represented by a very small number of specimens.

Septa of *F. antarcticum* are thin, wrinkled, and spinose, the spines often being concentrated on ridges along the side of the septa. None of the specimens at hand are sufficiently well preserved to show the details of the proximal edge of the septa.

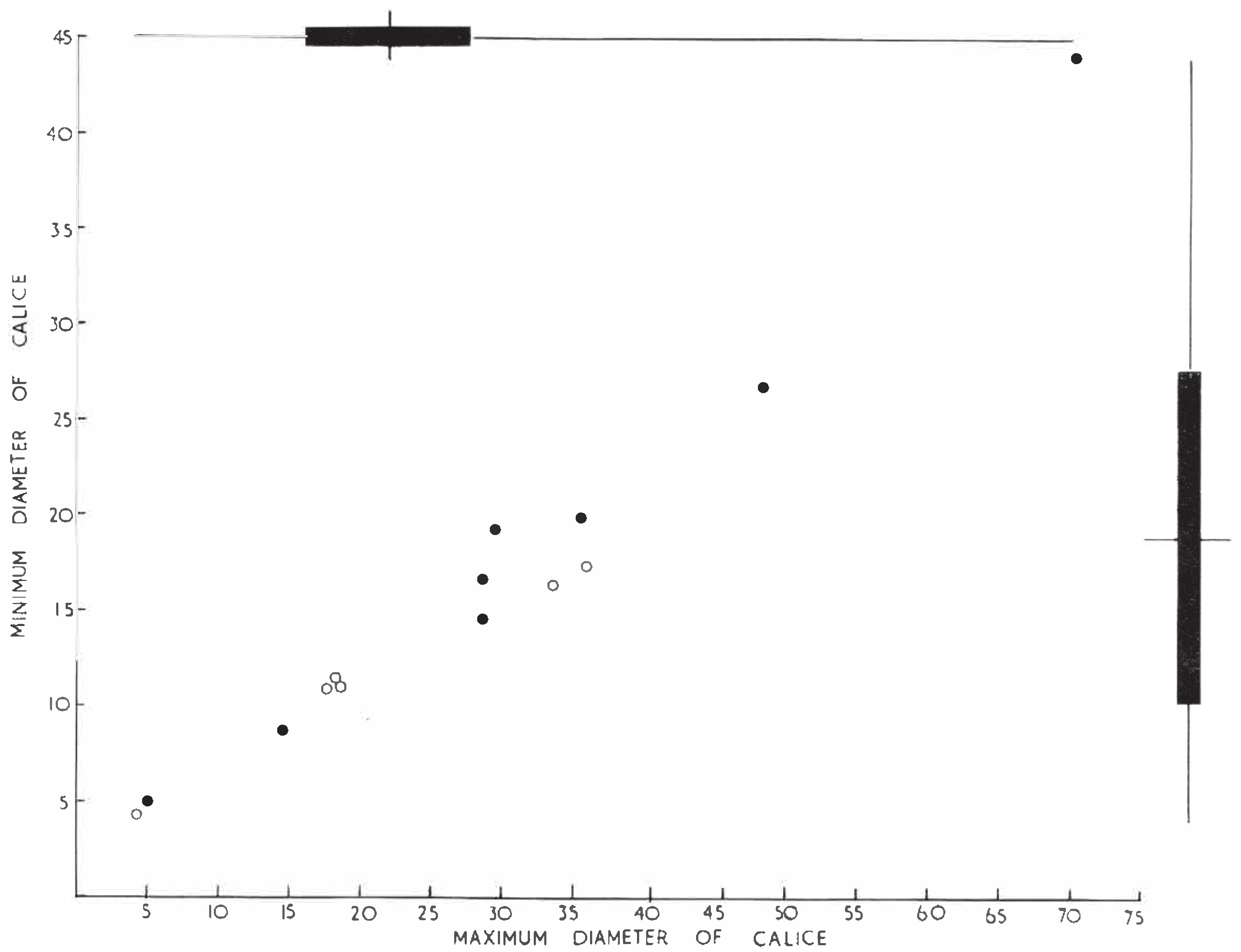

Fig. 7: Relationship between maximum and minimum diameters of calice in *Flabellum impensum*. Symbols and construction of diagram as in fig. 6. Measurements in millimetres.

