
THE ALCYONARIA OF PORTO RICO.

BY

CHARLES W. HARGITT, Ph. D.,

AND

CHARLES G. ROGERS, A. M.

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INTRODUCTORY.

The collection, of which the following paper gives a synopsis, was made during the winter of 1898-99, in and about the island of Porto Rico. It comprised some 25 separate packages, but of these several were duplicates from different stations and several so very fragmentary as to render an adequate description difficult, not to say impossible. Hence, while to most of them brief reference will be made in the appropriate portion of the report, to others no notice beyond the present will appear.¹

The material was in part preserved dry and in part in alcohol, but apparently by methods which failed to secure proper expansion of the polyps to facilitate their morphological study. In only two cases were polyps found in anything like an expanded or normal condition, and the dried specimens were in some cases badly distorted and crushed, leaving them difficult to determine. These facts, together with the very fragmentary condition of many specimens, have rendered the matter of determination unusually difficult.

While comparatively small, both as to the number of genera and species, the collection is not without some new interest, as at least two of the genera are entirely new to the region and several of the species are probably new to science. It will also be noted that one of the genera new to these waters comes from a depth greater than that common to most of its species—namely, that of *Spongodes*, taken from a depth of 75 fathoms. Further notice of this will be made in connection with its description.

While the senior author is responsible so far as the final determination and descriptions in the report are concerned, Mr. Rogers assumes responsibility for the synoptic table and for certain of the sketches, especially of spicules. No attempt has been made to give details of synonymy in connection with the descriptions of species.

Acknowledgments are made of the courtesy of the director of the biological laboratory of the U. S. Fish Commission, Woods Hole; also to the Museum of Comparative Zoology, Harvard University, to the director and curators of the U. S. National Museum, and to the Academy of Natural Sciences, Philadelphia, for favors shown; and to the Peabody Museum, of Yale University, for the privilege of examining specimens of the collection.

¹As compared with the earlier collections made by the *Blake*, 1880, the *Fish Hawk*, 1880-82, and the *Albatross*, 1883, the present is notably lacking in some of the more remarkable groups of the Alcyonaria, especially the *Pennatulacea* and *Alcyonacea*. As will be noted, the present collection is practically limited to the *Gorgonacea*. While naturally a somewhat larger proportion in both genera and species would be expected among the Gorgonias, still their extreme preponderance in the present collection is somewhat surprising. Whether the difference may in any wise be due to seasonal influence it is impossible to say. It may also be noticed that the collection was comparatively small in the number of specimens taken, except in a very few cases.

THE ALCYONARIA.

The order Alcyonaria includes those members of the class Anthozoa, Phylum Cœlenterata, characterized by the presence of eight pinnate tentacles and a corresponding number of mesenterial filaments or folds, with or without definite skeletal structures. All are of marine habit, and most are colonial, forming more or less complex clusters or groups of polyps united to a common stock. The buds which go to make up the colony arise usually from stoloniferous extensions of the body wall at the base of the polyp, or from disk-like expansions, containing nutritive canals which ramify through the more or less fleshy cœnenchyma and which give rise to secondary stems, branches and sub-branches, often forming a very complex, dendritic structure more resembling a plant than an animal, as, for example, in the beautiful "sea-fans," "sea-plumes," etc. Hence the term "Zoophyte," by which the older naturalists designated them.

Calcareous particles or spicules of an almost infinite variety of form are usually present in some part of the tissues, chiefly in the so-called cœnenchyma of the stem and branches, as well as in the tentacles and body of the polyps. They may occur somewhat promiscuously scattered throughout the tissues, or may be limited more or less to certain portions of the colony, or may become coalescent to form definite skeletal structures, as the axis of red coral or of the sea-fans. In certain forms, as the *Cornulariidae*, instead of calcareous spicules there may be a chitinous or horny secretion over the polyp walls and stolons.

So remarkable a feature do these spicular bodies form that elaborate systems of classification have been based upon their peculiarities, including families, genera, and even species. Indeed, at present, it may be said that these form one of the chief taxonomic characters in general use. Some doubt has, however, been recently thrown upon this method, notably by Hickson,¹ who has shown that they are of a very variable nature, even under ordinary conditions of depth, temperature, etc. These variable conditions may greatly modify their size, form, and color—the very features which have been held to be of diagnostic importance.

To some extent my own observations confirm those of Hickson, and I more than suspect that not a little revising of present categories of classification will be an early necessity. While among some groups there may be found a certain stereotyped form and size of spicular body, it does not seem to me that it can hold anything like the place of importance which has hitherto been claimed for it.

The following synoptic table or key has been compiled from several sources, chiefly from Edwards and Haime, *Histoire Naturelle des Coralliaires*; Kolliker, *Icones Histologicae*; Kükenthal, *Alcyonaceen von Ternate*; the *Synopses of Bronn, Klaseen und Ordnungen d. Thierreichs*; Leunis, *Synopsis der Thierkunde*; Kent, on the *Spicules of Gorgonaceae*; Wright and Studer, *Report on the Alcyonaria of the Challenger Expedition*, vol. xxxi. These have been supplemented by free reference to special papers and descriptions and by such notes as have seemed helpful and available for the more ready determination of family, if not generic, relations,

¹ Report Third International Congr. of Zoologists, p. 352.

by the ordinary collector or student. While under each family the recognized genera are named, only those coming within the range of West Indian or West Atlantic coast waters are included in the generic synopses.

The following authors have also been consulted in the preparation of the report:

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ALCYONARIA.

Polyps and polyp colonies having eight pinnate tentacles and eight mesenteric folds.

Order 1. ALCYONACEA Verrill.

Polyps single or in colonies; when the latter they are united by endodermic nutritive canals; are without axial skeleton.

- I. HALMEIDÆ. Polyps single, with or without spicules.
- II. CORNULARIDÆ. Polyps not united in bundles at the base to a stem or foot, but have cuticle-like or stolon-like expansions or are branched and bear lateral buds.
- III. TUBIPORIDÆ. Colonies formed of parallel tubular polyps and united by horizontal platforms containing endodermal canals. Colonies form calcified stocks of numerous calcareous tubes arising from the coalescence of spicules of the mesoderm. Anterior portion of polyps is retractile.
- IV. XENIDÆ. Colony consists of masses of long cylindrical polyps bearing terminal crowns of nonretractile tentacles. Polyps united in their lower portion by a canal system ramifying in a connecting cœnenchyma, which contains a few calcareous spicules.
- V. ORGANIDÆ. Elongated polyps united together so as to form a short upright stem. Polyps retractile. Spicules present in both polyp and tentacles.
- VI. ALCYONIDÆ. Polyp stalk fleshy, sometimes simple, sometimes irregularly branched. Basal portion generally without polyps. Polyp tubes, contained in the thick cœnenchyma, are united by endodermal canals, from which buds are formed. Isolated spicules are found in the cœnenchyma.
- VII. NEPHTHYIDÆ. Upright branched polyp colonies, consisting of a sterile trunk and branches ramifying in a most varied manner and bearing terminal polyps. Polyps do not exhibit separate calycine and tentacular regions, and the latter does not invaginate. Tentacles fold over oral disk when at rest. Buds arise from small endodermal canals between the polyps.
- VIII. HELIOPORIDÆ. Compact corallum formed of a fibro-crystalline calcareous mass. This is formed from a cœnenchyma made up of numerous tubes and from calyces with an irregular number of septa-like parietal ridges. Calyces and tubes of cœnenchyma are closed below by a series of transverse floors. Polyps completely retractile, and tentacles are invaginated. Delicate canals furnish communication between individual tubes and calyces.

Family I. HAIMEIDÆ.

(1) *Hæmea* Milne-Edwards. (2) *Hartea* Wright. (3) *Monoxenia* Haeckel.

None of these genera is found within the territory covered by this paper.

Family II. CORNULARIIDÆ.

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| 1. <i>Cornularia</i> Lamarck. | 7. <i>Cornulariella</i> Verrill. | 12. <i>Anthopodium</i> Verrill. |
| 2. <i>Rhizocenia</i> Ehrenberg. | 8. <i>Telesto</i> Lamouroux. | 13. <i>Sympodium</i> Ehrenberg. |
| 3. <i>Clavularia</i> Quoy & Gaimard. | 9. <i>Catogorgia</i> Milne-Edwards. | 14. <i>Erythropodium</i> Kolliker. |
| 4. <i>Sarcodictyon</i> Forbes. | 10. <i>Cyathopodium</i> Verrill. | 15. <i>Callipodium</i> Verrill. |
| 5. <i>Anthelia</i> Savigny. | 11. <i>Scleranthelia</i> Studer. | 16. <i>Pseudogorgia</i> Kolliker. |
| 6. <i>Gymnosarca</i> S. Kent. | | |

Probably not more than five genera of this family have been found in the North Atlantic near the American coast.

7. CORNULARIELLA. Colony consists of a series of creeping stolons from which the tubular polyps arise. Polyps have large tentacles, with short, thick pinnae; the upper portion of each polyp has few spicules and is retractile within the lower portion, which is quite rigid from being packed with numerous warty spindles.
8. TELESTO. The polyps arise from a membranous base or from stolons, and have deep gastral cavities. Lateral buds spring forth from their body walls. The walls of the polyp calyces contain spicules, which may sometimes be united by a horny substance.
12. ANTHOPODIUM. Colony is incrusting, firm. Polyps large, prominent, retractile within tubular verrucae; surface of coenenchyma and verrucae minutely granular with the dentations of projecting spicules, which are irregular in outline and closely united together. Spiny spicules and clubs are also found.
13. SYMPODIUM. The base of the colony is a thin leathery membrane, from which the rather numerous polyps arise. Polyps are short, retractile, and deeply sunk into the basal membrane. Spicules very small and disk-like.
14. ERYTHROPODIUM. Colony has an incrusting membranous base. Polyps retractile within very small verrucae. Spicules long, hexradiate, with rounded ends and small dentations.

Family III. TUBIPORIDÆ.

Tubipora Linnaeus.

Family IV. XENIDÆ.

Xenia Savigny.

Family V. ORGANIDÆ.

Organidus Danielssen.

Family VI. ALCYONIDÆ.

