THE BRYOZOAN FAUNA OF THE GALAPAGOS ISLANDS

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INTRODUCTION

Continuing our investigations of the dredgings of the United States Fish Commission steamer *Albatross* preserved in the United States National Museum, we have recently completed the study of the material collected from a few stations in the vicinity of the Galapagos Islands. As a result we find that the bryozoa of the Galapagos afford equally interesting results as other classes of animals from this classic area. In the pursuit of these studies we have had financial assistance from the American Association for the Advancement of Science, which help is here gratefully acknowledged.

Located on the equatorial line, the bryozoan fauna of the Galapagos Islands is found to be particularly interesting to the paleontologist. The species common with the Gulf of Mexico indicate the ancient communication of the Pacific with the Atlantic and the very recent formation of the Isthmus of Panama. These species are *Acanthodesia savartii*, *Aplousina filum*, *Callopora tenuirostris*, *Callopora curvirostris*, *Cupuladria umbellata*, *Puellina innominata*, *Trypostega venusta*, *Hippoporina cleidostoma*, *Mamillopora cupula*, and *Lichenopora radiata*. None of these is known to have made the circuit of any of the continents, so that free communication between the two oceans must have existed.

Another remarkable phenomenon is the persistence in this region of archaic forms known hitherto only as fossils and in which naturally the anatomic structure was unknown. Very useful comparisons can thus be made by means of such species as *Proboscina lamellifera*, *Plagioecia subpapyracea*, *Diaperoecia* (*Reticulipora*) *mean-*

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drina, *Defrancia stellata*, *Cavaria praesens*, and *Heteropora* sp. The materials collected were, unfortunately, not very numerous.

The bryozoa from the eastern side of the Pacific are still little known, so that we should not be surprised at the large number of new forms discriminated. Thus, of 53 species determined and studied, 29 are new and 4 new genera of Cheilostomata have been created. Three of the latter have a decided originality and are peculiar to the region.

Although under the influence of the southern current, which spreads even to the Sandwich Islands, we have not recognized the species common with South America. However, it is true that the bryozoan fauna of the South American continent is scarcely known. We hope that new explorations of the Galapagos Islands will furnish a larger quantity of material. Life is very active in these equatorial regions for a plancton of extraordinary richness assures the life of a great fauna as peculiar as it is varied.

The location, characteristics, and faunas of the three stations studied are as follows:

FAUNAL LISTS

Albatross Station D. 2813. Galapagos Island; 1° 21″ S; 89° 40′ 15″ W.; 40 fathoms; coral sand; April 7, 1888.

Acanthodesia savartii Savigny-Audouin, 1826.
Adeona granulata, new species.
Adeona tubulifera, new species.
Aplousina filum Jullien, 1903.
Callopora curvirostris Hincks, 1861.
Callopora tenuirostris Hincks, 1880.
Callopora verrucosa, new species.
Cavaria praesens, new species.
Chorizopora brongniarti Audouin, 1826.
Codonella granulata, new species.
Crepidacantha poissonii Savigny-Audouin, 1826.
Cupularia umbellata Defrance, 1823.
Dakaria sertata, new species.
Diaperoecia flabellata Canu and Bassler, 1923.
Diaperoecia? striatula, new species.
Diaperoecia subpapyracea, new species.
Diplonotos costulatum, new species.
Heteropora, species.
Hippomenella parvicapitata, new species.
Hippoporidra granulosa, new species.
Hippoporina cleidostoma Smitt, 1873.
Hippotrema(?) spiculifera, new species.
Holoporella hexagonalis, new species.
Holoporella quadrispinosa, new species.
Lagenipora marginata, new species.
Lichenopora radiata Savigny-Audouin, 1826.
Mamillopora cupula Smitt, 1873.

Membrendoecium claustracrassum, new species.
Microecia tubiabortiva, new species.
Micropora coriacea Esper, 1794.
Microporella gibbosula, new species.
Microporella tractabilis, new species.
Oncousoecia (*Proboscina*) *major* Johnston, 1847.
Osthimosia anatina, new species.
Pachycleithonia nigra, new species.
Plagioecia lactea Calvet, 1903, variety.
Proboscina lamellifera, new species.
Puellina innominata Couch, 1844.
Schizopodrella (*Stephanosella*) *biaperta* Michelin, 1842.
Smittina trispinosa Johnston, 1838, variety.
Trypostega venusta Norman, 1864.
Tubulipora, species.

Albatross Station D. 2815. Galapagos Islands; 1° 17′ 30″ S; 90° 30′ 15″ W.; 33.5 fathoms; gray sand with black specks; April 9, 1888.

Adeona tubulifera, new species.
Arthropoma cecili Savigny-Audouin, 1826.
Callopora tenuirostris Hincks, 1880.
Cauloramphus brunea, new species.
Cavaria praesens, new species.
Chaperia condylata, new species.
Codonella granulata, new species.
Crepidacantha poissoni Savigny-Audouin, 1826.
Defrancia stellata Reuss, 1847.
Dakaria sertata, new species.
Diaperoccia meandrina, new species.
Enantiosula manica, new species.
Hippoporina cleidostoma Smitt, 1873.
Hippotrema (?) *spiculifera*, new species.
Holoporella porosa, new species.
Holoporella quadrispinosa, new species.
Holoporella tridenticulata Busk, 1881.
Lagenipora verrucosa, new species.
Membrendoecium claustracrassum, new species.
Microporella tractabilis, new species.
Osthimosia anatina, new species.
Puellnia radiata Moll, 1803.
Schizopodrella (*Stephanosella*) *biaperta* Michelin, 1842.
Smittina reticulata MacGillivray, 1842.
Smittina trispinosa Johnston, 1838, variety.
Trypostega venusta Norman, 1864.
Tubulipora, species.
Tubulipora liliacea Harmer, 1898.

Albatross Station D. 3408. Off Galapagos Islands; 12′ 30″ N.; 90° 32′ 30″ W.; 684 fathoms; Globigerina ooze; April 3, 1891.

Diplonotos costulatum, new species.
Diplonotos striatum, new species.
Semihaswellia sulcosa, new species.

Order CHEILOSTOMATA Busk

Suborder ANASCA

Division MALACOSTEGA

Family BIFLUSTRIDAE Smitt, 1872

Genus ACANTHODESIA Canu and Bassler, 1920

ACANTHODESIA SAVARTII Savigny-Audouin, 1826

Zoological bibliography

1812. *Flustra savartii* SAVIGNY, Description de l'Egypte Polypes, pl. 10, fig. 10.
1826. *Flustra savartii* AUDOUIN, Explication sommaire des planches de Polypes de l'Egypte et de la Syrie, p. 240.
1873. *Biflustra savartii* SMITT, Floridan Bryozoa, Kongl. Svenska Vetenskaps-Akademiens Handlingar, vol. 11, p. 20, pl. 4, figs. 92–95.
1880. *Membranipora delicatula* HINCKS, Contributions toward a General History of the Marine Polyzoa, Annals and Magazine of Natural History, ser. 5, vol. 6, p. 18, pl. 11, fig. 1.
1881. *Biflustra delicatula* MACGILLIVRAY in McCoy, Prodrome Zoology of Victoria, decade 6, p. 28, pl. 37, figs. 2, 3.
1884. *Biflustra savartii* BUSK, Challenger, p. 67, pl. 14, fig. 2.
1887. *Membranipora savartii* WATERS, Bryozoa from New South Wales, North Australia, Annals and Magazine of Natural History, p. 181, pl. 4, fig. 8. (Variety.)
1909. *Membranipora savartii* WATERS, Reports on the marine biology of the Sudanese Red Sea, XII, Journal Linnean Society, London, vol. 31, p. 137, pl. 11, figs. 8–13.
1913. *Membranipora savartii* WATERS, Marine fauna of British East Africa and Zanzibar. Bryozoa Cheilostomata. Proceedings Zoological Society London, p. 486.
1914. *Membranipora savartii* OSBURN, Tortugas, Publication Carnegie Institution of Washington, No. 182, p. 1941.
1920. *Acanthodesia savartii* CANU and BASSLER, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 100, pl. 21, figs. 2–4. (Complementary bibliography geologic and geographic distribution.)
1923. *Acanthodesia savartii* CANU and BASSLER, North American Later Tertiary and Quaternary Bryozoa, Bulletin 125, U. S. National Museum, p. 30, pl. 11, figs. 1–3; pl. 2, figs. 2, 3; pl. 5, figs. 1–5; pl. 11, figs. 5–9 (forma *delicatula*); pl. 11, fig. 4; pl. 46, figs. 8, 9. (Study of the recent and fossil varieties.)
1928. *Acanthodesia savartii* CANU and BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, Art. 2710, p. 14, pl. 1, figs. 5, 6.
1929. *Acanthodesia savartii* CANU and BASSLER, Bryozoa of the Philippine Region, Bull. 100, vol. 9, U. S. National Museum, p. 66, pl. 1, figs. 1–5.

Our specimen is bilamellar, bifurcated, in narrow fronds with eight rows of cells. The mural rim is thick and granular. It is well represented by Figure 9 of Plate 11 of Canu and Bassler, 1923.

There are areal spicules but no serrate denticles, while in the Philippine and in the Gulf of Mexico specimens there are no spicules.

Biology.—The discovery of this equatorial species at the Galapagos confirms our preceding deductions on the recent formation of the Isthmus of Panama, in which we have discovered it with certainty as a fossil. Its geographic extension is very great, but everywhere it lives only in waters of little depth. Its presence in the fossils always reveals the vicinity of the shore. It is able to cross the great depths of the ocean only when parasitic on floating algae.

Occurrence.—Galapagos Islands, D. 2813.

Geographic distribution.—Atlantic: Gulf of Mexico and Florida (29 fathoms); Tortugas (10 fathoms) and between Florida and New Orleans (27–30 fathoms). Pacific: Sulu Sea and Celebes Sea in the Philippines (20–24 fathoms); Samboangan (10 fathoms); Australia, Queensland and Victoria, Palm Island (8–10 fathoms), and Darnley Island in Torres Strait. Indian Ocean: Zanzibar (8–10 fathoms); Sudanese Red Sea (5–30 fathoms) and Ceylon.

Plesiotypes.—Cat. No. 8469, U.S.N.M.

Family HINCKSINIDAE Canu and Bassler, 1927

Genus APLOUSINA Canu and Bassler, 1927

APLOUSINA FILUM Jullien, 1903

Plate 1, Figures 1, 2

1873. *Biflustra lacroixii* Smitt (not Audouin), Floridan Bryozoa, p. 18, pl. 4, figs. 85 to 88 (Florida, 21–97 m.).

1902. *Membranipora reticulum* Calvet (not Linnaeus), Bryozoaires marines des Cotes de Corse, Travaux de l'Institut Zoologique de Montpellier, ser. 2, mem. 12, p. 14.

1903. *Membranipora filum* Jullien, Bryozoaires provenant des campagnes de l'Hirondelle 1886–1888, Resultats des campagnes scientifiques accompanies par le Prince de Monaco, fasc. 23, p. 41, pl. 5, fig. 4 (Azores, 130–318 m.).

1907. *Membranipora filum* Calvet, Bryozoaires des expéditions scientifique du *Travailleur* et du *Talisman*, VIII, p. 386 (bibliography). (Cape Verde Islands, 80–180 m.; Cape Spartel, northwest of Morocco, 717 m.)

1923. *Callopora filum* Canu and Bassler, North American Later Tertiary and Quaternary Bryozoa, Bulletin 125, U. S. National Museum, p. 42, pl. 45, fig. 5 (Pleistocene of Mount Hope, Panama).

?1898. *Membranipora capriensis* Waters, Observations on Membraniporidae, Linnean Society's Journal, Zoology, p. 690, pl. 47, fig. 6 (Capri, Italy).

Structure.—In 1923 we interpreted badly the description of the ovicell given by Calvet in 1907 without figures. As it is easy to see on the figure of Smitt, 1873, the ovicell is really endozooecial; it is often ornamented with a small frontal cicatrix.

The opercular valve is very short and is supported on the mural rim, with a width of 0.16–0.20 mm. Smitt said also that it is small,

but he figures it isolated from the mural rim and gives it 0.18 mm. in width. It is difficult to appreciate these chitinous organs on the dry specimens. Our specimens are poorly located on their substratum and can be photographed only with difficulty. Nevertheless, in spite of their imperfections, they show great micrometric variations. We have measured Lz=0.60–0.73 mm. and lz=0.50–0.45 mm.

The figures of Jullien measure 0.80–0.64 mm. Waters for *M. capriensis* speaks of a length of 0.60–0.70 mm., and his figure indicates 0.84–0.44 mm. The mural rim is isolated and finely granulated. The small granulations are not always clearly visible; for this reason we have introduced doubtfully *Membranipora capriensis* Waters, 1898, which is figured with a smooth mural rim but in which the ovicell is clearly endozooecial.

The two small oral spines cited by Jullien are not visible on our specimens. Smitt did not figure them, so they appear inconstant and fragile.

We have not discovered this species in the dredgings made by the *Albatross* in the Gulf of Mexico, and we therefore can not confirm the observations of Smitt.

Our specimens from the Galapagos were dredged living on dead Cellepores at 40 fathoms of depth.

Biology.—"In the lowest state of development, it is a thin, glossy, yellow-white shining crust. In the zooecia, covered by their thin, translucent ectocyst, within the area, the bundle of tentacles and the *musculi retractores operculi* clearly present themselves through their black color." (Smitt.) The ectocyst of the adult zooecia easily loses its clearness.

This species has been observed on corals, on dead bryozoa (*Cellepora*, *Steganoporella*, etc.), on *Mytilus* and on fragments of dead shells. All the specimens collected to the present time appear to have lived at the depths where they were dredged. These vary from 2 to 717 meters, which reveals a great facility of adaptation to bathymetric and thermometric conditions. However, this is an equatorial or subequatorial species in which the extension toward the north does not transgress beyond the Mediterranean. We are ignorant of the causes which maintain it in these actual biologic limits.

The species was in reproduction at the Cape Verde Islands on July 27, 1883, but at the Galapagos Islands our specimens were ovicelled on April 7 to 9, 1888.

The simultaneous occurrence in the Gulf of Mexico and the Galapagos Islands and in the Quaternary of Panama indicates the ancient communication between the Pacific and the Atlantic and the recent formation of the Isthmus of Panama. The species common to these two oceans are now rather rare. At the Galapagos Islands

the great southern current has modified considerably the nature of the plancton and all the marine fauna. The simple forms indifferent to the thermic influences alone have been able to persist. This is precisely the case for *Aplousina filum.*

Occurrence.—Galapagos Islands, D. 2813.

Geographic distribution.—Eastern Atlantic: Cape Verde Islands, 80–180 meters; Azore Islands, 130–318 meters; Cape Spartel, northwest of Morocco, 717 meters. Mediterranean: Corse, littoral; Capri (?). Western Atlantic: Florida, 13–60 fathoms. Pacific: Galapagos Islands, 40 fathoms.

Plesiotypes.—Cat. No. 8470, U.S.N.M.

Genus MEMBRENDOECIUM Canu and Bassler, 1917

MEMBRENDOECIUM CLAUSTRACRASSUM, new species

Plate 1, Figures 3–7

Description.—The zoarium is multilamellar; it incrusts fragments of shells and dead gastropods. The zooecia are oval, the point above, a little enlarged at the base, elongated, distinct, separated by a deep furrow. The mural rim is a thin salient thread; the cryptocyst almost entirely surrounds the opesium; it is very much enlarged proximally and is finely granular. The opesium is elongated, oval, distally adjacent to the mural rim, finely crenulated. At the base of each zooecium there is a small triangular avicularium oriented longitudinally, the beak above. The opercular valve is small, removed from the mural rim laterally. The ovicell is endozooecial, little apparent, covered by a small chitinous band distally and a large, thick, and much chitinized opercular valve.

Measurements.—

Opesium $\begin{cases} ho = 0.26\text{–}0.30 \text{ mm.} \\ lo = 0.16\text{–}0.18 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.40\text{–}0.50 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases}$

Structure.—The structure of the ovicell is quite remarkable and can be seen only on the specimens preserving their ectocyst. It is a simple distal cavity covered by a chitinous band and by a large hinged operculum thicker and more chitinized than the small opercular valve of the other cells. It is therefore little visible on specimens deprived of the ectocyst, although the doubling of the small distal avicularium is often an index of its presence.

Certain zooecia have their cryptocyst perforated by a small subcircular median opesium; they are not regenerated and we are still ignorant of their anatomical structure. The ancestrula is very small; unfortunately our specimen does not show this structure very well.

On the much calcified zooecia the opesium is smaller and the cryptocyst more developed. A simple tuberosity then replaces the distal avicularium.

Affinities.—This species differs from *Membrendoecium ovatum* Canu and Bassler, of the Philippines, in its smaller zooecia and its finely crenulated opesium. It has much resemblance to *M. transversum* Canu and Bassler, 1920, of the American Midwayan and differs only in the longitudinal orientation of the small avicularia. It could perhaps be the same as *M. papillatum* Busk, 1884, of the Philippines, in which the cryptocyst is granulated and the opesium is regularly oval, but we have no other means of comparison than the incomplete figure of the author.

Biology.—The zoarium incrusts shells in many superposed lamellæ. The exterior lamella shows then false ancestrulæ which are not derived from a larva. The lamella directly in contact with the shell has zooecia less calcified and more irregular. Our specimens were in reproduction and fixation April 7, 1888.

Occurrence.—Galapagos Islands, D. 2813 and D 2815.

Cotypes.—Cat. Nos. 8471, 8472, U.S.N.M.

Family ALDERINIDAE Canu and Bassler, 1927

Genus CALLOPORA Gray, 1848

CALLOPORA TENUIROSTRIS Hincks, 1880

1918. *Membranipora tenuirostris* Waters, Some collections of the littoral marine fauna of the Cape Verde Islands, Bryozoa, Journal Linnean Society Zoology, vol. 34, p. 9. (Bibliography, geographic distribution).

1920. *Callopora tenuirostris* Canu and Bassler, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 154, pl. 29, figs. 10, 11.

1928. *Callopora tenuirostris* Canu and Bassler, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, art. 2710, p. 31, p. 3, fig. 4.

1929. *Callopora tenuirostris* Canu and Bassler, Bryozoa of the Philippine Region, Bull. 100, vol. 9, U. S. National Museum, p. 102, pl. 3, fig. 6.

Our specimens incrust dead shells, oysters, Cellepores, *Smittina*, Nullipores, and *Cupularia* umbellata. For the greater part they are living.

Biology.—This is a species of shallow water and does not pass beyond 90 meters. The *Albatross*, however, dredged a dead specimen in the Philippines at 379 meters. It is abundant in the equatorial or subequatorial zone, although it has been observed in the temperature zone of the Pacific.

It was in reproduction on January 30, 1885, in the region of the Gulf of Mexico, and on April 7–9, 1888, in the Gallapagos Islands, and in September 18, 1918, at La Jolla, Calif.

Occurrence.—Galapagos Island, D. 2813 and D. 2815.

Geographic distribution.—Atlantic: Madeira, Cape Verde Islands (10 fathoms). Gulf of Mexico (24–65 fathoms). Mediterranean: Naples (10–40 fathoms), Capri, Rapallo, Oran (85 meters), Adriatic. Pacific: Philippines (20–140 fathoms), La Jolla, Calif., and Queen Charlotte Islands.

Cat. No. 8473 U.S.N.M.

CALLOPORA CURVIROSTRIS Hincks, 1861

1918. *Membranipora curvirostris* WATERS, Some collections of the littoral marine fauna of the Cape Verde Islands, Bryozoa, Journal Linnean Society, Zoology, vol. 34, p. 9 (bibliography).

1923. *Callopora curvirostris* CANU and BASSLER, North American Later Tertiary and Quaternary Bryozoa, Bulletin 125, U. S. National Museum, p. 42 (Guernei).

1925. *Callopora curvirostris* CANU and BASSLER, Les Bryozoaires du Maroc et de Mauritanie, Mem. de la Société des Sciences Naturelles du Maroc, No. 10, p. 14.

1928. *Callopora curvirostris* CANU and BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico region, Proc. U. S. National Museum, Art. 2710, p. 32, pl. 3, figs. 9, 10; pl. 32, figs. 8.

Our specimens incrust a shell, a dead Cellepore and a large *Smittina foliacea*. They were living and ovicelled April 7, 1888.

Biology.—This species has almost always been dredged dead and its biology is therefore difficult to determine. We had the good fortune to find our specimens had been dredged alive. The species lives in the equatorial and temperate zones at depths varying up to 231 meters. It is another indication of the ancient communication between the Atlantic and the Pacific.

Occurrence.—Galapagos Islands, D. 2813.

Geographic distribution.—Atlantic; Polperro, Great Britain, 40 fathoms; Cape Verde Islands, 10 fathoms; shores of Morocco, 110–158 meters; Gulf of Gascogny, 135 meters; Brazil, 56 meters; Habana, Gulf of Mexico, 201 fathoms; between Cuba and Yucatan, 143 fathoms. Mediterranean: Naples, Oran, Pacific; Nukatofa, Tongatabu, 20 fathoms; Hawaiian Islands 91–113 fathoms; Indian Ocean: Dwarka, Gulf of Arabia, Laccadives Islands; Adelaide, Australia; Bangam, Bengal; Singapore (26 meters).

Cat. No. 8474 U. S. N. M.

CALLIPORA VERRUCOSA, new species

Plate 1, Figure 8

Description.—The zoarium incrusts fragments of shells. The zooecia are distinct, separated by a furrow, elongate elliptical or a little oval. The mural rim is smooth, thin, salient, and regular. The form of the opesium is that of the zooecium. The ovicell is hyperstomial, globular. In all the interopesial spaces there is a

small triangular avicularium with rounded beak. In the marginal zone of the colony, in the separating furrows of the cells, there are small elliptical zooeciules perforated by a submedian pore. On the margin itself, the zooeciules develop exclusively and arrest the formation of the normal zooecia.

Measurements.—

Opesium { *ho*=0.40 mm. *lo*=0.25 mm. Zooecium { *Lz*=0.50 mm. *lz*=0.30–0.35 mm.

Affinities.—The function of the small zooeciules is absolutely unknown. They have been observed in several species; in *Mystriopora areolata* Canu and Bassler, 1923, from the Pleistocene of California, in *Callopora pumicosa* Canu and Bassler, 1928, recent species from the Gulf of Mexico, and in *Electra distefanoi*, Cipolla, 1923, of the Sicilian of Italy. They appear to have a small polypide since they undergo the phenomenon of total regeneration. Our photographs show several examples. Adventitious zooeciules somewhat more elongated in form have also been observed in other genera of the bryozoa.

Occurrence.—Galapagos Islands, D. 2813.

Holotype.—Cat. No. 8475, U. S. N. M.

Genus CAULORAMPHUS Norman, 1903

CAULORAMPHUS BRUNEA, new species

Plate 1, Figures 9, 10

Description.—The zoarium incrusts dead Cellepores. The zooecia are distinct, elongated, separated by a very deep furrow, somewhat oval. The mural rim is thick, rounded, very salient. It bears 4 distal spines and 7–9 pairs of brown, areal spines. The pedunculate avicularia are white, a little longer than the spines. The ancestrula is a very small ordinary zooecium.

Measurements.—

Opesium { *ho*=0.30 mm. *lo*=0.15 mm. Zooecium { *Lz*=0.40–0.45 mm. *lz*=0.30 mm.

Affinities.—This species is very well characterized by the brown spines. They are white in *Cauloramphus spinifer* Johnston, 1847, which is the closest species.

Biology.—This is a sordid species for the living specimens, in spite of their large number of spines are always covered with calcareous granules, siliceous particles, fragments of sponges, and of dirt. It is difficult to find a specimen that can be photographed. By boiling in Javelle water the cells when completely freed from their spines and all the dirt have on the contrary a most agreeable aspect and resemble little crowns.

Occurrence.—Galapagos Islands, D. 2815.
Cotypes.—Cat. No. 8476, U.S.N.M.

Division COILOSTEGA Levinsen, 1909

Family OPESIULIDAE Jullien, 1888

Genus MICROPORA Gray, 1848

MICROPORA CORIACEA Esper, 1794

1920. *Micropora coriacea* CANU and BASSLER, Monograph Early Tertiary Bryozoa of North America, Bulletin 106 U. S. National Museum, p. 235, pl. 4, figs. 20–22. (Bibliography, geographic and geologic distributions).
1921. *Micropora coriacea* MARCUS, Bryozoen von den Juan-Fernandez Inseln in Skollsberg, The Natural History of Juan Fernandez and Easter Isles, vol. 3, p. 101, fig. 4.
1923. *Micropora coriacea* CANU and BASSLER, North American Later Tertiary and Quaternary Bryozoa, Bulletin 125, U. S. National Museum, p. 58.
1928. *Micropora coriacea* CANU and BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, vol. 72, p. 62, text, fig. 8c.

Measurements.—

Apertura $\begin{cases} ha = 0.06 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{cases}$ Zooecium $\begin{cases} Lz = 0.46 - 0.50 \text{ mm.} \\ lz = 0.24 - 0.30 \text{ mm.} \end{cases}$

A single dead specimen has been found; it has some transverse cells. This is the single species of the fauna from Juan Fernandez Island which has been drifted by the southern current as far as the Galapagos Islands. The *Albatross* also dredged it in the Hawaiian Islands.

Occurrence.—Galapagos Islands, D. 2813.
Cat. No. 8477, U.S.N.M.

