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VOLUME IV

Scientific Results of Cruises of the Yachts "Eagle" and "Ara", 1921-1928, William K. Vanderbilt, Commanding.

COELENTERATA, ECHINODERMATA AND MOLLUSCA.

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COELENTERATA, ECHINODERMATA AND MOLLUSCA, CRUISES OF THE "EAGLE" AND "ARA," 1921–1928, WILLIAM K. VANDERBILT, COMMANDING.

By Lee Boone.

Introduction.

The present Bulletin of the Vanderbilt Marine Museum, fourth in the scientific series, contains three separate reports, on the Coelenterate, Echinoderm and Mollusk collections obtained by Mr. William K. Vanderbilt, on a series of cruises conducted in his yachts, *"Eagle"* and *"Ara,"* during parts of the years 1921 to 1928, inclusive.

Four distinctly separate faunal regions are involved in these explorations: (*a*) The West Indian region, from which the greater percentage of species was obtained. Separate cruises during the years 1921, 1922, 1923, 1924 and 1925 were conducted by Mr. Vanderbilt in this region. Additional material was obtained in the West Indies in 1926 and also in 1928, supplementing the Galapagan expeditions of these years.

(*b*) The Labrador-New England region is represented by material collected in the waters of Newfoundland, Nova Scotia, eastern Canada, the coast of Maine and of New York, including Long Island Sound, in 1921, 1922, 1924 and 1926.

(*c*) The tropical American Pacific fauna is represented by explorations in the Galapagos Islands, Cocos Island, the west coast of Costa Rica and of Panama, including the Pearl Islands, also several deep-sea stations in this region, during the expeditions of 1926 and 1928.

(*d*) The Mediterranean fauna, with especial reference to the north coasts of Morocco, deep-sea dredgings off the coasts of southern France, off Sardinia and off Monaco, and explorations of the littoral fauna of the Adriatic Sea.

The bathymetric occurrence of the species taken in each of these major regions ranges from littoral to true deep-sea forms, the deep-sea stations ranging in depth from 100 fathoms to 900 fathoms.

The annotated discussion of the collections is presented with reference to their systematic classification. A list of the species found in each major faunal region is given also.

The principal value of these collections lies in the surprising percentage of rare species they possess and in the related extension of our knowledge of the geographic and bathymetric distribution of these forms, and of their anatomy, as presented in the systematic discussion. Much hitherto unpublished data on the colors of the various species were made in field sketches by Mr. Vanderbilt, during all of the cruises, except those to the Galapagos Islands, on which, his staff artist, Mr. W. E. Belanske, continued this work under Mr. Vanderbilt's direction. A few of these color plates have been published in Mr. Vanderbilt's "To the Galapagos on the *'Ara'* "; a great many more are in the study collections of the Vanderbilt Marine Museum. This volume also contains complete maps of the cruises of 1926 and 1928.

ACKNOWLEDGEMENTS.

As during the preparation of the preceding Volumes II and III, Mr. Vanderbilt has generously placed unexcelled facilities at my disposal during the preparation of the present reports. His splendid generosity and unfailing patience and helpful criticisms have been most valuable.

I am also indebted to Miss Ida Richardson Hood, curator of the Library of the American Museum of Natural History, and her assistants, the Misses Hazel Gay, and Ida Sledge, for many courtesies. The line drawings of the Echinoderms and many of the Cephalopoda were made by Mrs. Helen Ziska; those of the remainder of the Cephalopoda and Tectibranchiata, also all of the Coelenterata, were done by Mrs. Else Bostelmann, all under my supervision. The photographic illustrations were made by Mr. Julius Kirschner of the photographic laboratory of the American Museum, except that of *Stylaster roseus* (Pallas), which was kindly supplied by Mr. W. E. Belanske.

GEOGRAPHICAL DISTRIBUTION OF SPECIES OF COELENTERATA.

WEST INDIAN FAUNA.

Millepora alcicornis Linné.