Occurrence

Grahamland, 53–176 m (*Pourquoi-Pas*?); Valdivia Sea, 193–300 m (*Discovery*); Ross Sea, 322–591 m (*Endeavour*).

Genus **Gardineria** Vaughan 1907

Gardineria antarctica Gardiner 1929 (pl. 1, fig. 1–10)

Flabellum sp. Pax, 1910, Deutsche Südpolar-Exped. Vol. 12, Zool., p. 73, pl. 11, fig. 2.
Caryophyllia sp.? Gravier, 1914, Deuxième Expéd. Ant. Francaise, p. 130, pl. 1, figs. 9, 10.
Caryophyllia inskipi Duncan, Thomson, and Rennet, 1931, Australasian Ant. Exp., Sci. Repts., Ser. C, Vol. 9, No. 3, p. 40, pl. 10, fig. 6.
Gardineria antarctica Gardiner, 1929, British Museum (N.H.), (*Terra Nova*) Repts., Zool., Vol. 5, p. 124, pl. 1, figs. 11–18; Gardiner, 1939, *Discovery* Repts., Vol. 18, p. 328. Wells, 1958, B.A.N.Z. Ant. Res. Exped., Repts. Ser. B., Vol. 6, No. 11, p. 269, pl. 2, figs. 16–18.

The original suite described by Gardiner was obtained from McMurdo Sound, Ross Sea and contained very few specimens. In contrast, 141 specimens of the species were taken in a single dredge haul from Pennell Bank, Ross Sea, providing more than enough material for studies of corallum variation (fig. 8–9 and table 9).

Gardiner noted that most specimens showed some evidence of having been attached. Of the 155 specimens in the present collection examined, less than a dozen were still attached, but most showed evidence of having been broken off from the substrate. Thickness of wall noted in several specimens of an otherwise mature size, may indicate geronticism, but no other morphological features

TABLE 9—MEASUREMENTS (IN MILLIMETRES) OF SPECIMENS OF *Gardineria antarctica* FROM STATION A 521
(73 dead, 11 live specimens in population.)

	Number	*Range*	*Mean*	*Standard Deviation*	*Coefficient of Variability*
Height	80	12–42	23·42	5·19	22·16
Maximum Diameter ..	75	10–30	22·88	3·04	13·28
Septal Number	69	28–88	63·36	11·59	18·29
Pedicel Diameter	72	2·8–6·2	4·27	0·78	18·26