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| 1. <i>Crystallophanes</i> Danielssen. | 5. <i>Sarakka</i> Danielssen. | 9. <i>Lobophytum</i> Marenzeller. |
| 2. <i>Bellonella</i> Gray. | 6. <i>Alcyonium</i> Linnaeus. | 10. <i>Anthomastus</i> Verrill. |
| 3. <i>Nidalia</i> Gray. | 7. <i>Lobularia</i> Savigny. | 11. <i>Nannodendron</i> Danielssen. |
| 4. <i>Paralcyonium</i> Milne-Edwards. | 8. <i>Sarcophytum</i> Lesson. | |
6. ALCYONIUM. Colony presents appearance of variously lobed, soft masses, over the surfaces of which the polyps are spread. Polyps are completely retractile. Spicules chiefly spindles.
7. LOBULARIA. Colony like the preceding, but the short broad stem is furnished with a series of lobes or lappets, the coenenchyma of which is thickly packed with spicules, clubs, and double clubs.
10. ANTHOMASTUS. Colony forms a rounded mass with a short barren peduncle, either directly adherent or fixed in mud by root-like peduncles. Polyps dimorphic. Autozooids large, few in number. Spicules, spiny and branching spindles.

Family VII. NEPHTHYIDÆ.

(a) SPONGODINÆ, in which the walls between the stem canals have few or no spicules.

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| 1. <i>Varingia</i> Danielssen. | 5. <i>Gersenlopsis</i> Danielssen. | 9. <i>Annothea</i> Savigny. |
| 2. <i>Fulla</i> Danielssen. | 6. <i>Drifa</i> Danielssen. | 10. <i>Nephtya</i> Savigny. |
| 3. <i>Barathrobius</i> Danielssen. | 7. <i>Duva</i> Koren & Danielssen. | 11. <i>Spongodes</i> Lesson, emend. Verrill. |
| 4. <i>Gersemia</i> Marenzeller. | 8. <i>Eunephtya</i> Verrill. | |

(b) SIPHONOGORGINÆ, in which spicules are abundant in the walls of stem canals.

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| 12. <i>Paranephtya</i> Wright & Studer. | 14. <i>Chironephtya</i> Wright & Studer. |
| 13. <i>Scleronephtya</i> Wright & Studer. | 15. <i>Siphonogorgia</i> Kolliker. |

4. GERSEMIÆ. Colony consists of an upright stem with a few simple branches bearing tufts of polyps with nonretractile tentacular regions. Only the body wall of the polyps, the tentacles, and the cortical layer of the stem are provided with spicules.
8. EUNEPHTHYÆ. Colony forms an upright stem, from which accessory branches are given off on all sides. These may again branch or give origin directly to tufts of polyps. Polyps are large, nonretractile, and covered with thorny club-shaped or branched spicules, the ends of which project beyond the surface. These occur only in the cortex of the stem, not on the walls of the canals.
11. SPONGODES. Form of colony varies greatly according to the extent of the sterile trunk. Polyps are nonretractile. Their heads, containing large spicules, are arched over by tufts of large spindle-shaped spicules projecting as spines beyond the polyps. Internal septa not furnished with spicules. Cortex of stem and branches contain large spicules.

Family VIII. HELIOPORIDÆ.

Heliopora Blainville.

Order II. PENNATULACEA,¹

Unattached polyp colonies having a stalk embedded in the mud or sand and a rachis bearing polyps. The stalk generally has an axial rod.

SECTION I. PENNATULEA.

Sea-feathers, with pinnules, rachis with a bilateral arrangement of polyps, elongated, cylindrical.

- I. PTEREIDIDÆ. Pinnules well developed, with siphonozoids on the pinnules.
- II. PENNATULIDÆ. Pinnules well developed; siphonozoids on ventral and lateral sides of rachis.
- III. VIRGULARIDÆ. Pinnules small, without a calcareous plate.
- IV. STYLATULIDÆ. Pinnules small, with calcareous plate.

SECTION II. SPICATA.

Rachis elongated, cylindrical, with a bilateral arrangement of polyps; without pinnules. Polyps sessile.

- V. FUNICULINIDÆ. Polyps on both sides of rachis in distinct rows with cells. Ventral siphonozoids absent.
- VI. STACHYPTILIDÆ. Polyps (with cells) on both sides of the rachis in distinct rows.
- VII. ANTHOPTILIDÆ. Polyps on both sides of the rachis in distinct rows, without cells.
- VIII. KOPHOBELEMNIDÆ. Polyps on both sides of rachis in a single series, or in indistinct rows, large and without cells; rachis elongated, cylindrical; ventral streak of rachis without polyps.
- IX. UMBELLULIDÆ. Polyps on both sides of the rachis in a single series, or in indistinct rows, large and without cells; rachis short.
- X. PROTOCAULIDÆ. Polyps on both sides of the rachis in a single series, or in indistinct rows, small and without cells.
- XI. PROTOPTILIDÆ. Polyps on both sides of rachis in a single series, or in indistinct rows, with cells.

¹ After Sedgwick from Kolliker.

SECTION III. RENILLEA.

Rachis expanded in the form of a leaf, with bilateral arrangement of the polyps on one side of the expansion, without pinnules. A single large siphonozoid terminates the end of the central stem.

XII. RENILLIDÆ.

SECTION IV. VERETILLEA.

Club-shaped colonies, without pinnules. Polyps arranged all around the rachis.

XIII. CAVERNULARIDÆ. Spicules long.

XIV. LITUARIDÆ. Spicules short.

Order III. GORGONACEA.

Fixed colonial Alcyonaria with a more or less firm internal axis, which is covered with a cœnenchyma from which the polyps with short body cavities arise.

SECTION I. SCLERAXONIA.

Upright, branched polyp colonies. Polyp tubes short, surrounded by a canaliferous cœnenchyma containing spicules. Stem of a cortical substance containing the polyps and a central medullary substance. The spicules of latter are generally packed, sometimes fastened together by a horny secretion, or even cemented into a strong axis by a calcareous material.

- I. BRIAREIDÆ. Cœnenchyma a polyp bearing cortex and a medullary substance of closely packed spicules. SUBFAMILIES: (1) *Briareinae*. Central mass with nutritive canals; genera 1 to 7. (2) *Spongiodermina*. Central mass without nutritive canals; genera 8 to 10.
- II. SCLEROGORGIDÆ. Distinct axis formed by a mass of closely intercalated spicules with dense horny sheaths. Axis surrounded by numerous canals. Polyps exhibit a wart-like protruding calyx, within which the tentacles may be completely retracted.
- III. MELITODIDÆ. Axis well marked, jointed, the alternate segments being of a hard calcareous and of a soft horny substance, the soft joints being formed of loose calcareous spicules in a mesh of horny substance.
- IV. CORALLIDÆ. Axis of a dense calcareous mass of spicules fused together.

SECTION II. HOLAXONIA.

Axis of horny or calcified horny substance, or of alternating joints of amorphous calcareous material and horn.

- V. DASYGORGIDÆ. Colony simple or branched; cœnenchyma thin; axis horny-calcareous; polyps large and distinct, not retractile. Both cœnenchyma and polyps contain smooth needles or spindles or scales. SUBFAMILIES: (1) *Strophogorginae*. Axis simple, spicules rod-like or lenticular; genus 1. (2) *Chrysogorginae*. Branched; polyps large, spicules flattened, irregular in form, scale-like; genera 2 to 5.
- VI. ISIDÆ. Axis of alternating horny and calcareous portions. The horny joints, nodes, composed of connective tissue, irregularly calcified in delicate threads; calcareous matter amorphous. SUBFAMILIES: *Ceratoisidinae*. Simple or branched; calcareous internodes very long; cœnenchyma thin; polyps long, imperfectly retractile; genera 1 to 6. (2) *Mopseinae*. Branched from calcareous internodes; genera 7 to 9. (3) *Isidinae*. Branched; cœnenchyma thick; polyps wholly retractile. Genus 11.
- VII. PRIMNOIDÆ. Axis calcareous and horny; basal attachment always calcareous; polyp cups projecting, club-shaped; tentacular portion retractile. SUBFAMILIES: (1) *Callozostrinae*. Genus 1. Cf. generic description. (2) *Calyptrophorinae*. Genus 2. Cf. description. (3) *Primnoinae*. Simple or branched; calyces bilateral; cœnenchyma usually contains small elongated scales; genera 3 to 11. (4) *Primnoidinae*. Genus 12. Cf. description.
- VIII. MURICIDÆ. Axis usually horny, surrounded by an outer layer of variously shaped spicules, spiny disks, and half spiny spindles, spiny needles, spiny stars, and scales; spines usually project beyond the surface of the cœnenchyma.

- IX. PLEXAURIDÆ. Colony usually branched and upright; the axis horny or horny and calcareous, especially at the base; cœnenchyma thick; polyps scattered over entire surface; cups project little or not at all, appearing in many cases as pores in the cœnenchyma; spicules large and of various form; cortical mostly club-like, spindles beneath.
- X. GERGONIDÆ. Colony upright and branched, usually in one plane; axis horny, rarely calcareous; polyps arise on stem and twigs in bilateral manner.
- XI. GORGONELLIDÆ. Cœnenchyma thin and smooth on surface; spicules warty double stars and clubs; polyps on wart-like verrucæ, usually arranged biradially; axis lamellar and calcareous; branches and twigs frequently flattened.

Family I. BRIAREIDÆ.

Eleven genera belonging to this family have been described by various authors, of which four are found in this section:

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| 1. <i>Leucoella</i> Gray. | 5. <i>Anthothela</i> Verrill. | 9. <i>Spongioderma</i> Kolliker. ¹ |
| 2. <i>Solenocaulon</i> Gray. | 6. <i>Parogorgia</i> Milne-Edwards. | 10. <i>Icilogorgia</i> Ridley. |
| 3. <i>Semperina</i> Kolliker. | 7. <i>Briareum</i> Blainville. | 11. <i>Solanderia</i> Kolliker. |
| 4. <i>Suberia</i> Studer. | 8. <i>Titanidium</i> Agassiz. | |

5. ANTHOTHELA. Coral either incrusting or irregularly branched. Branched forms with a distinct spiculose axis, composed of fusiform spicula. Callicles prominent; can not be retracted within cœnenchyma; eight-lobed at summit.
7. BRIAREUM. Axis not well defined, penetrated by nourishing canals. Colony forms irregularly lobed upright masses. Polyps without calyces, completely retractile within cœnenchyma, disposed regularly on stem.
8. TITANIDIUM. Stem less porous than in *Briareum*, spongy, and contains many characteristic spicules. Polyps scattered and not very prominent.
10. ICILGORGIA. Stem brittle, formed of spicules packed closely together. The medullary portion is surrounded by a series of longitudinal canals. Colony upright, branched, with both stem and branches compressed. Polyps arise within a groove along the sharp edge of the branches, and are completely retractile.
11. SOLANDERIA. Colony arborescent. Axis composed of a mass of closely packed unfused spicules containing no nourishing canals, but bounded by a layer of rather indefinite, nourishing canals.