Several specimens in various stages of development, from the south coast of Cuba, February 19, 1923.

Stylaster roseus (Pallas).

Several fine colonies dredged in 150 fms., seven miles off Alligator Reef, Florida, March 30, 1926.

Olindias tenuis (Fewkes).

One specimen, Turtle Harbor, Florida, November 28, 1923.

Physalia physalis (Linné) Schneider.

Two, pelagic, taken at Sombrero Light, Florida, March 4, 1923.

Tamoya haplonema F. Muller.

One young specimen, Bahamas, field tag 128. One young specimen, Matanzas, Cuba, February 28, 1928. Nine specimens, all young, taken with marine light at night, Hawk's Nest, Cat Island, Bahamas, January 15, 1928.

Cassiopea xamachana H. B. Bigelow.

One unusually large specimen, taken in six fms., Dry Tortugas, Florida, November 26, 1923, field tag 315.

Cassiopea frondosa (Pallas).

One specimen taken on the south coast of Cuba, February 19, 1923, field tag 97, lot E.

Stomolophus meleagris L. Agassiz.

Eleven, collected off Miami Beach, Florida.

Corallium vanderbilti, new species, one four-branched colony, taken in over 100 fms., Casilda, south coast of Cuba, February 15, 1924.

Plexaura fusca Duchassaing and Michelotti.

One large colony, south coast of Cuba, February 19, 1923.

Rhipidogorgia flabellum (Linné).

Several fine specimens, from Nassau, Bahamas. Several from Port Tanamo, Cuba, 1923.

Pterogorgia acerosa forma typica Biel.

Two very fine colonies from Nassau, Bahamas, 1924.

Stenogorgia casta Verrill.

One very fine colony of this rare species, dredged in 150 fms., seven miles off of Alligator Reef, Florida.

Zoanthus pulchellus (Duchassaing and Michelotti).

Four colonies, Limon Bay, Panama, January 21, 1928.

LABRADOR-NEW ENGLAND FAUNA.

Zygodactyla groenlandica (Peron and Lesueur).

One very large specimen, Eastport, Maine, collected by the *"Eagle."*

Metridium dianthus (Ellis).

One large specimen, Bay of Islands, Newfoundland, September 3, 1926. Another, York Harbor, Newfoundland, September 12, 1923.

Actinauge rugosa Verrill.

Twelve specimens, dredged in 180 fms., Bay of Islands, Newfoundland, September 3, 1926. Four larger specimens taken from the same locality, attached to stones and various species of mollusks, September 3, 1926.

Bolocera longicornis Carlgren.

Five specimens, dredged in 200 fms., 9 miles S. W. by W. of Port Basque, Newfoundland, September 1, 1926.

Stomphia carneola (Stimpson).

One, taken by the *"Eagle"* at Eastport, Maine.

TROPICAL AMERICAN PACIFIC FAUNA.

Stomotica divisa Maas.

One specimen, dredged in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926.

Nectrodroma reticulata Bigelow.

One unusually fine colony and two not quite perfect nectophores of this rare animal were taken in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926.

Abylopsis eschscholtzii (Huxley).

Several bracts, dredged in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926.

Periphylla hyacinthina (Steenstrup).

One taken in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926.

Ptilosarcus gurneyi Gray.

One very fine specimen, Wafer Bay, Cocos Island, Pacific Ocean, in shallow water, March, 1926.

Pavonaria californica Moroff.

Eleven colonies, dredged in 100 fms., Punta Arenas, Costa Rica, February, 1928.

Beroe forskalii H. Milne Edwards.

Four taken in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926. One, Jicaron Island, Panama, January, 1928. One specimen, taken at 1090 fms., Pacific Ocean, Lat. 1° 14′ N.; Long. 90° W., January 30, 1928.

MEDITERRANEAN FAUNA.

Solmissus albescens Gegenbaur.

One specimen, taken 10 miles S. by E. of Monaco Harbor, April 19, 1923.

Abylopsis tetragona (Otto).