Family CALPENSIIDAE Canu and Bassler, 1923

Genus CUPULARIA Lamouroux, 1821

CUPULARIA UMBELLATA Defrance, 1823

1923. *Cupularia umbellata* CANU and BASSLER, North American Later Tertiary and Quaternary Bryozoa, Bulletin 125, U. S. National Museum, p. 80, pl. 2, figs. 15–19. (Bibliography, geologic distribution.)
1928. *Cupularia umbellata* CANU and BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, Art. 2710, p. 64, pl. 1, figs. 1–3.
1929. *Cupularia umbellata* CANU and BASSLER, Bryozoa of the Philippine Region, Bull. 100; vol. 9, U. S. National Museum, p. 142, pl. 15, figs. 5–11.

Variations.—The specimens collected are numerous and more vigorous than the specimens from Hawaii dredged at 4,411 meters depth.

In the great abyssal depths the bryozoa generally appear to be stunted.

At the center there is no visible ancestrula, but there are four zooecia in a cross. Each cell is perforated by six large opesiules. On the inner side the ribs are smooth when the colony is little calcified; they are granulated on the much calcified colonies.

All of our colonies were dead except one which had preserved its avicularian setae.

There exists a small variation *conica*, in which the colony is very small, full, and conical. It has been found in the Helvetian faunas of Touraine.

Biology.—This species has been dredged at very great depths, for it is one of the rare species characteristic of the abyssal ooze. Because of its mobility it can live upon the moving bottom. The bathymetric dispersion rises only up to a depth of 80 meters and it can not adapt itself easily to slight depths (Calvet, 1907). This statement of Calvet on the bathymetric dispersion is a little exaggerated, for it lives perfectly in waters of little depths, because Smitt discovered it at Cape Fear River at a depth of only 11 meters.

As it is very abundant between America and the Hawaiian Islands at the great depth of 4,411 meters with a temperature of 1.4° C. we may suppose it can exist in the boreal zone, but it is a species of the tropical zone and does not generally extend far from the Tropics. Neither the depth nor the temperature seem to modify its biologic limits.

Its locomotion facilities are much reduced and it is not able to

Occurrence.—Galapagos Islands, D. 2815; Hawaii, D. 3813.

Geographic distribution.—Mediterranean: Oran, 87 meters. Atlantic: Cape Verde Islands, 1,900 meters; Canary Islands, 80 meters; Madeira, 81–113 meters; Florida, 29 fathoms; Tortugas, 12–22 fathoms; Beaufort, N. C.; Cape Fear River, 7 fathoms. Indian Ocean: Mergui Archipelago. Pacific Ocean: Between California and the Hawaiian Islands, 2,723 fathoms.

Cat. No. 8478, U.S.N.M.

Suborder ASCOPHORA Levinsen, 1909

Family COSTULAE Jullien, 1888

Genus PUELLINA Jullien, 1886

PUELLINA RADIATA Moll, 1803

1920. *Puellina radiata* CANU and BASSLER, North American Early Tertiary Bryozoa, Bulletin 106, U. S. National Museum, p. 295, pl. 41, figs. 14–18. (Bibliography, geographic and geologic distribution.)

1925. *Puellina radiata* CANU and BASSLER, Les Bryozoaires du Maroc, Mémoires de la Société des Sciences naturelles du Maroc, vol. 10, p. 21.

1928. *Puellina innominata* CANU and BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, Art. 2710, p. 73, pl. 10, fig. 11.

1929. *Puellina radiata* CANU and BASSLER, Bryozoa of the Philippine Region, Bull. 100, vol. 9, U. S. National Museum, p. 238, pl. 22, fig. 1.

Our specimens were dead and incrusting Cellepores. They are of small dimensions.

Occurrence.—Galapagos Islands, D. 2815; Hawaii, D. 3813.

Cat. No. 8479, U.S.N.M.

PUELLINA INNOMINATA Couch, 1844

1925. *Puellina innominata* CANU and BASSLER, Les Bryozoaires du Maroc. Mémoires de la Société des Sciences naturelles du Maroc, vol. 10, p. 21.

1928. *Puellina innominata* CANU and BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, Art. 2710, p. 73, pl. 14, fig. 2.

The frontal pore is very constant on our specimens, which were almost all living and ovicelled. They incrust Cellepores and shells. One of them is incrusted by small Serpulas against which it could not defend itself. Reproduction occurred on April 7, 1888.

Occurrence.—Galapagos Islands, D. 2813.

Cat. No. 8480, U.S.N.M.

Family HIPPOTHOIDAE Levinsen, 1909

Genus CHORIZOPORA Hincks, 1880

CHORIZOPORA BRONGNIARTI Audouin, 1826

1925. *Chorizopora brongniarti* Canu and Bassler, Les Byrozoaires du Maroc, Mémoires de la Société des Sciences naturelles du Maroc, vol. 10, p. 23, pl. 7, fig. 2.

A single living ovicelled specimen on *Lithothamnion* (April 17, 1888).

Occurrence.—Galapagos Islands, D. 2813.

Cat. No. 8482, U.S.N.M.

Genus TRYPOSTEGA Levinsen, 1909

TRYPOSTEGA VENUSTA Norman, 1864

1920. *Trypostega venusia* Canu and Bassler, Bull. 106 U. S. National Museum, p. 330, pl. 85, fig. 15–16. (Bibliography, geographic distribution.)

1928. *Trypostega venusta* Canu and Bassler, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, vol. 72, art. 14, p. 77, pl. 8, figs. 5, 6.

1929. *Trypostega venusta* Canu and Bassler, Bryozoa of the Philippines, Bull. 100, U. S. National Museum, p. 248, pl. 22, figs. 9–11.

The ovicelled zooecia not having frontal tuberosities show that our specimens belong to the form *striatula* Smitt, 1873, just as in the Philippines and in the Indian Ocean.

Biology.—Our specimens were living and ovicelled and were therefore in reproduction April 7–9, 1888. We have stated in our work on the Gulf of Mexico that reproduction occurred from January to March, which must now be changed to April.

Our specimens incrust shells and nullipores as in Europe these being the most habitual substrata of this species. Nevertheless we have observed rare colonies on bryozoa, (*Steganoporella*, *Stylopoma*), corals, and hydroids in the Gulf of Mexico and on small pebbles in the Philippines.

The geographic extension of this species is rather great. It appears more abundant in the equatorial zone, but it extends in the Atlantic up to the fiftieth parallel. The localities in the temperate zone are very rare and not yet been dredged in the Mediterranean. Perhaps it has been brought to the English Channel only by a current from the Gulf stream.

The geographic distribution which we gave in 1920 was incomplete, and we believe it useful to give it anew, adding some bathymetric notes.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Geographic distribution.—Eastern Atlantic: Guernsey, 16 meters, and the shores of Calvados, France, in the English Channel; Ma-

deira, in shallow water; Cape Verde Island, 110–180 meters. Western Atlantic: Beaufort, South Carolina; Tortugas, 8–24 meters; Gulf of Mexico at Habana, 98–325 meters and Florida, 41–97 meters. Indian Ocean: Amirante, 37–137 meters; Saya de Malha, 47–202 meters; Wasin, British East Africa, 16 meters; Mauritius; Tizard Banks, China Sea, 43 meters. Pacific: Philippines at Jolo, Sulu Sea, 30 meters, in the Celebes Sea, 372 meters and 11.6° C. and at Anima Solo, 170 meters and 17.2° C. (specimens all dead); Murray Islands, Torres Strait, 24–32 meters; Port Phillips Heads, Australia; Sifu, Loyalty Islands; Galapagos Islands, 54–65 meters.

Cat. No. 8471, U.S.N.M.

Family GALEOPSIDAE Jullien, 1903

Genus SEMIHASWELLIA Canu and Bassler, 1917

SEMIHASWELLIA SULCOSA, new species

Plate 10, Figures 4–8

Description.—The zoarium is free, branching dichotomously at intervals usually of 5 to 7 mm. The zooecia are indistinct, gigantic; the frontal is formed by a very thick epitheca ornamented with very deep longitudinal sulci at the bottom of which are large vacuoles rather close together. The peristome is long, cylindrical, salient, oblique. The peristome is thick, sharp edged, orbicular. The aperture is buried at the bottom of the peristomie. The ascopore is tubular, salient, oriented toward the proximal zooecium. A small orbicular avicularium (?) appears sporadically on the frontal in the vicinity of the peristomie of an adjacent zooecium. On the dorsal of the colony there are deep longitudinal sulci with large vacuoles rather close together. Small orbicular avicularia replace the vacuoles about the level of the peristomes of the cellular face.

Measurements.—

Zooecia $\begin{cases} Lz = 2.75 \text{ mm.} \\ lz = 1.00 \text{ mm.} \end{cases}$ Peristome $\begin{cases} hp = 0.45 \text{ mm.} \\ lp = 0.45 \text{ mm.} \end{cases}$

Affinities.—This species differs from the genotype *Semihaswellia proboscidea* Waters, 1889, from St. Thomas (West Indies), in its smaller peristomes and in the presence of deep longitudinal sulci arranged on both sides of the colony. The dimensions of the fossil species (Jacksonian) collected in America are much smaller than those of the two known recent species of the genus. The discovery of the genus *Semihaswellia* in the Pacific is very interesting.

Occurrence.—Galapagos Islands, D. 3408.

Holotype.—Cat. No. 8536, U.S.N.M.

Family ESCHARELLIDAE Levinsen, 1909

Genus ARTHROPOMA Levinsen, 1909

ARTHROPOMA CECILI Savigny-Audouin, 1826

1925. *Arthropoma cecili* CANU and BASSLER, Les Bryozoaires du Maroc et de Mauritanie, Mémoires de la Société des Sciences naturelles du Maroc, vol. 10, p. 23. (Biology.)

1929. *Arthropoma cecili* CANU and BASSLER, Bryozoa of the Philippine Region, Bull. 100, vol. 9, U. S. National Museum, p. 296, pl. 32, fig. 1.

A single living ovicelled specimen on a Cellepore, dredged April 9, 1888. At La Jolla, Calif., we have observed specimens ovicelled on Sept. 18, 1918.

Occurrence.—Galapagos Islands, D. 2815. La Jolla, Calif.

Cat. No. 8484, U.S.N.M.

Genus SCHIZOPODRELLA Canu and Bassler, 1917

SCHIZOPODRELLA (STEPHANOSELLA) BIAPERTA Michelin, 1842

Plate 2, Figures 1, 2

1923. *Stephanosella biaperta* CANU and BASSLER, North American Later Tertiary and Quaternary Bryozoa, Bull. 125 U. S. National Museum, p. 99, pl. 16, figs. 4–9. (Bibliography, geologic and geographic distribution.)

1925. *Stephanosella biaperta* CANU and BASSLER, Les Bryozoaires du Maroc et de Mauritanie, Mémoires de la Société des Sciences naturelles du Maroc, vol. 10, p. 30, pl. 7, fig. 5 (operculum).

Measurements.—

Apertura { *ha*=0.10–0.12 mm. *la*=0.08–0.10 mm. Zooecium { *Lz*=0.40–0.50 mm. *lz*=0.34 mm.

Affinities.—The small oral avicularia are triangular and the tremopores are rather large. These are the noticeable differences from the European specimens. The ovicelled zooecia are also much better oriented, but they have the same cribriform frontal area. The affinities are essentially with the fossils from the California Pleistocene figured by Canu and Bassler, 1923 (more exactly with their figures 4–8). In tangential section the tremopores appear very small.

FIGURE 1. — SCHIZOPODRELLA (STEPHANOSELLA) BIAPERTA MICHELIN, 1842. TWO OPERCULA, × 85

The number of distal spines varies from 6 to 8. The operculum is the same as in typical *Schizopodrella.* Also as the ovicellarian area does not correspond to any evident or known function there is no need to maintain the genus *Stephanosella.*

The genotype itself, a fossil of the French Miocene has a smooth frontal. In our mind, the specimens of the genus *Stephanosella* were provided with a olocystal frontal, but it is indeed true that this appearance is only the result of an alteration in the fossils. It is also

true that the Miocene species is still represented in the recent seas by specimens with a tremocystal frontal. Our genus *Stephanosella* has no further reason for existence and should be suppressed. It might be preserved as an artificial subgenus for the group of species ornamented with an ovicellarian area.

Biology.—All of our specimens were living and generally ovicelled. They incrust the fragments of shells in two or many superposed lamellae. The formation of the superior lamellae is occasioned by the development of adventitious colonies arising from larvae affixed to the colony itself. These small, new, orbicular colonies suppress the ancient ones. The vitality of this species is such that the colony is sometimes 5 square centimeters in extent and sometimes entirely incloses the shells and débris. Here are, then, two extremely rare anomalies in the bryozoa. Usually a colony drives the larva far away. Generally also a single side of the shell is incrusted. However, if the latter is fixed to floating algae, we can conceive its complete envelopment, but then such colonies do not have any bathymetric significance. In 1925 (p. 30) we have shown that the bathymetric data of this species should be revised.

Our specimens were in reproduction April 7–9, 1888. Those collected by the Vanneau on the shores of Morocco were in reproduction July 26, 1923.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Plesiotypes.—Cat. Nos. 8485, 8486 U.S.N.M.

Genus DAKARIA Jullien, 1903

DAKARIA SERTATA, new species

Plate 2, Figures 3–6

Description.—The zoarium incrusts *Lithothamnion* and Cellepores. The zooecia are distinct, separated by a deep furrow, elongated and elliptical. The frontal is very convex and formed by a granular tremocyst with small pores. The apertura is large, suborbicular with a broad proximal, shallow sinus; the peristome is salient, thin distally, very much enlarged and festooned in its proximal part. The ovicell is large, buried in the distal zooecium, very globular, and of the same nature as the frontal, closed by the operculum with a marginated orifice.

Measurements.—

Apertura { *ha*=0.14–0.16 mm. *la*=0.16 mm. Zooecium { *Lz*=0.60 mm. *lz*=0.30–0.40 mm.

Affinities.—The genus *Dakaria* is still poorly known. It was formed by Jullien in 1903 for the species in which the young orifice

has two lips juxtaposed at their extremities, the extremities of the anter included between those of the poster. The genotype has never been rediscovered alive. Canu and Bassler, 1920, have extended its limits to all the *Schizoporellas* in which the hyperstomial ovicell is closed by the operculum and in which the frontal is a tremocyst. Unfortunately their text figure was erroneous in consequence of a poor interpretation of certain published figures.

Dakaria sertata rigorously agrees with their definition and can take the place of the genotype in which the ovicell and operculum are unknown.

The operculum is white, rather thick; its proximal border is triangular and of a different form from that of the apertura. It is surrounded by a thick band like that in *Lepralia montferrandi* Audouin, 1826, figured by Waters, 1909, which is classed in the group we have called *Codonella*. This form of operculum is peculiar enough to justify the formation of a special genus if that of the genotype was not identical. *Schizoporella brunescens* Ortmann, 1890, from Japan, seems to us to belong to the same group, but its peristome is not festooned.

FIGURE 2.—DAKARIA SERTATA, NEW SPECIES. THREE FORMS OF OPERCULA, × 85

This species differs from *Codonella granulata*, new species which is very similar in general aspect in the absolute absence of avicularia.

Biology.—Almost all of our specimens were living and ovicelled. The species was in reproduction April 7–9, 1888. With its peristome enlarged and festooned, it is a very elegant species and easy to determine.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. Nos. 8487, 8488, U.S.N.M.

Genus HIPPOPORINA Neviani, 1895

HIPPOPORINA CLEIDOSTOMA Smitt, 1873

1873. *Lepralia cleidostoma* SMITT, Florida Bryozoa, Kongl. Svenska Vetenskaps Akademiems Handlingar, vol. 11, p. 62, pl. 11, figs. 217–219.

1928. *Hippoporina cleidostoma* CANU AND BASSLER, Fossil and Recent Bryozoa of the Gulf of Mexico Region, Proc. U. S. National Museum, art. 2710, p. 104, pl. 9, fig. 7, pl. 32, fig. 5.

Measurements.—

$$\text{Apertura}\begin{cases} ha = 0.14 \text{ mm.} \\ la = 0.10 \text{ mm.} \end{cases} \quad \text{Zooecium}\begin{cases} Lz = 0.44 \text{ mm.} \\ lz = 0.30 \text{ mm.} \end{cases}$$

Affinities.—Our specimens incrusted shell fragments, *Lithothamnion* and Cellepores. They generally conform well to the figures of Smitt, 1873. Some of our specimens have appeared doubtful, but

their state of preservation does not permit us to make a serious study.

All of the synonymies given for this species are false. The determinations made without illustration must be revised, and there is confusion between many species.

Biology.—Our specimens were in reproduction and fixation in April, 1888. In the Gulf of Mexico we have observed it in March and April, 1885. It is essentially a tropical species.

Geographic distribution.—Atlantic: Brazil, 27 fathoms; Gulf of Mexico; Habana, 201 fathoms; between Cuba and Yucatan, 24 fathoms; Florida, 30–133 fathoms; Fovey, 40 fathoms.

Geologic distribution.—Pleistocene of Panama.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cat. Nos. 8489, 8490, U.S.N.M.

Genus HIPPOMENELLA Canu and Bassler, 1917

HIPPOMENELLA PARVICAPITATA, new species

Plate 2, Figures 7–11

Description.—The zoarium incrusts the débris of shells and echinoids. The zooecia are distinct, separated by a deep furrow, somewhat elongated, elliptical or rectangular on the margins. The frontal is convex and formed by a pleurocyst surrounded by a triple row of areolar pores. The apertura, visible at the bottom of the peristome, is semielliptical. The peristomice bears two very small cardelles separating a very large anter from a very small concave poster. The ordinary zooecia bear a small triangular avicularium, adjacent to the peristome, transverse, the point oriented exteriorily. The marginal zooecia very much enlarged, bear two avicularia arranged symmetrically. The ovicell is *small*, very globular, marginated, and finely porous.

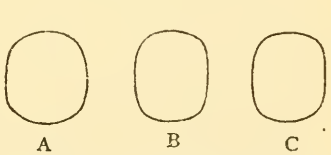

FIGURE 3.—HIPPOMENELLA PARVICAPITATA, NEW SPECIES. *A–C*, DIFFERENT FORMS OF OPERCULA, × 85

Measurements.—

Apertura { *ha* = 0.14–0.16 mm. / *la* = 0.14–0.16 mm. } Zooecium { *Lz* = 0.60–0.70 mm. / *lz* = 0.40–0.50 mm. }

Variations.—The zooecia are arranged in linear series branching dichotomously rather regularly, so that their size increases without ceasing from the center to the circumference. Our measurements relate to the cells placed at a distance from the border. The marginal cells are rectangular and considerably enlarged. The ancestrula is very small, of the ordinary form but deprived of avicularia.

The granulated pleurocyst placed on the median part is always very small, often even it disappears and the frontal appears as a true tremocyst. On the much calcified zooecia the peristome is thickened and festooned in the proximal portion.

The ovicell appears much smaller when it surmounts a wide zooecium. Its diameter measures 0.25–0.30 mm. This is one of the smallest dimensions observed in the genus. The operculum is very thin, semiellipitical, a little elongated without any visible insertion for the opercular muscles.

Our specimens were living and we have been able to photograph an embryo in its ovicell.

Affinities.—In the genus *Hippomenella* there are two rather distinct groups. In the first the peristome is mucronated and the ovicell is richly decorated; in the second there is no mucron and the ovicell is finely punctate (at least on the young cells). *Hippomenella parvicapitata* belongs to the second group, still little rich in species. It is very well characterized by its small dimensions. The ovicells of the other species measure at least 0.35 mm. in diameter.

Biology.—The species was in reproduction and fixation on April 7, 1888. All of our specimens were ovicelled. It incrusts especially the débris of shells; a single colony incrusted a fragment of echinoid.

The physiologic function of the small avicularia is not apparent. They do not appear even of any great utility for the greater part of the cells have only one.

Occurrence.—Galapagos Islands, D. 2813.

Cotypes.—Cat. No. 8491, U.S.N.M.

Genus MICROPORELLA Hincks, 1877

MICROPORELLA GIBBOSULA, new species

Plate 3, Figures 1, 2

Description.—The zoarium incrusts shells. The zooecia are distinct, separated by a deep furrow, somewhat elongated, irregularly hexagonal. The frontal is arched, ornamented by small tremopores and fine granules. The ascopore is small, median, sometimes oblique. The avicularium is small, triangular, with pivot, arranged transversely in the portion where the cell is widest and below the ascopore; the beak is oriented toward the exterior; the mandible is long, setiform, or, more rarely, lanceolated. The apertura is small, semielliptical; the peristome is little salient and bears five spines. The ovicell is globular salient, arranged on the distal zooecium, ornamented by pores identical with those of the frontal.

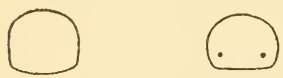

FIGURE 4.—OPERCULA OF MICROPORELLA, × 85. A, M. TRACTABILIS, NEW SPECIES. *B*, M. GIBBOSULA, NEW SPECIES

Measurements.—

Apertura $\begin{cases} ha = 0.08 \text{ mm.} \\ la = 0.09 \text{ mm.} \end{cases}$ Zooecium $\begin{cases} Lz = 0.50\text{–}55 \text{ mm.} \\ lz = 0.45 \text{ mm.} \end{cases}$

Variations.—The micrometric variations are extraordinary; on certain specimens the marginal cells are twice as long as the cells close to the ancestrula. In order to get the average measurement, we have considered a rather large specimen in which all the zooecia were almost of the same dimension. The greatest length observed is 0.65 mm; the greatest width is 0.70 mm. on the transverse cells.

The avicularium is not rigorously transverse; it is a little oblique with the point directed toward the top. In reality it is almost always oriented parallel to the line of junction of two adjacent cells. It is placed to the right or to the left of the cell but always in a fixed portion of the colony.

Affinities.—In its operculum with two proximal attachments and in its lanceolated mandible this species resembles *Microporella coronata* Audouin, 1826, figured by Waters, 1909. It differs in the arched, hexagonal zoœcia, in the presence of a single avicularium placed below the ascopore and not of two avicularia placed at the level of the ascopore. These are the only two species provided with this kind of operculum so easily recognized.

Biology.—This is the most common species in the Galapagos Islands. Its fecundity is very great, as is also the resistance of its larva. The avicularia are the organs of relation in the bryozoa. They are not absolutely necessary to the life of the cell or the colony, but they reveal their habits and their instincts. As the latter are infinitely varied, we can only with difficulty interpret the multiple functions of these minute organs. Here the avicularium is constant in its position, its direction, and its presence; it is therefore zooecial, for it is of service to the cell and is indispensable to it. But for what function? It is the more difficult to conceive that in the small locality another species lives ornamented with avicularia absolutely different. The mandible is open and even flattened on the frontal when the tentacles are invaginated.

The object of the zooecial avicularia appears to be especially to stir the surrounding water and to direct it in a fixed direction. Of little import is the nature of the avicularium employed for this function if the object is attained. Heredity has fixed for each species the form and the advantageous position.

Our specimens were in reproduction and fixation April 7, 1888.

Occurrence.—Galapagos Islands, D. 2813.

Cotypes.—Cat. No. 8492, U.S.N.M.

MICROPORELLA TRACTABILIS, new species

Plate 3, Figures 3–5

Description.—The zoarium incrusts shells and Cellepores. The zooecia are distinct, little elongated, hexagonal; the frontal is convex, ornamented with tremopores and with very fine granules. The aperture is semielliptical, the peristome is thin, salient with straight proximal border, ornamented with five or six large spines. The ascopore is large, subtriangular, closed by a perforated lamella, surrounded by a salient, often oblique peristome always adjacent to the apertural peristome. On each side of the apertura there is a small triangular avicularium with pivot, the beak oriented toward the top; the mandible is setiform and always long enough to touch the avicularium of the adjacent superior zooecium. The ovicell is large, globular, ornamented by tremopores like the frontal.

Measurements.—

Apertura { *ha*=0.06–0.08 mm. / *la*=0.10–0.12 mm. } Zooecium { *Lz*=0.55–0.60 mm. / *lz*=0.40–0.50 mm. }

Affinities.—The operculum is transverse and has a proximal border somewhat convex, when the proximal border of the peristome is rectilinear. The tremocyst has small pores. The ascopore is triangular, large, with a distal border somewhat concave; when it is oblique its form is that of a crescent.

This species has absolutely the structure of *Microporella californica* Busk, 1854. Compared with the recent specimens collected at Santa Monica, it differs from them in its avicularia placed higher above the level of the ascopore, less oblique, smaller, in its neater frontal verrucosities and in its larger zooecial dimensions (*Lz*=0.55–0.60 mm. and not 0.40–0.50 mm.).

Biology.—This is a very remarkable species because of its avicularia. The mandibles are very delicate and rather long setae. Their feeble hairlike dimensions compared with the great surface of the cells do not permit us to consider them as organs of oxygenation. Really they can scarcely agitate the surrounding water to an appreciable and sufficient manner, especially under a pressure of 40 to 60 meters. But the mandibles are always long enough to touch the pivot of the avicularia of the adjacent superior zooecia so that all the avicularia of the same colony are in tactile direct communication. Even on dried specimens this phenomenon is clearly apparent. The avicularia are here organs of tactile sensibility, justifying the specific name we have chosen. The simultaneity of the mandibular movements is the consequence of this ingenious arrangement. These avicularia are of little service to the zooecia which bear them, but they assure the biologic unity of the colony. They give us a good example of social discipline, each at the service of the other.

All the setiform mandibles of the incrusting cheilostome colonies appear to be rather organs of tactile sensibility than organs of oxygenation, but we can not always understand their immediate utility as well as in *Microporella tractabilis*.

