

# THE RECENT SOLITARY MUSSID SCLERACTINIAN CORALS

by

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## INTRODUCTION

In 1937 the writer, following Matthai (1928, p. 209), placed the solitary mussid genera *Cynarina*, *Homophyllia*, *Rhodocyathus*, *Protolobophyllia*, *Sclerophyllia*, *Scolymia* (*Lithophyllia* — placed in *Mussa* by Verrill in 1902, p. 130, and suspected of being only the young of colonial mussids by Pourtalès in 1871, p. 70) as subjective synonyms of the various colonial genera such as *Lobophyllia*, *Symphyllia*, and *Mussa*, on the assumption that these supposed solitary forms were based on early monostomatous (monocentric) stages of colonial forms. The late T. W. Vaughan and the writer later (1943, p. 194) adopted the same treatment. Wells followed much the same line in 1956 (p. 417-418), except that *Homophyllia* was once more recognized as a distinct genus.

Grave difficulties have arisen in absorbing the remaining genera in the colonial forms, and evidence has accumulated that several of these should be recognized as valid genera. The present paper, stimulated particularly by the study of a number of solitary mussids from New Caledonia sent by Dr. R. Catala of Nouméa, to whom the writer expresses his appreciation not only for the specimens but also for permission to use certain photographs taken by Dr. Catala, is an attempt to rectify some of these errors of judgment.

The position now is that the names *Cynarina*, *Rhodocyathus*, *Sclerophyllia*, and *Protolobophyllia* all pertain to a single genus (*Cynarina*), that *Acanthophyllia* and *Homophyllia* are distinct, and that *Scolymia* (*Lithophyllia*), a West Indian form, and *Parascolymia* n. gen., a Pacific form, are indistinguishable from each other on the basis of skeletal structure, but differ in mode of asexual budding. The living solitary mussids may be distinguished as follows:

- I. Major septa of mature coralla with non-dentate lobe on upper margin and palus-like inner lobe . . . . . *Cynarina*
- II. Septa wholly dentate on margins:
  - A. Dentations approximately equal:

1. Dentations 10-12 cm; calice small (less than 4 cm) . . . *Homophyllia*
2. Dentations 4-6 cm on larger septa; calices large (more than 4 cm):
  - a. Centers with lamellar linkage; lateral septal granules numerous  
*Parascolymia*
  - b. Centers with trabecular linkage; lateral septal granules sparse *Scolymia*
- B. Dentations much larger over walls of calice . . . . . *Acanthophyllia*

Of these *Cynarina* is the most widely distributed, ranging from the Red Sea eastward to the Loyalty Islands and New Caledonia, and northward to Japan. *Homophyllia*, with one living species, *H. australis*, is known only from the subtropical and temperate waters of the southern coast of Australia from the latitude of Rottne I. in Western Australia eastward to Lord Howe Island. *Parascolymia*, with one living species, *P. vitiensis*, occurs in the southwest Pacific, from Fiji westward to the Great Barrier Reef, and off northwest Australia. *Scolymia*, with one living species, *S. lacera*, is known only from the West Indies. *Acanthophyllia* has only one living species, *A. deshayesiana*, and is confined to the Sulu and South China Seas.

These solitary mussels appear to be generally uncommon on surface reefs and live in deeper parts of reefs, whereas the colonial mussels are commoner nearer the surface.

### **Cynarina** Brueggemann, 1877

*Cynarina* Brueggemann, 1877, Ann. Mag. Nat. Hist., ser. 4 vol. 20, p. 305. Type species (by monotypy): *C. savignyi* Brueggemann, 1877 (= *Lithophyllia lacrymalis* Milne Edwards & Haime, 1857 = *Caryophyllia lacrymalis* Milne Edwards & Haime, 1848).

*Sclerophyllia* Klunzinger, 1879, Korallenth. Roth. Meeres, vol. 3, p. 4. Type species (by monotypy): *S. margariticola* Klunzinger, 1879.

*Rhodocyathus* Bourne, 1905, Rept. Pearl Oyster Fish. Ceylon, pt. 4, p. 191. Type species (by monotypy): *R. ceylonensis* Bourne, 1905.

*Protolobophyllia* Yabe & Sugiyama, 1935, Journ. Geol. Soc. Japan, vol. 42, p. 382. Type species (by original designation): *Antillia japonica* Yabe & Sugiyama, 1931.

### **Cynarina lacrymalis** (Milne Edwards & Haime, 1848)

(pls. XX, XXI, pl. XXIII fig. 4)

*Caryophyllia carduus?* Audouin, 1826, Descr. Égypte, vol. 4, p. 233, pl. 4 fig. 2 (non *Madrepora carduus* Ellis & Solander, 1786; nec *Caryophyllia carduus* Lamarck, 1816).

*Caryophyllia lacrymalis* Milne Edwards & Haime, 1848, Ann. Sci. Nat. Zool., ser. 3 vol. 10, p. 238, pl. 8 figs. 1, 1a.

*Lithophyllia lacrymalis* Milne Edwards & Haime, 1857, Hist. nat. Corall., vol. 2, p. 292.

*Cynarina savignyi* Brueggemann, 1877, Ann. Mag. Nat. Hist., ser. 4 vol. 20, p. 305. non *Scolymia lacrymalis* Brueggemann, 1877, Ann. Mag. Nat. Hist., ser. 4 vol. 20, p. 305. (probably an immature *Acanthophyllia*).