Free Eudoxid stage taken in 400 fms., off St. Raphael, bearing S. S. E. distance 9 miles S. of France, Mediterranean Sea, March 23, 1927.

Velella velella (Linné).

Two, pelagic, 10 miles S. by E. of Monaco Harbor, April 19, 1927.

Cotylorhiza tuberculata (Macri).

One very fine specimen, Monaco, Mediterranean Sea, April 19, 1927.

Alcyonium palmatum Pallas.

Two, dredged in 35 fms., 5 miles N. E. by N. of Cape Carthage, Gulf of Tunis, Mediterranean Sea, July 21, 1927. One small specimen from 325 fms., Cape Spartivento, Sardinia, 1927.

Geographical Distribution of Species of Echinodermata.

WEST INDIAN FAUNA.

Neocomatella pulchella (Pourtales).

One very fine specimen dredged in 150 fms., 7 miles S. W. off Alligator Reef, Florida, March 30, 1926.

Astropecten antillensis Lutken.

Two specimens, Porto Padre, Cuba, March, 1928, collected by the *"Ara."*

Luidia marcgravii Lutken.

Two very fine specimens, south of Catalina Creek, Cuba, February 11, 1924. Another large specimen, Guantanamo Bay, Cuba, February 8, 1924. Another fine specimen, Port Segua la Grande, Cuba, February 13, 1925.

Oreaster reticulatus (Linné) Muller and Troschel.

Three large dry specimens from Bury Island Flats, B. W. I., January 19, 1925. Five younger specimens of various sizes, in spirit, from the same locality.

Peltaster planus Verrill.

One, dredged in 150 fms., 7 miles off Alligator Reef, Florida, March 30, 1926.

Echinaster echinophorus (Lamarck) Perrier.

Two specimens, from the Florida Reefs, January, 1923. One larger specimen, from the south of Catalina Creek, Cuba, dredged in 5 fms., February 11, 1924.

Asteronyx loveni Muller and Troschel.

One specimen, dredged in 150 fms., 7 miles S. W. off Alligator Reef, Florida, March 30, 1926.

Astrophyton muricatum (Lamarck).

One large specimen, taken on the Florida Reefs, 1923. One large dry specimen, dredged off the south coast of Cuba, in deep water, February, 1924.

Hemipholis elongata (Say).

One specimen, taken in Turtle Harbor, Florida, April 14, 1923.

Ophiothrix angulata (Say).

One specimen, Thompson Key, Florida, January 27, 1923. Two, dredged in 150 fms., 7 miles S. W. off Alligator Reef, Florida, March 30, 1926.

Ophiothrix suensonii Lutken.

Two dry specimens, Pigeon Key, Florida, April 17, 1926, collected by the "*Ara.*" Two young specimens, Turtle Harbor, Florida, 2 fms., April 19, 1922. One from south of Catalina Creek, Cuba, February 14, 1923. Two specimens from Barnett Harbor, Bahamas, January 13, field tag 12.

Ophioderma appressum (Say).

Two specimens from Porto Padre, Cuba, 2 fms., March, 1928.

Ophioderma cinereum Muller and Troschel.

Two, dredged in 70 fms., south of Marquesas Keys, Florida, March 2, 1924.

Ophiolepis elegans Lutken.

One specimen, Porto Padre, Cuba, March, 1928.

Stichopus badionotus Selenka.

Three specimens, Egg Island Harbor, Bahamas, B. W. I., January 19, 1925. One specimen, Port Tanamo, Cuba, February 23, 1924, taken in 2 fms.; another much younger specimen, from the same locality, also taken in 2 fms.

Holothuria arenicola Brandt.

One specimen, Dry Tortugas, Florida, March, 1925.

Cidaris affinis (Philippi).

Four specimens, seined, Porto Padre, Cuba, 3 fms., March, 1928.

Eucidaris tribuloides (Lamarck).