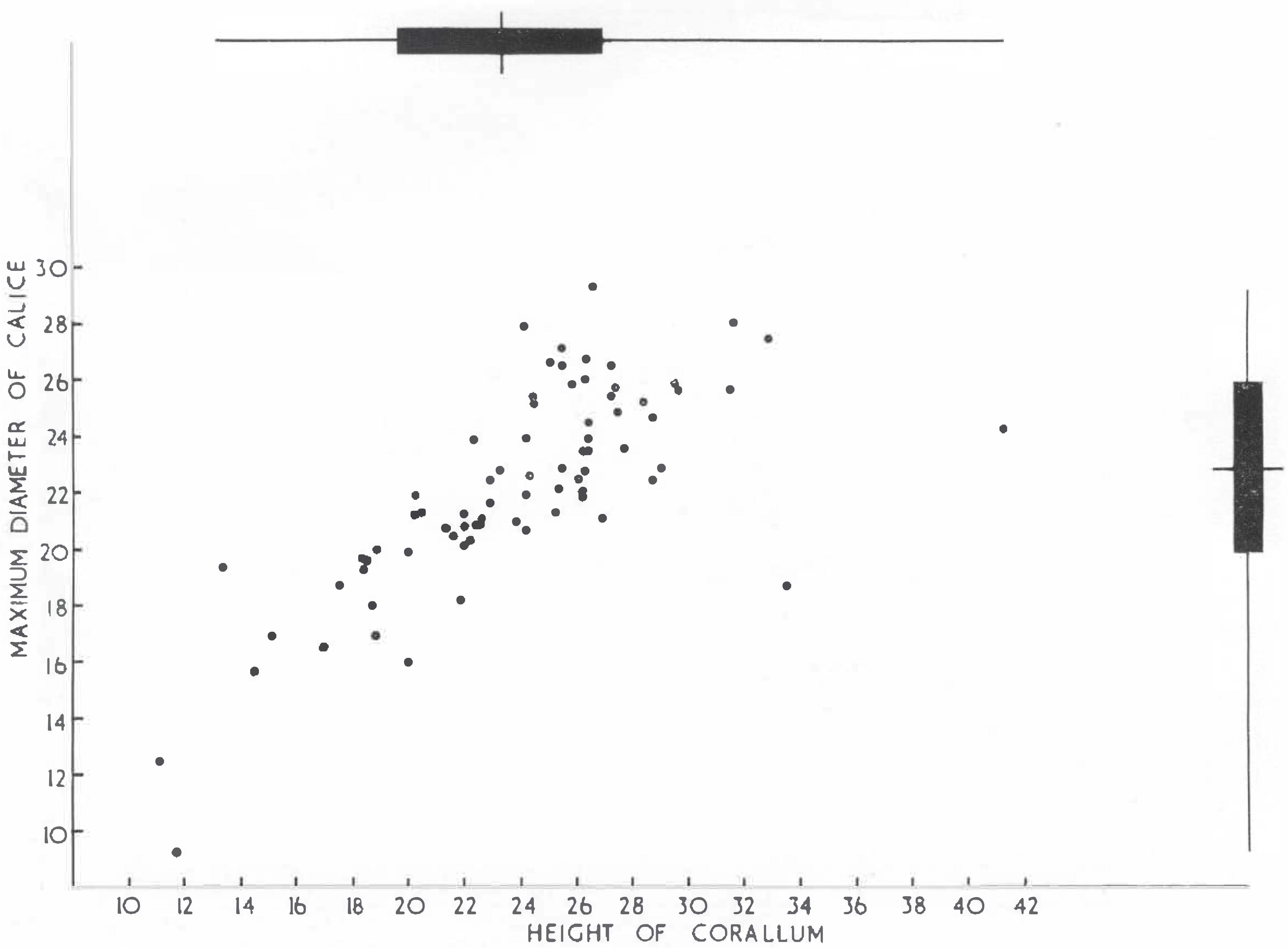

Fig. 8: Relationships between maximum diameter of calice and height of corallum in *Gardineria antarctica* Gardiner. Seventy-five specimens from Sta. A 521 were measured. Construction of diagram as in fig. 6. Measurements in millimetres.

were noted to support this observation. Mr Bullivant (*in. lit.*) notes that the polyps of specimens of this species taken on Pennell Bank were an orange colour.

Specimens of *Gardineria antarctica* examined in this study show a somewhat greater range of variation in the size and character of the columella than indicated by Gardiner (1929) and Wells (1958, fig. 17) illustrated a specimen with a more massive columella than those shown by Gardiner. The greater number of specimens examined here have a lightly constructed columella, but several possess a dense heavy columella formed by thick rod-like central trabeculae.

Occurrence

McMurdo Sound, Ross Sea, 148–441 m (*Terra Nova*); Palmer Peninsula, 460 m (*Pourquoi-Pas?*); Bismark Straits, Palmer Peninsula, 90–130 m South Georgia, 245 m (*Discovery*); Queen Mary Coast, 600 m (Australasian) Gaussberg, 46–170 m (*Gauss*); Valdivia Sea, 193–603 m (*Discovery*); Ross Sea, 256–591 m (*Endeavour*).

Family DENDROPHYLLIIDAE

Genus **Balanophyllia** Wood 1844

Balanophyllia chnous, n. sp. (pl. 1, fig. 17, pl. 2, fig. 1–3.)

Thecopsammia, sp.? *Balanophyllia*, sp.? Gardiner, 1929, British Museum (N.H.) (*Terra Nova*) Exped. Repts., Zool., Vol. 5, p. 126.