*Sclerophyllia margariticola* Klunzinger, 1879, Korallenth. Roth. Meeres, vol. 3, p. 4, pl. 1 fig. 12.

- Cynarina savignyi* Klunzinger, 1879, Korallenth. Roth. Meeres, vol. 3, p. 4.  
*Lithophyllia lacrymalis* Bassett-Smith, 1890, Ann. Mag. Nat. Hist., ser. 6 vol. 6, p. 367.  
*Lithophyllia palata* Gardiner, 1899, Willey's Zool. Res., pt. 2, p. 166, fig. 6a, b.  
*Rhodocyathus ceylonensis* Bourne, 1905, Rept. Pearl Oyster Fish. Ceylon, pt. 4, p. 191, pl. 1 fig. 1, 1a.  
*Sclerophyllia margariticola* Vaughan, 1907, Proc. U.S. Nat. Mus., vol. 32, p. 258.  
*Sclerophyllia margariticola* Gravier, 1911, Ann. Inst. Océanogr. Paris, vol. 2, p. 42, pl. 11 fig. 45.  
? *Lithophyllia martini* Felix, 1913, Palaeontographica, vol. 50, p. 341, pl. 27 fig. 7, 7a.  
*Anthemiphyllia verbeeki* Gerth, 1921, Samml. Geol. Reichs-Mus. Leiden, new ser. vol. 1, p. 404, pl. 55 figs. 11, 12, pl. 56 fig. 20.  
*Mussa* (*Lithophyllia*) *lacrymalis* Faustino, 1927, Mon. Bur. Sci. Manila, no. 22, p. 154, pl. 38 fig. 3, 4 (copies of Milne Edwards & Haime's figures).  
*Antillia japonica* Yabe & Sugiyama, 1931, Sci. Repts. Tôhoku Univ., ser. 2 vol. 14, p. 128, pl. 37 figs. 1-5, pl. 38 figs. 1, 2.  
*Antillia nomaensis* Yabe & Sugiyama, 1931, Sci. Repts. Tôhoku Univ., ser. 2 vol. 14, p. 128, pl. 38 figs. 3-5.  
*Protolobophyllia japonica* Yabe & Sugiyama, 1935, Jour. Geol. Soc. Japan, vol. 42, p. 382 (footnote), pl. 9 figs. 3, 4 (non pl. 9 figs. 1, 2 = *Parascolymia*).  
*Protolobophyllia japonica* Yabe, Sugiyama & Eguchi, 1936, Sci. Repts. Tôhoku Univ., ser. 2 special vol. 1, p. 45, pl. 16 figs. 8, 8a, 9, 9a.  
non *Symphyllia margariticola* Montanaro-Gallitelli, 1943, Miss. Geol. Danalia Merid., vol. 4, p. 35, pl. 6 fig. 3.  
*Cynarina savignyi* Crossland, 1952, Sci. Repts. Great Barrier Reef Exped. 1928-29, Brit. Mus. (N.H.), vol. 6 no. 3, p. 137, pl. 4 figs. 1, 2.  
Three figures, 1959, 26 franc postage stamp of New Caledonia (colored orange).  
*Protolobophyllia japonica* Ma, 1959, Oceanogr. Sinica, spec. vol. 1, p. 73, pl. 37 fig. 2a, 2b. (non pl. 104 fig. 3a, b = *Trachyphyllia*).

From the preceding synonymy it will be seen that this distinctive solitary mussid has had a complicated taxonomic history, details of which it is unnecessary to go into. The specimen identified with doubt by Audouin as *Madrepora carduus* Ellis & Solander (= *Mussa angulosa*, a West Indian species) is in the Paris Museum. It is not a *Mussa* or *Lobophyllia* and is clearly the same as Milne Edwards & Haime's *Caryophyllia lacrymalis*. The latter was based on a small, immature corallum in which the pali-like inner lobes of the larger septa were not evident; the specimen appears to have been lost, and could not be found in 1960. In Brueggemann's eight specimens of his *C. savignyi*, from the Gulf of Suez, in the British Museum, the inner lobes are well-developed in the larger specimens but weak or lacking in the small ones. *Protolobophyllia* Yabe & Sugiyama 1935, was founded on *Antillia japonica* of the same authors ("the type specimen of this species is that from the coral bed of Noma"). This specimen, figured in 1931 on pl. 37, figs. 1-3, is undoubtedly *C. lacrymalis*. In 1935 they figured two specimens of two different species as *P. japonica*, figures 1 and 2 of plate 9 being *Parascolymia*, whereas figures 3 and 4 are *Cynarina*.

The growth-form of this species is generally turbinate, straight or slightly

cornute, with a circular to slightly ovate calice rarely over 6 cm in longer diameter. The septa are commonly irregular cyclically, but in a large normal corallum of 5 × 6 cm there are 96 septa (Gravier, 1911, fig. 45): 12 large, thick, lobulate with well-developed pali-like lobes; 12 septa of the third cycle, slightly less thick but also with pali-like lobes; 24 thinner, regularly dentate septa of the fourth cycle; and 48 very thin septa of the fifth cycle. The costae are no less characteristic than the septal margins: alternately thick and thin, corresponding to the first four and the fifth cycles, with short, blunt spines or beads — contrasted with the lack of costae related to the minor septa and acute, highly developed spines in *Parascolymia* and *Scolymia*. The wall is septothecal and the epitheca weakly developed as shredlike bands. For further details see Vaughan's careful description (1907, p. 258) of specimen from the Gulf of Tadjourah.