Six specimens, dredged in shallow water, Egg Island, Bahamas, B. W. I., January, 1925. Another specimen, from the same locality, figured in plate. Two specimens, taken in 3 fms., south of Catalina Creek, Cuba, February 1, 1924.

Diadema setosum (Leske).

One large specimen, Port Tanamo, Cuba, 2 fms., January 23, 1924. Two young ones from the same locality. One large specimen, Dry Tortugas, Florida.

Lytechinus variegatus (Leske).

Eight beached tests from the West Indies. One specimen, Dry Tortugas, Florida.

Tripneustes esculentus (Leske).

Ten very young specimens, Bury Island Flats, B. W. I., January 19, 1925. Two small specimens, Porto Padre, Cuba, March, 1928.

Echinometra lucunter (Linné).

Two small specimens, Dry Tortugas, Florida.

Clypeaster ravenelii Agassiz.

Two specimens, dredged in 70 fms., S. of Marquesas Keys, Florida, March 2, 1924.

Clypeaster rosaceus Linné.

Two beach worn tests from Dry Tortugas, Florida.

Moira atropus (Lamarck).

Three dredged in 3 fms., Cape Cruz, Cuba, field tag 410 A, February 11, 1924. Five young specimens, Porto Padre, Cuba, seined in 2 fms., March, 1928.

Meoma ventricosa (Lamarck).

One large specimen, dredged at Egg Island, British West Indies, January 19, 1925.

LABRADOR-NEW ENGLAND FAUNA.

Ctenodiscus crispatus (Retzius).

Seven specimens, dredged in the middle of St. George's Bay, Newfoundland, September 2, 1926.

Peltaster planus Verrill.

One larger than the type, dredged in 200 fms., 9 miles S. W. by W. of Port Basque, Newfoundland.

Solaster papposus (Linné).

Three young specimens, dredged in the middle of St. George's Bay, Newfoundland, September 2, 1926.

Solaster endeca (Retzius).

Three specimens, from the coast of Maine, collected by the *"Eagle."*

Henricia sanguinolentus (O. F. Muller).

One specimen, off Cuttyhunk, Vineyard Sound, Mass., June 16, 1922. Two small specimens, without label, but probably from Vineyard Sound, June, 1922. One young and two somewhat larger specimens, dredged in 200 fms., 9 miles S. W. of Port Basque, Newfoundland, September 2, 1926. One larger specimen, dredged in Long Island Sound, off Northport, N. Y., summer of 1929.

Asterias vulgaris Verrill.

Three specimens, from the coast of Maine, taken by the *"Eagle."* Another large dry specimen, from the coast of Maine. One young specimen, dredged off Eastport, Maine, August 22, 1923.

Gorgonocephalus arcticus (Leach).

One large specimen, in spirit, dredged in 200 fms., 9 miles S. by S. W. off Port Basque, Newfoundland, September 1, 1926. One dry specimen, from the coast of Maine, collected by the *"Eagle."*

Ophiopholis aculeatus (Linné).

One specimen, dredged in 200 fms., 9 miles S. W. by W. of Port Basque, Newfoundland, September 1, 1926.

Ophiura sarsii Lutken.

One, collected at Eastport, Maine, by the *"Eagle."*

Echinarachinus parma (Lamarck).

Three, collected at Eastport, Maine, August 24, 1924. Four, from the W. K. Vanderbilt estate shores, Northport Harbor, Long Island, N. Y.

Cucumaria frondosa (Gunnerus).

Two, from the Bay of Islands, Newfoundland, September 10, 1923.

Psolus phantapus (Strussenflet).

One specimen, dredged in the middle of St. George's Bay, Newfoundland, September 2, 1926.

TROPICAL AMERICAN PACIFIC FAUNA.

Nidorellia armata Gray.

One specimen, taken at Webb Cove, Albemarle Island, Galapagos Islands, March, 1928.

Luidia columbia (J. E. Gray).

One specimen, Webb Cove, Albemarle Island, Galapagos Islands, February 3, 1926.