Description

Corallum tall, digitiform, attached in life to the substrate by a broadly spreading base. Calice oval in cross section, but the diameters vary greatly through the lower, essentially cylindrical, portion of the corallum. Margin of calice lies in a single plane, its edge being even. The wall is porous, thin, and more or less spinose in the upper portion. Lower on the corallum the spines are arranged in parallel rows more or less simulating costae, and are recurved downward, having a hook-like appearance. Epitheca may be developed to varying heights on the corallum and is absent on three specimens. Where present, the epitheca may be thin or thick and is often sporadically formed. The calice is

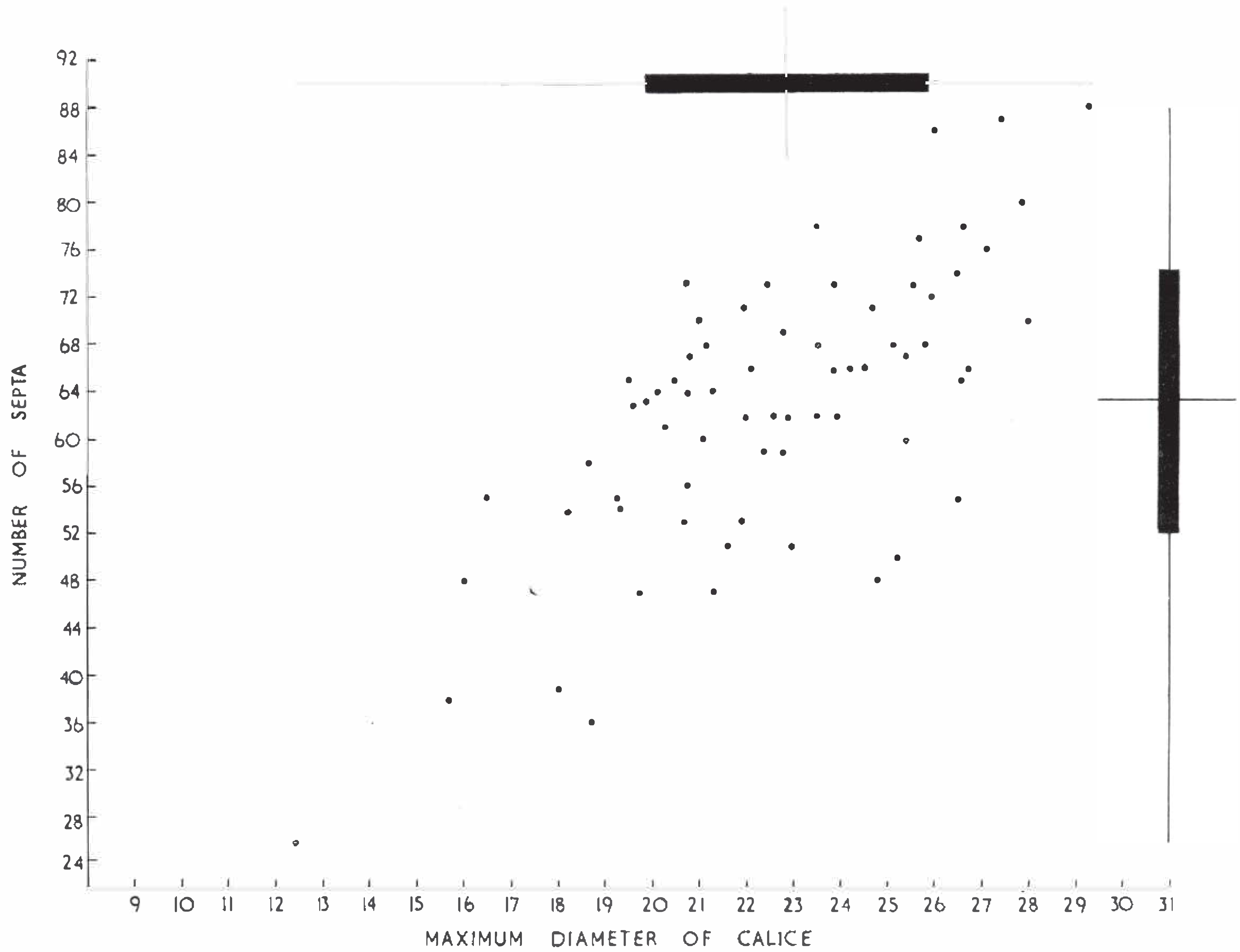

Fig. 9: Relationships between number of septa and maximum diameter of calice in *Gardineria antarctica* Gardiner from Sta. A 521. Construction of diagram as in fig. 6. Measurements in millimetres.