One time more we must consider the avicularia as organs of relation. They are the eyes of animals that are without such organs. By their presence and their nature they constitute an important physiological perfection to be considered in the general classification.

Our specimens were living and ovicelled. They were in reproduction and fixation on April 7–9, 1888. We have not observed the ectocyst, probably because of the great desiccation of the specimens.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. No. 8493, U.S.N.M.

ENANTIOSULA, new genus

Greek: *Enantios:* inverse, referring to the appearance of the cells; *ula*, suffix indicating the absence of ovicell.

Escharellidae? Without ovicell. The zooecia are surrounded by a common row of parietal dietellae. The frontal is a tremocyst. The

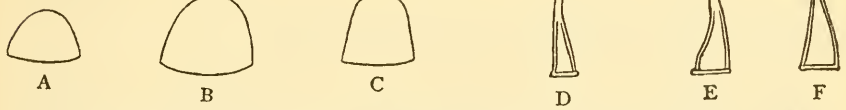

FIGURE 5.—ENANTIOSULA MANICA, NEW GENUS AND SPECIES. *A–C*, DIFFERENT FORMS OF OPERCULA, × 85. *D–F*, MANDIBLES OF AVICULARIUM, × 85

peristomice (apparent aperture) is semielliptic. The operculum has the form of a bell with concave proximal border. There are two oral avicularia with beak converging on the axis of the distal half of the aperture.

Genotype.—Enantiosula manica, new species. Recent (equatorial zone).

ENANTIOSULA MANICA, new species

Plate 3, Figures 6–11

Description.—The zoarium is free, formed of many lamellae superimposed and covering one over the other like the fingers of a glove. The zooecia are little distinct, separated by a shallow furrow, little elongated wide, ansiform. The frontal is somewhat convex, ornamented with tremopores on the young cells and with radial costules on the calcified ones. The apertura is semielliptical and transverse; the peristome is distal and little salient. On each side of the apertura there is an unguiculated avicularium adjacent to the peristome in which the beak reaches the distal half of the apertura.

Measurements.—

Apertura { *ha*=0.12–0.14 mm. *la*=0.16 mm. Zooecium { *Lz*=0.60–0.80 mm. *lz*=0.40 mm.

Structure.—The zooecia are surrounded by large dietellae, but these are not special to each cell as in *Adeona*. They are common to the adjacent zooecia. The larger correspond to the avicularia which do not belong therefore in reality to the zooecium on which they appear placed but are truly interzooecial. The decoration on the young zooecia is very elegant. Here 8 to 12 tremopores are tubular and salient. The interstices fill up the progress of calcification and the frontal then has only radial costules and large lateral pores. Under this aspect they measure 0.60 by 0.40 mm. and the aperture 0.10 by 0.12 mm.

The colonies are large, of irregular form, vaguely ramified and with a curious aspect. The section shows the habitual arrangement of the superposed lamellae. The base is very broad. The summit of the branches, on the contrary, is very small, for the lamellae are here less numerous. The result of this singular arrangement is the orientation of the zooecia toward the base, an arrangement absolutely contrary to that observed on the other cheilostomes. As all the colonies were separated from their substratum without showing a trace of rupture we would judge that the latter was very fragile. They were undoubtedly attached beneath the marine algae.

This particular arrangement of superposed lamellae is frequent in the Ceriopores and the Heteropores in which the colonies are ascendant and more or less ramose. But their tubes are not oriented and we can very well conceive the normal arrangement of their tentacles. *Enantiosula manica* is, on the contrary, a cheilostome with oriented cells, and we can not see any other cause for their apparent inversion than the reversal of the colony itself.

The operculum is of great simplicity; its bell form is similar to that of *Codonella* and we have not seen any muscular attachment. The mandibles are more often unguiculate, rarely straight.

Biology.—The habits of this species are very curious. Each colony lives with its head at the base, attached to the more or less mobile substratum, as the irregularity of the forms observed proves. The food thus captured must also be rather special and very abundant in order to assure the growth of a relative large edifice and of the unusual cells.

Neither the beak of the avicularia nor the mandible are in immediate contact. The simultaneity of the movements of many cells at a time is certainly probable, since the avicularia are interzooecial and in contact with their mesenchymatous fibers which pass through the entire colony. The mandibles appear to close when the tentacles are withdrawn into the tentacular sheath.

The avicularia considered two by two are perpendicular. But on the very curved or small parts of the colony this geometric arrangement is changed. On the much calcified zooecia the avicularia have a very reduced shape, and the utility of their interposition there appears doubtful, or at least very slight use.

The intensity of the life is very great in the tropical zone. The least substratum is watched not only by the larvae of bryozoa, but also by the corals and by the spores of *Lithothamnion*. While the colony is living it is clean and never incrusted. We may suppose that the defensive rôle of the frontal and more particularly of the operculum is held by the avicularia when the cells are closed and by the tentacles when they are open.

Reproduction must occur as in *Cryptosula*, because here also there are no ovicells.

Occurrence.—Galapagos Islands, D. 2815.

Cotypes.—Cat. No. 8494, U.S.N.M.

Family PETRALIIDAE Levinsen, 1909

PACHYCLEITHONIA, new genus

Greek: *Pachys*, thick; *cleithon*=closure; referring to the thickness of the operculum.

The cells are gigantic in size. The frontal is a tremocyst not superposed on an olocyst. The aperture is arranged in the peristomie bearing two large condyles and two small symmetrical cups.

Genotype.—Pachycleithonia nigra, new species. Recent (Pacific).

We have classed this genus in the Petraliidae provisionally by simple analogy. The large size and the form of the cells are those of *Coleopora*. The peristomie presents the proximal undulations of certain *Petraliella*.

PACHYCLEITHONIA NIGRA, new species

Plate 4, Figures 9–13

Description.—The zoarium incrusts shells. The zooecia are unusually large, distinct, separated by a deep furrow, very elongated, elliptical; the frontal is a simple tremocyst with small pores; the ectocyst is thick and *black*. The peristomie is tubular, somewhat deep, perpendicular to the zooecial plane; it bears on the interior two large oblique condyles and two small lateral cups. The peristome is thin, smooth, complete; the peristomice is semicircular distally and bears in its proximal portion a rounded mucron and two sublateral denticles. The apertura is limited by the anter, the condyles, the cups, and the mucron.

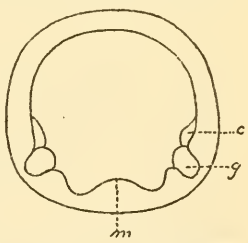

FIGURE 6.—PACHYCLEITHONIA NIGRA, NEW GENUS AND SPECIES. SKETCH OF THE ORIFICE OF A PERISTOME, × 85; *c*, OBLIQUE CONDYLES; *g*, CUP; *m*, PROXIMAL MUCRON

Measurements.—

Zooecium { Lz=1.25–1.50 mm. / lz=0.80–1.00 mm. Peristomice { hp=0. 30 mm. / lp=0. 25 mm.

Structure.—The text figure represents the peristome and its orifice or peristomice drawn with the camera lucida. In the distal portion a large anter almost semicircular is noted. The proximal portion bears a broad, convex (or almost straight) mucron, limited on the sides by two concavities and laterally two orbicular indentations. Two large condyles, directed into the peristomie, separate the anter from the poster. The form of the operculum does not correspond at all to that of the peristomice.

In the interior of the peristomie, two small lateral, shallow cups (g) are lodged in the lateral indentations. They are not covered by the operculum. They are hidden by the ectocyst and they appear frequently as two lucidas on the visible closure. When they are not visible, the ectocyst is confused with the operculum and the closure showing exteriorly has a different form, but deceiving from that of the operculum.

In the interior of the cells there is no olocyst. The visible orifice which is the base of the peristomie, does not have the form of the operculum. The two large condyles are visible in perspective. The proximal border is rectilinear and continues to the zooecial walls in order to limit two small canalicules (c) placed exactly under the small cups of the peristomie.

The operculum is black, very thick, and we have been unable to see any muscular attachments. Its very special form has no analogy with any other known operculum. It closes the true aperture. In order that the latter correspond to it, it is necessary that it be placed in the peristomie itself and limited posteriorily by the condyles, the cups, and the exteriorily visible mucron. This very special arrangement is, however, compatible only with a rigid operculum. In the other known cheilostomes the apertura is placed at the bottom of the peristomie. The mucron, visible exteriorily, is, then, not a true mucron, for it does not have the protective function. It is a calcareous piece, rather variable in form, extending into the peristomie up to the apertura. The tremocyst, seen by transparency, is also very special and of an unusual aspect. Between the small tremopores there are small clear spaces vaguely polygonal, not limited, which can correspond only to the little calcified portions invisible in the ordinary light.

The ectocyst alone is a very deep brown almost black, but the calcareous walls of the zooecia are white without any trace of color.

This remarkable species is not rare. However, we have not observed ovicells. Specimens preserved in alcohol will be very desirable for anatomical study, for these alone can give us the information necessary to work out the biology.

Occurrence.—Galapagos Islands, D. 2813.

Holotype.—Cat. No. 8495, U.S.N.M.

Family SMITTINIDAE Levinsen, 1909

Genus SMITTINA Norman, 1903

SMITTINA RETICULATA J. MacGillivray, 1842

1889. *Smittina reticulata* JELLY, A, Synonymic Catalogue of Marine Bryozoa, p. 25 (General bibliography).

1908. *Smittina reticulata* ROBERTSON, The incrusting Cheilostomatous Bryozoa, of North America, University of California Publications, vol. 4, p. 306, pl. 23, figs. 75, 76.

1925. *Smittina reticulata* CANU and BASSLER, Les Bryozoaires du Maroc et de Mauritanie, Mémoires de la Société des Sciences naturelles du Maroc, vol. 10, p. 39 (supplementary bibliography).

We have found only a single dead specimen incrusting a Cellepore. This species is rare in the equatorial zone.

Occurrence.—Galapagos Islands, D. 2815.

Cat. No. 8496, U.S.N.M.

SMITTINA TRISPINOSA Johnston 1838, variety

Plate 4, Figures 1–5

1923. *Smittina trispinosa* CANU and BASSLER, North American Later Tertiary and Quaternary Bryozoa, Bulletin 125, U. S. National Museum, p. 143, pl. 22, figs. 7–14. (Bibliography, geologic distribution.)

Structure.—The colonies are large, multilamellar, ramose, dendroid, irregular; the base is orbicular, little expanded, fixed on agglomerated pebbles of the ocean bottom. This is the first time this species has been noted in this exuberant zoarial form.

At the extremity of the branches the zooecia are poorly oriented, separated by a salient thread with a granular frontal and rather large areolar pores. The peristomice is orbicular, with a concave proximal border. At the bottom of a very short peristomie there is a small, flat lyrule and two small, strong cardelles. The frontal bears two small elliptical avicularia arranged on each side of the aperture or irregularly below it with the beak oriented toward the proximal portion of the cell.

On the branches the zooecia are more decorated. Frequently a large avicularium is developed at the side and even above the aperture; its mandible is solid, falciform, never spathulate; the beak is oriented toward the proximal portion of the cells. On the other

zooecia the avicularia are irregularly disseminated; they are often elliptical and oriented toward the inferior portion of the cells, but frequently there are triangular avicularia with pointed beak oriented toward the superior portion.

The triangular avicularia are observed ordinarily on the typical form. The large avicularium is characteristic of the variety *nitida* Hincks, 1881. The aperture and the zooecial form are also those of the same variety. This mixture of characters causes us to doubt the reality of the numerous varieties cited for this proteiform species.

The cells are oriented in all directions; this is the celleporine structure of Smitt. The species consequently exhibits the development of a colony like a true Cellepore. However, the internal structure is not that of a Cellepore, for the lamellae are very regularly superposed, the zooecia of one above the other. It should be observed that the irregular orientation of the cells is observed on the colonies of the same form.

Biology.—The aspect of the large colonies is identical with that of the Cellepores. We have shown (Maroc, p. 54) that the special and irregular development is a special adaptation to a mobile substratum. In *Smittina trispinosa* var. the same phenomena are apparent. The more or less agglomerated sands and pebbles on which the colonies are fixed constitute a substratum without solidity and rigidity, analagous to the floating algae. In order to develop, the animal must constantly rectify its equilibrium which is compromised unceasingly by causes impossible to foresee or to observe. The disconcerting irregularity of the colony is, therefore, quite justified. What are the means employed to assure the equilibrium? The principal ones are the irregularity of budding and the nonorientation of the cells. *Smittina trispinosa* has this property of modifying at will the orientation of the cells, a characteristic very rare in the noncelleporidan Cheilostomes. It is not simply by caprice that a normal zooecium engenders an inverse one for it certainly complies with a zoarial necessity.

The zooecia provided with large avicularia are the ordinary zooecia having the same form, the same irregularity and the same frontal. They are generally a little larger than their neighbors. A third at least of their surface is occupied by the avicularium. The aperture is no longer subterminal but is considerably removed from the distal end. The polypide in order to lodge in the narrow space available must necessarily be dwarfed or twisted abnormally. Anatomic studies by decalcification would be very desirable and would perhaps determine the physiologic action of the large avicularium. The latter is arranged obliquely in such a fashion that it passes above the aperture in opening or closing. It is difficult to evaluate the force and efficacy of the movements of the avicularium but as they are ex-

ecuted in different ways on each cell, we must suppose that they are zooecial and not zoarial; they are useful only to the zooecia which bear them. We found only a single living specimen with ectocyst and ovicell at station D. 2815. The species was in reproduction April 9, 1888.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Plesiotypes.—Cat. Nos. 8498, 8499, U.S.N.M.

Genus CODONELLA, new genus

Greek, *codon*=bell, referring to the form of the operculum

Smittinidae in which the ovicell is hyperstomial, closed by the operculum, porous and marginated. The frontal is a tremocyst. A median avicularium is placed before the aperture. The peristome is salient and complete. The aperture is suborbicular with a very concave poster; the peristomice bears two false cardelles, limiting laterally a broad rounded sinus. There are oral glands and 15 to 17 tentacles.

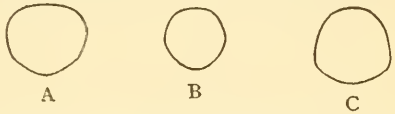

FIGURE 7.—CODONELLA GRANULATA, NEW GENUS AND SPECIES. THREE FORMS OF OPERCULA, × 85

Genotype.—*Codonella* (*Lepralia*) *galeata*, Busk, 1852.

The species appearing to belong to this genus are:

Codonella (*Lepralia*) *galcata* Busk, 1852 ..... Antarctic.
Codonella (*Lepralia*) *obtusata* Ortman, 1890 ..... Japan.
Codonella (*Lepralia*) *acuta* Ortman, 1890 ..... Japan.
Codonella (*Schizoporella*) *pellucida* Ortman, 1890 ..... Japan.
Codonella (*Porella*) *cribriformis* O'Donoghue, 1923 ..... Vancouver.
Codonella (*Lepralia*) *pachnoides* MacGillivray, 1886 ..... Australia.
Codonella (*Lepralia*) *montferrandi* Audouin, 1826 ..... Red Sea.
Codonella, species ..... Hawaii.

Exteriorly, in the form of the visible aperture (or peristomice) this genus resembles *Schizomavella* very much. In the fossils it would be almost impossible to note the difference, for only the preparation of the operculum permits the recognition of the true form of the aperture.

The difference from *Porella* is slight and consists only in the form of the operculum and the peristomice.

CODONELLA GRANULATA, new species

Plate 4, Figures 6–8

Description.—The zoarium incrusts shells, nullipores, and bryozoa. The zooecia are distinct, separated by a deep furrow, elongated, elliptical; the frontal is quite convex and formed of a very granular

tremocyst. The median avicularium is triangular, acuminate, the beak below, adjacent to the peristome. The apertura is large orbicular with a simply concave proximal border; the peristome is salient, indented in front by a broad, round rimule. The ovicell is large, globular, salient, buried in the distal zooecium, perforated by small pores, and margined by a large salient collar.

Measurements.—

Apertura { *ha*=0.14 mm. *la*=0.14 mm. Zooecia { *La*=0.55–0.60 mm. *la*=0.30–0.40 mm.

Structure.—This species is very deceiving. Without the preparation of the operculum and the interior we would have classed it in *Schizomavella.* It is only the peristomice which has the schizoporellidan form; the form of the apertura is different.

Certain colonies have a curious form of successive palm-shaped branches, as in *Berenicea.* There are four uniporous septules. As in other genera of Smittinidae, the operculum is very thin and without any ornament.

Affinities.—The closest species is *Lepralia pachnoides* MacGillivray, 1886, of Australia, but the present form differs in its suborbicular (not subelliptic) aperture and in the presence of numerous frontal granulations.

Biology.—Our specimens were in reproduction on April 7, 1888.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. Nos. 8500, 8501, U.S.N.M.

Family RETEPORIDAE Smitt, 1867

DIPLONOTOS, new genus

Greek; *diplos,* double; *notos* back; referring to the double dorsal of the zoarium.

Reteporidae in which the two faces of the reticulated colony are covered by vibices. The zooecia are arranged on the edges of the branches in the fenestrae.

Genotype.—*Diplonotos costulatum,* new species. Recent (equatorial Pacific).

The reticulated colony and the presence of the vibices have caused us to class this genus in the Reteporidae. In reality we are ignorant of the ovicell, the operculum, the aperture, and the frontal structure.

DIPLONOTOS COSTULATUM, new species

Plate 5, Figures 1–4

Description.—The zoarium is free, reticulated, composed of principal branches bearing pinnules; the latter often join the neighboring branches forming a kind of fenestrae; the branches are sub-

cylindric, slightly compressed. The two faces of the colony are covered by salient vibices outlining polygonal spaces in each of which there is an elliptical avicularium and sporadically, radial sculpture. The zooecia are arranged on the edge of the branch in the fenestrae and in a single row; they are little distinct, separated by a salient thread, little elongated, wide; the frontal bears salient longitudinal nervures. The apertura is oblique, located at the bottom of a parietal peristomie and hidden by a salient, more or less sinuous mucron. Two small lateral avicularia are placed at the extremities of the transverse axis of each zooecium.

Biology.—We have found only small dead and incomplete fragments of this strange species and therefore are unable to make a serious study. The function of the vibices in the Reteporidae being unknown, we are not able to explain their presence on the two faces of the colony. One must admire the really prodigious work accomplished by the two simple rows of cells of each branch, their length being only 0.70 mm. Their architectural ability must be accompanied by an enormous voracity, for which reason there is a large number of avicularia. The function of the latter must be to chase the plancton into the fenestrae, where it is easily snapped up by the tentacles.

Occurrence.—Galapagos Islands, D. 2813 and 3408.

Holotype.—Cat. Nos. 8502, 8503, U.S.N.M.

DIPLONOTOS STRIATUM, new species

Plate 10, Figures 1–3

Description.—The zoarium is free, ramified, with cylindrical or somewhat compressed pinnules. The latter bear two rows of cells placed opposite each other and arranged laterally. The branches are very finely striated by delicate and incomplete sulci at the bottom of which are minute scattered vacuoles. Salient vibices occur in the wider portions, which give the branches a vague articulated aspect. Between two vibices there are at least three cells. The zoarial epitheca is very thick and formed of numerous cylindrical lamellae. The zooecia are indistinct, elongated, oriented laterally toward the adjacent pinnules. The aperture is broad, very little elongated, and bears a small proximally rounded sinus. No peristome. Ovicell unknown. Some of the lateral vacuoles are transformed into small avicularia.

Measurements.—

Apertura ha=0.22–0.24 mm., la=0.20–0.22 mm. Zooecia Lz=1.00–1.60 mm., lz= ?

Diameter of the large branches, 2 mm.

Affinities.—This second species of *Diplonotos* differs from the genotype *D. costulatum*, new species, in the much larger zoarial dimensions, in the absence of an oral mucron, in the absence of nervules on the cells, in the much rarer and transversely arranged vibices, and in the presence of sulci and of vacuoles. The number of fragments collected does not permit a more detailed study of this strange species.

Occurrence.—Galapagos Islands, D. 3408.

Cotypes.—Cat. No. 8504, U.S.N.M.

Family CREPIDACANTHIDAE Levinsen, 1909

Genus CREPIDACANTHA Levinsen, 1909

Norman, 1907, has given the bibliography of the genotype *Flustra poissonii* Savigny-Audouin, 1828. In 1926 we rediscovered this species as a fossil at Panama, and we also gave its bibliography. In 1929 (Philippines) we specified the characters of the genus and we tried to clear up the known species and those confused with the genotype, describing three new species. We can now give the list of the known species and outline the geographic extension.

Recent species.—

Crepidacantha (*Flustra*) *poissonii* Audouin, 1826_____Atlantic, Pacific.
Crepidacantha (*Hippothoa*) *setigera* Smitt, 1873_____Gulf of Mexico.
Crepidacantha longiseta Canu and Bassler, 1928_____Gulf of Mexico.
Crepidacantha crinispina Levinsen, 1909_____Siam, Australia.
Crepidacantha setifera, new name (=*Lepralia poissonii* MacGillivray, 1882). Australia.
Crepidacantha solea, new name (=*Lepralia poissonii* Kirkpatrick, 1888). China Sea.
Crepidacantha zelanica, new name (=*Lepralia poissonii* Waters, 1889). New Zealand.
Crepidacantha papulifera Canu and Bassler, 1929_____Sulu Sea.
Crepidacantha altirostris Canu and Bassler, 1929_____Sulu Sea.
Crepidacantha grandis Canu and Bassler, 1929_____Pacific (Philippines).

Fossil species.—

Crepidacantha (*Lepralia*) *odontostoma* Reuss, 1874___ Miocene (Europe).
Crepidacantha (*Flustra*) *poissonii* Audouin, 1826_____ Pleistocene (Panama).
Crepidacantha parvipora, new name (=*Lepralia poissonii* Hincks, 1885)_____ Miocene (New Zealand).

This is an equatorial genus. Only the genotype occurs as far north as Madeira, so that it passes but little from the warm zone. The bathymetric dispersion is quite variable even for the same species. However, the depths observed are never great. Below 120 meters representatives of the genus are very rare.

CREPIDACANTHA POISSONII Savigny-Audouin, 1826

Plate 5, Figure 5

1928. *Crepidacantha poissonii* CANU and BASSLER, Bryozoaires des Iles Hawaii, Bull. de la Société des Sciences de Seine et Oise, fasc. 7, p. 37, pl. 8, fig. 7.

Measurements.—

Apertura $\begin{cases} ha = 0.10 \text{ mm.} \\ la = 0.08 \text{ mm.} \end{cases}$ Zooecia $\begin{cases} Lz = 0.54\text{–}0.60 \text{ mm.} \\ lz = 0.40 \text{ mm.} \end{cases}$

Structure.—This species is very vigorous in the Galapagos Islands, and its dimensions are somewhat larger than those of a specimen from the Hawaiian Islands, of which we give a photograph. The characters are quite the same as those of specimens from Madeira and Panama. The ovicell is decorated with a distal border and the two vibracula are placed below the aperture. The latter are not always arranged symmetrically (as in Panama), but they are somewhat more removed from each other as at Madeira.

The operculum has the ordinary form of the opercula of the species dredged at the Philippine Islands, with two lateral bands curved for muscular attachments.

Affinities.—Hincks, 1885, wrote that at Tahiti and New Zealand "two forms occur—in one the vibracula are situated below the orifice and are placed horizontally (=typica); in the other they are vertical and placed at the side of the orifice near the top of it and close to the margin (=new species)." He cites also a common fossil in New Zealand a variety of *Crepidacantha poissonii* with "orifice very small and the vibracula are placed in good way down the cell with a prominent central umbo between them." This is a distinct species which we have called *Crepidacantha parvipora.*

Waters, 1887, also cites from New Zealand *Lepralia poissonii*, of which he gives the operculum. This is not the same as our identification of the species because he has selected the second form with lateral vibracula, which Hincks mentions in 1885. We have called this species *C. zelanica*, although we can not give all the characters, for we know only the operculum and the place of the avicularia. It is perhaps *Crepidacantha setigera* MacGillivray, 1882 (not Smitt, 1873); but we have no illustration permitting as to make this synonymy. Moreover MacGillivray's species, differing notably from that of Smitt, has caused us to change his specific name and to call it *Crepidacantha setifera.* Hincks, 1885, in writing that the place of the vibracula was of no importance appears to have caused all the confusion.

Finally Waters, 1889, figures a variety of *Crepidacantha poissonii* from Australia with an ovicell "immersed"; that is to say, endo-

zooecial. This is perhaps only an appearance, and it is necessary to dissect this ovicell in order to be certain of its nature.

We do not believe that the mandibles of this species are really the bristles of vibracula. They do not have the organs of articulation which permit movement in every direction. To us they are setiform mandibles of true avicularia, for they can move only in a certain way, variable, however, in each species.

Biology.—Our specimens from the Galapagos Islands incrust dead shells and *Lithothamnion.* They were in reproduction on April 7 to 9, 1888, and in March, 1902. They appear to have lived on the bottoms dredged at that time. The species has not yet been rediscovered living in the Gulf of Mexico. It has lived there, however, because we have found it as a fossil in the Pleistocene of Panama. It was doubtless transported from Madeira by the equatorial current. Its presence in the Pacific is therefore ancient and dates to the time when the Isthmus of Panama had not yet formed. The large migratory fish have transported its larvae across the Pacific to the Hawaiian Islands and Tahiti, and even farther.