The polyps of *Cynarina* are illustrated on pl. XXI figs. 3-6 (after photographs by Dr. René Catala). They appear to be similar to those of *Lobophyllia* and *Symphyllia* as described by Yonge (1930, p. 32-33).

Distribution. —

Miocene, Java (*Anthemiphyllia verbeeki* Gerth).

Pliocene, Naha limestone, Okinawa (U.S. Nat. Mus., coll. F. S. MacNeill; pl. XXIII fig. 4). Java (*Lithophyllia martini* Felix).

Subrecent, Honshu, Japan.

Recent, Indo-Pacific eastward into the Red Sea; known bathymetric range: 25-75 m. Red Sea (Audouin, 1826, Paris Museum). Suez (Brit. Mus. 1913. 12.23.1). Suez (*C. savignyi* Brueggemann, Brit. Mus. 69.2.25.39; 58.2.12.3, also unnumbered specimen, Brueggemann's type). Koseir, Red Sea (*S. margariticola* Klunzinger, types: Berlin Mus. No. 2181), Gulf of Tadjourah (Vaughan, 1907; Gravier 1911). Trincomalee, Ceylon (Bourne, 1905). Macclesfield Bank, China Sea (*L. lacrymalis* Bassett-Smith, 1890, Brit. Mus. 89.9.24.134). Borneo (*S. lacrymalis* Brueggemann, 1877, Brit. Mus. 51.1. 20.7). Japan, Honshu (Hama-Zima), Enoura-Wan (*P. japonica* Yabe & Sugiyama). Great Barrier Reef, Australia (*C. savignyi* Crossland, 1952, Brit. Mus. 1934.5.14.492). Gubbins Reef, 14 fms. (see pl. XX figs. 1-3). Lifu, Loyalty Is. (*L. palata* Gardiner, 1899). Banc Gail, near Nouméa, New Caledonia, 35-40 m.

#### **Homophyllia** Brueggemann, 1877

*Homophyllia* Brueggeman, 1877, Ann. Mag. Nat. Hist., ser. 4 vol. 20, p. 310. Type species (by monotypy): *Caryophyllia australis* Milne Edwards & Haime, 1849.

#### **Homophyllia australis** (Milne Edwards & Haime, 1849)

*Caryophyllia australis* Milne Edwards & Haime, 1849, Ann. Sci. Nat. Zool., ser. 3 vol. 11, p. 239; vol. 10, pl. 8 f. 2.

- Isophyllia australis* Milne Edwards & Haime, 1851, Polypes Foss. Terr. Palaeoz., p. 87.  
*Isophyllia australis* Milne Edwards & Haime, 1857, Hist. Nat. Corall., vol. 2, p. 375.  
*Homophyllia australis* Brueggemann, 1877, Ann. Mag. Nat. Hist., ser. 4 vol. 20, p. 310.  
*Culicia magna* Tenison-Woods, 1878, Proc. Linn. Soc. New South Wales, vol. 2, p. 325, pl. 4 fig. 3a, b, c.  
*Homophyllia australis* Dennant, 1904, Trans. Proc. R. Soc. South Australia, vol. 28, p. 8, pl. 2 fig. 2.  
*Homophyllia australis* Howchin, 1909, Trans. Proc. R. Soc. South Australia, vol. 33, p. 246.  
*Culicia magna* Totton, 1952, Ann. Mag. Nat. Hist., ser. 12 vol. 5, p. 975, pl. 36 figs. 9, 10, 11.

Milne Edwards & Haime's types of this species are in the British Museum (Nat. Hist.) (40.11.30 77, 79), and additional specimens of this small mussid of temperate southern waters have been well illustrated by A. K. Totton.

*Montlivaltia variformis* Dennant (1898, p. 414, pl. 20 fig. 1a, b), from the upper Oligocene of Table Cape, Tasmania, may be another species of *Homophyllia*.

Distribution. — South coast of Australia from Western Australia (in shallow water with reef corals at Rottne Island; Garden I., Point Peron, and Triggs Bay), 32° S., eastward to Port Phillip (Melbourne), 38° S. Type locality: Port Lincoln, Gulf of St. Vincent. Specimens in Australian Museum (No. 12630) from Lord Howe Island.

#### **Parascolymia** new genus

Type. — *Scolymia vitiensis* Brueggemann, 1877.

Diagnosis. — Like *Scolymia* Haime but asexually produced corallites with lamellar rather than trabecular linkage.

As previously noted, *Scolymia* Haime refers to the West Indian solitary mussids, and *Protolobophyllia* Yabe & Sugiyama was based on a specimen of *Cynarina lacrymalis*, hence a new name appears necessary to distinguish the Pacific homologue of *Scolymia*.