Family II. SCLEROGORGIDÆ.

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| 1. <i>Suberogorgia</i> Gray. | 2. <i>Keroides</i> Wright & Studer. |
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1. SUBEROGORGIA. Colony upright, branched, with branches sometimes anastomosing. Axis formed of numerous closely intercalated spicules with dense horny sheaths. Polyps with slightly protruding calyces, disposed on either side of the flattened stems and branches. Cœnenchyma thick, with longitudinal furrows on the surface of areas free from polyps. Spicules are warty spindles, and in one species birotate.
2. KEROIDES. Colony upright, branched in one plane. Axis similar in structure to that of *Suberogorgia*, and retains its form after decalcification. The polyps form wart-like verrucæ, disposed mainly on the two sides of flattened branches, leaving a free interspace. Spicules are broad spindles and polygonal, often triangular disks.

Family III. MELITODIDÆ.

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| 1. <i>Melitodes</i> Verrill. | 4. <i>Psilacabaria</i> Ridley. | 6. <i>Clathraria</i> Gray. |
| 2. <i>Mopsella</i> Gray-Ridley. | 5. <i>Wrightella</i> Gray. | 7. <i>Parisis</i> Verrill. |
| 3. <i>Acabaria</i> Gray. | | |

No genera of this family seem to have been found in West Indian waters.

¹ Of the separateness of genera 9 and 11 there is some doubt.

Family IV. CORALLIDÆ.

1. *Corallium* Lamarck. 2. *Pleurocorallium* Gray.

The genera of this family are closely related to those of the preceding family and have not been found in West Indian waters.

Family V. DASYGORGIDÆ.

1. *Strophogorgia* Wright. 3. *Dasygorgia* Verrill. 5. *Herophila* Steenstrup.
2. *Iridogorgia* Verrill. 4. *Chrysogorgia* Duch. & Mich. 6. *Lepidogorgia* Verrill.

1. STROPHOGORGIA. Colony simple, unbranched, erect or creeping. Axis horny and calcareous, iridescent. Base calcareous. Polyps prominent, stalked or sessile, disposed in a uniserial manner on stem. Ctenenchyma sometimes very thin with few spicules, sometimes membranous with numerous spicules.
2. IRIDOGORGIA. Colony consists of a main stem arising from a calcareous base. Axis horny, iridescent. Branches arise in an ascending spiral. Polyps large, perpendicular to stem or directed obliquely toward apex of stem, placed at wide intervals. Ctenenchyma thin, containing transparent spindles or scales, which are smooth or finely warty.
3. DASYGORGIA. Colony a main axis with spirally disposed branches. Axis and base as in preceding genus. Polyps large, generally perpendicular to stems, not retractile, placed at wide intervals; seldom more than two on one node. Last polyp never terminal. Spicules in two layers. Scale-like, smooth or slightly dentate at the margins.
4. CHRYSOGORGIA. Colony and axis very similar to preceding genus. Polyps narrowed at base and covered by long, spiny spicules, those at base of polyps being placed somewhat transversely.
5. HEROPHILA. Colony branched. Axis and base as above. Polyps, club-shaped, arise near ends of short twigs, beyond which projects a short, blunt stolon. Spicules are small warty spindles.
6. LEPIDOGORGIA. Colony a simple, tall, unbranched stem. Axis iridescent. Root divided into many divergent branches. Polyps large, prominent, directed obliquely upward, second and far apart on the stem, which is covered by a thin layer of small oblong scales.

Family VI. ISIDÆ.

Of the eleven genera of this family, six are found in the north Atlantic, though not all have been reported from the West Indies.

1. *Bathygorgia* Wright. 5. *Acanella* Gray. 9. *Mopsa* Lamarck.
2. *Ceratoisis* Wright. 6. *Isidella* Gray. 10. *Acanthoisis* Wright & Studer.
3. *Lepidisis* Verrill. 7. *Sclerisis* Studer. 11. *Isis* Linnæus.
4. *Callisis* Verrill. 8. *Primnoisis* Wright & Studer.

2. CERATOISIS. Colony branched simply or not at all from calcareous internodes. Nodes horny, internodes calcareous and hollow in young specimens, becoming solid in older specimens. Base calcareous. Polyps large and prominent, with defensive calyx formed of eight large fusiform spicules starting below tentacles, scattered or arranged in a uniserial manner. Ctenenchyma thin and membranous, sometimes without spicules. Spicules fusiform or lenticular, or both.
3. LEPIDISIS. Colony simple or branched. Branches when present arise from horny nodes. Axis consists of long, solid or tubular calcareous internodes and short, horny nodes. Base with root-like projections. Polyps large. Ctenenchyma includes an outer layer of small, elongated scale-like spicules, with sometimes a few fusiform spicules beneath them.
4. CALLISIS. Colony branched from the calcareous internodes, which may be solid or very slightly hollow. Polyps short and contain spindle-shaped spicules. Ctenenchyma contains many flat scales. This genus, according to Wright & Studer, may be equivalent to *Ceratoisis*.
5. ACANELLA. Colony simple or branched. Branches when present arise in twos or threes from horny nodes. Axis as in *Lepidisis*. Polyps prominent, with numerous fusiform spicules, sometimes bent or twisted. Ctenenchyma thin. Tentacles imperfectly retractile.

7. *SCLERISIS*. Colony upright, branched from internodes. Axis made up of short, disk-shaped, horny nodes and long, finely furrowed calcareous internodes. Calyces bell-shaped. Cœnenchyma very thin, without spicules. Spicules of calyces are larger, curved, and spinose.
11. *ISIS*. Colony branched. Polyps wholly retractile within cœnenchyma. Cœnenchyma thick. Spicules radiately stellate with 6, 8, or 12 rough warts.

Family VII. PRIMNOIDÆ.

Although this family has a wide distribution, only four genera seem to have been reported from the north Atlantic along the American coasts.

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| 1. <i>Callozostron</i> Wright. | 7. <i>Thouarella</i> Gray, emend. W. & S. |
| 2. <i>Calyptrophora</i> Gray, emend. W. & S. | 8. <i>Amphiplaphis</i> Wright & Studer. |
| 3. <i>Primnoa</i> Lamouroux. | 9. <i>Plumarella</i> Gray, emend. |
| 4. <i>Stachyodes</i> Wright & Studer. | 10. <i>Primnoella</i> Gray, emend. Studer. |
| 5. <i>Calypterinus</i> Wright & Studer. | 11. <i>Caligorgia</i> Gray, emend. Studer. |
| 6. <i>Stenella</i> Gray. | 12. <i>Primnoides</i> Wright & Studer. |
3. *PRIMNOA*. Colony a single stalk or branched dichotomously or forming a bipinnate plume. Axis horny, calcified. Polyps on calciferous papillæ, club-shaped or scale-like, scattered irregularly. Spicules small, scoop-shaped in superficial layer.
6. *STENELLA*. Colony feebly or irregularly and much branched. Axis hard, horny in young specimens, often highly iridescent. Polyps large and prominent, in whorls of 2-4, opposite. Cœnenchyma thin. Spicules large, disk-shaped, often concave with turned-up edges.
9. *PLUMARELLA*. Colony upright, branched in one plane, fan-shaped. Axis brittle, calcareous. Polyps generally small, cylindrical; in alternating series, usually much separated. Cœnenchyma thin, with two layers of calcareous scales. Spicules thin, cycloid scales with central nucleus, prominences small, edge finely toothed.
11. *CALIGORGIA*. Colony ramified, mostly in one plane. Polyp calyces cylindrical or club-shaped, irregularly distributed on stem. Cœnenchyma thin, white, containing two layers of spicules. Calyx scales fan-shaped, warty, with ribs, arranged fan-like, which project as spines from upper edge.

Family VIII. MURICEIDÆ.

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| 1. <i>Acanthogorgia</i> Gray & Verrill. | 13. <i>Menacella</i> Gray & Ridley. |
| 2. <i>Hypnogorgia</i> Duch. & Mich. | 14. <i>Heterogorgia</i> Verrill. |
| 3. <i>Paramuricea</i> Kolliker & Verrill. | 15. <i>Astrogorgia</i> Verrill. |
| 4. <i>Muriceides</i> Wright & Studer. | 16. <i>Bebruce</i> de Phillipi. |
| 5. <i>Anthomuricea</i> Wright & Studer. | 17. <i>Acamptogorgia</i> Wright & Studer. |
| 6. <i>Clematissa</i> Wright & Studer. | 18. <i>Thesea</i> Duch. & Mich. |
| 7. <i>Villogorgia</i> Duch. & Mich., Ridley. | 19. <i>Aeis</i> Duch. & Mich. |
| 8. <i>Anthogorgia</i> Verrill. | 20. <i>Elasmogorgia</i> Wright & Studer. |
| 9. <i>Menella</i> Gray. | 21. <i>Muricella</i> Verrill. |
| 10. <i>Placogorgia</i> Wright & Studer. | 22. <i>Eumuricea</i> Verrill. |
| 11. <i>Echinomuricea</i> Verrill. | 23. <i>Muricea</i> auct. emend. Verrill. |
| 12. <i>Echinogorgia</i> Kolliker. | |
1. *ACANTHOGORGIA*. Colony branching. Axis horny and fibrous. Polyp calyces elongated, expanded toward mouth, disposed irregularly. Anterior portion of polyp slightly retractile. Cœnenchyma thin. Spicules spindle-shaped and form large, beautiful extensions on polyp cups.
2. *HYPNOGORGIA*. Colony upright and branched. Branches pendulous. Axis horny and fibrous. Polyp calyces attached by inner surface to the axis of growth; operculum elevated and conical. Polyps on two sides of axis opposite or alternate. Spicules are long spindles.
3. *PARAMURICEA*. Colony generally large, upright, for the most part strongly branched in one plane. Axis horny, soft, flexible, translucent, generally flattened on thinner branches. Polyps short, cylindrical or verruciform, surrounded by short projecting spicules. Polyps disposed irregularly, generally three or four at ends of thickened branches, facing in different directions, none being exactly terminal. Cœnenchyma not very thick. Spicules are spiny needles, sometimes dentate, straight, curved, or bent at an angle.