The length of the mandibles is equal to the distance between the two avicularia. The mandibles form a cross on the frontal. They appear to be tactile organs, but special to the zooecium which bears them.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815; Hawaiian Islands, 325–483 meters and 5.3° C., D. 3813 (265–302 meters); Tahiti and New Zealand (Hincks); Madeira (30 fathoms). Red Sea and Gulf of Suez (Norman). Pleistocene of Panama (Canu and Bassler).

Plesiotypes.—Cat. Nos. 8505, 8506, U.S.N.M.

Family ADEONIDAE Jullien, 1903

Genus ADEONA Lamouroux, 1916

ADEONA TUBULIFERA, new species

Plate 5, Figures 6–9

Description.—The zoarium incrusts shells and nullipores. The zooecia are distinct, separated by a furrow, elongated, elliptic, swollen; the frontal is convex and ornamented with two rows of large areolar pores. The peristomie is *tubular*, very long, and very oblique on the young zooecia, shorter and little oblique on the much calcified zooecia; the peristome is thick and smooth; the peristomice is suborbicular, more often somewhat transverse. A thin triangular avicularium, the beak oriented superiorly, is placed on the peristomie. The

ascopore is large, lunate arranged on the frontal at the bottom of the peristomie. The gonoecia are very broad without peristomie and without avicularia. The ancestrula is a small ordinary zooecium.

Measurements.—

Zooecium { *Lz*=0.60–0.70 mm. *lz*=0.44–0.48 mm. Peristomice { *hp*=0.10–0.12 mm. *lp*=0.10–0.12 mm.

Variations.—The zooecia with very long peristomie border only the zoarial margins; they are observed also on the very small colonies and around the ancestrula. They, therefore, characterize the young cells. On the others the reduction of the length must correspond to a great thickening of the frontal. The width of the zooecia is variable and may measure 0.60 mm. All of our specimens were dead, and we have observed only two gonoecia.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. No. 8507, U.S.N.M.

Family PHYLACTELLIDAE Canu and Bassler, 1917

Genus LAGENIPORA Hincks, 1877

LAGENIPORA VERRUCOSA, new species

Plate 6, Figure 1

Description.—The zoarium incrusts dead Cellepores. The zooecia are distinct, separated by a deep furrow, and have the form of a swollen bottle; the frontal is very convex, verrucose, formed by a tremocyst with small pores superposed upon an olocyst. The peristomie is oblique, short, smooth at the extremity, partially covered by the tremocyst; the peristome is thick, smooth, orbicular. The aperture hidden at the bottom of the peristomie is elongate, elliptic. The ovicell is small, opening into the peristomie above the aperture, finely perforated, marginated by a salient thread. The ancestrula is a small ordinary zooecium.

Measurements.—

Zooecium { *Lz*=0.75–0.80 mm. *lz*=0.50 mm. Apertura { *ha*=0.16 mm. *la*=0.14 mm.

Structure.—It is easy to follow on our photograph the development of the ovicell. It develops at the same time as the peristomie elongates and the peristome grows definitely above it. It is of endocystal nature and inserted between the olocyst and the tremocyst; the frontal is therefore olocystal and the bordering thread the vestige of the tremocyst arrested in its development. This mode of formation and structure appear to be general in the genus. The ancestrula shows no particular character and is surrounded by five zooecia. Its

peristome presents traces of spines. Our specimens were living and ovicelled April 9, 1888.

Occurrence.—Galapagos Islands, D. 2815.

Holotype.—Cat. No. 8508, U.S.N.M.

LAGENIPORA MARGINATA, new species

Plate 6, Figures 2–3

Description.—The zoarium incrusts shells and often dead *Cupularia umbellata;* it is formed of large linear branches, generally triserial, sometimes spreading out palm shaped. The zooecia are distinct, *margined* by a salient thread, much elongated; the frontal is a tremocyst with very small pores separated by very fine granules, superposed on the olocyst; it is convex and supports laterally two small orbicular avicularia. The peristomie is short, very oblique, costulated; the peristome is orbicular and irregularly denticulated. On the long peristomies the peristome is widened and adorned with denticles and very irregular spicules. The ovicell is very small, always fixed at the base of the peristomie, and ornamented with a small, finely perforated area. The ancestrula is a small ordinary zooecium.

Measurements.—

Zooecium { Lz=0.60–0.7 mm. lz=0.30 mm. Apertura { ha=0.12 mm. la=0.10 mm.

Variations.—Uni or biserial branches are not rare. The colony is most often fixed on very small objects. The movements of the latter do not bother it. It develops on occasions on both sides of the substratum, and we have seen it even on the edge of the small shell fragments.

The peristomie is generally short; it is much elongated according to rule in the sheltered or narrowed parts of the substratum. The peristome then enlarges considerably and presents the most fantastic cut edges.

Affinities.—This species differs from *Lagenipora spinulosa* Hincks in its much greater dimensions, in its more numerous pores, its shorter periostomie, and the presence of small frontal avicularia.

Biology.—Most of our specimens were living, and many of them were ovicelled April 7, 1888.

The habits of *Lagenipora* resemble very much those of *Proboscina* which in the Cyclostomata have the same zoarial arrangement.

Occurrence.—Galapagos Islands, D. 2813.

Cotypes.—Cat. No. 8510, U.S.N.M.

Family CELLEPORIDAE Busk, 1852

Genus HOLOPORELLA Waters, 1909

HOLOPORELLA QUADRISPINOSA, new species

Plate 6, Figures 4–6

Description.—The zoarium incrusts bivalves, gastropods, cellepores, and algae. The zooecia, oriented or marginal, are distinct, separated by a deep furrow, elongated, elliptical; the frontal is convex, granulated, sometimes decorated with areolar pores and with small elongated avicularium with pivot. The peristome is salient, thin, decorated with four spines; the apertura is semielliptic and placed at the bottom of the peristomie. In front of the aperture

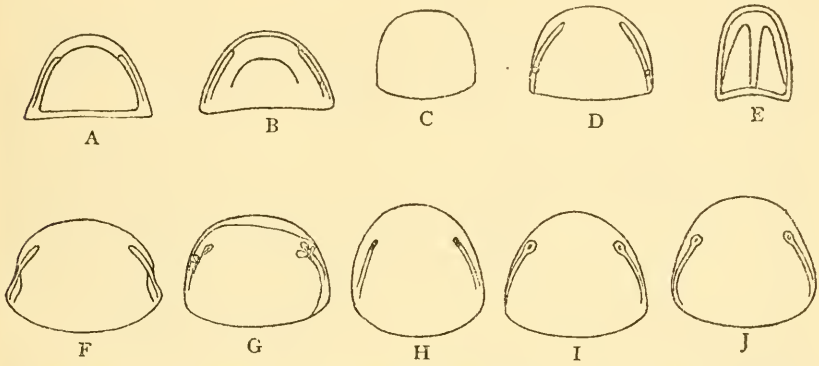

FIGURE 8.—GENUS HOLOPORELLA WATERS, 1909. *A, B*, OPERCULA, × 85 OF H. TRIDENTICULATA BUSK, 1881, THE FIRST WITH THE PROXIMAL BORDER AND THE SECOND BEARING TRACES OF THE TENTACULAR SHEATH. *C–E*, H. QUADRISPINOSA, NEW SPECIES. *C, D*, TWO OPERCULA, × 85, AND *E*, MANDIBLE OF AN INTERZOOECIAL AVICULARIUM, × 85 WITH THICK BORDER AND A COLUMNELLA. THE INTERIOR DECORATIONS MARK THE LIMITS OF THE MUSCULAR FIBERS. *F, G*, H. HEXAGONALIS, NEW SPECIES. OPERCULA, × 85. *H–J*, H. POROSA, NEW SPECIES. DIFFERENT FORMS OF OPERCULA, × 85

there is a small triangular avicularium, the beak at the top; it limits at its base a pseudorimule formed in the peristomice. The cumulate zooecia are irregular, granulated, ornamented sporadically by rare areolar pores or by small, elliptical avicularia. The peristome is nonsalient and bears two spines. The interzooecial avicularia are narrow, little elongated, with pivot. The ovicell is globose, widely opened above the operculum, much granulated as the frontal.

Measurements.—

Apertura $\begin{cases} ha = 0.15 \text{ mm.} \\ ha = 0.18 \text{ mm.} \end{cases}$ Oriented zooecia $\begin{cases} Lz = 0.50\text{–}0.60 \text{ mm.} \\ Lz = 0.35\text{–}0.40 \text{ mm.} \end{cases}$

Structure.—At first sight this species resembles *Schizostoma* because of its pseudorimule cut in the peristomice. Close observation shows that this is in reality formed by the projection of the small

oral avicularium and a projection of the peristome and that its plane is oblique to the plane of the apertura.

The colonies are very often adorned with marginal oriented cells They are never visible on floating specimens.

The operculum is in the form of a bell with the two lateral bands near the border.

Affinities.—All of the affinities of this species are with *Cellepora bispinosa* Busk, 1852, from Australia; the same frontal, ovicell, oriented cells, and the same pseudorimule in front of the apertura. Busk, 1852, figures two spines on the marginal zooecia; MacGillivray did not figure them, but indicates two large articulated spines on the cumulate zooecia.

If the operculum figured by us had been identical with that of MacGillivray, we would not have created a new species; the position of four spines on the oriented zooecia and the two on the cumulate zooecia indicated only varietal characters. MacGillivray's figure is so abnormal in the genus that it is perhaps erroneous.

Biology.—The ectocyst is white. Some rare living specimens were ovicelled April 7 to 9, 1888.

The specimens incrusting shells appear to have lived on the bottom where dredged, but a certain number of other specimens are attached to filaments of algae; they are cylindrical or similar to our Figure 4. Colonies developed on both sides of a fragment of shell or surrounding entirely a piece of coral are also subfloating. By floating specimens we do not intend to imply that they float freely as *Cupularia* or *Conescharellina*; we mean only that they are developed on or attached to floating bodies and that they have no bathymetric significance. There were often mollusks attached to the tufts of marine algae, and it is these which these organisms like the Cellepores entirely surrounded.

Holoporella quadrispinosa is therefore a species both fixed and floating.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. Nos. 8511, 8512, U.S.N.M.

HOLOPORELLA HEXAGONALIS, new species

Plate 7, Figure 1

Description.—The zoarium incrusts débris of shells. The zooecia are distinct, separated by a furrow, rather regularly hexagonal, nonoriented; the frontal is convex and covered with scattered pores. The apertura is semielliptic or suborbicular, median; it is surrounded by four salient avicularian tuberosities.

Measurements.—Apertura, la=0.20 mm. Zooecium, lz=0.50–0.65 mm.

Affinities.—The tuberosities are directed obliquely on the apertura; they modify the exterior aspect.

The operculum is transverse in the form of a bell, somewhat sinuate laterally. The muscular attachments are very narrow and close to the border. In its frontal tuberosities this species is close to *Lepralia turrita* Smitt, 1873, but differs in its rather regularly hexagonal cells and its porous frontal.

Only the figured specimen was found; it was living but not ovicelled.

Occurrence.—Galapagos Islands, D. 2813.

Holotype.—Cat. No. 8513 U.S.N.M.

HOLOPORELLA POROSA, new species

Plate 6, Figures 7, 8

Description.—The zoarium is globular, hemispheric, fixed to nullipores. The zooecia are distinct, separated by a furrow, orbicular or polygonal; the frontal is convex and covered with large scattered pores. The apertura is median, semielliptic, somewhat elongated with proximal, concave border. The ovicell is very large and convex, with a median area covered by pores smaller than those of the frontal; it is never closed by the operculum.

Measurements.—

Apertura { *ha*=0.22 mm.
la=0.18–0.20 mm.

Affinities.—This species differs from *Holoporella hexagonalis* in the absence of tuberosities around the apertura and in the special nature of the muscular attachments of the operculum.

The operculum is light colored and rigid. It has the form of a bell with a very concave proximal border. The muscular attachments are much thickened and each terminates in a point.

Biology.—The single specimen dredged was living and ovicelled April 9, 1888.

Occurrence.—Galapagos Islands, D. 2815.

Holotype.—Cat. No. 8514, U.S.N.M.

HOLOPORELLA TRIDENTICULATA Busk, 1881

Plate 7, Figures 2, 3

1881. *Cellepora tridenticulata* Busk, Note on the chitinous organs in the Cheilostomata, Journal Linnean Society, vol. 15, p. 347, pl. 26, fig. 9.

1884. *Cellepora tridenticulata* Busk, Challenger, p. 188, pl. 29, fig. 3; pl. 35, fig. 17 (operculum).

1885. *Cellepora tridenticulata* Waters, Aldinga, Quarterly Journal Geological Society, vol. 41, p. 306.

1886. *Cellepora tridenticulata* MacGillivray, Prodromus Zoology Victoria decade 13, p. 110, pl. 128, fig. 3.

1887. *Cellepora tridenticulata* WATERS, On Tertiary Bryozoa from New Zealand, Quarterly Journal Geological Society, vol. 43, p. 68.

1890. *Cellepora tridenticulata* KIRKPATRICK, Hydroida and Polyzoa, Torres Straits, Scientific Proceedings, Royal Dublin Society, vol. 6, p. 612.

1895. *Cellepora tridenticulata* MACGILLVRAY, A monograph of Tertiary Polyzoa of Victoria, Transactions of the Royal Society of Victoria, p. 107, pl. 14, figs. 4–6.

Measurements.—

Apertura { *ha*=0.14–0.16 mm. / *la*=0.16–0.20 mm. Diameter of tubes, 0.30 mm.

Variations.—The species of the *tridenticulata* group are quite variable and easy to confuse among themselves. The published figures of *Holoporella tridenticulata* are incomplete, and it is rather difficult to get an exact idea of the species. Fortunately, the published determinations having been made by actual comparison of specimens, the bibliography is exact.

The apertural width is 0.16–0.20 mm. measured on the same large zoarium. It is about 0.16 mm. on fossil specimens from the Balcombian of Muddy Creek, Australia, and on the recent examples of Busk, 1884, while the one from Australia (Waters, 1885) shows 0.20 mm. The aperture is always transverse.

The lyrule and the two cardelles are very resistant, rather large, sometimes bifurcated. They disappear only by mutilation after death. Even on the fossils they persist sufficiently to permit determination. Our specimens did not have oral spines. There are two on Busk's figure, 1884, and two to four on those of MacGillivray, 1886; they are often lacking on the fossils from Australia.

The surface of the cell is smooth. It is granular as figured by Busk, 1884, and MacGillivray, 1886, but on the fossils from Australia it is smooth or granular. The areolar pores are large, rare, and very irregularly distributed. They are more numerous and more regular on the fossils from Australia. There are none on the recent specimens figured by Busk and by MacGillivray. There is not a single interzooecial avicularium. Waters, 1885, said that they were very rare. Busk, 1884, found and figured the mandible on a recent specimen from Australia. On our fossils from Australia they were very numerous and never elliptical. Although variable, they are generally long, narrow, a little constricted in the middle of their length.

Sporadically, between the zooecia, long cylindric tubes spring forth on which there is neither operculum nor denticles. This is the first time that they have been figured. Busk, 1884, noted them thus: "Another curious feature is the frequent occurrence on the surface of the zoarium of long tubular processes or tunnels, looking like enormously elongated zooecia. The nature of these appendages appears very obscure." MacGillivray (1886 and 1895) did not rediscover them on his specimens recent or fossil. They are observed only on

the large colonies. The colonies are massive, mammillated, more or less expanded, thickened, the largest measuring 3 centimeters in diameter. On the inferior face, they appear to be formed of superposed lamellae; the section does not confirm this appearance; these pseudolamellae are only foliaceous expansions emitted by the colony probably for the purpose of general consolidation. The same phenomenon is noted by MacGillivray, 1895, in the variety *nummularia*, but the concentric ridges cited by the author do not indicate at all in section true superposed lamellae.

Busk, 1884, indicated a free, lamellar zoarium. MacGillivray, 1886, observed only small incrusting colonies. Fossil specimens from Australia have small incrusting colonies. The variety *numullaria* is formed of free specimens, more or less globular, but of small dimensions. Waters, 1885, indicates colonies of 25 millimeters among the fossils of *Aldinga*. These variations are habitual in the Cellepores, for the hazards of their precarious life causes them to die at all ages.

The operculum has very thick margins; the lateral bands are discerned with difficulty. We are not certain of our restoration. Busk, 1881, appears to have encountered the small difficulties, for his operculum is incomplete. New preparations are very desirable.

Biology.—The colonies have a brown ectocyst. The ovicell has never been discovered but it has been observed on another species of the same group. The sporadic salient tubes also have an unknown zoarial function. When this species is better known it will certainly reveal to us a curious biologic history.

From inspection of the colonies it is a species both fixed and floating. The floating specimens hang directly to algae or to nullipores, themselves attached to floating algae. A substratum so inconstant and mobile can support only free colonies irregularly developed. The lamellar expansions of the inferior face are simply a sort of clamp destined to better fix the colony to its substratum. Only the specimens collected with their substratum have a bathymetric value.

The small denticles of the apertural poster (lyrule and cardelles) are identical with those of *Smittina*, *Porella*, *Mucronella*, and *Petralia*. Their function must be identical, namely, to limit the movement of the operculum and to block it when it is closed. This is an equatorial species.

Occurrence.—Galapagos Islands, D. 2815.

Geographic distribution.—Pacific: Cape York (8 fathoms), Port Phillip Head and Warnamboul in Australia (Busk, MacGillivray); Torres Strait, 15–20 fathoms (Kirkpatrick).

Geologic distribution.—Miocene of Australia and New Zealand (Waters, MacGillivray).

Plesiotypes.—Cat. No. 8515, U.S.N.M.

Genus OSTHIMOSIA Jullien, 1888

OSTHIMOSIA ANATINA, new species

Plate 7, Figures 4–8

Description.—The zoarium is free, ramose, with branches rather regularly cylindrical or compressed. The zooecia are irregularly erect and oriented. The frontal is smooth or very slightly granulose, surrounded by areolar pores. The aperture is terminal, suborbicular, very little elongated; the rimule is wide, rounded, shallow, and is partially hidden by a large very salient avicularian umbo with semicircular mandible. The ovicell is large, globular, perforated by large pores arranged in quincunx, not closed by the operculum. The interzooecial avicularia are large, long, salient, oval, without pivot, with two condyles for the rotation of the mandible; the orifice is formed by a narrow, elongated, oval proximal opesium and a very much enlarged distal calcified area; the mandible is large with duck-bill form. The umbo of the deep zooecia projects between the superficial zooecia in the form of small cylindrical, avicularian tubes.

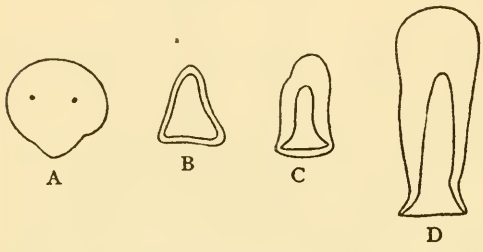

FIGURE 9.—OSTHIMOSIA ANATINA, NEW SPECIES. *A*, OPERCULUM, × 85, WITH ITS TWO SMALL MUSCULAR ATTACHMENTS. *B–D*, MANDIBLES, × 85, *B*, OF A SMALL INTERZOOECIAL AVICULARIUM, *C*, OF AN ABNORMAL INTERZOOECIAL AVICULARIUM; AND *D*, OF AN INTERZOOECIAL AVICULARIUM WITH DUCK-BILL FORM

Measurements.—

Apertura $\begin{cases} ha = 0.16 \text{ mm.} \\ la = 0.14 \text{ mm.} \end{cases}$ Large avicularia $\begin{cases} Lav = 0.60 \text{ mm.} \\ lav = 0.30 \text{ mm.} \end{cases}$

Affinities.—The interzooecial avicularia are large or small; our measurements are the maximum and are those of the avicularian chamber itself and not that of the orifice.

The avicularian beak measures 0.50 by 0.20 mm. on the well-preserved specimens. It much resembles in this feature, as also in the frontal, with areolar pores, *Cellepora eatoniensis* Busk, 1881. *Osthimosia anatina* differs in its perforated ovicells (and not smooth according to Waters, 1904). It differs again from *Cellepora cylindriformis* Busk, 1884, from the Cape of Good Hope and from Australia, which it resembles very much in its avicularium and its perforated ovicell, by the presence of areolar pores. The areolar pores not only are hidden by the ectocyst, but they are not visible on the incompletely calcified living specimens. A single specimen preserved the base which is orbicular and little expanded. The substratum is unknown.

The genus *Schismopora* and *Osthimosa* are poorly defined by the perforation of the ovicells; the frontal calcification appears to furnish the better distinctive character.

Biology.—We have observed specimens living and ovicelled in April, 1888.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. Nos. 8516, 8517, U.S.N.M.

Genus HIPPOPORIDRA Canu and Bassler, 1927

HIPPOPORIDRA GRANULOSA, new species

Plate 8, Figures 1, 2

Description.—The zoarium incrusts shells. The zooecia are oriented or cumulate. The oriented zooecia are distinct, separated by a furrow, ovoid, a little elongated; the frontal is quite granular, convex, surrounded by scattered areolar pores. The aperture is small, elongated, and formed of a large circular anter and of a very small rounded poster, surmounted by six distal spines. In the vicinity of the aperture there is sometimes a small avicularium of inconstant form and position. The cumulate zooecia are erect and form very salient verrucosities. The operculum bears two sinuous bands.

Measurements.—

Apertura { *ha*=0.12 mm. / *la*=0.07–0.09 mm. Zooecia { *Lz*=0.40–0.50 mm. / *lz*=0.30–0.35 mm.

Variations.—The width of the aperture is rather variable; it has in consequence a great variability in the operculum. On a dozen of opercula visible in our preparation not one is exactly similar to the other, but all, however, have their two characteristic sinuous bands. There are no dietellae.

Affinities.—This species is very well characterized by its frontal granules and the large number of oriented zooecia. We have not observed the large interzooecial avicularia as in *Hippoporidra brancoensis* Calvet, 1907, and *Hippoporidra edax* Smitt, 1873.

Our specimen was living but very incomplete, since it did not show an ovicell. It incrusts the two sides of a shell; the cumulate cells are arranged only on the edge of the shell. The latter then must have been attached to some more or less floating tuft and did not live on the bottom when dredged.

Occurrence.—Galapagos Islands, D. 2813.

Holotype.—Cat. No. 8518, U.S.N.M.

Genus HIPPOTREMA Canu and Bassler, 1927

HIPPOTREMA(?) SPICULIFERA, new species

Plate 8, Figures 3–5

Description.—The zoarium is free, cylindrical, branching or in thick fronds. The zooecia are cumulate, small, oblique; the frontal

bears scattered pores and three to four very salient spicules, erect, almost cylindrical. The aperture is elliptical, little elongated; two small cardelles separate a large anter from a small poster of the same width; three to five long and very fine spines. The interzooecial avicularia are long, large, salient with pivot; the mandible is very narrow.

Measurements.—

Apertura { *ha* = 0.12 mm. / *la* = 0.10 mm. Avicularia { *Lav* = 0.20–0.30 mm. / *lav* = 0.14–0.16 mm.

Diameter of spicules = 0.04–0.06 mm.

Structure.—Our colonies do not have their base. The ectocyst is thick and hides the frontal pores. The large avicularia are oriented in every direction; they are numerous at places and rare at others. The mandible is narrow, longitudinally convex, which makes it appear much in a special preparation.

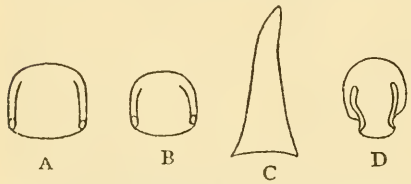

FIGURE 10.—HIPPOTREMA AND HIPPOPORIDRA, CANU AND BASSLER, 1927. *A–C*, HIPPOTREMA SPICULIFERA, NEW SPECIES. *A*, *B*, OPERCULA, × 85, AND *C*, MANDIBLE OF AN AVICULARIUM, × 85. *D*, OPERCULUM, × 85 OF HIPPOPORIDRA GRANULOSA, NEW SPECIES

The spicules form an ornamental system particular to this species. They are sometimes hollow. The operculum has the form of the aperture. Two lucidas indicate the place of the cardelles; there are two lateral rectilinear bands very near the border. It is thick, much chitinized, light colored.

Affinities.—This is a very original species with no analogy with the known species. It differs from *Lepralia brancoensis* Calvet, 1907, from the Cape Verde Islands in the presence of frontal spicules and in a different operculum with no lateral contraction.

Biology.—Our specimens were living but not ovicelled on April 7–9, 1888.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Cotypes.—Cat. No. 8519, U.S.N.M.

Suborder HEXAPAGONA Canu and Bassler, 1927

Family CHAPERIIDAE Jullien, 1888

Genus CHAPERIA Jullien, 1881

CHAPERIA CONDYLATA, new species

Plate 9, Figures 1–3

Description.—The zoarium incrusts dead bryozoa and nullipores. The zooecia are distinct, separated by a salient mural rim, ogival, with transverse aspect. The mural rim bears six large distal spines with a black articulation. The cryptocyst is deep and smooth and

supports an avicularium placed in a proximal angle. The opesium is suborbicular and restricted laterally by two large condyles. The ovicell is large, salient, smooth, marginated proximally, with a very large orifice; it is often decorated by one or two avicularia in which the beak is always turned inferiorily. The avicularia are long, thin, triangular, without pivot; when there is one only it is placed transversely, but when there are two their beak is oriented distally.