Linckia columbiae Gray.

One, Webb Cove, Albemarle Island, Galapagos Islands, February 3, 1928.

Heliaster multiradiatus (Gray).

One young specimen, Webb Cove, Albemarle Island, Galapagos Islands, February 3, 1928.

Amphiura diomedeae Lutken and Mortensen.

Two disks with broken arms and 50 to 100 arms minus the disks, dredged in 100 fms., Punta Arenas, Costa Rica, February, 1928.

Ophiocoma aethiops Lutken.

Five very large specimens, collected in Webb Cove, Albemarle Island, Galapagos Islands, tide-pool, February, 1928.

Ophioderma variegatum Lutken.

Eight specimens, from Punta Arenas, Costa Rica, February, 1928.

Eucidaris thouarsii (Valentin).

Three large specimens, Hood Island, Galapagos, March, 1928.

Strongylocentrotus gibbosus Agassiz and DeSor.

Six specimens, shallow water, Webb Cove, Albemarle Island, Galapagos Islands, March, 1928.

Pegalothuria natatrix Ludwig.

Three specimens, in very good condition, dredged in 300 fms., 50 miles S. W. off Cape Mala, Panama, Pacific Ocean, March 16, 1926, by the *"Ara."*

Holothuria impatiens (Forskal).

Two, Gardner Bay, Hood Island, Galapagos Islands, February, 1928.

Holothuria kefersteinii (Selenka).

Ten specimens, tide-pool, Hood Island, Galapagos Islands, February, 1928.

MEDITERRANEAN FAUNA.

Antedon adriatica A. H. Clark.

One specimen, dredged in 65 fms., 11 miles S. W. of Lissa Island, Dalmatia, Adriatic Sea. Ten specimens, dredged in 100 fms., 9½ miles E. by S. ½ S. off Cape Bon Tunis, N. Africa, July 21, 1927.

Echinaster sagenus (Retzius).

One young specimen, dredged in 19 fms., 10 miles S. of Cagliari, Sardinia, July 23, 1927.

Brisinga mediterranea Perrier.

Six rays without the central disk, taken in dredge, 102 fms., mud bottom, St. Andrea Island, off Dalmatian coast, Adriatic Sea.

Ophiomyxa pentagona (Lamarck).

One dredged in 35 fms., 5 miles N. E. by N. of Cape Carthage, Gulf of Tunis, North Africa, July 19, 1927.

Ophioderma longicauda (Linck).

Eight specimens, dredged in 19 fms., 10 miles south of Cagliari, Sardinia, July 23, 1927.

Ophuira texturata Lamarck.

One large specimen, 35 fms., N. E. by N. of Cape Carthage, Gulf of Tunis, North Africa, July 21, 1927.

Sphaerichinus granularis (Lamarck).

Eleven young specimens, dredged in 19 fms., grassy bottom, 10 miles S. of Cagliari, Sardinia, Mediterranean Sea, July 23, 1927.

Stichopus regalis (Cuvier).

Three specimens, dredged in 100 fms., 9½ miles S. by E., ½ S. off Cape Bon Tunis, North Africa, Mediterranean Sea, July 19, 1927.

Holothuria tubulosa Gmelin.

Three specimens, from grassy bottom, 19 fms., 10 miles south of Cagliari, Sardinia, Mediterranean Sea, July 23, 1927.

Cucumaria planci von Marenzeller.

One, taken in 35 fms., 5 miles N. E. by N. of Cape Carthage, Gulf of Tunis, North Africa, July 21, 1927.

Geographical Distribution of Species of Mollusca.

West Indian Fauna.

Onychoteuthis banksii Leach.

Two very young specimens, from Bimini, British West Indies, January 19, 1923.

Rossia tenera (Verrill).

One, dredged in 100 fms., Marquesas Keys, Florida, 1924.

Loligo brevis Blainville.

One specimen, Hogsty Island, San Salvador, B. W. I., February 13, 1926. One specimen, Limon Bay, Panama, caught in dragnet, 1⅔ fms., January 21, 1928.