#### **Parascolymia vitiensis** (Brueggemann, 1877)

(pl. XXII, pl. XXIII figs. 1-3)

- Scolymia vitiensis* Brueggemann, 1877, Ann. Mag. Nat. Hist., ser. 4 vol. 20, p. 304.  
 ? *Antillia indica* Duncan, 1880, Palaeont. Indica, ser. 14 vol. 1, p. 84, pl. 24 fig. 1.  
 ? *Montlivaltia jacquemonti* Duncan, 1880, Palaeont. Indica, ser. 14 vol. 1, p. 85, pl. 24 fig. 4.  
 ? *Leptomussa rugosa* Duncan, 1880, Palaeont. Indica, ser. 14 vol. 1, p. 85, pl. 22 fig. 8.  
*Lithophyllia lacrymalis* Saville Kent, 1893, Great Barrier Reef of Australia (London), p. 372.  
*Lithophyllia vitiensis* Gardiner, 1899, Willey's Zool. Res., pt. 2, p. 166.  
*Lithophyllia margariticola* Folkeson, 1919, K. Svenska Vetensk. Akad. Handl., n. ser. vol. 59, p. 14, figs. 20-21.  
*Lithophyllia grandissima* Felix, 1921, Paläont. Timor, pt. 15, p. 24, pl. 1 fig. 5, 5a.

- Lithophyllia grandissima* Gerth, 1923, Samml. Geol. Reichs-Mus. Leiden, ser. 1 vol. 10, p. 64.
- Lithophyllia sumatrensis* Umbgrove, 1926, Wetens. Meded. Dienst. Mijnb. Ned.-Indië, no. 4, p. 32, pl. 1 figs. 1, 2.
- Protolobophyllia japonica* Yabe & Sugiyama, 1935, Jour. Geol. Soc. Japan, vol. 42, p. 382 (footnote), pl. 9 figs. 1, 2 (non figs. 3, 4 = type of *P. japonica* = *Cynarina lacrymalis*).
- Lithophyllia grandissima* Umbgrove, 1946, Jour. Paleont., vol. 20, p. 524 (Also: Proc. K. Ned. Akad. Wetens., vol. 48, p. 342).
- Lobophyllia* sp. cf. *japonica* Squires, 1958, New Zealand Geol. Surv., Palaeont. Bull., no. 29, p. 42, pl. 6 figs. 13, 14.
- Two figures, 1959, 26 franc postage stamp of New Caledonia (colored brown; one specimen is figured in present paper: pl. XXIII fig. 1).
- non *Lithophyllia vitiensis* Crossland, 1952, Sci. Repts. Great Barrier Reef Exped. 1928-29, Brit. Mus. (N.H.), vol. 6, p. 138, pl. 9 fig. 4 (= *Echinophyllia*).

Although Brueggemann (1877) did not illustrate *Scolymia vitiensis*, his description is very good and comparison of his type in the British Museum (55.12.7.157) with other specimens leaves no doubt as to the nature of this hitherto uncommon solitary mussid. The corallum is generally turbinate and straight (pl. XXII fig. 2), but a suite of specimens from a depth of 35 m on Banc Gail near Nouméa, New Caledonia, shows a wide variation from sub-diskoidal or patellate (pl. XXIII figs. 2, 3) with small base of attachment to thick cylindrical columns broadly attached with very shallow calices up to 10 cm in diameter. The large size of the solitary polyp and corallum makes it highly improbable that these corals are immature monostomatous stages in the development of such colonial forms as *Lobophyllia* (pl. XXIII fig. 5) or *Symphyllia*, both of which occur at the same locality in the same ecologic niche. In one specimen (pl. XXIII fig. 1), in which rejuvenation from a very large solitary individual has resulted in a tricentric corallum with lamellar linkage, the centers are about the same size as those of *Lobophyllia* or *Symphyllia*, a condition indicative of a very close relationship among these three genera. It is not unlikely that *Parascolymia*, like *Scolymia*, represents a surviving remnant of the solitary mussid type from which the colonial genera arose late in the Tertiary.

At present *Parascolymia* is restricted to the western Pacific and East Indies, with a known depth-range of 20 to 40 meters, but if the several species described by Duncan (1880), referred to with doubt in the synonymy, belong to the genus, it was more widely distributed in the Tertiary.

The distinction between *Parascolymia* of the Pacific and *Scolymia* of the Atlantic is a difficult one. There is complete identity of form and size of the corallum and its structures, unless one accepts the presence of sparse trabecular granulations on the sides of the septa in *Scolymia* (pl. XXII figs. 3, 6) and very thickly set ones on the septa of *Parascolymia* as being of generic sig-

nificance. *Scolymia* bears the same relationships to the colonial genus *Mussa* as *Parascolymia* does to *Lobophyllia* (and *Symphyllia*), and the only observable difference between *Mussa* and *Lobophyllia* is in the nature of the linkage between corallite centers—trabecular in *Mussa* and lamellar in *Lobophyllia*. Indeed, until this small but significant difference was first pointed out in 1928 by Matthai (p. 209) these genera had not been differentiated by previous workers. But until the nature of the linkage in *Scolymia* is determined, the status of *Parascolymia* will remain uncertain; it is not impossible that these two “genera” are actually one, a survivor of a widespread Tertiary ancestor of the large colonial mussids.

Distribution. —

Miocene, Borneo (*Lithophyllia grandissima* Felix); Java (Umbgrove, 1946); Sumatra (*L. sumatrensis* Umbgrove, 1926); New Zealand (Squires, 1958).

Pliocene, Borneo (*L. grandissima* Gerth, 1923); Kikai-Shima, Ryukyu Is. (Yabe & Sugiyama, 1935).