Measurements.—

Opesium { *ho* = 0. 15–0. 20 mm. / *lo* = 0. 20–0. 23 mm. } Zooecium { *Lz* = 0.40–0.40 mm. / *lz* = 0.45 mm. }

Avicularium { *Lav* = 0. 20–0. 25 mm. / *lav* = 0. 10 mm. }

Affinities.—In its exterior aspect this resembles *Chaperia annulus* Manzoni, 1875, very much, but differs from it in the presence of two condyles to the opesium, in having six spines and not four, in the simple spines (and never bifurcated), in the avicularia irregularly oriented and never placed in the median axis of the zooecium, and in the frequent occurrence of two avicularia on the ovicell. It differs from *Chaperia galeata* Busk, 1854, in the absence of bifurcated spines. Moreover, this species is rather poorly known because of the erroneous interpretations of the figures by the authors. Its bibliography must be revised entirely.

Biology.—The colonies are a deep purple or a beautiful red violet. In life they are always covered with dirt and never have the beautiful aspect of the published figures. Their numerous spines retain a large number of small particles of all kinds, calcareous, argillaceous, and sandy, with small foraminifera developed among them. The operculum itself is not free. The chitinous sponges erect their first filaments here which seems to indicate a much restrained mobility of the spines. Also the immediate determination is absolutely impossible, for an army of small dirty sticks only is visible. Washing in Javelle water is absolutely necessary in order to discover the other characters, whereupon the cells appear with an incomparable richness of ornamentation, the usual indication of calm waters.

The action of the avicularium is absolutely incomprehensible and their inversion on the ovicells does not give us any information.

Occurrence.—Galapagos Islands, D. 2815.

Cotypes.—Cat. No. 8250, U.S.N.M.

Family MAMILLOPORIDAE Canu and Bassler, 1927

Genus MAMILLOPORA Smitt, 1873

MAMILLOPORA CUPULA Smitt, 1873

We have observed 15 very small dead colonies. We have studied equally small colonies from the Gulf of Mexico, but they are much

more rare. The species has apparently degenerated in the Pacific since the formation of the Isthmus of Panama.

Occurrence.—Galapagos Islands, D. 2813.

Cat. No. 8521, U.S.N.M.

Order CYCLOSTOMATA Busk

Family DIASTOPORIDAE Gregory, 1899

Forma PROBOSCINA Audouin, 1826

PROBOSCINA LAMELLIFERA, new species

Plate 11, Figures 1, 2

Description.—The zoarium incrusts shells and is formed of sinuous branches joined together by a smooth calcareous lamella. The tubes are indistinct, short, serrated, and terminated by a long peristomie perpendicular to the zoarial plane.

Measurements.—Diameter or orifice, 0.12 mm.; diameter of peristome, 0.16–0.18 mm.; internal separation of tubes, 0.20–0.30 mm.; width of branches, 1.5 mm.

Affinities.—This arrangement of the branches on a calcareous lamella, cellular because of decortication, is quite special and very characteristic. It has been observed only on the fossils, notably on *Idmonea hagenowi* Sharpe, 1854, from the English Cenomanian, and on *Tubulipora biduplicata* Waters, 1887, from the Miocene of New Zealand. It is interesting to rediscover in the recent seas a feature observed in the ancient seas, permitting an explanation of the structure. Unfortunately the number of our specimens was too small for a detailed study by thin sections.

It is necessary to note the special arrangement of the peristomes; they are oriented not longitudinally as in true *Proboscina* but obliquely toward the zoarial margins as in *Idmonea*.

Occurrence.—Galapagos Islands, D. 2813.

Holotype.—Cat. No. 8522, U.S.N.M.

Family ONCOUSOECIIDAE Canu, 1918

Genus ONCOUSOECIA Canu, 1918

ONCOUSOECIA (PROBOSCINA) MAJOR Johnston, 1847

1884. *Stomatopora major* Hincks, Polyzoa of Queen Charlotte Islands, Annals and Magazine of Natural History, ser. 5, vol. 10, p. 204 (sep. 33).

1889. *Stomatopora major* Jelly, A synonymic Catalogue of Marine Bryozoa, p. 257 (bibliography).

1900. *Tubulipora* (*Stomatopora*) *major* Neviani, Bryozoi neogenici della Calabrie, Paleontographica italica, vol. 6, p. 235 (sep. 121) (local bibliography).

1905. *Tubulipora* (*Stomatopora*) *major* NEVIANI, Bryozoi fossili di Carrubare, Calabria. Bolletino della Societe geologica italiana, vol. 23, p. 548 (sep. 48), fig. 18 (ovicell).

1907. *Stomatopora major* CALVET, Bryozoaires des Expeditions scientifique du *Travailleur* et du *Talisman*, p. 461 (bibliography).

1912. *Stomatopora major* NORDGAARD, Revision av universitets museets samling av norske Bryozoer. Kgl. norske Videnskabers Selskabs Skriften, No. 3, p. 14.

1923. *Stomatopora major* H. and E. O'DONOGHUE, A preliminary list of Polyzoa from the Vancouver Islands Region. Contributions to Canadian Biology, new series, vol. 1, p. 11.

Measurements.—Diameter of orifice, 0.14–0.18 mm.; diameter of peristome, 0.20–0.24 mm.; distance of orifices, 0.80–1.20 mm.; diameter of tubes, 0.30–0.40 (max.) mm.

Variations.—The peristomie (that is to say, the portion free from the tubes) is here very erect and almost perpendicular to the rampant surface. Calvet has noted the variations. On the rampant portion the tubes are separated by a furrow or by a little salient thread. The peristome is thin or thick.

The branches are arched and formed of 1, 2, or 3 rows of tubes. Our specimens were dead and incrusted shells and Cellepores.

Biology.—This species has been observed in the Pacific by only two authors. Hincks (Queen Charlotte Island) and O'Donoghue (Northumberland Channel). Its geographic extension appears rather great, since we have found it in the equatorial belt.

In the Atlantic region it is a species of the temperate zone and of the Mediterranean. But it extends, however, almost to the Cape Verde Islands in the equatorial zone, so that its discovery in the Galapagos Islands is not astonishing. Moreover its paleontologic distribution justifies its geographic extension. However, the fossils found by Waters, 1887, in New Zealand appear too small. The diameter of 0.12 mm. is observed sometimes on certain recent colonies, but always among the much larger tubes. The species lives very rarely on algae.

Occurrence.—Galapagos Islands, D. 2813.

Geographic distribution.—Atlantic: shores of England, 23–170 fathoms; Gulf of Gascogny, 135–180 meters; English Channel to Roscof; shores of Norway at Bergen and at Bongostrommen; Cape Spartel, Morocco, 717 meters; Pico-Fayol; Azores, 80–130 meters; Saint Vincent, Cape Verde Islands, 21 meters. Mediterranean: Corsica on the coast from Rousse Island and to Bastia, 40 meters; Villefranche-sur-Mer; Toulon. Pacific: Queen Charlotte Islands, Gabriola and Northumberland Channel, 15–40 fathoms.

Geologic distribution.—Miocene, Astian, Sicilian and Quaternary of Italy.

Cat. No. 8523, U.S.N.M.

Family MECYNOECIIDAE Canu, 1918

Genus MICROECIA Canu, 1918

MICROECIA TUBIABORTIVA, new species

Plate 8, Figures 6, 7

Description.—The zoarium incrusts shells. The primitive Berenicea form gives rise to palmate or rectilinear fronds. The tubes are little distinct, very little convex, smooth, irregularly arranged; the peristomies are very short and oblique. The orifice is orbicular; the peristome is thin. Aborted tubes, visible or invisible, form irregular spots on the colonial surface. The ovicell is small, orbicular, little convex, perforated by a small oeciopore.

Measurements.—Diameter of orifice, 0.10 mm.; diameter of peristome, 0.14 mm.; distance of orifices, 0.44 mm. (variable); separation of orifices, 0.16–0.24 mm.

Affinities.—The colony is very irregular in appearance because the fronds rising from the primitive *Berenicea* form are irregular in dimensions. This mode of ramification of the branches is rather rare and very well characterizes this species.

The large, smooth, irregular spaces distributed between the tubes on the zoarial surface are occupied in reality by aborted tubes. They are altogether invisible or simply indicated by salient threads or, more rarely, visible but closed by a lamella. We are absolutely ignorant of the utility of this structure.

Occurrence.—Galapagos Islands, D. 2813.

Holotype.—Cat. No. 8524, U.S.N.M.

Family PLAGIOECIIDAE Canu, 1918

Genus PLAGIOECIA Canu, 1918

PLAGIOECIA LACTEA Calvet, 1903, variety

Plate 11, Figures 7, 8

1903. *Diastopora lactea* Calvet in Jullien and Calvet, Bryozoaires provenant des Campagnes de l'Hirondelle, p. 163, pl. 18, fig. 4 (Gulf of Gascogny, 43° 37′ N.; long. 99° 27′ 300 meters, on hydroids).

1907. *Diastopora lactea* Calvet, Bryozoaires des expeditions scientifiques du *Travailleur* et du *Talisman*, p. 466 (Cape Spadel, Morocco, 717 meters on *Lophohelia*).

Measurements.—Diameter of orifice, 0.08 mm.; diameter of peristome, 0.10–0.12 mm.; distance of tubes, 0.40–0.50 mm.; external separation of tubes, 0.40–0.50 mm.

Affinities.—Our specimen differs from those from the Gulf of Gascogny in the less numerous cells on the border and in the presence of

tubes closed by a calcareous lamella with median tubule. The dimensions are identical, the colony is also free and pedunculated, and we were able to observe the same concentric striae and the same ovicells.

The same closures with median tubules are commonly observed in *Plagioecia sarniensis* Norman, 1864; but the tubes are much more slender than in our species.

It is often very difficult to discover characters really specific in the Cyclostomata, and we do not believe a new species should be created with characters so little different from those assigned by Calvet to his *Diastopora lactea*.

Occurrence.—Galapagos Islands, D. 2813.

Plesiotypes.—Cat. No. 8525, U.S.N.M.

Family DIAPEROECIIDAE Canu, 1918

Genus DIAPEROECIA Canu, 1918

DIAPEROECIA STRIATULA, new species

Plate 11, Figures 3–6

Description.—The zoarium is orbicular and incrusts shells or algæ. The tubes are indistinct, immersed in a concentrically striated crust. The peristomie is salient, short, very oblique; the orifice is orbicular or somewhat elliptical; the peristome is thin. The ovicell is a long, transverse, salient sack perforated by tubes, more often placed near the zoarial margin.

Measurements.—Diameter of orifice, 0.08 mm.; diameter of peristome, 0.12 mm.; distance of orifices, 0.30–0.40 mm.; internal separation of orifices, 0.30–0.34 mm.

Affinities.—This species bears concentric striae like *Microecia suborbicularis*, with tubes closed by a lamella with tubule like *Plagioecia sarniensis* Norman, 1864, and closely approximated cells as in *Diastopora congesta* Busk, 1875. It is nevertheless distinctly different from these three species in the ensemble of its characters and in its measurements.

If the substratum is very regular, the peristomies are of equal size; they are on the contrary very irregular if the substratum is irregular and much elongated in the more sheltered parts. This is the rule, moreover, in all the Cyclostomata.

The basal lamella is broad, very fragile, and is frequently lacking on the dead colonies.

This species is clearly distinct from *Plagioecia lactea* Calvet, 1903, not only in the nature of its ovicell but also in the more closely arranged orifices. This form of ovicell perforated by the tubes is rather common both in the recent seas and in the fossils since the Cretaceous.

It is deprived of an oeciostome, and we do not still understand the method of escape of the larvae. It may be necessary to create a special genus, for in true *Diaperoecia* there is a fine submedian and salient oeciostome.

Occurrence.—Galapagos Islands, D. 2813.

Cotypes.—Cat. No. 8526, U.S.N.M.

DIAPEROECIA SUBPAPYRACEA, new species

Plate 12, Figures 1–4

Description.—The zooecium is discoidal, simple or composite, surrounded by a very thick, wide, and porous margin. The tubes are little distinct, with a short and very oblique peristomie; the peristomes are thick, round, or oval, very close together, arranged in quincunx on the young colonies but in radial very irregular rows on the old zoaria. The ovicell is located on the zoarial margin; it is long, convex, fusiform, perforated by tubes, often closed by a calcareous lamella.

Measurements.—Diameter of orifice, 0.08 mm.; diameter of peristome, 0.11 mm.; maximum diameter of colonies, 7.5 mm.

Affinities.—This species is the perfect representation of *Actinopora papyracea* D'Orbigny, 1852,[1] from the Maastrichtian of Meudon near Paris. If we can not make the comparison complete, it is because the ovicell of the fossil is unknown.

Biology.—When two colonies are coalescent they never cover each other but arise from two different larvae. It is not rare, even in the Cheilostomata to see many colonies on the same shell for they arise from the same swarm of larvae which seem to travel together.

It is most remarkable to note, as in Figure 1, larvae from an unknown colony fix themselves on the same substratum at almost the same place so that colonies are superposed. On our figures we can note that the larvae arrived here for five years or seasons with an almost mathematical precision. Moreover, in order that there be superposition, it is necessary that the inferior zoarium be dead. Such a small disk is born, grows, and dies the same year. We have here a good example to evaluate the length of the zoarial life. This species is not only interesting because of its archaic aspect but also it reveals the voyage of the larvae in swarms and the duration of the zoarial development.

The ovicell belongs to the group of *Diaperoecia* without oeciostome.

Occurrence.—Galapagos Islands, D. 2813.

Cotypes.—Cat. No. 8527, U.S.N.M.

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[1] Bryoz. Cret., pl. 643, figs. 12–14.

DIAPEROECIA MEANDRINA, new species

Plate 12, Figures 5–9

Description.—The zoarium is free, formed of bilamellar, reticulated fronds, forming a meandriform ensemble with all the basal lamellæ oriented superiorily and exteriorily. The tubes are little distinct, striated transversely; the peristomes are thin, elliptical or orbicular, very little salient on the fronds, very long in the vicinity of the basal lamella. The ovicell is a long, elongated sack, elliptical, very

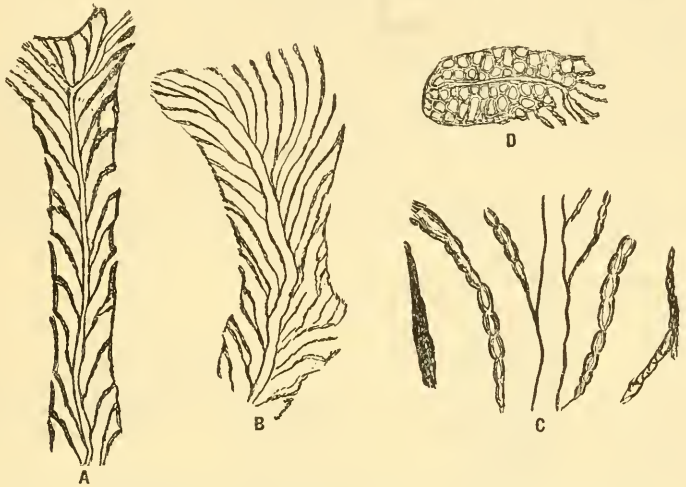


FIGURE 11.—DIAPEROECIA MEANDRINA, NEW SPECIES. *A*, LONGITUDINAL SECTION, × 16, THROUGH A BRANCH MADE IN THE ZOARIAL AXIS BUT NOT PARALLEL TO THE DIRECTION OF THE TUBES. THE GEMMATION HAS THE APPEARANCE OF TRIPARIETAL ALONE. *B*, LONGITUDINAL SECTION, × 18, MADE IN THE DIRECTION OF CERTAIN TUBES WHERE THE DORSAL GEMMATION IS SOMEWHAT APPARENT. *C*, PORTION OF THE SAME SECTION, × 55, SHOWING THE MONILIFORM STRUCTURE OF THE WALL. *D*, TRANSVERSE SECTION, × 16, EXHIBITING THE DOUBLE MEDIAN LAMELLA AND THE TWO BERENICOID LOBES GROWING BACK TO BACK AND BECOMING FREE. THE TUBES ARE CYLINDRICAL AND SEPARATED BY A CALCAREOUS TISSUE

salient, perforated by the tubes, arranged parallel to the zoarial margin.

Structure.—The colony is a true *Reticulipora* so often observed in the Cretaceous formations. The ovicells alone are different.[2] The development of the zoarium is identical with that of *Diaperoecia dorsalis* Waters, 1879, of which we have indicated the different phases in 1925.[3] It is at first sight an ordinary *Berenicea* with two lobes developing in a different plane remaining back to back and their median lamella oriented superiorily and developed laterally.

The branches are formed in an identical fashion and the basal lamella, now median, is quite visible in our figure. As they are very

[2] Canu and Bassler, Les Bryozoaires du Maroc et du Mauritanie, Memoires de la National Museum, vol. 61, p. 29, pl. 5, figs. 9–12.

[3] Idem, p. 67, pl. 9, figs. 1–16.

compressed, their dorsal—that is to say, the side opposite the basal lamella—is very narrow and the tubes there are visible in part of their length. The peristomes are grouped in transverse rows but oriented obliquely in the direction of the latter. The tubes in their length are curved almost at right angles to the basal lamella.

The longitudinal section indicates cylindrical tubes with triparietal gemmation. But it is a deceiving indication, this section not being made in the same direction as the tubes. The mode of gemmation is indicated, on the contrary, by the meridional section and is in reality dorsal as in the other Diastoporas. The walls of the tubes are vesicular as in *Heteropora claviformis* Waters, 1904. The base of a rather large colony is small, suborbicular; it is the primitive Berenicea form in which the concentric striae may be seen (fig. 6). The first branches arise a little farther away on the same substratum in order to give solidity to the ensemble. In reality *Reticulipora* is formed only of free branches of an encrusting colony. We have not yet observed the oeciostome on the ovicell of this species. It is not yet a true *Diaperoecia.*

Occurrence.—Galapagos Islands, D. 2815.

Cotypes.—Cat. No. 8528, U.S.N.M.

DIAPEROECIA FLABELLATA Canu and Bassler, 1923

1923. *Diaperoecia flabellata* Canu and Bassler, Later Tertiary and Quaternary Bryozoa of North America, Bull. U. S. Nat. Mus. No. 125, p. 202, pl. 13, figs. 18, 19.

Our specimens are simple, bifurcated, dead fragments. They are ovicelled. The tubes are grouped in linear series somewhat more accentuated than on our figures of 1923. This is a typical *Diaperoecia* with oeciostome on the nonmarginal ovicell.

Occurrence.—Galapagos Islands, D. 2813.

Cat. No. 8529, U.S.N.M.

Family TUBULIPORIDAE Johnston, 1838

Genus TUBULIPORA Lamark, 1816

TUBULIPORA, species

Plate 14, Figure 6

The small figured specimen incrusts a shell. It does not coincide exactly with any published figure. The bundles have three tubes at most. The peristome measures approximately 0.12 mm. and the orifice 0.08 mm. The oeciostome is a tube smaller than the others, little salient with transverse orifice.

Occurrence.—Galapagos Islands, D. 2815.

TUBULIPORA TUBULIFERA Lamouroux, 1821

Plate 14, Figures 1–4

1821. *Obelia tubulifera* Lamouroux, Exposition methodique des genres de Polypiers, p. 80, pl. 8, fig. 8 (Mediterranean).

1870. *Idmonea serpens* Manzoni, Bryozoi fossili italiani; quarto contribuzione. Sitz. der k. Akademie der Wissenschaften, p. 27, pl. 6, fig. 22 (linear form) (Sicilian of Italy).

1905. *Idmonea serpens* Neviani, Bryozoi fossili di Carrubare, Bollettino Societa geologica Italiana, vol. 23, p. 547 (45), fig. 16 (ovicell) (Sicilian of Italy).

1922. *Idmonea serpens* Waters, On mediterranian *Tervia* and *Idmonea*, Annals and Magazine of Natural History, ser. 9, vol. 10, p. 13, pl. 2, figs. 3, 5, 8, 10 (ovicelli) (Naples, Rapallo, Menton, San Remo, Saint-Raphael, on *Posidonia* and algæ).

1925. *Idmonea serpens* Canu and Bassler, Les Bryozoaires du Maroc et de Mauritanie, Mémoires do la Société des Sciences naturelles du Maroc, vol. 10, p. 68 (shores of Morocco).

Measurements.—Diameter of orifice, 0.08 mm.; width of lines (peristome), 0.12–0.14 mm.; interior separation, 0.20–0.30 mm.; diameter of oeciopore, 0.08 mm.; diameter of oeciostome, 0.14 mm.; number of tubes to the fascicle, 4; diameter of protoecium, 0.16 mm. (Waters).

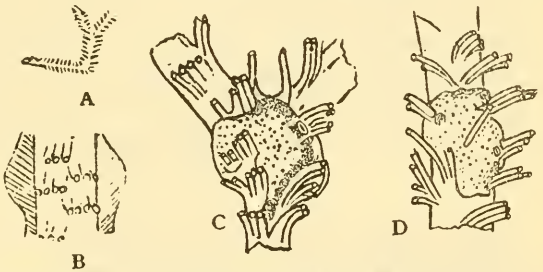


Figure 12.—Tubulipora tubulifera Lamouroux. *A*, Example, × 2. *B*, Sketch showing selvage. *C*, Specimen with ovicell, × 12. *D*, An ovicelled example showing two oeciostomes. Recent, St. Raphael and Naples (after Waters, 1922), as T. serpens)

On the dorsal the tubes are cylindrical. The oeciopore is elliptical, nonsalient; it is the first tube of a fascicle. The figure of Neviani, 1905, is perfectly correct, and we reproduce it. The tubes of the same fascicle are not always rigorously adjacent; they appear then interrupted. The micrometric measurements taken from the figures of Waters, 1922, correspond almost to ours.

The colonies are very variable and exhibit triangular, rounded, and bifurcated lobes; the linear forms are short and rare.

Affinities.—This species differs from *Tubulipora liliacea* Harmer, 1898, in its smaller orifice (0.08 mm. and not 0.10 mm.), in its interrupted fascicles, in the elliptical form of its oeciostome, and its smaller and more slender colonies.

The specimen figured by Busk, 1875,[4] shows analogous dimensions, and it is probably the Mediterranean species.

[4] Catalog Marine Bryozoa, vol. 2, p. 29, pl. 22.

We have reviewed the specimens collected in the Atlantic region. With the aspect of the figure of *Tubulipora liliacea* Harmer, 1898, it shows the small micrometric measurements of the Mediterranean species. It is not at all the Atlantic species dredged in the more northern regions.

Historical.—Harmer, 1898 (p. 96), was the first to separate *Obelia tubulifera Lamouroux*, 1821, from the long synonymy erroneously given by Smitt in 1867 and by Miss Jelly in 1889, but he believed it identical with his *Tubulipora phalangea*, which in our opinion is incorrect, as the oeciostomes are totally different.

The older authors made no use of micrometric measurements, and as a result they made a large number of erroneous determinations which are often very difficult to correct when one can not see the figured specimens. All the specialists now know that perfectly distinct species of bryozoa can have absolutely identical zoarial aspects.

Biology.—*Tubulipora tubulifera* Lamouroux, 1821, lives principally on algae and is therefore a floating species. It is quite prolific and its small colonies are often very numerous on the same substratum. When the latter is dead they persist because of their calcareous nature as free forms, but they soon die. The bathymetric indications furnished by the specimens dredged dead have no value.

Occurrence.—Alascio and Porto d'Anzio, Italy.

TUBULIPORA, species

Plate 14, Figure 5

The small specimen figured incrusts a shell. Its oeciostome is identical with that of the first species we have noted here. The micrometric measurements are also very close, but the fascicles are rare and bear only two tubes. The colony is not flabellate.

We can not be certain that these small colonies are completely developed. Moreover, in this important genus, in which the species are quite variable, we have not yet an absolute criterion for the limitation of the species.

TUBULIPORA LILIACEA Harmer, 1898

Plate 13, Figures 1–10

1898. *Tubulipora liliacea* Harmer, On the development of *Tubulipora*, Quarterly Journal Microscopical Science, vol. 41, p. 90, pl. 8, figs. 7–9 (Trondjhem, Liverpool, St. Andrews Bay, on hydroids).

1903. *Tubulipora liliacea* Nordgaard, Die Bryozoen, des westlichen Norwegens Meeresfauna von Bergen, p. 99 (Hjeltefjord, 6–20 meters; Skjaergaard, 30–40 meters).

1905. *Tubulipora liliacea* NORDGAARD, Hydrographical and biological investigations in Norwegian fiords, Bryozoa, Bergen Museum, p. 173 (Sag Fiord, 200 meters, on branches of *Isidella hippuris;* Malangen, 100–200 meters).

1912. *Tubulipora liliacea* NORDGAARD, Revision av universitets samling av norske Bryozoer. Kgl norske Videnskabers Selskabs Skriften, no. 3, p. 14, (Riser; Glesvaer; Manger; Flors; Bognostrommen; Beran; Skarnsund, Bodo, Hammerfest).

1912. *Tubulipora liliacea* OSBURN, Bryozoa of Woods Hole region, Bulletin Bureau of Fisheries, vol. 30, p. 217, pl. 20, fig. 10 (Vineyard Sound, Sow and Pigs Reef; Buzzards Bay near Robinson Hole; Woods Hole, shallow water, 4–24 meters, on algae, hydroids, *Bugula*, shells).

1918. *Tubulipora liliacea* NORDGAARD, Bryozoa from the arctic regions, Tromso Museums Aarshefter, vol. 40, p. 17 (between Lodingen and Kjollefjord in Finmark, 30–200 meters on hydroids).

Measurements.—Diameter of orifice, 0.12–0.14 mm., diameter of peristome, 0.16–0.20 mm.; internal distance (between the fascicles), 0.20–0.30 mm.; diameter of protoecium, 0.10–0.16 mm.; diameter of oeciostome, 0.16 mm; number of tubes, 5 to 8.