6. *CLEMATISSA*. Colony branched in one plane. Terminal branches long, their apices being thickened and knob-like. Axis horny, soft, and flexible. Calyces bluntly conical and rise upright from stem and branches. Polyyps disposed in short spirals on stem and branches. Termination of branch always formed by a polyp. Cœnenchyma thick, rough, and opaque. Spicules of cœnenchyma stout, usually thickened, with knob-like termination. Spicules of polyp spiny, club-like, thickened at one end.
7. *VILLOGORGIA*. Colony branched in one plane. Branches sometimes anastomose. Axis horny. Polyyps cylindrical, perpendicular to stem. Cœnenchyma thin. Spicules of cœnenchyma 4-8 rayed stars with a few spindles. Spicules of polyyps tripartite.
10. *PLACOGORGIA*. Colony upright, branched in one plane. Axis horny and flexible. Polyyps short, cylindrical, and flattened on oral aspect, disposed in narrow spirals. Cœnenchyma thick. Spicules of polyp broad, warty, or thorny plates. Spicules of cœnenchyma warty spindles, often bent on long axis.
18. *THESEA*. Colony upright and branched, with a horny and calcareous axis. Polyyps are slightly projecting and disposed on either side of flattened branches. Spicules are large, warty, scoop-shaped; superficial spindles with large warty knobs.
19. *ACIS*. Colony branched in one plane. Branches of same thickness throughout. Axis horny. Polyyps small and placed at long intervals on sides of branches and twigs. Cœnenchyma a single layer of large spindles. Spicules are extraordinarily large, smooth or warty spindles with scales and disks on the polyyps.
22. *EUMURICEA*. Colony branched. Polyyps tubular warts, exhibiting an 8-rayed figure when retracted. Spicules elongated, sharp-pointed spindles.
23. *MURICEA*. Colony branched. Axis horny. Polyyps cylindrical, calciferous, cup edges bilabiate or circular, disposed irregularly. Cœnenchyma thick. Spicules short, thick, spiny and warty spindles and clubs.

Family IX. PLEXAURIDÆ.

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|---|---|---------------------------------|
| 1. <i>Eunicea</i> Lamouroux. | 4. <i>Plexaurella</i> Kolliker. | 7. <i>Psammogorgia</i> Verrill. |
| 2. <i>Plexaura</i> Lamouroux. | 5. <i>Pseudoplexaura</i> Wright & Studer. | 8. <i>Eunicella</i> Verrill. |
| 3. <i>Plexauroides</i> Wright & Studer. | 6. <i>Euplexaura</i> Verrill. | 9. <i>Platygorgia</i> Studer. |
1. *EUNICEA*. Colony arborescent, trunks cylindrical, branches free, not forming broad plates. Axis horny. Polyp cup edges bilobed or crenate. Polyyps disposed over whole surface of colony on verruciform or papilliform, rather prominent tubercles. Cœnenchyma thick or moderately so. Spicules leaf-like or thorny clubs. On inside large warty spindles and smaller spindles, either of which may be red, violet, or colorless.
2. *PLEXAURA*. Colony arborescent, trunks cylindrical and free. Axis horny. Polyyps scattered over whole surface of colony, sunken entirely or nearly so into cœnenchyma. Cup edges smooth or slightly crenate. Cœnenchyma very thick and corky. Spicules are club-shaped or spinose spindles.
4. *PLEXAURELLA*. Colony arborescent. Trunks cylindrical. Axis horny and calcareous. Branches free. Polyyps as in *Plexaura*. Cœnenchyma usually very thick, thin in *P. phillipiensis* Wright & Studer. Spicules are tripartite and quadripartite and simple and leafy clubs.
5. *PSEUDOPLEXAURA*. Colony feebly branched. Axis horny, with central calcareous portion. Polyyps close together in a somewhat close spiral, completely retractile. Cœnenchyma thick; outer layer soft and friable, inner layer contains numerous light purple or violet irregularly stellate spicules. Spicules of outer layer are spiny spindles with numerous pink stars and a few leafy clubs.
6. *EUPLEXAURA*. Colony closely resembles *Plexaura*. Polyyps are larger, numerous, and completely retractile. Cœnenchyma dense and granular. Spicules for the most part short, stout, blunt, warty spindles of rather small size, with a few small double spindles and rarely small irregular crosses.
7. *PSAMMOGORGIA*. Colony upright, branched. Axis horny. Polyyps scattered over surface, level with it or projecting in form of roundish warts. Cœnenchyma moderately thick. Surface finely granular, with small rough spicules. Spicules are short, thick, spiny, and warty spindles and warty clubs.

8. *EUNICELLA*. Colony flabelliform, branched dichotomously or palmate. Axis horny. Polyps scattered, raised on verrucae or flat. Cœnenchyma thin or moderately thick. Spicules small, warty, double spindles. External layer of small clubs perpendicular to surface.
9. *PLATYGORGIA*. Colony upright, branched. Axis horny, flattened. Branches flattened in plane of ramification. Calices sunken into cœnenchyma and do not project. Spicules a cortical layer of small clubs; under these, thick warty spindles.

Family X. GORGONIDÆ.

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| 1. <i>Platycaulus</i> Wright & Studer. | 7. <i>Gorgonia</i> Linneus, emend. Verrill. |
| 2. <i>Lophogorgia</i> Milne-Edwards. | 8. <i>Eugorgia</i> Verrill. |
| 3. <i>Leptogorgia</i> Milne-Edwards, emend. Verrill. | 9. <i>Danielssenia</i> Grieg. |
| 4. <i>Stenogorgia</i> Verrill. | 10. <i>Xiphigorgia</i> Milne-Edwards. |
| 5. <i>Callistophanus</i> Wright & Studer. | 11. <i>Hymenogorgia</i> Valenciennes. |
| 6. <i>Swiftia</i> Duch. & Mich. | 12. <i>Phycogorgia</i> Valenciennes. |

3. *LEPTOGORGIA*. Colony varies much in form, generally ramified more or less in one plane. Axis horny. Branches often anastomose, forming a net-like structure. Polyps usually in two lateral rows, having between them naked cœnenchyma. Polyps sometimes form short verrucae and sometimes are completely retracted into cœnenchyma. Spicules are minute double spindles of varying length.
4. *STENOGORGIA*. Colony branched. Axis horny. Polyps project from surface, retractile, disposed in two rows or scattered. Polyps bent inward when at rest. Cœnenchyma thin. Spicules small warty spindles. On surface a few short, irregular, rough, granular spicules, not forming a complete layer.
6. *SWIFTIA*. Colony upright, branched. Axis horny, calcareous. Polyps within verrucae, at either side of branches. Spicules of cœnenchyma are scales; of polyp tentacles are spindles.
7. *GORGONIA*. Colony upright, varies much in form. Axis horny. Branches sometimes anastomose, sometimes plume-like. Polyps project more or less, disposed in two rows on either side of branches and twigs. Spicules are spindles and scaphoid forms.
10. *XIPHIGORGIA*. Colony more or less branched. Trunks cylindrical. Axis horny. Branches much compressed, forming wave-like longitudinal ridges of cœnenchyma. Polyps in rows on ridges of cœnenchyma. Spicules like those of *Gorgonia*.
11. *HYMENOGORGIA*. Colony ramified in one plane, upright, of a leaf-like appearance. Axis horny. Branches sometimes coalesce. Polyps scattered over face of expanded folia, not on edges. Cœnenchyma forms a continuous sheath over whole axis and its ramification.
12. *PHYCOGORGIA*. Axis horny, divided into a number of thin leaf-like expansions. Polyp openings sunk within cœnenchyma. Cœnenchyma overlays the thin expansions of axis.

Family XI. GORGONELLIDÆ.

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|---|-------------------------------------|
| 1. <i>Nicella</i> Gray. | 6. <i>Verucella</i> Milne-Edwards. |
| 2. <i>Scirpearia</i> Cuvier, emend. Studer. | 7. <i>Gorgonella</i> Milne-Edwards. |
| 3. <i>Scirpearella</i> Wright & Studer. | 8. <i>Ctenocella</i> Val. |
| 4. <i>Juncella</i> Val., emend. Studer. | 9. <i>Phenitia</i> Gray. |
| 5. <i>Ellisella</i> Gray, emend. Studer. | 10. <i>Hiliana</i> Gray. |

4. *JUNCCELLA*. Colony simple or branched. Polyps sometimes small and disposed in two lateral rows, sometimes with well-developed, elongated verrucae. Cœnenchyma thick. Spicules simple and double clubs in external layer.
6. *VERUCELLA*. Colony branched. Axis lamellar and calcified. Verrucae wart-like, on summits of which bases of tentacles form an eight-rayed operculum. Spicules of cœnenchyma beset with roundish and conical warts, double spindles, and simple spindles.
8. *CTENOCELLA*. Colony branched in one plane, with branches on upper side only of stem. Polyps short, disposed on two sides of twigs. Cœnenchyma has distinct median furrows. Spicules warty double clubs.

DESCRIPTIONS OF PORTO RICAN ALCYONARIA.

Telesto riisei (Verrill.) Fig. A.*(Clavularia riisei* Duch. & Mich.)

Several specimens of this species are among the collection, all preserved in alcohol. The general form of the colony is that of an erect, sparingly branched, white tubular stem, having the polyps arranged in irregular, somewhat alternating series, strongly projecting from the axial surface, and at distances from each other of from 3 to 6 mm. The color of the stem is white, that of the



FIG. A.—(1) Colony of *Telesto riisei*, nine-sixteenths natural size.
(2-6) Spicules of same, magnified.

calicles a sort of dirty brown. The stems are further marked by a series of eight longitudinal ridges, not easily distinguished except by rather careful inspection with a lens. A similar character is distinguishable upon the calyces.