Recent, Southwest Pacific; known depth range: 35 m. Off Cape Jaubert (19° S.), N.W. Australia, 35 m (Folkesson). San Cristoval, Solomon Is. (Brit. Mus. 55.12.7.157). Fiji (Brit. Mus. holotype: 62.2.4.49). Sandal Bay, Lifu, Loyalty Is. (Gardiner). Great Barrier Reef, Australia: Coll. Saville Kent (Brit. Mus. 92.12.1.481); Eshelby I., Whitsunday Group (Coll. J. W. Wells). Banc Gail, near Nounéa, New Caledonia, 35 m (Dr. R. Catala).

**Scolymia** Haime, 1852

*Scolymia* Haime, 1852, Mém. Soc. Géol. France, vol. 4, p. 279 (footnote). Type species (selected by Vaughan, 1901, p. 6): *Madrepora lacera* Pallas, 1766.

*Lithophyllia* Milne Edwards & Haime, 1857, Hist. Nat. Corall., vol. 2, p. 290. Type species (selected by Felix, 1925, p. 100): *Madrepora lacera* Pallas, 1766.

There can be no question as to the priority of *Scolymia* over *Lithophyllia*. Chevalier (1961, p. 275) gives no reason for maintaining the latter name.

**Scolymia lacera** (Pallas, 1766) (pl. XXII figs. 5, 6)

*Lithophyllia lacera* and *L. cubensis* Gregory, 1895, Quart. Jour. Geol. Soc. London, vol. 51, p. 259 (with earlier synonymy).

*Scolymia* sp. Vaughan, 1901, Samml. Geol. Reichs-Mus. Leiden, ser. 2 vol. 2, pp. 6, 34.

*Mussa lacera* (in part) Verrill, 1902, Trans. Connecticut Acad., vol. 11, p. 130.

*Mussa angulosa* ? Matthai, 1928, Cat. Madrep. Brit. Mus. (N.H.), vol. 7, p. 204, pl. 64 fig. 2 (Ehrenberg's *M. lacera*), pl. 68 fig. 2 (Esper's *M. lacera*).

*Mussa lacera* (in part) Walton Smith, 1948, Atlantic Reef Corals, p. 96, pl. 34 (non pl. 35).

The close relationship or possibility of identity of this form with *Parascolymia* has been pointed out, the only apparent difference between the two being the somewhat hypothetical different linkage of polycentric corallites. As yet, the di- or tricentric condition has not been observed in *Scolymia* to test the presumption that the linkages should be trabecular. Like *Parascolymia*, *Scolymia* occurs in the deeper zones of reefs and specimens are scarce, although as shown by collections made by Dr. T. F. Goreau on Jamaican reefs, it is actually abundant in depths of 30 to 60 meters, and exhibits the same range of growth-forms as *P. vitiensis*, with calices up to 10 cm in diameter; monocentric corallites of *Mussa* rarely attain 5 cm before dividing or developing additional centers. *Mussa* is common in shallower water but Dr. Goreau has recently found it at depth in Jamaica with *Scolymia*.

Distribution. —

Miocene (?), Dominican Republic (*Caryophyllia affinis* Duncan, 1863).

Pleistocene, Curaçao (Vaughan, 1901).

Recent, West Indies and Florida: known bathymetric range: 25-140 m.

### **Acanthophyllia** Wells, 1937

*Acanthophyllia* Wells, 1937, Bull. Amer. Paleont., vol. 23, p. 242. Type species (by original designation): *Carophyllia deshayesiana* Michelin, 1850.

#### **Acanthophyllia deshayesiana** (Michelin, 1850)

*Caryophyllia deshayesiana* Michelin, 1850, Revue et Mag. Zool., ser. 2 vol. 3, p. 238, 1 pl. (non *C. deshayesiaca* Geinitz, 1846).

*Antillia grandiflora* Gerth, 1921, Samml. Geol. Reichs-Mus. Leiden, new ser. vol. 1, p. 409, pl. 55 figs. 8, 9.

*Antillia* sp. cf. *A. ponderosa* Umbgrove, 1924, Pleist. and Plioc. Corals of Ceram, p. 7, pl. 2 fig. 3, 4.

*Acanthophyllia deshayesiana* Wells, 1937, Bull. Amer. Paleont., vol. 23, p. 242, pl. 36.

*Protolobophyllia* sp. cf. *P. deshayesiana* Yabe & Eguchi, 1941, Proc. Imp. Acad. Tokyo, vol. 17, p. 213, fig. 2a, b.

*Acanthophyllia* sp. cf. *A. deshayesiana* Eguchi, 1941, Jour. Geol. Soc. Japan, vol. 48, p. 414.

*Protolobophyllia sinica* Ma, 1959, Oceanogr. Sinica, spec. vol. 1, p. 73, pl. 1 (no description of the species).

The single living species of this genus is known only from the China Sea and Sulu Islands.

Distribution. —

Pliocene, Ceram (Umbgrove, 1924), Java (Gerth, 1921).

Plio-Pleistocene, Sumagui formation, Mindoro, Philippines (Yabe & Eguchi, 1941).



Recent, Sulu Is., 16 m (Wells, 1937), Macclesfield Bank, 65-75 m (Ma, 1959).

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## EXPLANATION OF THE PLATES

## Plate XX

*Cynarina lacrymalis* (Milne Edwards & Haime)

1, 4, calicular aspect; 2, 5, lateral aspect; 3, calice. 1-3, specimen from Gubbins Reef near Cooktown, Great Barrier Reef, Queensland, 25 meters; 4, 5, specimens from Banc Gail near Nouméa, New Caledonia, 35-40 meters. 1, 2, 4, 5,  $\times 1$ ; 3,  $\times 2$ .