Structure and variations.—We have been able to examine a certain number of specimens of diverse origin, corresponding rigorously to the figures of Harmer, 1898, and have given photographs in order to prove the homogeneity of their characters. The latter are essentially (1) violet color of the colonies, (2) the slight separation of the fascicles, (3) the continuity of the fascicles, never interrupted, (4) the great thickness of the peristomes, and (5) the presence of an oeciostome of the same diameter as the tubes but arranged obliquely.

A specimen dredged from Rokall Bank, Scotland, shows a linear basal portion on which the separation of the fascicles is somewhat greater (0.40 mm.) The other specimens were flabellate and bifurcated.

Another specimen from the Atlantic dredged at LeCroissic, France, is composed of four rectilinear branches arranged in a cross. Its protoecium is very small, little apparent, with a diameter of 0.10 mm.

The specimen dredged in the English Channel at Etretat, France, is claviform. Its protoecium is a little swollen and measures 0.16 mm. in diameter.

All these characters are visible on the excellent figure of Osburn, 1910 (pl. 20, fig. 10), representing a specimen from Vineyard Sound, Mass. The only difference is the isolation of a certain number of tubes on the distal portion of the colony. But in the eastern Atlantic we have not observed specimens so young. Moreover the author did not indicate the enlargement of his figure. The oeciostome figured is that of *Tubulipora liliacea* and not *T. tubulifera* Lamouroux, 1821. The Galapagos specimens are not exactly identical, as the

fascicles are not as wide and the occiostome is larger. We consider them provisionally as a new variety, *tenuis*.

Affinities.—*Tubulipora liliacea* Harmer, 1898, is a species of the northern part of the temperate zone and does not appear to descend as far as the Gulf of Gascogny. It is there replaced in the Atlantic and in the Mediterranean by *Tubulipora tubulifera* Lamouroux, 1821, which is a species more slender and less vigorous. As it has been confused with *Tubulipora serpens* Linnaeus, 1758, we give a new description.

In his synonymy of *Tubulipora liliacea* Pallas, 1756, Harmer adds *Tubulipora serpens* Busk, 1875, Smitt, 1867, and Hincks, 1880. It is difficult for us to accept this conclusion, as Busk's figure of 1875, in its micrometric measurements, indicates more the Mediterranean species. The figures of Smitt, 1867, and of Hincks, 1880, indicate a different species characterized by a more linear zoarial form and especially by a greater internal separation of the fascicles, because this varies from 0.40 mm. to 0.60 mm. Moreover, there are never more than four tubes to the fascicle. In order not to change the nomenclature perhaps it would be well to consider this third species as the true *Tubulipora serpens* Linnaeus, 1758. We have not been able to secure a sufficient number of specimens for an exact study, but it is certain that our photographs do not have any relationship with those published by Hincks, Busk, and Smitt.

Biology.—All our specimens of *Tubulipora liliacea* (Pallas) Harmer, incrust shells. A single specimen from Wissant (Pas-de-Calais, France) incrusts a *Sertularia*. This is then not a floating species like the Mediterranean species and the species of Smitt-Hincks. Finally, observed on a solid substratum, it furnishes good bathymetric indications.

Occurrence.—Galapagos Islands, D. 2815.

Plesiotypes.—Cat. No. 8530, U.S.N.M.

Family LICHENOPORIDAE Smitt, 1866

Genus LICHENOPORA Defrance, 1823

LICHENOPORA RADIATA Savigny-Audouin, 1826

1923. *Lichenopora radiata* Canu and Bassler, North American Later Tertiary and Quaternary Bryozoa, p. 204, pl. 44, fig. 10. (Bibliography, geologic and geographic distribution.)

We have found only a single dead specimen. It is free and very well preserved.

Biology.—This species is another evidence of the ancient communication between the Atlantic and the Pacific, for we have discovered it also in the Gulf of Mexico and in the Philippines.

It lives rather frequently on floating algæ, so that the bathymetric indications which it can furnish are only relative.

Occurrence.—Galapagos Islands, D. 2813.

Cat. No. 8531, U.S.N.M.

DEFRANCIA STELLATA Reuss, 1847

Plate 14, Figures 7–12

1847. *Defrancia stellata* Reuss, Die fossilen polyparien des Wiener Tertiarbeckens, Haidinger's naturwissenschaftliche Abhandlungen, vol. 2, p. 37, pl. 6, fig. 2.

1877. *Defrancia stellata* Manzoni, I Briozoi fossili del Miocene d'Austria ed Ungheria, II parte, Denkschriften der math. natur. Classe der k. Akademie der Wissenschaften, vol. 33, p. 16, pl. 16, fig. 63.

Structure.—It is quite remarkable to rediscover in the recent seas this European fossil. We have been able to compare the Galapagos specimens with different fossil specimens from the Canu collection, and the identity of the micrometric measurements is as exact as possible.

In order to show the exactness of our determination we reproduce at the same magnification fossil specimens. The only appreciable difference is in the separation of the fascicles, which appears to be slightly larger on the recent specimens.

The specimen from the Lower Miocene of El Amran, Algeria, shows manifest traces of the basal lamella around each subcolony. The orifice of the tubes is a little smaller (0.06 mm.). The specimens found in the Friren collection are simply marked "Helvetian"; the exact bed is unknown. The fascicles are a little narrower, measuring 0.16 mm.

The micrometric measurements of the specimen from the Sahelian of Oran are exactly those shown in specimens from Galapagos.

The entire absence of the solid substratum indicates a special adaptation to floating life. Indeed most of the Galapagos specimens are attached to floating cellepores. The following table gives a summary of the micrometric measurements:

	Diameter of orifice	Width of fascicles	Diameter of intermediate pores
	Mm.	*Mm.*	*Mm.*
Recent (Galapagos)	0. 08	0. 18–0. 20	0. 06–0. 08
Burdigalian	0. 06	0. 20	0. 08
Helvetian	0. 06	0. 16	0. 06–0. 08
Sahelian	0. 08	0. 16–0. 20	0. 08

It is possible that the recent species is different from the fossil one, but in the present state of knowledge it is impossible to estimate the importance of the separation of the fascicles on colonies. The discovery of the ovicells would give perhaps a better character of differentiation.

Our specimens are attached to corals, to nullipores, and to Cellepores. Their color is violet. They are formed of superposed subcolonies, forming short bifurcated branches. The superior subcolony only remained alive; it is bordered by a wide, smooth basal lamella, free or covering the inferior subcolony. The tubes are formed of two or three rows of polygonal tubes; they are little salient and arranged laterally. The cancelli(?) are numerous, with a diameter almost equal to that of the tubes; they occupy all the superior part of the colony and the space between the fascicles. On the dead slightly worn specimens the fascicles are more visible and they then resemble *Cerioporas*.

As the ovicell is not known, it is useless to attempt the proper classification of this species, and it is preferable to leave it under the primitive name. The rare simple colonies have the aspect of *Lichenopora* and the composite colonies have that of *Tholopora* or *Domopora*.

The synonymy given by Miss Jelly (p. 86) for *Domopora stellata* is absolutely false. This author has confused the present species with *Coronopora truncata* Fleming, 1828, which is a boreal species of the Tubuliporidae and with another species of Jameson.

Occurrence.—Galapagos Islands, D. 2815.

Plesiotypes.—Cat. No. 8532, U.S.N.M.

CAVARIA PRAESENS, new species

Plate 9, Figures 7–9

Description.—The zoarium incrusts Cellepores and shells; it is surrounded by a wide smooth, basal lamella, and emits short, cylindrical fragments terminated by irregular pores and divided into two parts by a very little salient diametrical lamella (basal lamella). The tubes (invisible exteriorily) are in section, cylindrical, with dorsal gemmation on the basal lamella covered at the extremity of their length with moniliform walls. The peristome is thin, little salient. The tubes are separated by irregular ramified mesopores, closed exteriorily by a diaphragm more or less apparent.

Measurements.—Diameter of orifice, 0.14 mm.; diameter of peristome, 0.18 mm.

Structure.—In spite of its complex appearance, the structure of this species is very simple; it is a *Berenicea*, in which the peristomies of the tubes are separated by mesopores. This *Berenicea* emits

fronds in the *Diastopora* form (double face), having the same character. This is the structure of a large number of Cretaceous fossils classed by Gregory, 1899, in the Petaloporidae and Clausidae. The old genus which corresponds most to our recent specimens is *Cavaria* Hagenow, 1851, where we have also tubes with dorsal gemmation on a basal lamella and separated by irregular mesopores. However, we have cylindrical expansions and not hollow colonies with diaphragms.

As the ovicell is unknown we have adopted the genus of the old zoarial nomenclature to classify this species in order not to create a new term which might have to be eliminated after the discovery of the ovicell.

On our recent specimens, as moreover on many of the fossils, may be noted grouped on the same colony the forms *Berenicea* and *Diastopora*. The classification based on the zoarial form is perfectly useless, as in the Cheilostomata.

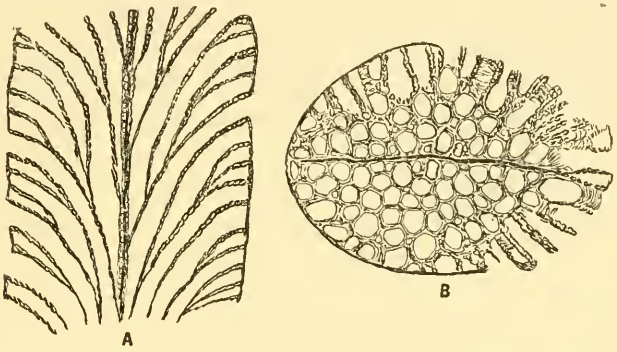


FIGURE 13.—CAVARIA PRAESANS, NEW SPECIES. *A*, LONGITUDINAL SECTION OF A CYLINDRICAL BRANCH, × 16, SHOWING THE TUBES ADJACENT TO THE MEDIAN LAMELLA. *B*, TRANSVERSE SECTION, × 16, EXHIBITING THE CYLINDRICAL TUBES AND THE MEDIAN LAMELLA. THE SMALL PORES ADJACENT TO THE LAMELLAE ARE TUBES WHILE THE MINUTE DISSEMINATED PORES ARE MESOPORES

Affinities.—Exteriorily this species resembles *Tretocycloecia pelliculata* Waters, 1879, in the presence of closed mesopores between the peristomes. They differ in their internal structure. In Waters's species the gemmation is peripheral and the mesopores are subparietal, as shown in the sections of Waters, 1879, and Canu and Bassler, 1920. Moreover, under the name of *Heteropora pelliculata* several species have been confused. The exact determination of species with mesopores can not be made without sections.

Biology.—Our specimens, having been separated from their substratum, prove that only they came from the depths indicated by their surrounding. Moreover, they were dead. The zoarial surface is wrinkled transversely. These wrinkles overlap on the closures of

the mesopores. There is, then, a kind of exterior calcification rather difficult to understand on incomplete specimens.

Occurrence.—Galapagos Islands, D. 2813 and D. 2815.

Holotype.—Cat. No. 8533 U.S.N.M.

HETEROPORA, species

Plate 9, Figures 4–6

Our photograph shows two small incomplete colonies. The peristome is hardly salient and measures 0.10 mm. in diameter; it bears a small distal visor (galea) directed toward the base of the colony, as in certain *Lichenoporas;* its orifice measures 0.08 mm. in diameter. The peristomes are arranged in quincunx distant from each other 0.30 mm. and separated by smaller irregular polygonal pores.

The colony is bordered inferiorily by a smooth basal lamella little enlarged, which appears to be the true zoarial margin.

Without ovicell or sections it was impossible for us to give an exact idea of the structure of this species. It recalls certain *Multicrescis* of the Cretaceous, and it would be interesting to make a detailed study of it.

Occurrence.—Galapagos Islands, D. 2813.

Cat. No. 8534, U.S.N.M.

EXPLANATION OF PLATES

Plate 1

Figs. 1, 2. *Aplousina filum* Jullien 1903 (p. 5).

1. Portion of the incrusting zoarium, × 20, showing the small zooecia with ectocyst and the endozooecial ovicell.
2. Surface of zoarium, × 20, with large zooecia covered by the ectocyst. The opercular valve is wide but very short.

Albatross Station D. 2813.

3–7. *Membrendoecium claustracrassum*, new species (p. 7).

3. The incrusting zoarium, × 20, with little calcified zooecia in immediate contact with the substratum.
4. Zooecia with ectocyst, × 20, showing the endozooecial structure of the ovicells. The zooecium without ectocyst is regenerated.
5. Ancestrular region, × 20.
6. Ectocysted zooecia, × 20, showing the large operculum of the ovicelled zooecia and the small opercular valve of the ordinary zooecia.
7. Calcified zooecia, × 20, of the external lamella of an incrusting multilamellar colony.

Albatross Station D. 2813.

8. *Callopora verrucosa*, new species (p. 9).

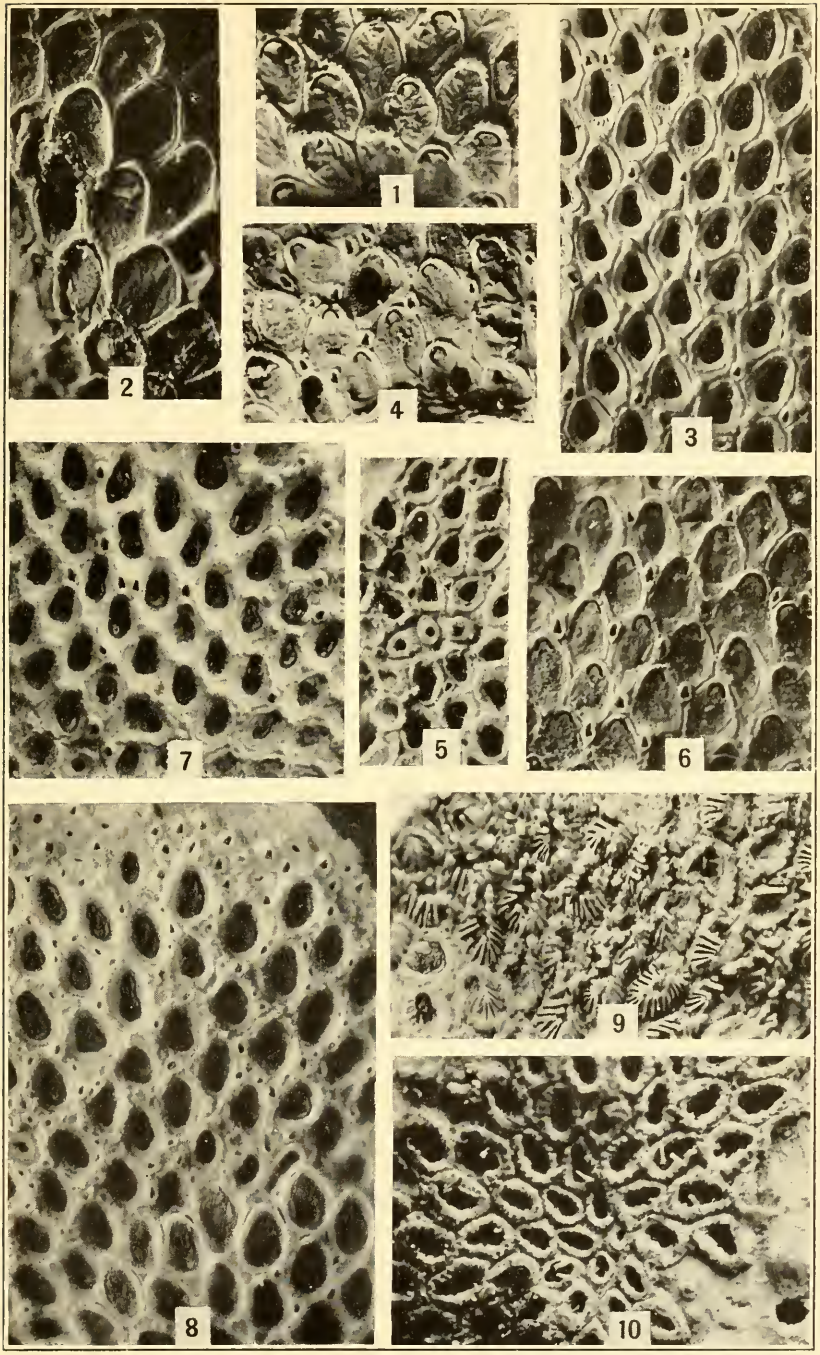
Portion of the incrusting colony, × 20. The normal zooecia are at the base. The marginal zooecia have zooeciules on their mural rim. The marginal zooeciules have stopped the growth of the colony.

Albatross Station D. 2813.

9, 10. *Cauloramphus brunea*, new species (p. 10).

9. Incrusting specimen, × 20, preserving the spines which are brown in the original. The pedunculated avicularia are white.
10. Ancestrular portion of a colony which has lost its spines, × 20.

Albatross Station D. 2815.



BRYOZOA OF GALAPAGOS ISLANDS

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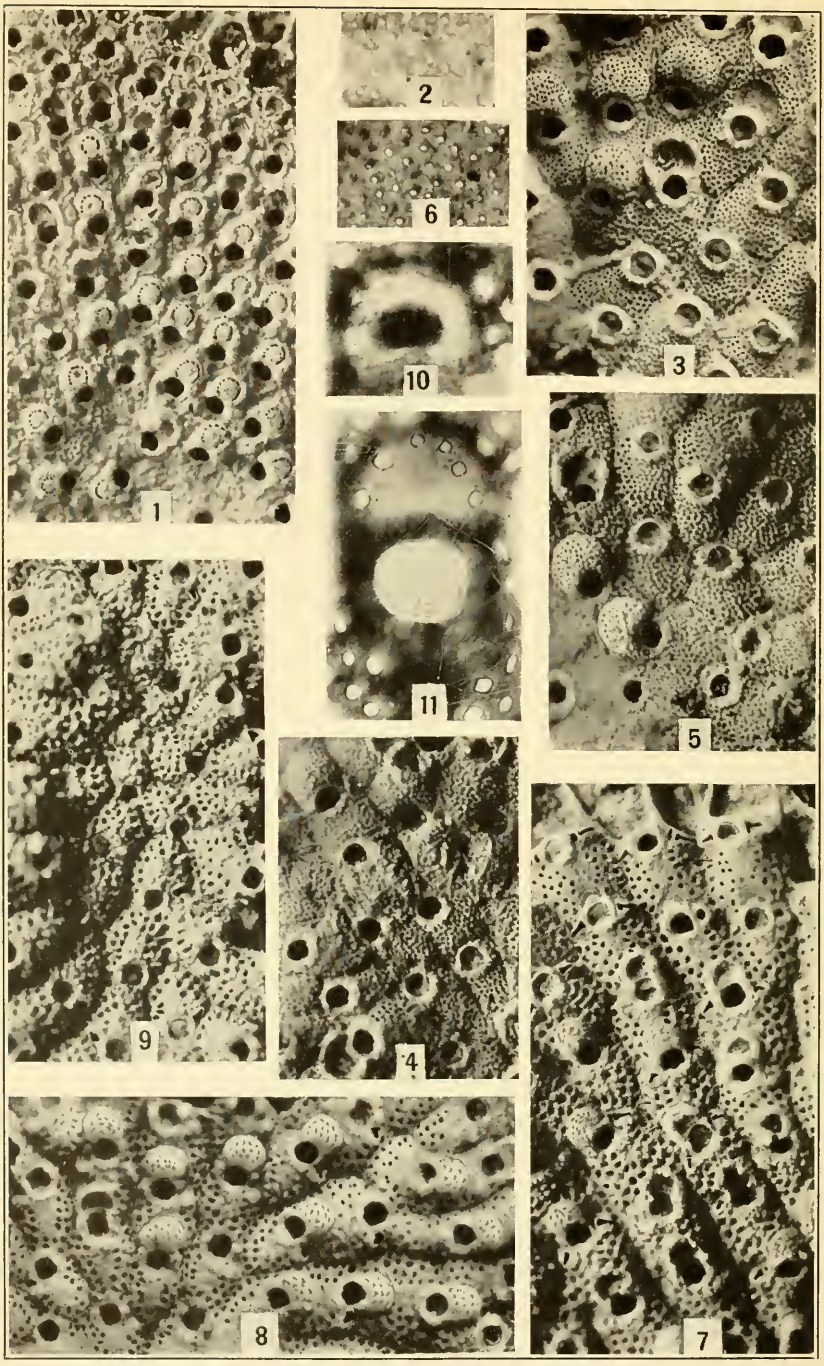

BRYOZOA OF GALAPAGOS ISLANDS

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Plate 2

Figs. 1, 2. *Schizopodrella* (*Stephanosella*) *biaperta* Michelin, 1842 (p. 16).

1. Portion of an incrusting ovicelled colony, × 20.
2. Structure of the frontal, × 85, showing the small tremopores. Albatross Station D. 2813.

3–6. *Dakaria sertata*, new species (p. 17).

3. Incrusting zoarium, × 20, showing the frontal of the zooecia and the ovicell which have the same structure.
4. Irregular zooecia in the ancestrular region, × 20.
5. The zooecia are poorly oriented. The peristome is thick and festooned proximally; × 20.
6. Structure of the frontal with small tremopores, × 85. Albatross Station D. 2813, and D. 2815.

7–11. *Hippomenella parvicapitata*, new species (p. 19).

7. Incrusting specimen, × 20, showing the broad cells some of which have no pleurocyst. No dietellae.
8. An example, × 20, in which the narrow zooecia have only a single avicularium.
9. Specimen, × 20, showing the ancestrula. The irregularity of the substratum has determined the development and an abnormal direction of the cells.
10. View by transparency of the embryo in the ovicell, × 85.
11. A cell viewed by transparency showing the frontal structure, the ovicell, areolar pores and pleurocyst. Albatross Station D. 2813.

Plate 3

Figs. 1, 2. *Microporella gibbosula*, new species (p. 20).

1. Incrusting specimen, × 20, showing the micrometric variations from the ancestrula to the marginal zooecia.
2. Ovicelled specimen much calcified, × 20. The form of the avicularia is altered by the intensity of calcification.

Albatross Station D. 2813.

3–5. *Microporella tractabilis*, new species (p. 22).

3. Incrusting zoarium with ovicelled zooecia, × 20. The ovicells have the same structure as the frontal.
4. An example with setiform avicularian mandibles, × 20. The point of the latter touches the pivot of the avicularium of the adjacent superior zooecium.
5. Structure of the frontal, shown by transparency, × 85. The ascopore is large and triangular.

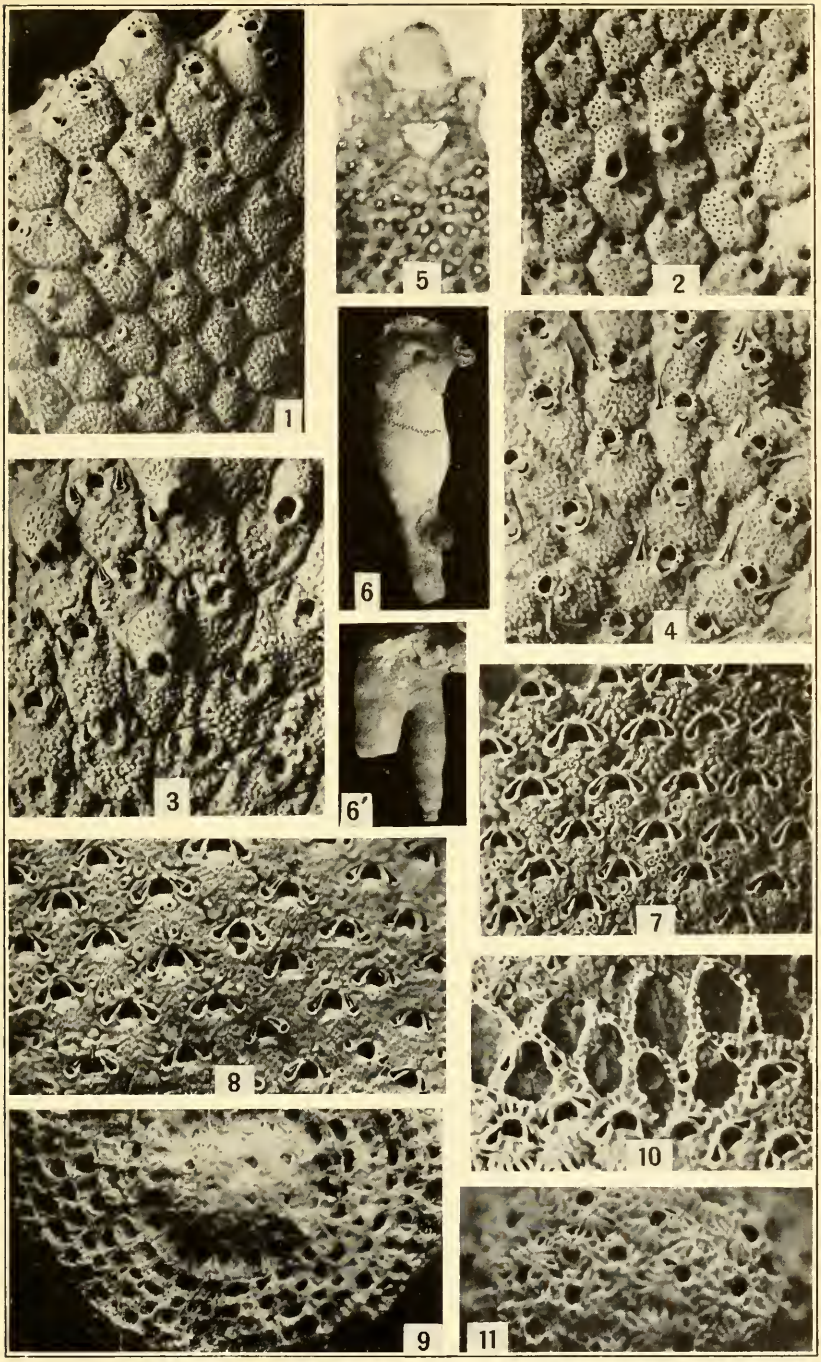
Albatross Station D. 2815.