From stations 6072 and 6074, at depths of $7\frac{1}{4}$ and $6\frac{1}{2}$ fathoms. Bottom shelly and with coral sand. Fig. A shows the general aspects of the colony, the creeping base, form of budding, etc., spicules closely interlaced, forming a definite tubular skeleton, which remains intact even after digestion in hot caustic potash.

Spongodes portoricensis Hargitt, nov. species. Fig. B.

The collection contained a single specimen of this genus, which, though somewhat fragmentary, is in general form and characteristics distinctively a *Spongodes*. While corresponding in many respects to several of Kukenthal's species, the character and size of the spicules seem clearly to indicate a new species. And while the fragmentary condition of the specimen renders difficult any conclusive determination of this point, I am strongly convinced of its specific distinctness, and would propose the name *portoricensis* as signaling both the place of its occurrence and the first record of a member of the genus from Atlantic waters, and specially from a West Indian habitat. Its occurrence here is particularly interesting in this last respect, as extending the range of the genus and at the same time locating it in an environment in many ways similar to that of its Pacific relatives.

Height of colony, or fragment, about 45 mm. Color (alcoholic), somewhat dirty white.

The specimen is densely spinose throughout, the spicules of relatively large size. In comparison with measurements of species of Kukenthal, Alcyonaceen von Ternate, and May, Alcyonaceen, Jenaisch, Zeitsch., March, 1899, there are very few species indeed ranging as large as the present. Polyp spicules, 0.22-0.72 mm. long; polyp stalk, 1.68-2.05 mm.; upper stem, 0.94-3 mm.; lower stem, 1.36-2.45 mm.

Taken at station 6063, from a depth of 75 to 76 fathoms by trawl. Bottom rocky, sand, and coral. The depth is greater than any of Kukenthal's species, except *rhodista*, *lava*, and *collaris*, taken at Kei Island from a depth of 140 fathoms.

Renilla reniformis (Cuvier).

(*Pennatula reniformis* Pallas, 1766. *R. americana* Lamarck, 1816. *R. reniformis*, Agass., 1850.)

The collection contained but a single specimen of this very common species. *Renilla* forms one of the highest of the Alcyonaria. It is a colonial organism, having the form of a reniform disk with a deep sinus at one side and borne upon a rather flexible peduncle, which is loosely attached to the sandy substratum upon which it grows. The polyps are arranged in a somewhat radial manner over the upper surface of the disk, but project almost horizontally from its margin, where new polyps constantly bud out.

Color of specimen (alcoholic), a dark purplish tint; polyps white.

From Mayaguez Harbor.

Solanderia nodulifera Hargitt, nov. species. Fig. C.

(*Spongioderma*?)

Of this genus two imperfect specimens were contained in the collection. The one here considered measured 125 mm. in height, somewhat arborescent, though sparingly branched. The main stem measured 5 to 6 mm. in diameter, the branches from 2.5 to 4 mm.

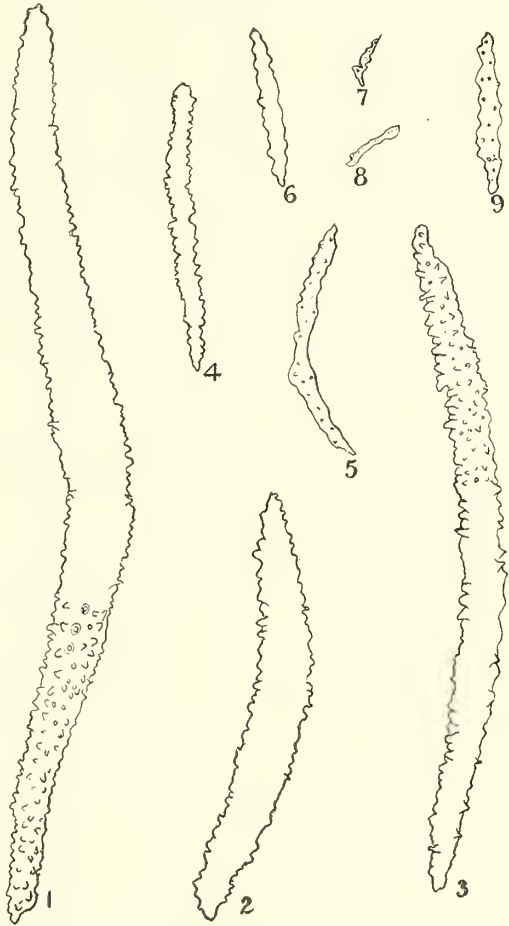


FIG. B.—Spicules of *Spongodes portoricensis*, $\times 40$.

In color (alcoholic) the surface was of a dull yellow, mottled by purplish red where the low, noduliferous calyces are located. The spongy axial portion clearly locates the specimen among the *Briaraceæ*, and while there is some doubt as to its exact genetic affinities, they seem from the relations of the nutrient canals and form of spicules most closely allied with *Solanderia*, and I have so referred it, though in specific character it does not conform to either *gracilis* of Milne-Edwards or to *verrucosa* or *fraunfeldii* of Kolliker. I incline to regard it as a new species, and propose for it the name *S. nodulifera*, on account of the nodular form of the calicles and of many of the spicules as well. So far as is known no reports of its occurrence in West Indian waters have hitherto been made.

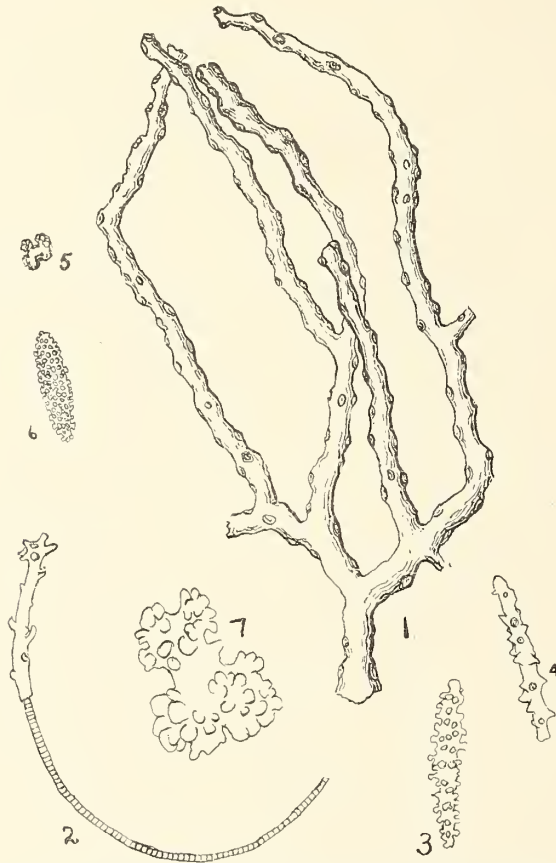


FIG. C.—(1) Colony of *Solanderia nodulifera*, natural size. (2) Colony of *S. crustata*, natural size. (3) to (5) Spicules of *S. nodulifera*, $\times 60$. (6) Yellow spindle. (7) Small red spicules of *S. crustata*, $\times 360$.

Spicules of two types. An attenuate, warty, red variety making up most of the axis, and a yellow attenuate spindle form comprising most of the rind portion. Spicules yellow, 0.26 mm.; red tuberculate, 0.36 mm.; red spiny, 0.37 mm.; small short, 0.06 by 0.048 mm.

From station 6079, off St. Thomas; 20 to 23 fathoms; coral bottom; taken with tangle.

***Solanderia crustata* Hargitt, nov. sp. Fig. D.**

The second specimen is of a somewhat unique character, best illustrated in Fig. C, showing the general aspect of the colony and a cross section of the same. The specimen seems to be an incrusting species, somewhat similar in form to Studer's genus *Suberia*, though of a character more like that of *Anthothela* Verrill. When first examined the general aspects and hollow axis gave the impression of

a *Kophobelemnion*, but a critical examination showed the spicular and structural character of a *Solanderia*, to which, with some hesitation, it is here referred. It has seemed that the horny, tubular support is but the secretion of the colony about a foreign stem, which had either disintegrated and fallen away or from which the dredge had withdrawn it in the capture. In size and form the spicules indicate its close genetic relations with *Solanderia*, and in the color, texture, etc., the colony is very much like the previous species. With these probabilities in view the specific name *crustata* is here proposed as indicative of the habit, if such should prove characteristic of the species.

Station 6064, Mayaguez Harbor; depth, 22 to 33 fathoms; sand and mud; taken by dredge.

Spicules tuberculate, 0.18 mm.; spiny spindle, 0.23 mm.

Chrysogorgia desbonni Duchassaing & Michelotti. Plate 1, figs 1 to 5.

This beautiful colony is flabellate, usually branching in single plane. In the specimen under consideration there is a division near the base into two branches of about equal size. These subdivide and branch in a perfectly similar way, forming two parallel fan-shaped forms. In size the specimen measured 100 mm. in height by about 110 mm. in breadth, base not present. The axis is horny and somewhat calcareous, black and very hard. Cœnenchyma thin and white (alcoholic) and contains oblong and fusiform warty spicules. Cf. fig. Calicles rather large, somewhat scattered, and standing almost at right angles to the axis. Spicules, large, thorny spindle, 0.53 mm.; irregularly warty, 0.27 mm.; thorny, 0.20 to 0.24 mm.

A single specimen taken by trawl from station 6070; depth, 220 to 225 fathoms; rocky bottom; January 21, 1899.

Primnoa pourtalesii Verrill. Fig. D.

Only a small fragment of a single specimen of this species is contained in the collection, but sufficient to clearly establish its identity. Specimen about 50 mm. in height, with alternating branches in same plane about 3 to 5 mm. apart. Only the slightest indications of the zigzag aspect of the main stem mentioned by Verrill, though larger specimens would probably show this more clearly. Both stem and branches bear calicles on opposite edges in close rows, slightly alternating or almost opposite. They are beautifully covered with series of imbricating scales, the terminal ones, eight in number, forming a sort of operculum, being triangular in shape. The color is white (alcoholic), axis light amber, or straw color. Spicules in Fig. D.