## Plate XXI

*Cynarina lacrymalis* (Milne Edwards & Haime)

1, corallum attached to oyster (*Pycnodonta* spec.); 2, calice; 3-6, polyps, from contracted state (3) to fully expanded (6). All specimens from Banc Gail near Nouméa, New Caledonia. 1,  $\times 1$ ; 2,  $\times 2$ . Photos 3-6 by Dr. R. Catala, Aquarium de Nouméa.

## Plate XXII

*Parascolymia vitiensis* (Brueggemann)

1, calice; 2, lateral aspect; 3, septal margins; 4, polyp in contracted state. Specimens from Banc Gail near Nouméa, New Caledonia. 1,  $\times 1$ ; 2,  $\times \frac{1}{2}$ ; 3,  $\times 2$ . Photo 4 by Dr. R. Catala.

*Scolymia lacera* (Pallas)

5, calice; 6, septal margins. Specimen from 25-35 meters, northwest of Tampa, Florida, collected by Dr. F. G. Walton Smith. 5,  $\times 1$ ; 6,  $\times 2$ .

## Plate XXIII

*Parascolymia vitiensis* (Brueggemann)

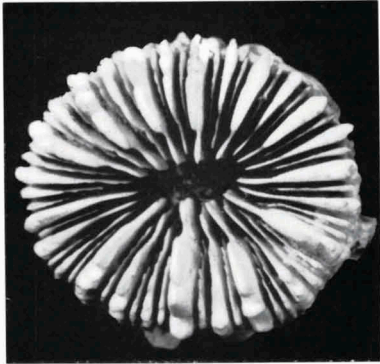
1, calicular aspect of tricentric corallum rejuvenated from large monocentric corallum; 2, lateral aspect of discoidal corallum; 3, calicular aspect of same specimen. Specimens from Banc Gail near Nouméa, New Caledonia. 1-3,  $\times 1$ .

*Cynarina lacrymalis* (Milne Edwards & Haime)

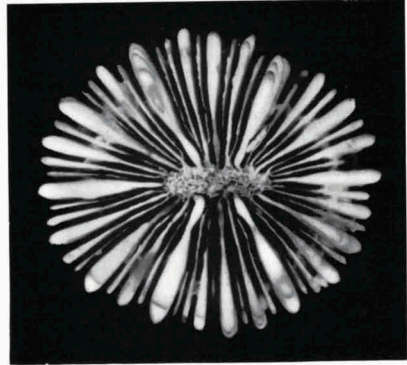
4, lateral aspect. Specimen from Naha limestone (Pliocene), Okinawa, collected by Dr. F. S. McNeill.  $\times 1$ .

*Lobophyllia hemprichi* (Ehrenberg)

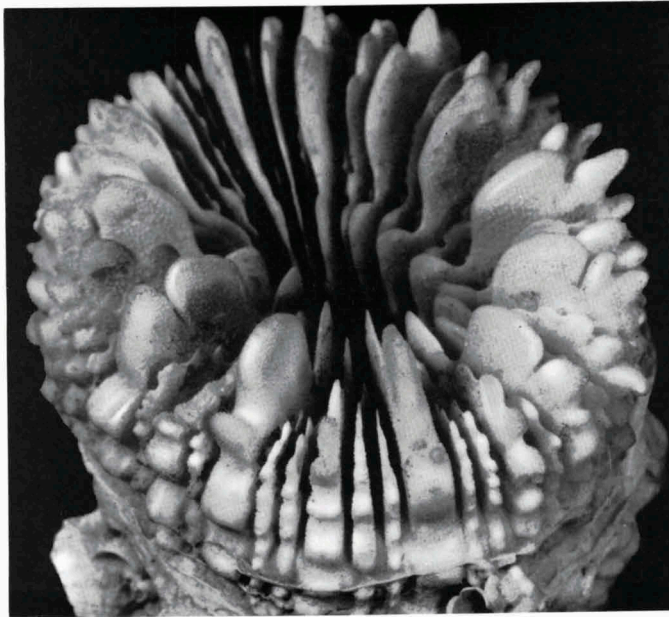
5, septa. Specimen from Banc Gail near Nouméa, New Caledonia, 40 meters.  $\times 2$ .



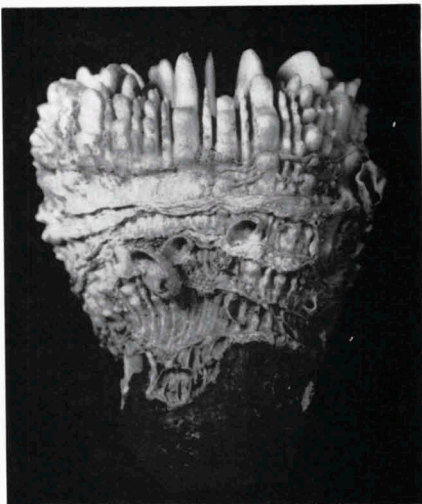
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4