open and deep, the columella almost 10 mm below the calicular rim. Septa are non-exsert, narrow at the top, and slope evenly and convexly to the columella. The columella is elongate, highly compressed, formed of a mesh of trabeculae. The non-exsert septa are arranged according to Pourtalès' plan and are present in four complete cycles with portions of the fifth present in some systems. First- and second-cycle septa are solid, with even edges and have spinose granulations on the lateral faces. First-cycle septa are somewhat thinner than the second and reach to the columella; those of the second cycle being slightly notched before the columella. Third-cycle septa are short before the uniting fourth cycle and are only slightly spinose on the proximal edge. Septa of the fourth cycle unite before the third and are highly spinose proximally, the spines extending as much as 1 mm before the septa. Septa of the third cycle are also quite porous, the pores being relatively coarse. Fourth-cycle septa are not as spinose as the third, but are more porous. Fifth-cycle septa, where present, are very short and are both spinose and porous.

Dimensions of specimens examined are given in table 10.

Material Examined

Holotype: British Museum (Natural History) 1929–10–22–25; Sta. 191, *Terra Nova* Expedition, Bay of Whales, Ross Sea Antarctica. Depth, 355–457 m (194–250 fm). *Other specimens:* B. M. (N.H.) 1929–10–22–22 to 1929–10–22–24, 1929–10–22–26, 1929–10–22–27. All from Sta. 191, *Terra Nova* Expedition.

Discussion

The specimens listed above were noted by Gardiner (1929), who mentioned the presence of epitheca on three of them and generally attributed such deposits on balanophyllids as being the result of external forces in the environment. Van der Horst (1922) concluded as a result of his intensive studies of tropical *Balanophyllia* that the presence or absence of an epitheca in dendrophyllid corals was of little significance. Although Gardiner was reluctant to describe the species, it is apparent that they are quite unlike any of the *Balanophyllia* of neighboring areas. A new species of *Balanophyllia* described from the Patagonian Shelf (Squires, 1961) is quite different in having a much more massive corallum, with a stouter columella and more solid septa. More closely related are some *Balanophyllia* of the south-western Pacific such as *Balanophyllia* cf. *B. alta* Tenison-Woods, illustrated by Ralph and Squires (1962). All of these differ in the more massive appearance of the corallum, the new species being very delicate in construction.

Occurrence

Ross Sea, 355–457 m (*Terra Nova*).

TABLE 10—MEASUREMENTS (IN MILLIMETRES) OF *Balanophyllia chnous*, n. sp.

Specimen	*Height*	*Maximum Diameter*	*Minimum Diameter*	*Number Septa*	*Epitheca*
Holotype					
1929–10–22–25	30·2	11·8	9·7	70	Present.
Paratypes					
1929–10–22–26	46·2	11·4	9·7	59	Present.
1929–10–22–27	16·1	11·3	9·8	56	Present.
1929–10–22–22	16·9	9·5	8·8	45	Absent.
1929–10–22–23	18·8	8·4	7·5	48	Absent.
1929–10–22–24	16·0	–	–	50	Absent.

REFERENCES

BULLIVANT, J. S. 1959a: An Oceanographic Survey of the Ross Sea. *Nature Lond. 184*: 422–3.

——— 1959b: Photographs of the Bottom Fauna in the Ross Sea. *N.Z.J.Sci. 2(4)*: 485–97, figs.

DAVID, T. W. E., and PRIESTLY, R. E. 1914: Glaciology, Physiography, Stratigraphy, and Tectonic Geology of South Victoria Land. *Rep. Sci. Invest. Brit. Ant. Exped. 1907–9 Geology 1*: 319 pp.