Acanthogorgia aspera Pourtalès. Plate 1, figs. 6-12.

In height the colony is about 300 mm., sparingly and unequally branched in a somewhat flattened plane. Axis dark and horny. Cœnenchyma thin, filled with elongate, fusiform spicules which project from the surface, giving it a very rough appearance. Calyces elongate, about 2 mm. by 1.2 mm. thick, somewhat constricted near summit, which is enlarged and furnished with sharp, slender, divergent spicules. See plate 1, figs. 6-12. Spicules, oral, 0.717 to 1.04 mm.; stem, 0.647 to 0.68 mm.; quadripartite, 0.21 by 0.24 mm. to 0.20 by 0.34 mm.

A single specimen from station 6070, at a depth of 220 to 225 fathoms, from rocky bottom; taken by trawl, January 21, 1899.

Paramuricea hirta? Pourtalès. Fig. E.

In height the specimen is about 80 mm. by about 55 mm. broad, grayish white (alcoholic), much branched, flabellate in form, the smaller branches at various angles, surface rather rough, granular. Calicles rather prominent, 1 to 1.5 mm. in length by 0.75 mm. in diameter. Cœnenchyma

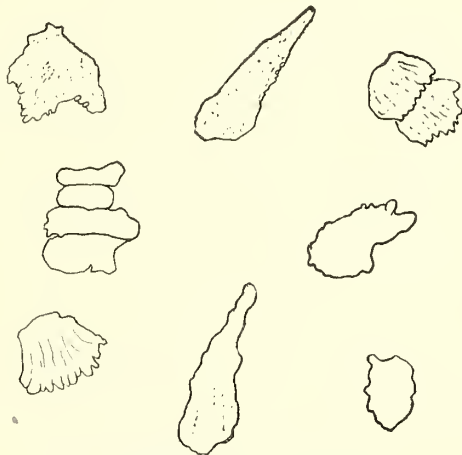


FIG. D.—Spicules of *Primnoa pourtalesii*, $\times 40$.

thin, filled with various-shaped warty and spinulose spindle-shaped spicules, often curved. Axis dark, horny, cylindrical.

Not having access to the original description of this species there is some doubt as to its exact identification, though it would seem to be more nearly allied to this than to other described species. In case it should become necessary to give it specific separation I would propose the name *spinulifera*.

A single specimen, not perfect, from station 6067; depth, 97 to 120 fathoms; coral bottom; dredge. January 20, 1899.

Muricella megaspina Hargitt, nov. sp.

A small fragment of a single specimen in the collection has characters much resembling those of the genus *Muricella*, namely, the general form of the colony, thin conenchyma, small verruce, large spiny and warty spindles, the larger measuring from 2 to 3 mm. in length. It would also seem to have

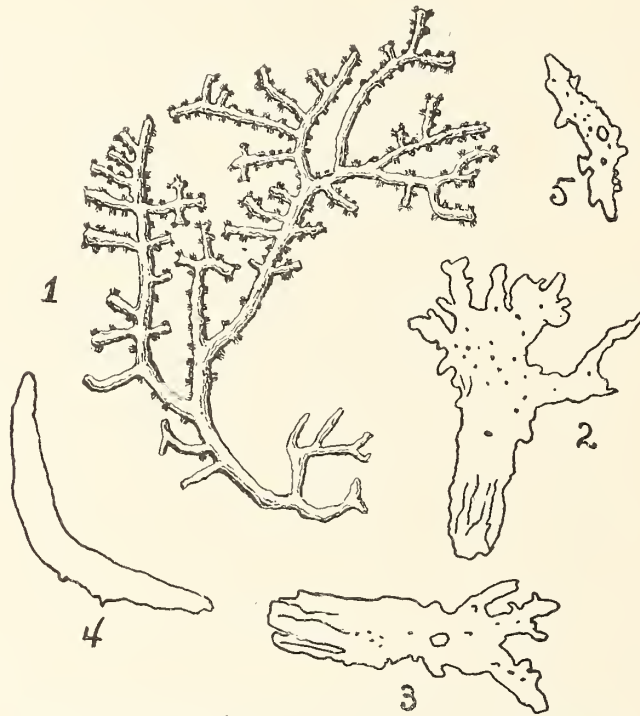


FIG. E.—(1) Colony of *Paramuricea hirta*, nat. size. (2-5) Spicules of same, $\times 75$. (2, 3) Leafy clubs from stem. (4) Spindle from callicte.

affinities more or less close with *Acis*, chiefly, however, in the size and disposition of the spicules. In the numerous calyces, and their oblique aspect upon the stem and branches, it seems, however, quite unlike the typical *Acis*. The verruce arise from the axis of stem and branches, not at right angles, as seems to be the more common form for this genus, and are covered with a series of much smaller spiny and somewhat warty spindles which cover the apex of the calicles, forming a hoodlike covering. In height the fragment is about 70 mm. The axis is horny, light brown to almost white in the terminal branches, very flexible. Conenchyma very thin, almost wholly comprised of a layer of large spindle-shaped spicules arranged horizontally longitudinally over the axis. Color of specimen (alcoholic) white, spicules all colorless. It would seem to be specifically distinct, the very large size of its spicules alone being sufficient to justify specific separation. I would therefore propose for it the name *megaspina*.

Muricea flexuosa Verrill. Fig. F.*(Lissogorgia flexuosa* Verrill.)

A single specimen preserved in alcohol. Colony branched, flabelliform, branches somewhat pinnate, slender. Axis horny, dark brown, flexible. Cœnenchyma thin, packed with large spindle-shaped spicules. Calicles verruciform, rather uniformly distributed over surface. Height of colony about 90 mm. by about 40 mm. broad. Color dull grayish white. Spicules large, 0.59 by 0.21 mm., 0.58 by 0.17 mm.; violet, 0.28 by 0.07 mm.

Taken at station 6077, off Gallardo Bank, by tangle; depth, 11½ fathoms; coral sand bottom.

Eunicea rousseaui Milne-Edwards.

Plate III, fig. 1.

A single specimen, incomplete. Colony somewhat arborescent, the branches tending to occupy a common plane. Entire colony heavy; the branches thick and somewhat club-shaped. Specimen about 200 mm. in height. Diameter of branches, 10 to 16 mm. Axis horny and rather massive, of a dark-brown color, almost black, and somewhat flattened in plane of colony. Calicles very prominent, the outer lip projecting into a horn-like hook, upper lip almost lacking. Cœnenchyma thick and densely packed with massive tubercular spicules, varying from 0.5 to 2.5 mm. in length by 0.2 to 0.6 mm. in diameter. Besides the larger ones of the cœnenchyma there are smaller, club-shaped ones lying just beneath the ectoderm and others of a pale purplish color about the axis.

Plate III, fig. 1, will afford a good general idea of the colony as a whole.

Eunicea crassa Edwards & Haine. Plate II.*(Eunicea turgida* Ehr.; *Plexaura turgida* Verrill.)

Several specimens of this species were in the collection, all dry. The colony is large, somewhat dichotomously branched, the branches long, of fairly uniform diameter throughout, and tending to occupy a common plane. Height of colony from 300 to 500 mm. by about half as broad. Diameter of branches, 8 to 15 mm. Cœnenchyma thick, suberous, hard. Calices rather evenly distributed over entire surface, forming rather prominent oval cups with slightly raised border. Polyps retractile, the tentacles showing plainly within the calices. Spicules of some three distinct types: (1) Large, heavy, tuberculate spindles 1.34 to 1.8 mm. long; (2) smaller spinose spindles 1 mm. long; (3) very small purplish, and white, tubercular spindles, 0.1 to 0.13 mm. long.

This species would seem to be identical with Verrill's *Plexaura turgida*, but in its general aspects and the character of its spicules it seems distinctively Eunicean, and I have so designated it.

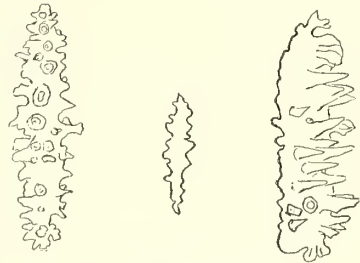
Plate II, figs. 1-9, will afford a good general impression of the character of colony and spicules.

Eunicea lugubris Duch. & Mich. Plate II.

A single specimen from Mayaguez Harbor. The colony is arborescent, arising from a single massive base and short, thick stem; but the latter soon becomes lost in its numerous branches, which form a dense cluster resembling somewhat a madrepore coral. Entire colony about 400 mm. in height; color dark brown or nearly black. Diameter of stem at base 22 mm.; branches 5 to 8 mm., including the elongated calicles. Axis black, horny, very hard and tough. Cœnenchyma thick, suberous, and somewhat friable. Plate II, fig. 10, gives a general impression of the appearance of the colony.

Eunicea laxispina Milne-Edwards. Fig. G.*(Gorgonia laxispica* Lamk.; *Eunicea mammosa* Lamx.; *Gorgonia papillosa* Dana.)

A single specimen, somewhat imperfect. Colony sparingly branched, rising from a calcareous base. Height of colony about 150 mm. Calicles very prominent and scattered rather sparsely over the surface, the larger having a length of about 4 mm. by 2 mm. in diameter. Diameter of main stem:

FIG. F.—Spicules of *Muricea flexuosa*, × 55.

from 3 to 4 mm. Color in alcohol, pale brown or yellowish. Cœnenchyma moderately thick, rather suberous in texture. Axis horny, dark brown in color, lighter in terminal portion. Spicules of two rather distinct kinds: (1) Large, white tuberculate spindles, 1 to 2.15 mm. in length; (2) small, spinose, and tuberculate spindles, of violet color, from 0.09 to 0.20 mm. in length.

Fig. G shows the general characteristics of the colony.

Taken with tangle, at station 6090; coral bottom, depth of 16 fathoms.