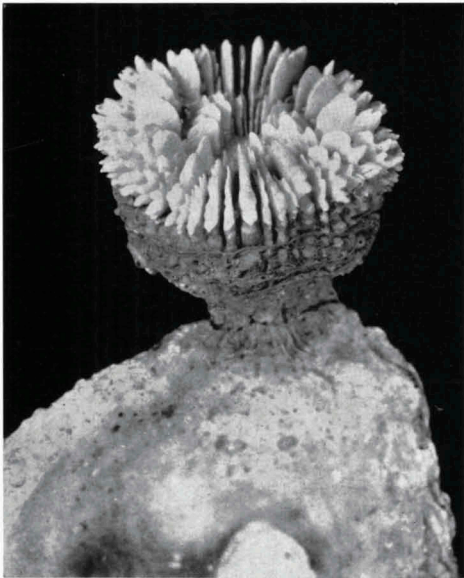
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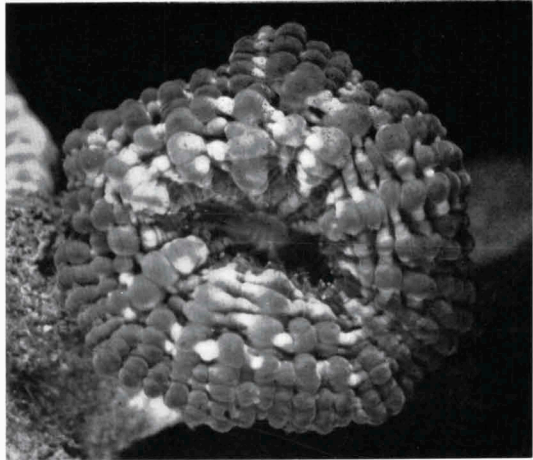
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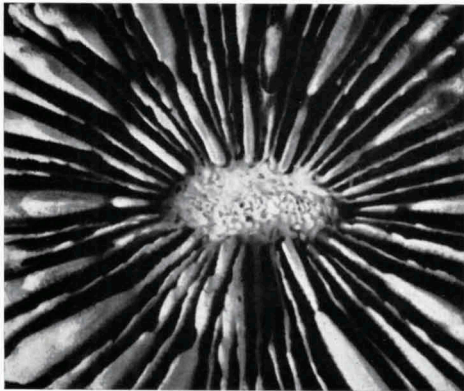
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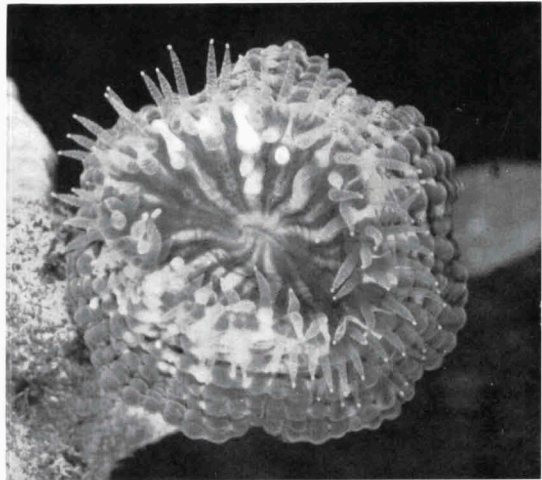
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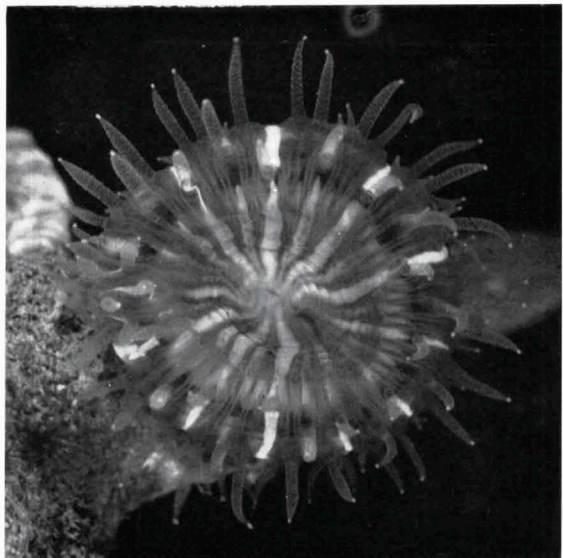
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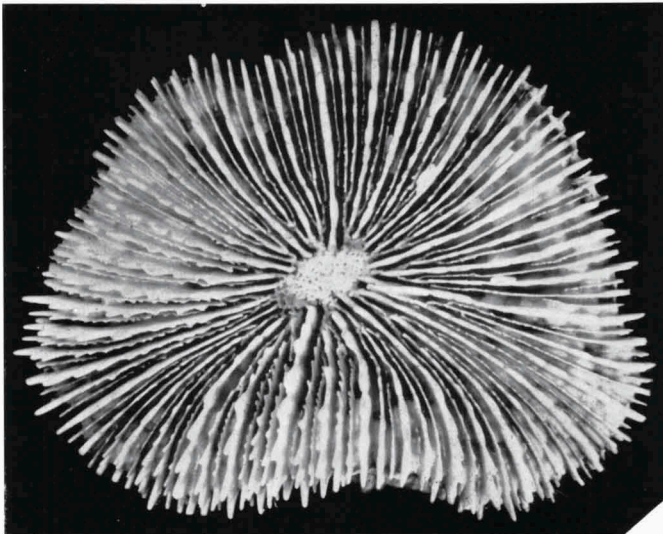