DEBENHAM, F. 1920: A New Mode of Transportation by Ice; The Raised Marine Muds of South Victoria Land. *Quart. J. Geol. Soc.* 75(2): 51–76.

EKMAN, S. 1953: The Zoogeography of the Sea. Sedgwick and Jackson, Ltd. London. 417 pp., illust.

GARDINER, J. S. 1929: Coelenterata. Madreporaria. Turbinolidae and Eupsammidae. *Brit. Ant.* (*Terra Nova*) *Exped. 1910. Zool. Rep. 5(4)*: 121–30, 1 pl.

——— 1939: Madreporarian corals, with an account of Variation in *Caryophyllia. Discovery Rep. 18*: 323–38, pls. 20–1.

———; and P. WAUGH, 1938: The Flabellid and Turbinolid Corals. *John Murray Exped. 1933–34, Sci. Rep. 5(7)*. 167–202, pls. 1–7.

MARENZELLER, E. VON 1904: Steinkorallen. *Deutsch. Tief-See Exped. Valdivia, 7*: 261–318, pls. 14–18.

RALPH, P. M. 1956: Coelenterates of the Ross Sea Dependency. *Roy. Soc. N.Z. Ant. Res. Comm. spec. Rep. No. 19*. Mimeo.

RALPH, P. M., and SQUIRES, D. F. 1962: The Extant Scleractinian Corals of New Zealand. *Zool. Publ. Vict. Univ. Wellington 29:* 19 p. 8 pl.

SPEDEN, I. G. 1962: Fossiliferous Quaternary Marine Deposits in the McMurdo Sound Region, Antarctica. *N.Z. J. Geol. Geophys. 5 (5) :* (in press)

SQUIRES, D. F. 1958: The Cretaceous and Tertiary Corals of New Zealand. *N.Z. geol. Surv. pal. Bull. 28*: 107 pp. 16 pls.

——— 1960: Scleractinian Corals from the Norfolk Island Cable. *Rec. Auck. Inst. Mus. 5* (*3 and 4*): 195–201.

——— (1961): Deep Sea Corals collected by the Lamont Geological Observatory. 2. Scotia Sea Corals. *Amer. Mus. Novit.* No. 2046, 48 pp., 31 fig.

SHACKELTON, E. H. 1909: The Heart of the Antarctic. Heinemann, London. 2 Vol.

VAN DER HORST, C. J. 1922: Madreporaria of the *Siboga* Expedition, Part 3. Eupsammidae *Siboga Exped. Rep. Mon 16c*: 99–127, pls. 7–8.

WELLS, J. W. 1958: Scleractinian Corals. *B.A.N.Z. Ant. Res. Exped. 1929–31 Rep., Ser. B, 6(11)*: 257–75, pls. 1, 2.

PLATE 1

1–10. *Gardineria antarctica* Gardiner. 1–8. Calice and side views of four specimens, × 1·3. 9–10. Side views of two other specimens showing attachments of coralla, × 1·2.

11, 12. *Caryophyllia antarctica* von Marenzeller. B.M. (N.H.) 1939–7–20–244, specimen identified by Gardiner (1939) as *C. arcuata* Moseley, *Discovery* Sta. 190, × 3·3.

13, 14. *Caryophyllia profunda* Moseley. B.M. (N.H.) 1939–7–20–210, specimen identified by Gardiner (1939) as *C. cyathus* (E. and S.), *Discovery* Sta. 190. × 3·3.

15, 16. *Caryophyllia antarctica*? von Marenzeller. B.M. (N.H.) 1939–7–20–246, specimen identified by Gardiner (1939) as *C. mabahithi* Gardiner and Waugh, *Discovery* Sta. 182, × 3·3.

17. *Balanophyllia chnous*, n. sp., Holotype, oblique view of calice, × 5·3.