Loligo pealeii (Leseuer).

Three specimens, Thompson Key, Florida, January 26, 1926. One specimen, caught at night with marine electric light, Hawk's Nest,

Cat Island, Bahamas, January 15, 1923. Three specimens, caught on the south coast of Cuba, February 14, 1923.

Sepioteuthis sloanii Leach.

Two specimens, caught in Turtle Harbor, Florida.

Octopus verrilli Hoyle.

Three specimens, dredged in 200 fms., off Miami, March 31, 1926.

Octopus vulgaris Lamarck.

One specimen, Bimini, Bahamas Islands, March, 1924. One, taken at Miami, Florida. The cut-off arm of a specimen which resisted capture and attacked one of the sailors on the schooner *"Sonia"* while the boat was crossing from Bimini to Miami Beach, Florida. This specimen was probably between seven and eight feet umbrella diameter. The naturalist of the *"Sonia,"* Mr. L. L. Mowbray, reported that the octopus was basking in the sunlight close to the surface, as if asleep, when first sighted. A mother octopus, with umbrella diameter of about ten inches, and her brood of 522 young, seven of which are not fully escaped from the egg-capsule; taken from loggerhead sponge, Knight's Key, Florida, dredging 2 fms., March 6, 1925. Two young specimens, Le Mole, Carenge Bay, Haiti, February 5, 1924. One very minute young specimen, taken in 34 fms., off Fowey Rock Light, Florida, April 26, 1922. One large specimen, Bimini, British West Indies. Another large specimen, Miami, Florida, 1923. One very young specimen, Cualeo Reales Channel, Cuba, February 18, 1923. One large octopus, caught by hand in rock crevice, Miami, Florida, no. 10, lot B.

Ischnochiton (Stenoplax) limaciformis Sowerby.

One specimen, dredged in 5 fms., American Shoal Light, Florida.

Tethys dactylomela (Rang).

One specimen, off American Shoal Light, Florida, 6 fms., March 23, 1924.

Dolabrifera virens Verrill.

One, taken at the surface, 15 miles east of Casilda, Cuba, February 14, 1923.

TROPICAL AMERICAN PACIFIC MOLLUSCAN FAUNA.

Onychoteuthis banksii Leach.

One young specimen, taken 17 miles S. W. of Pinta Island, Galapagos, January 31, 1928.

Pyrgopsis schneehageni (Pfeffer).

Two specimens, dredged in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926. Very rare.

Dosidicus gigas (D'Orbigny).

One, taken 17 miles S. W. of Pinta Island, Galapagos, January 31, 1928.

Loligo diomedeae Hoyle.

One fairly large adult, dredged in 300 fms., 50 miles S. W. off Cape Mala, Panama, March 16, 1926. Seven very young specimens, in the post-embryonic stage, just from the capsule, dredged in 100 fms., Punta Arenas, Costa Rica, 1928.

Argonauta argo Linné.

One egg-laden female and shell, from 50 miles off Cape Mala, Panama, pelagic at surface, March 16, 1926.

Octopus bimaculatus (Verrill).

One large specimen, taken by blasting rocks, at Eden Island, Indefatigable group, Galapagos Islands, March 12, 1926. One smaller specimen, taken in drag-net, Coiba Island, Panama, Pacific side, February, 1928.

Chiton (Chiton) latus Sowerby.

One large specimen, collected on the rocks at Gardner Bay, Hood Island, Galapagos Islands, February 4, 1928.

Chiton (Chiton) goodallii Broderip.

Six specimens, Wafer Bay, Cocos Island, Pacific Ocean, March 5, 1926. Seven very large specimens, Wafer Bay, Cocos Island, February 4, 1928.

Chiton (Radsia) sulcatus Wood.

One very large specimen, on the rocks, Gardner Bay, Hood Island, Galapagos Islands, February 4, 1928.