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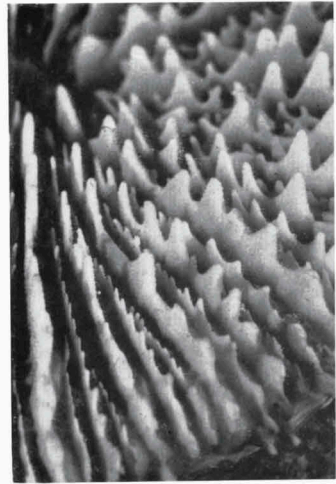
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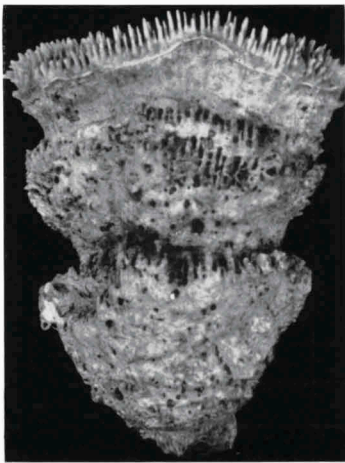
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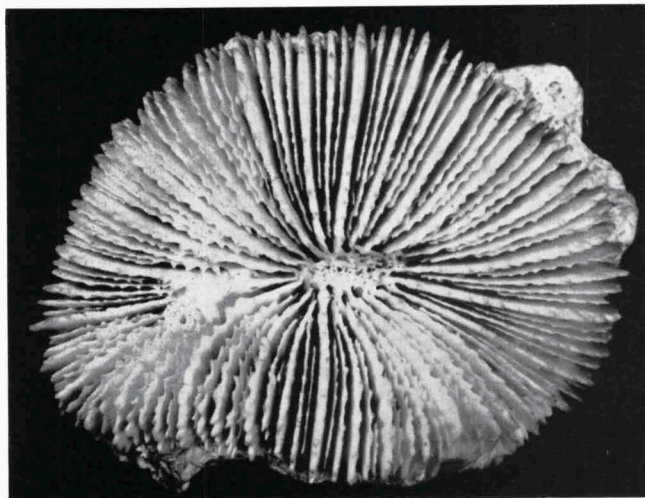
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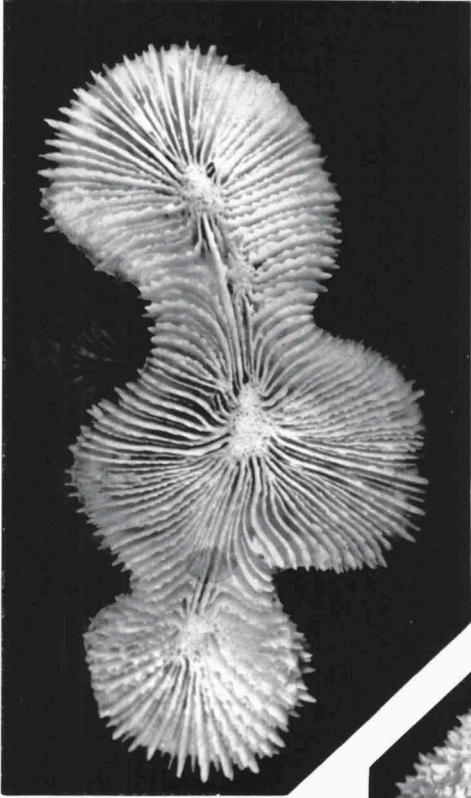
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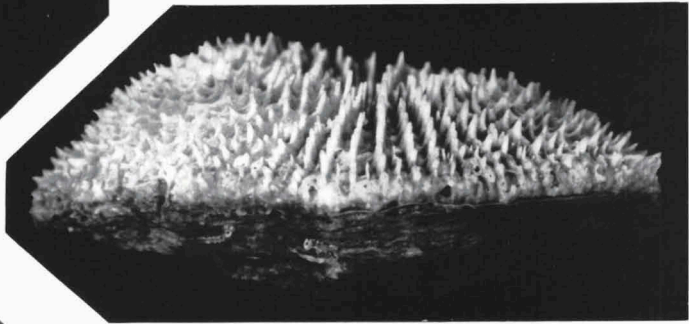
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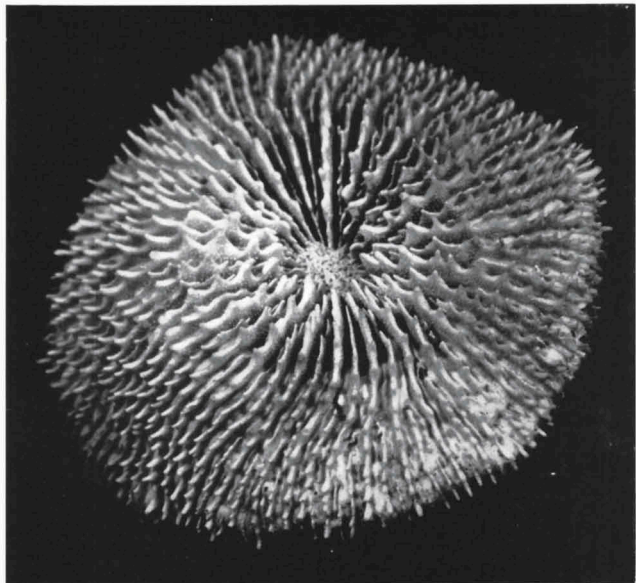
4



2



5



3