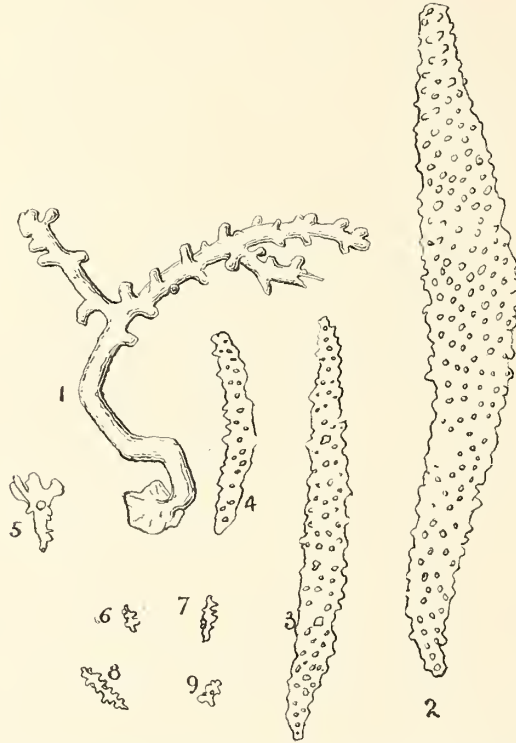


FIG. G.—Colony of *Eunicea taxispina*, $\frac{2}{3}$ natural size. Figs. 2-5 White spindles of outer layer. Fig. 2, Spindles 2.14×0.209 mm. Fig. 3, 1.35×0.145 mm. Fig. 4, 0.654×0.10 mm. Fig. 5, Club, 0.20×0.04 mm. Figs. 6, 7, 8, 9, Violet spicules of inner layer, 0.009 to 0.02 mm. long.

Plexaura flexuosa Lamouroux. Plate IV.

(*Eunicea furcata* Ehr., 1834; *Gorgonia anguiculata* Dana, 1846; *Plexaura rhipidalis* Val., 1855; *P. salicornoides* Milne-Edw., 1857.)

Two specimens of this species in the collection are quite typical, both as to size and form, and also as to the variation so characteristic of the species. From examination of a considerable collection in the National Museum, I am able to verify Verrill's note on this point (cf. Bull. Mus. Comp. Zool., vol. I, p. 35): "This species varies greatly in form, color," etc.

Colony shrubby or arborescent, branching and sub-branching rather freely, and with a tendency to occupy a common plane. Height 250 to 300 mm. Stems cylindrical, from 5 to 8 mm. in diameter. Axis horny, black, very hard, cylindrical. Cœnenchyma rather thick and densely packed with spindle-shaped spicules of some three types: (1) Large, white, tubercular; (2) small, purplish, spinose forms surrounding the axis; (3) very minute, somewhat clavate, spicules close beneath the ectoderm.

Color of dry specimens vary from dull chocolate brown to purplish.

Figs. 13 to 16, plate IV, give a good general idea of the form of the colony, as well as of typical spicules.

Plexaura homomalla Lamouroux. Fig. H.*(Gorgonia homomalla Esper.)*

Several specimens of this species were contained in the collection, all of the same general size and character. Color of dry specimens mostly black or very dark brown. Like the preceding species, the colonies branch profusely, with slight tendency to occupy a common plane. The branches arise obliquely from the base, but soon become vertical, the whole colony having a height of from 250 to 350 mm., with an almost equal breadth. The axis and cœnenchyma are quite similar in character to the former species, though the size of stem and branches average somewhat smaller. The calicles present some differences. In *P. flexuosa* they are wholly included, and leave pit-like depressions, which thickly cover the entire surface. In *P. homomalla*, while the calicles are also included and very numerous and evenly distributed, they do not present the pit-like depressions of the former, but often have a definite raised border or edge.

Fig. H shows characteristics of colony and of spicules.

Plexaura crassa (Verrill.)*(Gorgonia crassa Ellis & Solander; Gorgonia porosa, Esper; Plexaura porosa E. & H.)*

Colony arborescent, about 300 to 400 mm. in height. Branches not numerous, but somewhat extended in common plane. The specimens are dull yellow to light chocolate brown, dry. Axis horny, black, hard. Cœnenchyma moderately thick, very friable, the surface thickly and rather uniformly covered with the pore-like calicles, which are oval in outline, and, as in *P. flexuosa*, are definitely depressed below the surface. Of the exact specific relations of the specimens there is some little doubt.

Plate IV, figs. 1 to 12, show general features of colony and also of the spicules.

Plexaurella dichotoma Dana.*(Gorgonia dichotoma Esp.; G. multicauda Lamk.; G. heteropora Lamour.; Plexaura heteropora, Lamour.; G. crassa Dana, Eunicea multicauda E. & H.)*

An incomplete colony only was contained in the collection. Stem from 12 to 20 mm. in diameter, branches smooth, somewhat club-shaped. Color of dry specimen light brown or clay color.

Of this very common and well-known species it is not deemed necessary to give figures of either colony or spicules.

Leptogorgia solitaria Hargitt, nov. sp. ? Fig. K.

In the collection were several specimens which in general aspects quite closely resembled the descriptions and figures of *Niphogorgia setacea* E. & H. They were, however, very much shorter, and wholly devoid of the purplish border given for that species. The specimens were rather slender and ribbon-like in shape, with polyps arranged in a row along each margin of the stem and quite close together. In color (alcoholic), they were white, with a brown, horny axis, the whole somewhat flattened, as shown in Fig. K, 2.

The colony measured from 100 to 170 mm. by about 3 to 3.5 mm., and is wholly devoid of branches. It would seem to arise from a somewhat fleshy creeping disk, but while several portions of the base, or what appeared such, were contained with the specimens in the bottle, having young polyps growing upon them, there was not a single one with a definite stem attached, the latter apparently having been detached in the process of dredging. The spicules, which are typical Leptogorgian, vary in form and size; one an attenuate, highly tuberculate spindle 0.12 to 0.16 mm. long by 0.03 to 0.05 mm. thick, the other scaphoid in shape and 0.11 to 0.13 mm. long by 0.04 to 0.06 mm. thick.

In some respects the specimen here described resembles Pourtales's description of *Acis solitaria*, Bull. Comp. Zool., vol. 1, p. 132; but the spicules are neither large nor scale-like. Not having access

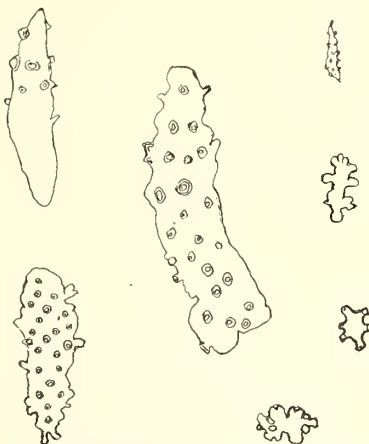


FIG. H.—Spicules of *Plexaura homomalla* magnified.

to Pourtales's specimens or figures, I am unable to infer whether he might have confused the spicules of some other form; the relative size, form, color, etc., being so closely similar to those under consideration as to suggest the possibility of such confusion. In case such were true, then his *Acis* should become *Leptogorgia*; if otherwise, I should propose that the present specimens be christened *L. solitaria*.

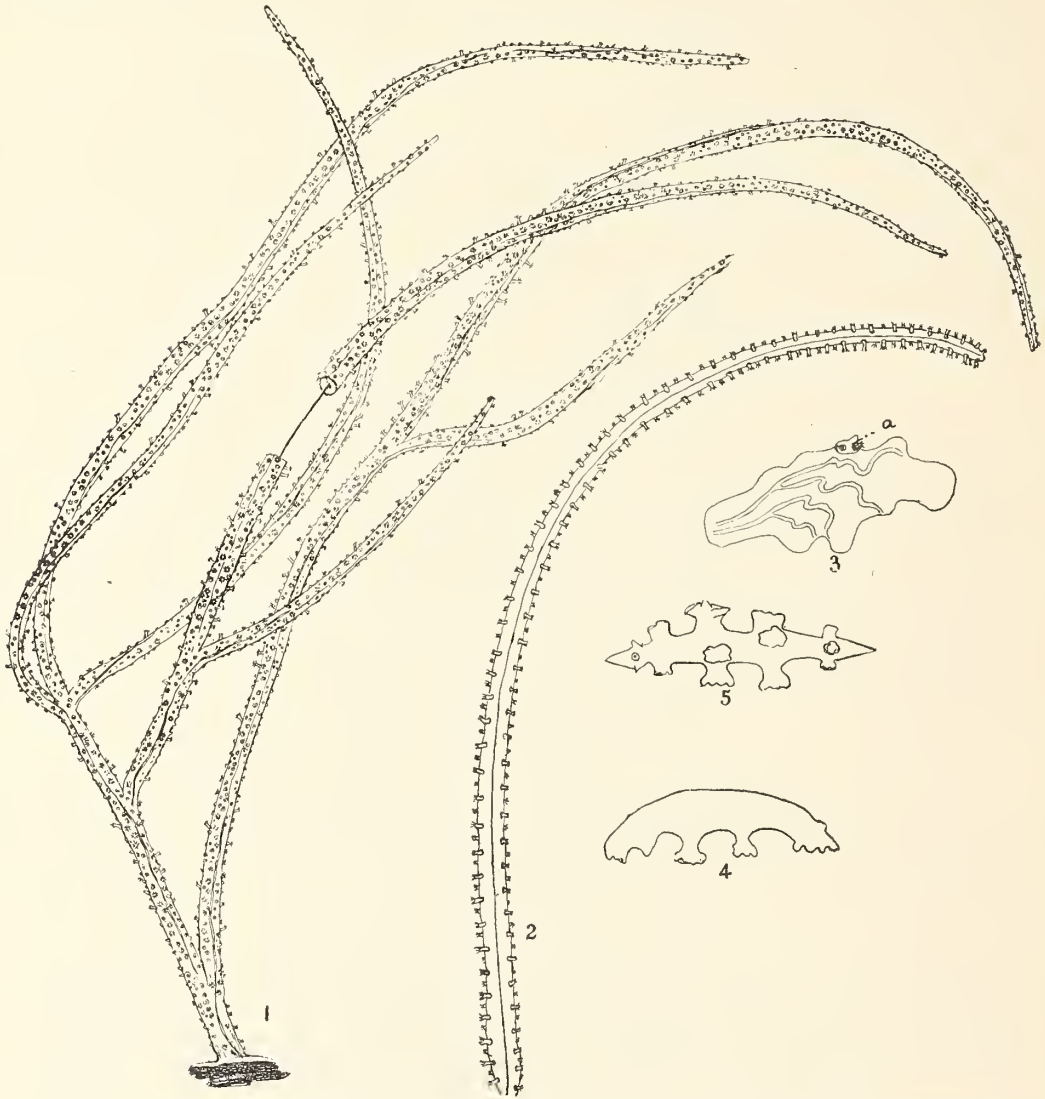


FIG. K.—(1) A colony of *Leptogorgia virgulata*, one-third natural size. (2) A colony of *L. solitaria*. (3) Portion of base, with single polyps at *a*. (4 and 5) Spicules of *L. solitaria*, greatly magnified.