6–11. *Enantiosula manica*, new species (p. 23).

6,6.[1] Two colonies, natural size, showing their real position.

7. Surface, × 20, showing young zooecia with tubular tremopores.
8. Fragment of a lamella, × 20, on which the tremocyst is much calcified and the frontal tubules are adjacent.
9. Portion of a transverse section of a colony, × 10, showing the superposed concentric lamellae.
10. Margin of a lamella, × 20, illustrating the parietal dietellae formed before the frontal and the aperture. The avicularia are visible among the dietellae.
11. End of a branch, × 20. The cells are much calcified and unadorned. The tremopores are closed by costules.

Albatross Station D. 2815.



BRYOZOA OF GALAPAGOS ISLANDS

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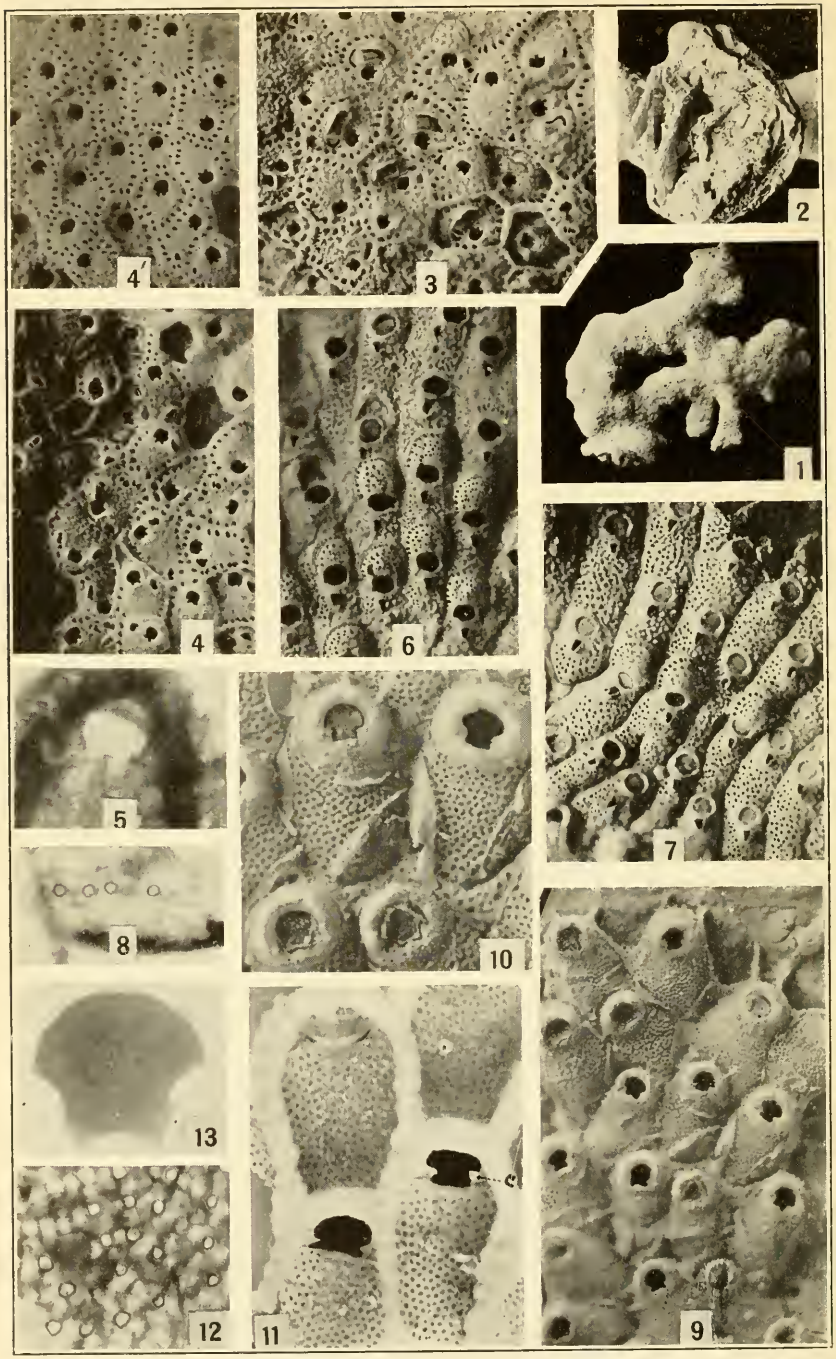

BRYOZOA OF GALAPAGOS ISLANDS

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Plate 4

Figs. 1–5. *Smittina trispinosa* Johnston, 1838 variety (p. 27).

1, 2. Zoarium, natural size and base of same, × 2.

3. Another example, × 20 with ovicelled zooecia, and also zooecia with small avicularia as well as those with large avicularia, ornamented with a mandible.

4. Zoarium, × 20, in which the zooecia do not have large avicularia. The small avicularia are always elliptical; sometimes some of them are triangular.

4.[1] Zooecia, × 20, without avicularia or only a single one present.

5. View by transparency, × 85, showing the arrangement of the cardelles and of the lyrule in the aperture.

Albatross Station D. 2813.

6–8. *Codonella granulata*, new species (p. 29).

6. Surface of the incrusting specimen with regular zooecia, × 20.

7. Zoarium with irregular zooecia, × 20. The frontal granulations are quite visible between the tremopores.

8. Lateral wall of the zooecium showing the four uniporous septulae, × 85.

Albatross Station D. 2815.

9–13. *Pachycleithonia nigra*, new species (p. 25).

9, 10. Surface of the incrusting zoarium, × 10 and several zooecia, × 20. The ectocyst persists on some of the zooecia as a torn film.

11. Interior, × 20, showing the operculum in place in one zooecium and the condyles and lateral canals under the condyles in others.

12. Structure of the frontal, × 85.

13. Operculum, 85.

Albatross Station D. 2815.

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Plate 5

Figs. 1–4. *Diplonotos costulatum*, new species (p. 30).

1, 2. Fragment of zoarium, natural size, and the first lateral face of the reticulated colony, × 20, bearing vibices and avicularia.

3. Second lateral face of the same colony × 20, showing the same features.

4. Cellular side, × 20. It is uniserial and the zooecial openings are arranged on the edge of the branches in the fenestrae.

Albatross Station D. 2813.

5. *Crepidacantha poissonii* Audouin, 1826 (p. 33).

Portion of the incrusting zoarium, × 20.

Hawaiian Islands, Albatross Station D. 3813.

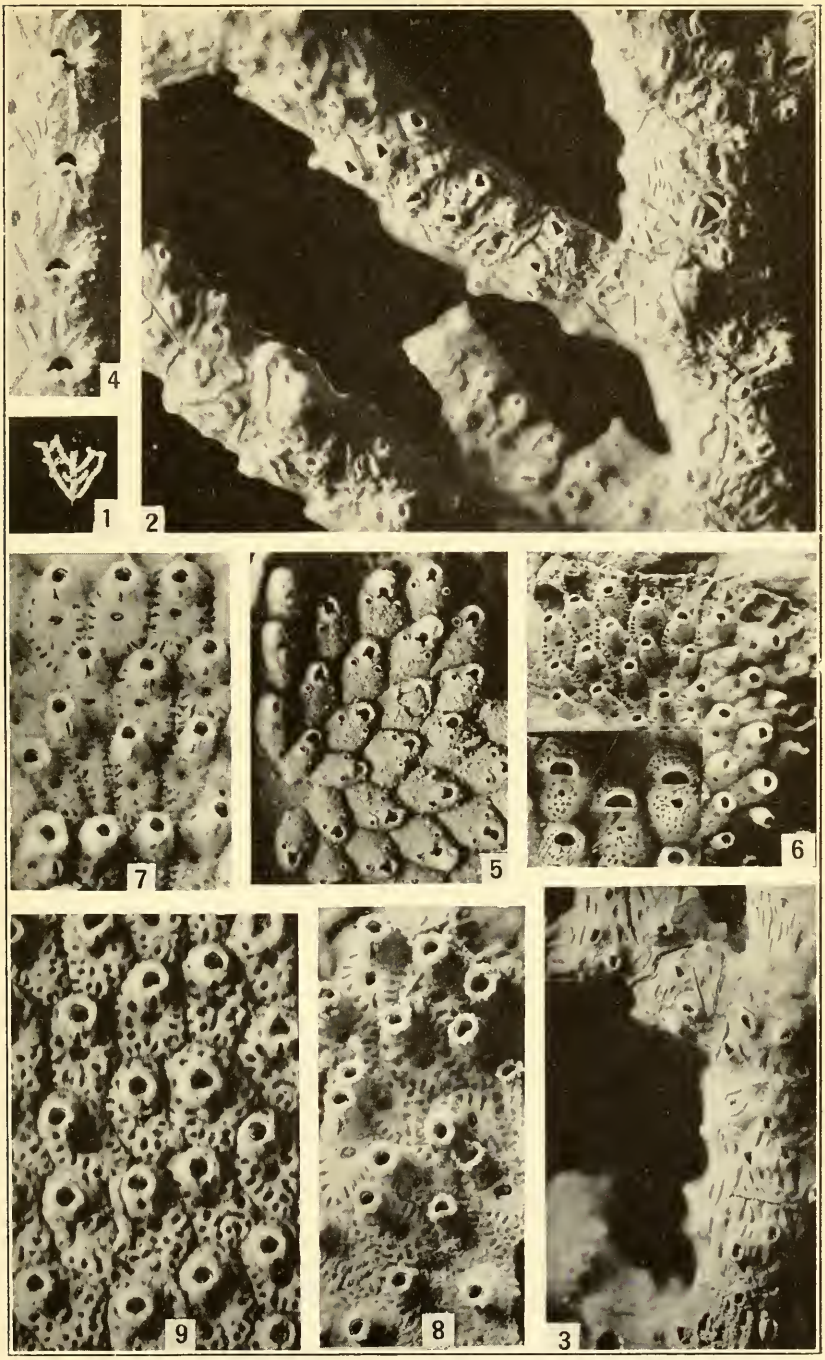
6–9. *Adeona tubulifera*, new species (page 34).

6. Portion of the incrusting zoarium, × 10, and a few zooecia of the same, × 20, showing gonoecia.

7, 8. Portions of a colony × 20 with very tubular zooecia.

9. Much calcified colony, × 20. The peristomes are shorter and much thickened.

Albatross Station D. 2815 and D. 2813.



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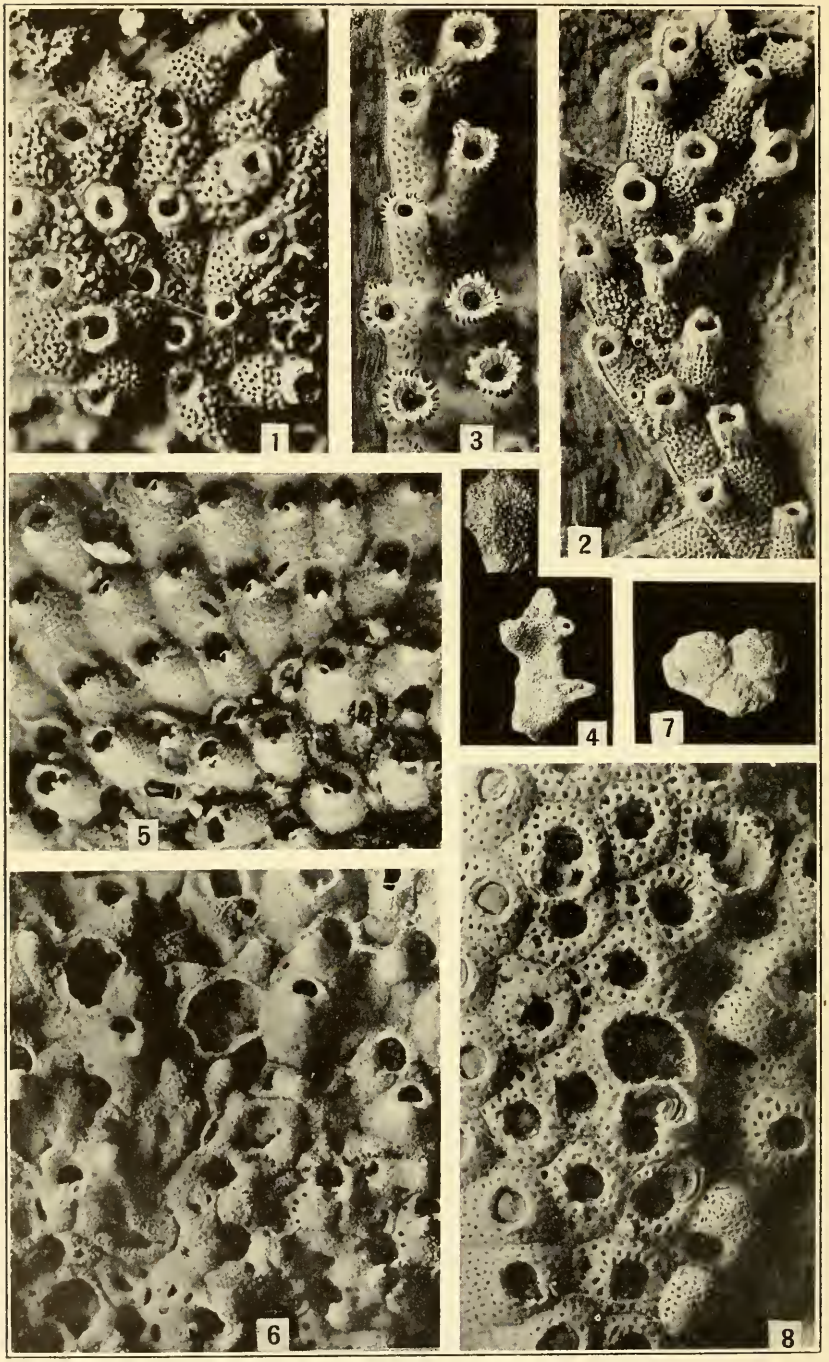

BRYOZOA OF GALAPAGOS ISLANDS

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Plate 6

Fig. 1. *Lagenipora verrucosa*, new species (p. 35).
Incrusting ovicelled specimen × 20.
Albatross Station D. 2813.

2, 3. *Lagenipora marginata*, new species (p. 36).
2. Incrusting bi-triserial specimen, × 20, The superior cells are operculated.
3. An example, × 20, with laciniated and expanded peristomes of zooecia with long peristomie.
Albatross Station D. 2813.

4–6. *Holoporella quadrispinosa*, new species (p. 37).
4. Two colonies, natural size.
5. Oriented cells of an incrusting colony, × 20. There are small frontal avicularia.
6. Cumulate zooecia of a colony, × 20. The small frontal avicularia are buried in the thickness of the frontal.
Albatross Station D. 2813 and D. 2815.

7–8. *Holoporella porosa*, new species (p. 39).
7. Two colonies developed on the same nullipore, natural size.
8. Portion of a colony × 20, showing the ovicells and some operculated zooecia.
Albatross Station D. 2815.

Plate 7

Fig. 1. *Holoporella hexagonalis*, new species. (p. 38).

1. Surface of the colony, × 20. Some zooecia are operculated.

Albatross Station D. 2813.

2, 3. *Holoporella tridentculata* Busk, 1881 (p. 39).

2. The massive colony, natural size.

3. Surface of a large massive colony, × 20, bearing cylindrical, salient tubes.

Albatross Station D. 2815.

4–8. *Osthimosia anatina*, new species (p. 42).

4. Fragments of the ramose zoarium, natural size.

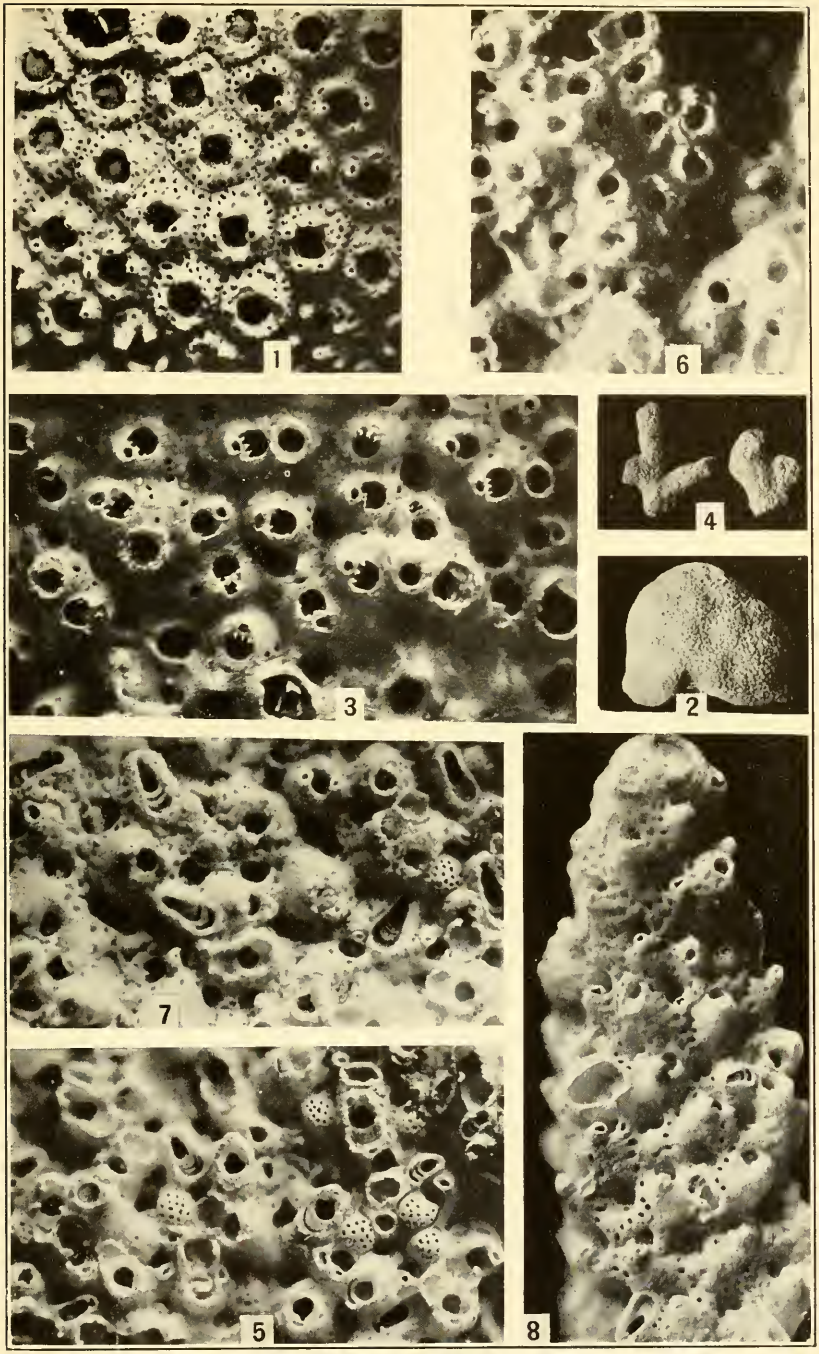
5. Ovicelled portion of a ramose colony, × 20.

6. Portion of a ramose colony, × 20, where the areolar pores are little visible and the ovicells are broken.

7. Surface of a colony, × 20, with large interzooecial avicularia of duck bill shape.

8. Young zooecia, × 20, at the extremity of a branch.

Albatross Station D. 2813 and D. 2815.



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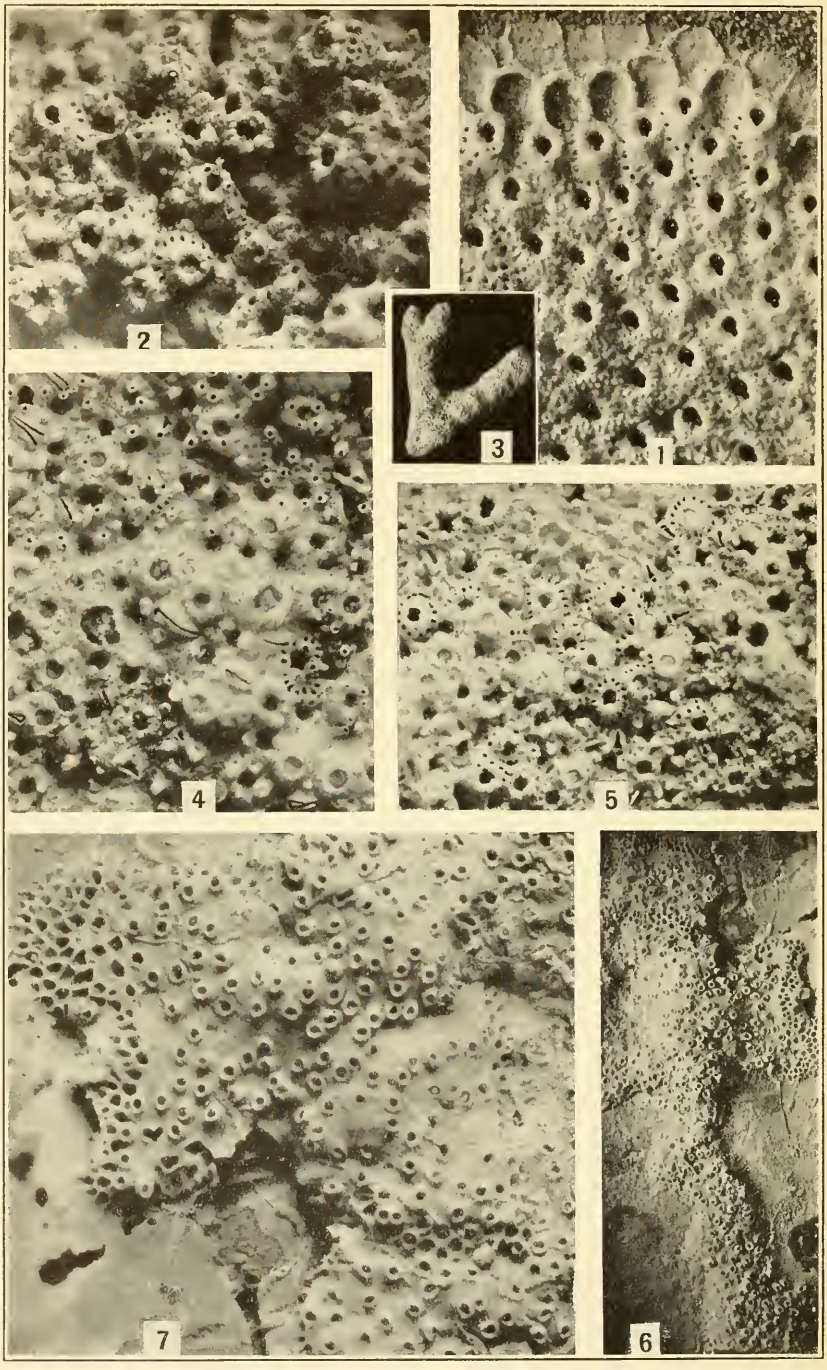

BRYOZOA OF GALAPAGOS ISLANDS

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Plate 8

Figs. 1, 2. *Hippoporidra granulosa*, new species (p. 43).

1. Portion of an encrusting colony with oriented zooecia, × 20.
2. Another part of the same zoarium, × 20, with erect and poorly oriented zooecia.

Albatross Station D. 2813.

3–5. *Hippotrema spiculifera*, new species (p. 43).

3. The ramose zoarium, natural size.
4. Portion of a free colony, × 20, showing the large interzooecial avicularia and the frontal spicules.
5. Zoarial surface, × 20, showing the spicules placed on the frontal of the cells.

Albatross Station D. 2813.

6, 7. *Microecia tubiabortiva*, new species (p. 48).

6. An entire colony, × 4, showing the primitive *Berenicea* emitting various lobes.
7. Portion of the same colony, × 12, showing the ovicell and the spaces with aborted tubes.