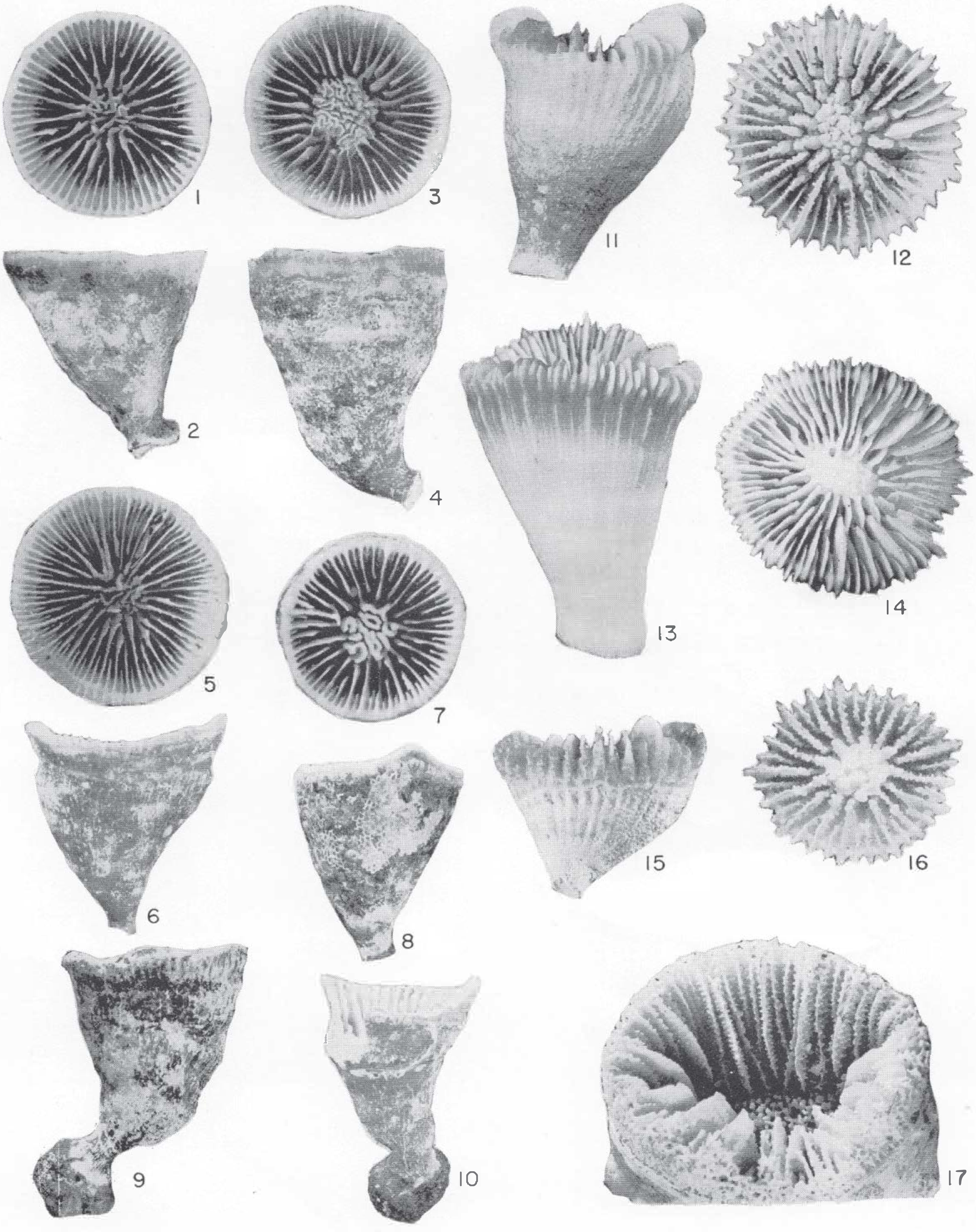

PLATE 1

PLATE 2

1–3. *Balanophyllia chnous*, n. sp. 1. Holotype, B.M. (N.H.) 1929–10–22–25, side view, × 1·75. 2. Holotype, calice, × 4·2. 3. Paratype, B.M. (N.H.) 1929–10–22–22, oblique view, × 2·5.

4–7. *Flabellum impensum*, n. sp. 4. Holotype, corallum, × 0·8. 5. Paratype, calice, × 1–0. 6. Same specimen, side view, × 1·0. 7. Septum of another paratype, the proximal edge on the right side, × 5·0.