Leptogorgia, sp. ?

Only a very small fragment of a single specimen, evidently of this genus, was contained in the collection, too small to warrant any definite determination of its specific affinities, though its spicules in general form and size would seem to identify it with *L. floridana* or *L. hebes*. Color, brick red. Taken at station 6062, Mayaguez Harbor, January 20, 1899, by means of dredge, from a depth of 25 to 30 fathoms. Bottom sand, mud, and shells.

Leptogorgia virgulata E. & H. (Fig. K, 1.)

Among a collection of Alcyonaria obtained by Mr. George M. Gray were specimens of this genus, probably identical with *L. virgulata* E. & H. The specimens are from Jamaica, but no data as to depth, bottom, or time were available. Its occurrence is therefore merely mentioned as a matter of incidental interest. Fig. K, 1, shows the general aspects of the colony.

Gorgonia acerosa Pallas. Plate III, fig. 2.

(*Pterogorgia acerosa* Ehr.)

Of this species the collection contained several fine specimens, all preserved dry. They varied in size from 35 to 80 cm. in height. The colonies are completely branched and paniced, the branches regularly pinnate, rather long, slender, and flexible. The colonies are light yellowish straw colored. This is one of the finest of the Gorgonias, and is well represented in Plate III, fig. 2. These, with other species of *Gorgonia*, *Pleraura*, and *Eumicca*, were taken from comparatively shallow waters in the bay of Mayaguez, though no specific data are furnished with the dry specimens.

Gorgonia flabellum Linn. Plate III, fig. 3.

(*Rhipidogorgia flabellum* Valenciennes.)

Several fine specimens of this species were taken in the same locality as the last, varying in height from 30 to 60 cm. and in width from 20 to 40 cm. The form is typical flabellate, the branches reticulate and coalescent in the most intricate way, with open meshes of fairly similar size and form. Occasionally accessory branches or colonies arise from the otherwise plane surfaces and grow into structures quite similar to the mother colony, which is distinctively fan-shaped, whence the popular term "sea fans," by which they are commonly known. Color in general yellowish brown, varying in places to purple.

Gorgonia bipinnata Verrill.

(*Pterogorgia bipinnata* Verrill.)

In height the specimens measured 110 and 350 mm., respectively, by about 60 to 150 mm. in width. They are of characteristic flabelliform shape, branches twice pinnate and somewhat coalescent. Color white (alcoholic), with black, horny axis showing through the rather thin coenenchyma. Spicules. Roughly tuberculate spindles. Plate III, fig. 4, affords a good general impression of the colony as a whole.

Taken at stations 6079 and 6088, by the tangle from depths of 20 to 23 fathoms, February 6, 1899.

Antipathes tristis Duchassaing.

A single specimen of this species was taken at station 6070, at a depth of 220 to 225 fathoms, from rocky bottom, by means of the trawl. While not now generally recognized as a true Alcyonarian, it may be briefly described in this connection. The specimen is about 15 cm. in height. Polyps closely contracted upon rather slender branches, having a somewhat spiral arrangement upon the stem. The spines are sharp, triangular, quite as figured by Pourtales (Bull. Mus. Comp. Zool., vol. VI, No. 4).

SYRACUSE UNIVERSITY, *September 1, 1900.*

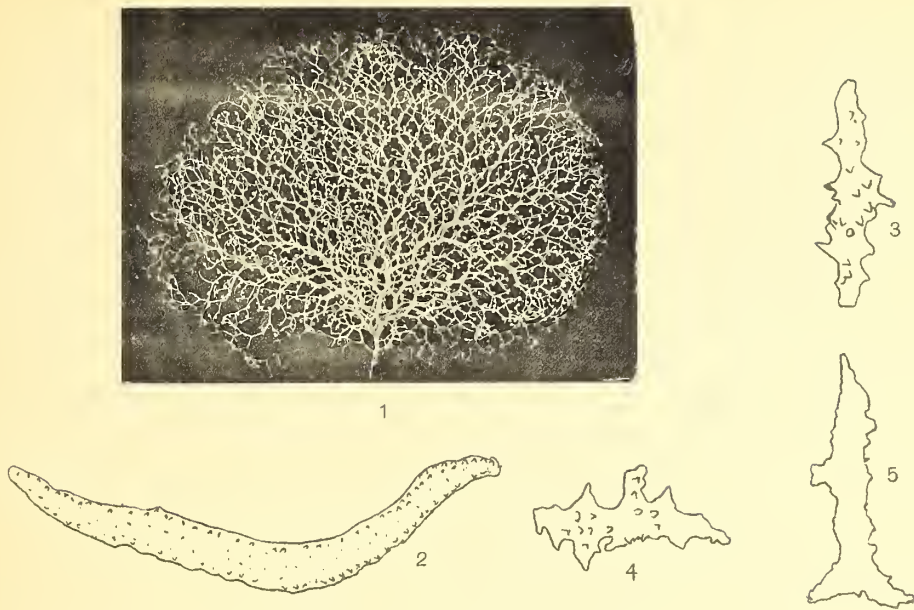


FIG. 1, COLONY OF CHRYSOGORGIA DESBONNI. FIGS. 2 TO 5, SPICULES OF SAME X ABOUT 120.



FIG. 6, COLONY OF ACANTHOGORGIA ASPERA. FIGS. 7, 8, ORAL SPINES OF SAME, 0.717 TO 1.04 MM IN LENGTH. FIGS. 9 TO 12, STEM SPICULES, 0.68 MM; 0.64 MM; 0.21 X 0.24 MM; 0.34 X 0.20 MM, RESPECTIVELY.



FIG. 1, COLONY OF EUNICEA CRASSA. FIG. 2 TO 9, SPICULES OF SAME. FIG. 2, 1.34 X 0.20 MM; FIG. 3, 1.80 X 0.39 MM; FIG. 4, 1.0 X 0.125 MM; FIGS. 5 TO 6, PALE VIOLET SPINDLES OF INNER LAYER, 0.31 TO 0.43 MM. LONG; FIGS. 7, 8, 9, VIOLET SPINDLES, 0.16 TO 0.22 MM. IN LENGTH.



FIG. 10, COLONY OF EUNICEA LUGUBRIS. FIGS. 11, 12, TUBERCULATE SPINDLES OF OUTER LAYER, X 75. FIG. 13, CLUB FROM OUTER LAYER, 0.35 X 0.15 MM; FIGS. 14, 15, RED SPICULES FROM INNER LAYER, 0.31 AND 0.16 MM. LONG.



1. COLONY OF EUNICEA ROUSSEAUII.



2. COLONY OF GORGONIA ACEROSA.



3. COLONY OF GORGONIA FLABELLUM.



4. COLONY OF GORGONIA BIPINNATA.



FIG. 1, COLONY OF PLEXAURA CRASSA. FIGS. 2 TO 12, SPICULES OF SAME. FIG. 2, WHITE, 0.36 X 0.17 MM; FIG. 3, 0.34 X 0.219 MM; FIG. 4, 0.469 X 0.149 MM; FIG. 5, 0.45 X 0.25 MM; FIG. 6, 0.34 X 0.24 MM; FIG. 7, 0.265 X 0.117 MM; FIG. 8, 0.14 X 0.117 MM; FIG. 9, RED, 0.13 X 0.09 MM; FIG. 10, RED, 0.125 X 0.09 MM; FIG. 11, WHITE, 0.72 X 0.1 MM; FIG. 12, RED, 0.33 X 0.19 MM;

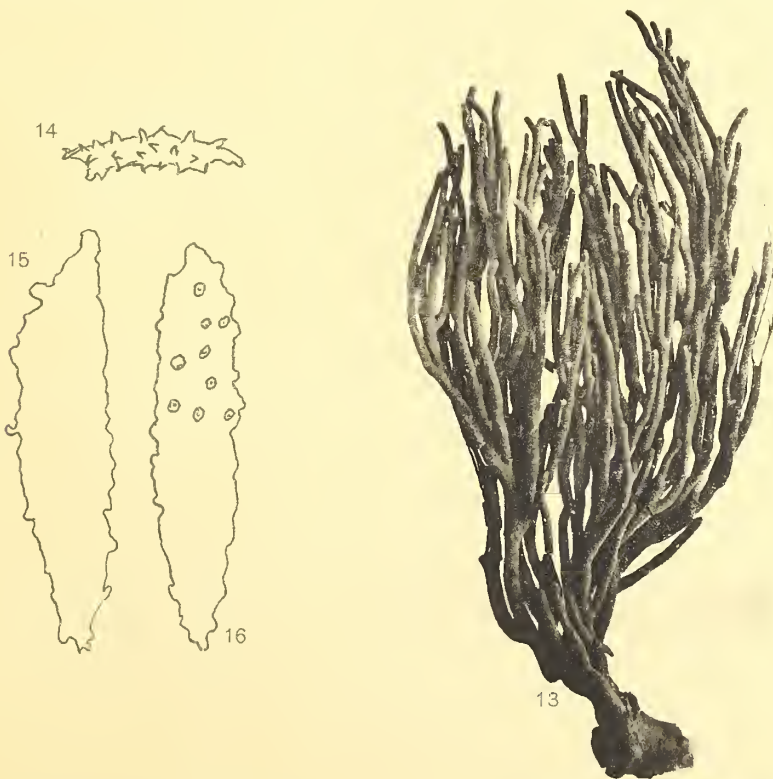


FIG. 13, COLONY OF PLEXAURA FLEXUOSA. FIG. 14, RED THORNY SPINDLE, 0.36 X 0.093 MM; FIG. 15, RED WARTY SPINDLE, 0.86 X 0.20 MM; FIG. 16, WHITE WARTY SPINDLE, 0.83 X 0.19 MM.