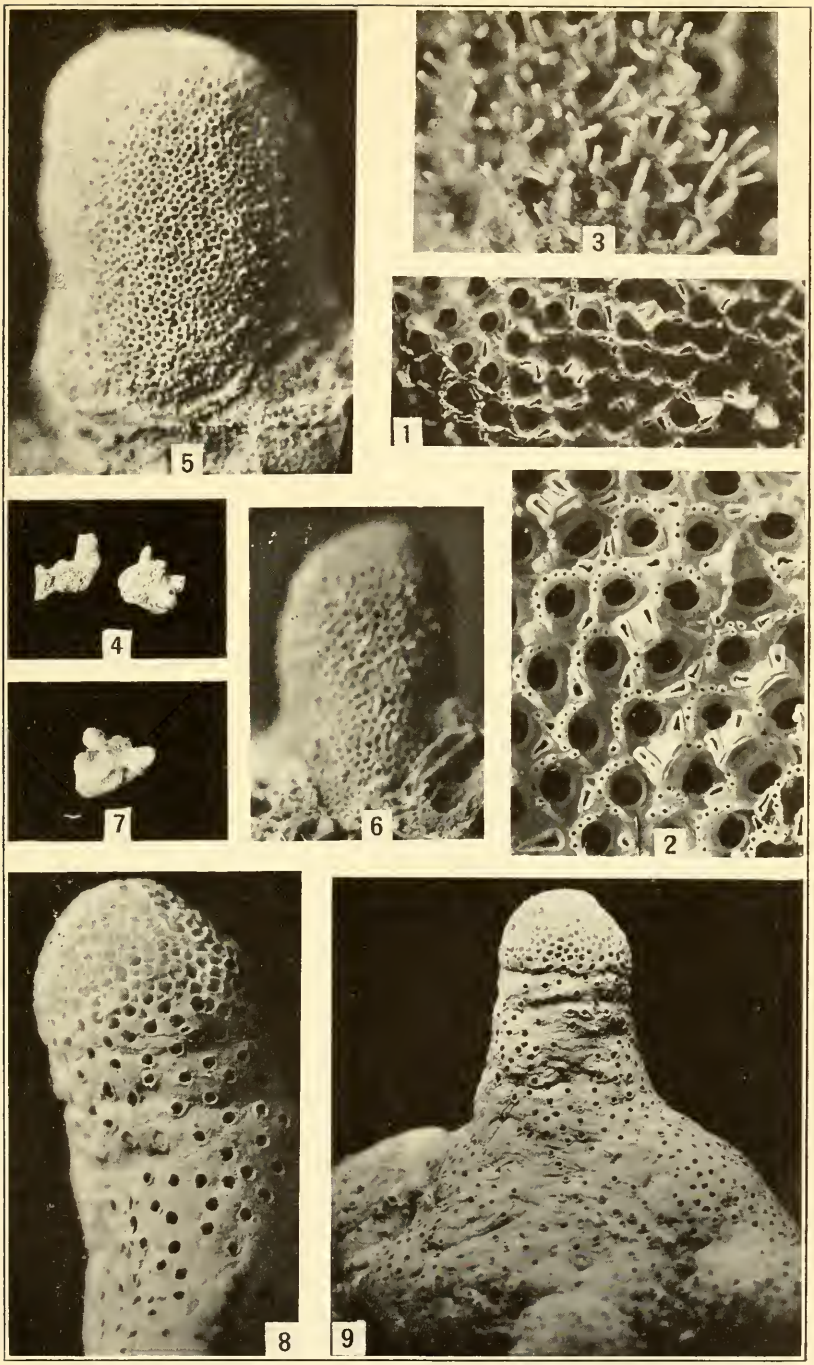
Albatross Station D. 2813.

Plate 9

Figs. 1–3. *Chaperia condylata*, new species (p. 44).
1. The incrusting zoarium, × 10.
2. Portion of the same surface, × 20.
3. Zooecia, × 20, preserving the six, large, simple, distal spines.
Albatross Station D. 2815.

4–6. *Heteropora*, species (p. 60).
Two zoaria natural size and, × 12.
Albatross Station D. 2813.

7–9. *Cavaria praesens*, new species (p. 58).
7. Zoarium natural size.
8. The bereniceoid colony, × 6, emitting cylindrical branches. The mesopores are biserial under an epitheca.
Albatross Station D. 2813.



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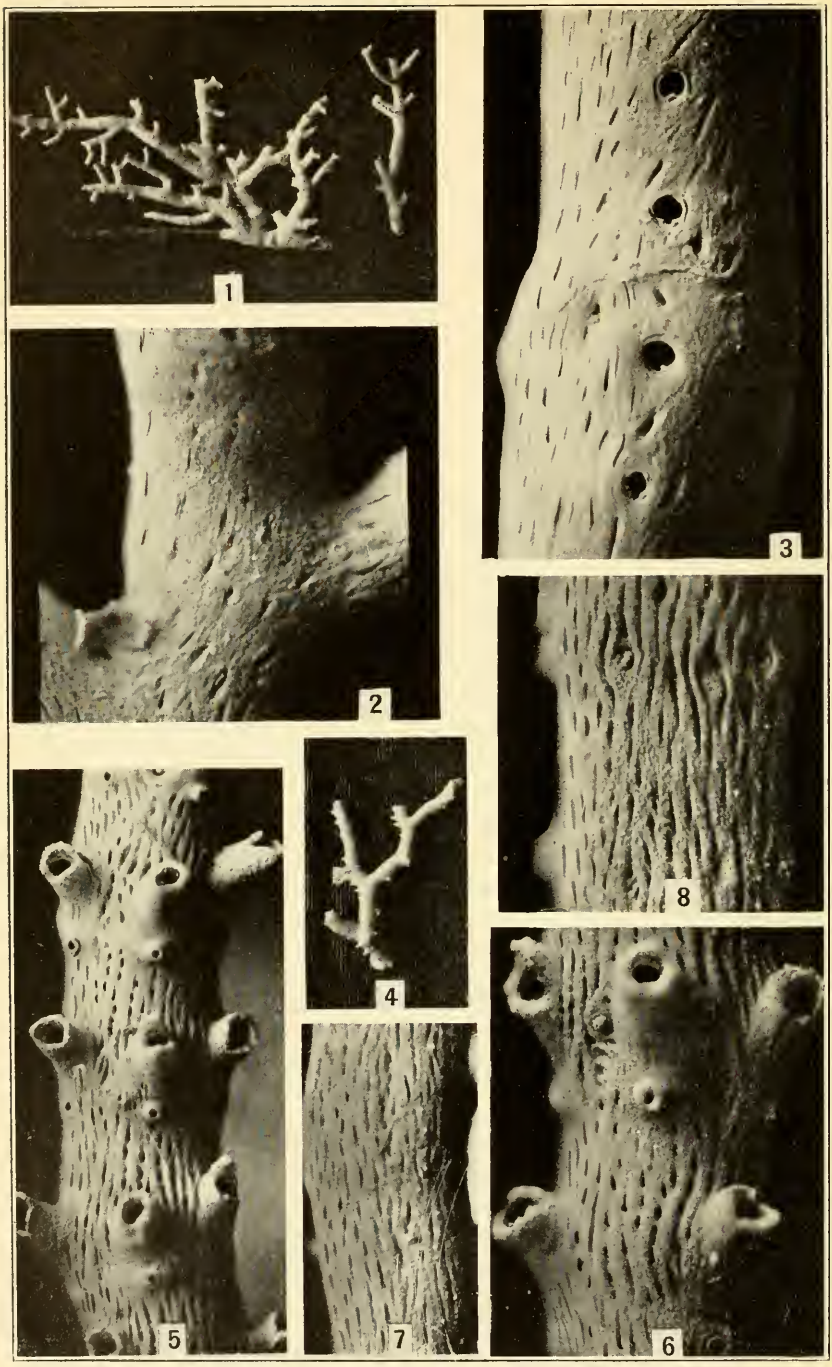

BRYOZOA OF GALAPAGOS ISLANDS

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Plate 10

Figs. 1–3. *Diplonotos striatum*, new species (p. 31).

1. An entire colony and a fragment, natural size. The branches show noncellular faces for the apertures are arranged laterally.
2. Noncellular surface, × 20, with sulci of little depth.
3. Lateral cellular side of branch, × 20, in which the enlarged portions bear salient transverse vibices.

Albatross Station D. 3408.

4–8. *Semihaswellia sulcosa*, new species (p. 15).

4. Colony, natural size.
5, 6. Frontal cellular side, × 12 and a portion, × 20, showing the longitudinal sulci.
7, 8. Dorsal side, × 12 and × 20, with longitudinal sulci and very small vacuoles.

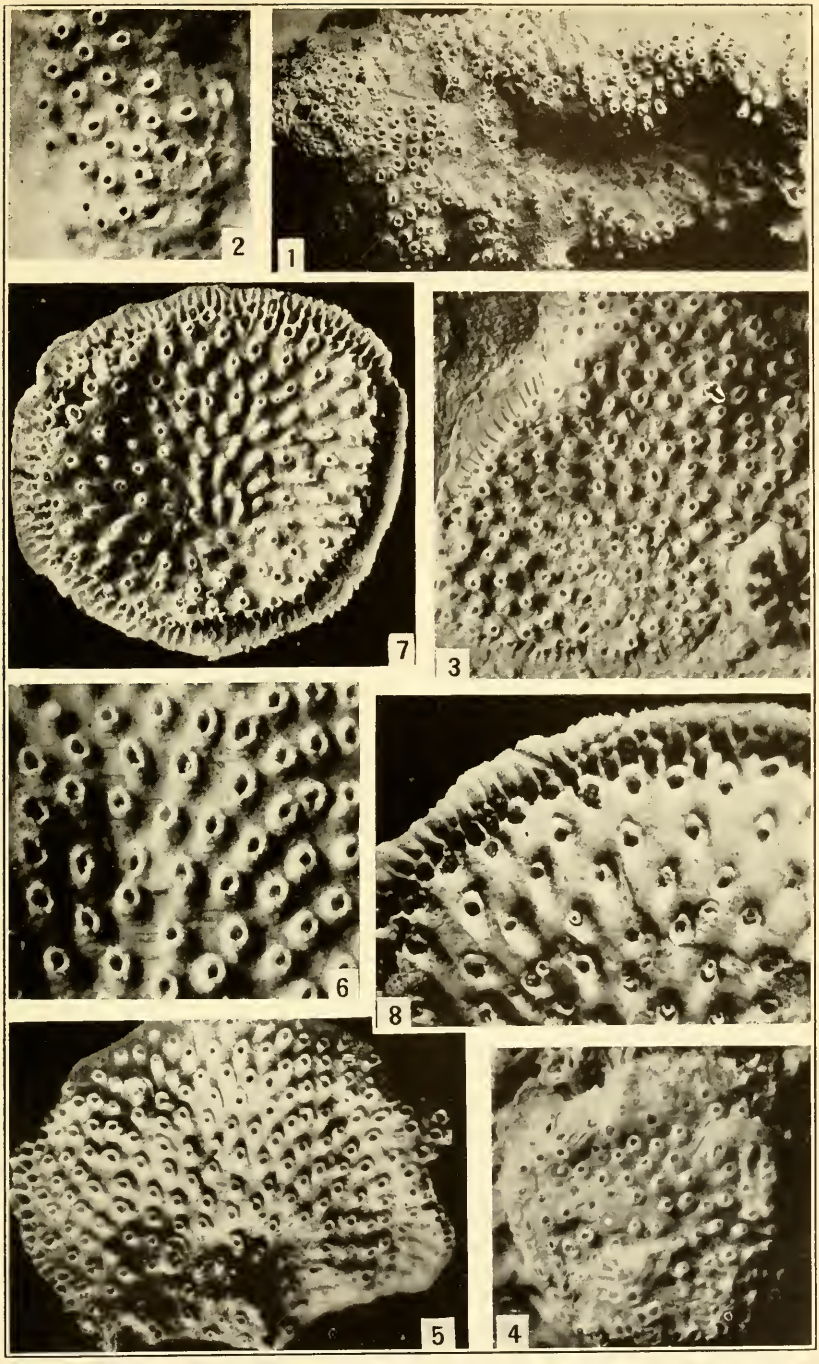
Albatross Station D. 3408.

Plate 11

Figs. 1, 2. *Proboscina lamellifera*, new species (p. 46).
The incrusting zoarium, × 6 and a portion × 12.
Albatross Station D. 2813.

3–6. *Diaperoecia striatula*, new species (p. 49).
3. A colony incrusting in concentric wrinkles with a wide basal lamella and an ovicell.
4. An example, × 12, with three ovicells.
5. A free colony, × 12.
6. Portion of fig. 5, × 25, to show the concentric striae.
Albatross Station D. 2813.

7, 8. *Plagioecia lactea* Calvet, 1903, var (p. 48).
7. A complete free colony, × 12, with marginal ovicell.
8. Portion of the same, × 25, to show the tubes closed by a diaphragm with tubule.
Albatross Station D. 2813.



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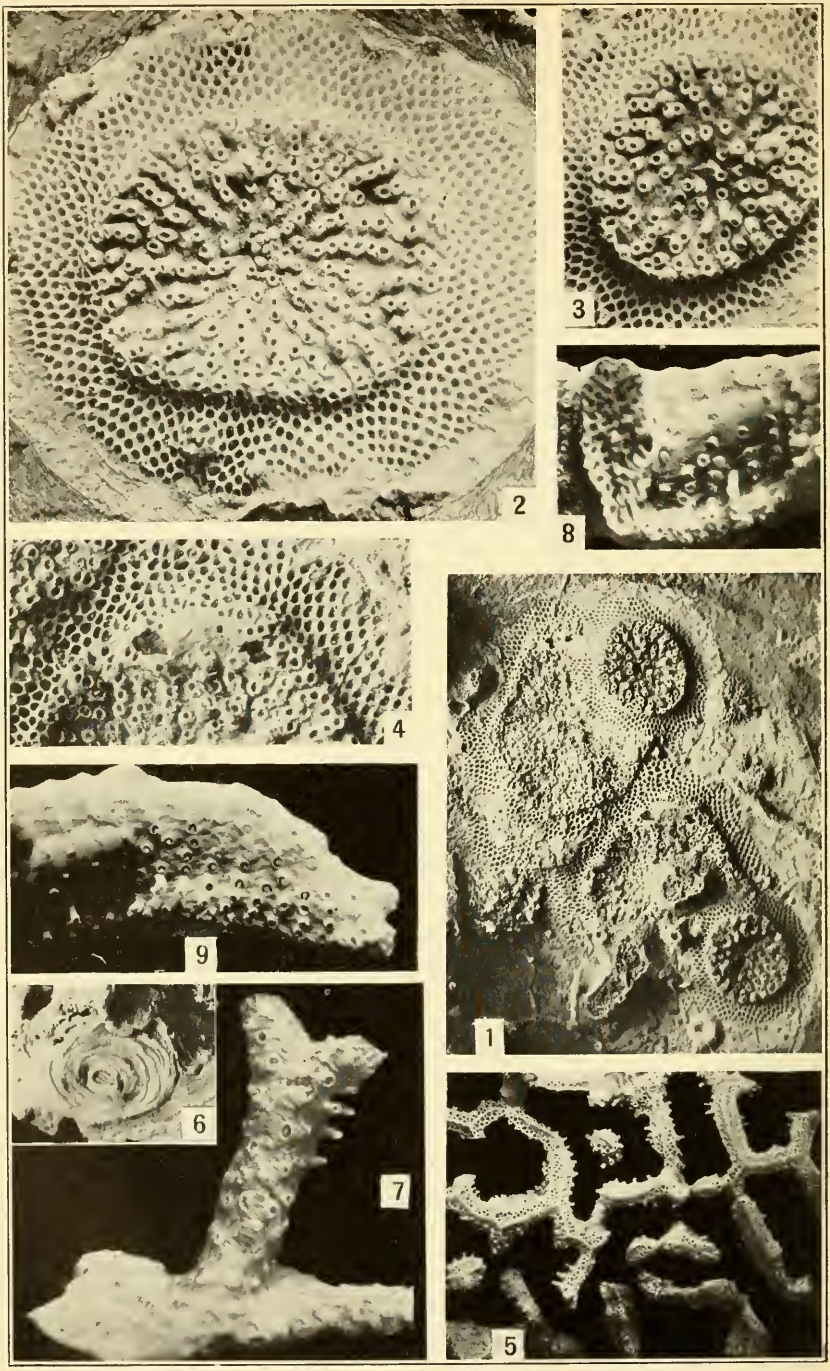

BRYOZOA OF GALAPAGOS ISLANDS

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Plate 12

Figs. 1–4. *Diaperoecia? subpapyracea*, new species (p. 50).

1. Superposed colonies, × 4, arising from many successive larvae.
2. A large isolated colony, × 12, showing the arrangement of the tubes in radial rows and the large smooth basal lamella.
3. A small isolated colony, × 12, showing the irregular arrangement of the peristomes.
4. Portion of an incrusting colony, × 12, illustrating the marginal ovicell.

Albatross Station D. 2813.

5–9. *Diaperoecia meandrina*, new species (p. 51).

5. Superior face, × 4, showing the zoarial reticulations, the basal lamella, and the great saliency of the superior tubes.
6. Base of the same zoarium, × 4. The primitive *Berenicea* is visible, as is also the point of attachment.
7. Dorsal of a young branch, × 12. It is formed from the principal branch by a bifurcation of the basal lamella in which the two parts are attached back to back.
8. Lateral face of an ovicelled branch, × 12, showing the insertion of a secondary branch.
9. Lateral view of a young ovicelled branch, × 12, illustrating the growth of the basal lamella by the addition of new recurved tubes. Sometimes the tubes are closed by a diaphragm with a tubule.

Albatross Station D. 2815.

Plate 13

Figs. 1–10. *Tubulipora liliacea* Harmer, 1898 (p. 54).

1. Incrusting colony, × 12, commencing in the linear form.
2. Incrusting specimen, × 12, showing the small protoecium, the ovicell, and the oeciostome.
3. The initial linear portion, × 12, of example shown in Figure 1.

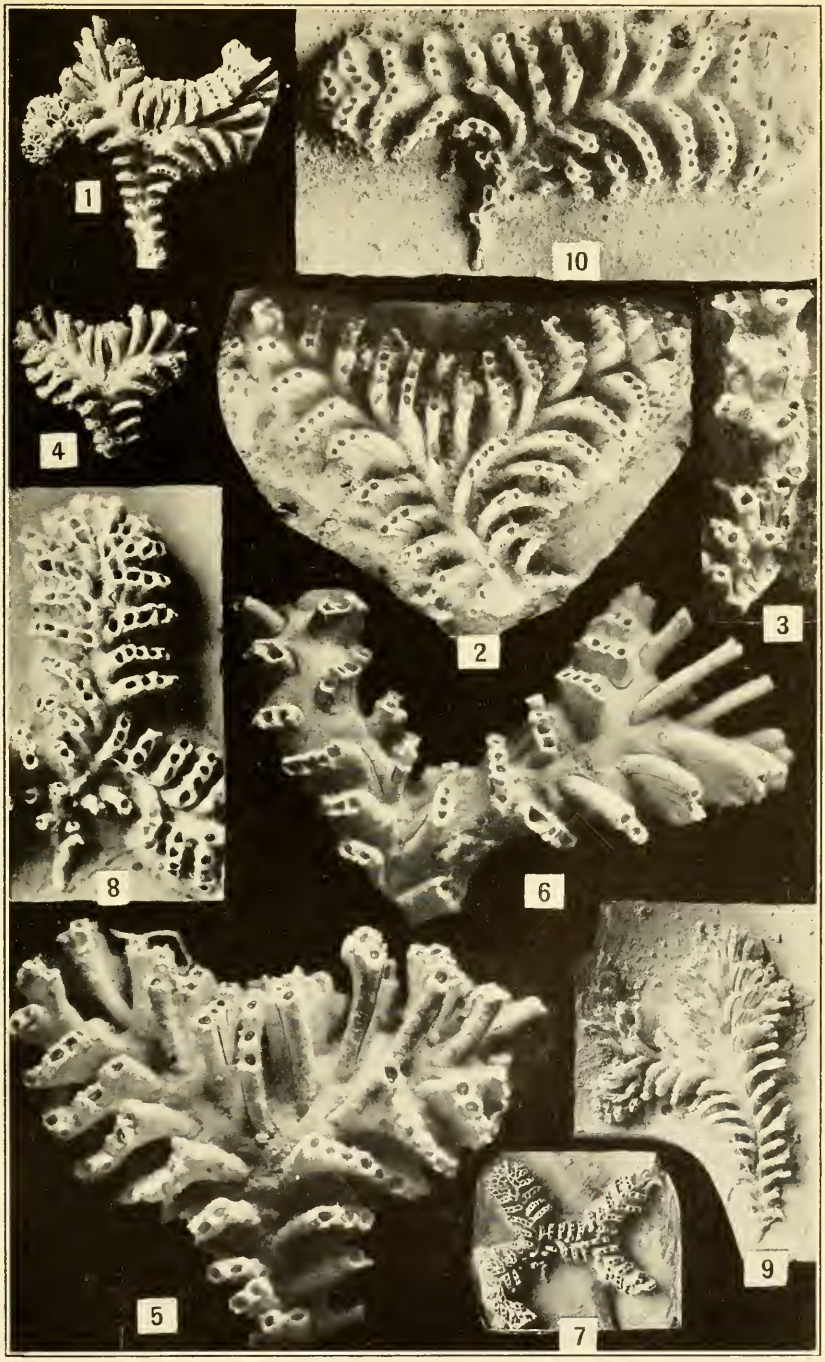
4, 5. Incrusting flabellate zoarium, × 4, and × 12, the latter showing the ovicell.

6. Bifurcated ovicelled specimen with linear branches, × 12. Banc de Rokall, Spain (Atlantic).

7, 8. Incrusting specimen, × 4 and a portion × 12, showing the very small protoecium.
Atlantic, LaCroisic, Manche.

9. Another example with small protoecium, × 4.
English Channel, Etretat, France.

10. Incrusting colony, × 12. The ovicell and the oeciostome are not entirely formed.
Albatross Station D. 2815.



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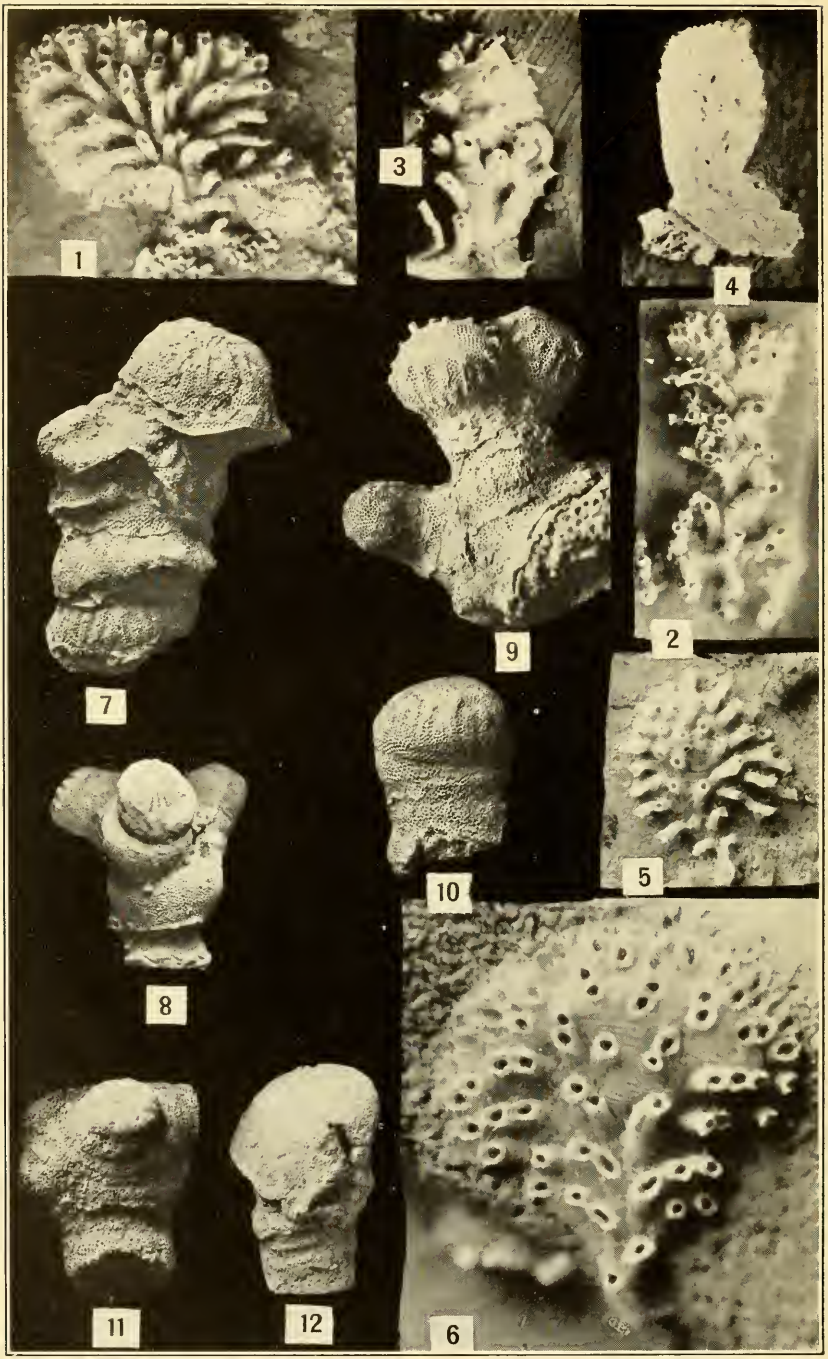

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Plate 14

Figs. 1–4. *Tubulipora tubulifera* Lamouroux, 1821 (p. 53).

1. Flabellate specimen growing on an alga, × 12.
2. Linear specimen, × 12, with interrupted fascicles, incrusting an alga.
3. Linear ovicelled specimen, × 12, attached to an alga.
4. Dorsal face of a specimen, × 12, showing the cylindrical tubes.

Porto d'Anzio, Italy.

5. *Tubulipora*, species (p. 54).

Small incrusting, ovicelled specimen with the oeciostome visible, × 12.

Albatross Station D. 2813.

6. *Tubulipora*, species (p. 52).

Small ovicelled specimen, × 25. The oeciostome is recumbent and adjacent to a tube.

Albatross Station D. 2815.

7–12. *Defrancia stellata* Reuss, 1847 (p. 57).

7. An example, × 4, with superposed colonies.

Sahelian, Oran (Algeria).

8. An example, × 12.

Lower Miocene (Burdigalian), El Amran, Algeria.

9. Specimen attached to a Cellepore.

Albatross Station D. 2815.

10–12. Specimens from the Helvetian (Miocene) of France.

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