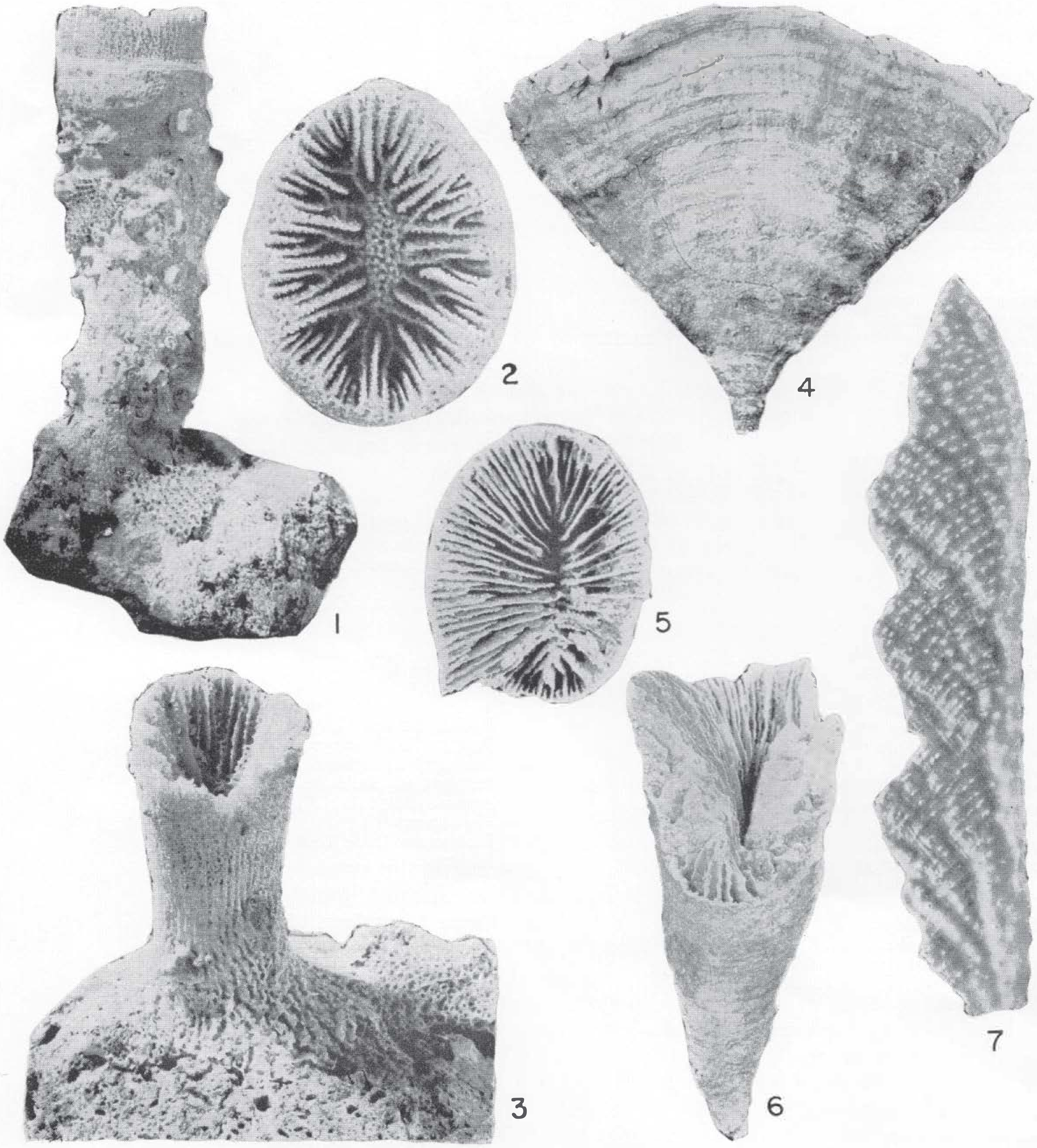

PLATE 2

INDEX

THE FAUNA OF THE ROSS SEA

PART 2

SCLERACTINIAN CORALS