LABRADOR-NEW ENGLAND MOLLUSCAN FAUNA.

Illex illecebrosus illecebrosus (Leseuer).

One specimen, taken in 200 fms., 9 miles S. W. of Port Basque, Newfoundland, September 1, 1926. One specimen, Halifax, Nova Scotia, August 3, 1923.

MEDITERRANEAN MOLLUSCAN FAUNA.

Onychoteuthis banksii Leach.

One specimen about six inches long, taken in storm, washed up on the upper deck of the yacht "*Ara*" between Madeira and Casa Blanca, Morocco, August 4, 1924.

Sepiola rondeletii (Gesner).

One, dredged in 100 fms., 9 miles E. by S. ½ S. off Cape Bon Tunis, North Africa, July 19, 1927.

Rossia macrosoma (Delle Chiaje).

One, dredged in 100 fms., 9 miles E. by S. ½ S. off Cape Bon Tunis, North Africa, July 19, 1927.

Loligo vulgaris Lamarck.

Two specimens, dredged in 11 fms., Casa Blanca, Morocco, August 20, 1924.

Octopus (Octopus) vulgaris Lamarck.

One large specimen, taken in Monaco Harbor, Mediterranean Sea.

Scaeurgus unicirrhus (Delle Chiaje) D'Orbigny.

One taken in 100 fms., 9 miles E. by S. ½ S. off Cape Bon Tunis, North Africa, July 19, 1927.

Eledone moschatus (Lamarck).

One, from rock crevices, Monaco Harbor, Mediterranean Sea, 1927.

Cymbulia peronii Blainville.

Four specimens, pelagic, in the Mediterranean Sea, 10 miles S. by E. of Monaco Harbor, April 19, 1927, 900 fms. Two, from 400 fms., St. Raphael, bearing S. S. E., 9 miles S. of France, March 27, 1927.

Tethys depilans (Linné).

One large specimen, Palermo, Italy, September 2, 1924.

Tethys fimbria (Bohascht).

One very fine specimen, Monaco, Mediterranean Sea, May 14, 1927.

Carinaria mediterranea (Peron and Leseuer).

One, taken in dip-net, Monaco, Mediterranean Sea, May 2, 1927. Another slightly smaller specimen, from the same locality, May 14, 1927.

Firola coronata Forskal.

One, dredged in 400 fms., St. Raphael, bearing S. S. E. distance 9 miles S. of France, March 23, 1927.

MEDUSA.

"I looked down into the current
And saw Medusa pass,
A delicate tinted creature,
Like languidly pulsing glass;
An exquisite filmy nothing
That has no meaning for me,
And yet she is holding the heart
Of the sea.

Why are the oceans stirring,
What makes their waters run
Cold from the inshore icebergs,
Warm from the offshore sun,
Green where the banks lie sleeping,
Blue in the deeps outside;—
All are Medusa's servants,
Hers to ride.

So in the sea of letters
Some artfully shaded word
Is drifted down the ages
Sure as a homing bird,
Unreal and without substance,
Yet meaning more to you
Than all of the hard statistics
That are true."

—J. T. Nichols.

COELENTERATA: SYSTEMATIC DISCUSSION.

HYDROCORALLINAE.

Family: **MILLEPORIDAE.**

Genus: **MILLEPORA** Linné.

Millepora alcicornis Linné.

NAME: Sea-Ginger.

TYPE: Linné states: *"Habitat in O. India utriusque."*

DISTRIBUTION: Shallow water to ten fathoms; found from Florida to northern Brazil.

MATERIAL EXAMINED: Several specimens collected on the south coast of Cuba, February 19, 1923.

REMARKS: This is one of the most important and abundant of the reef-building animals of the West Indies. In life it is usually dark russet-brown, but occasionally it is orange-brown or umber-brown. When young it often encrusts shells, corals or gorgonians; when well grown it forms large clusters of finger-like fronds, the groups often being four to six feet across and one to two feet high. The shape of the fronds varies greatly. When young it forms encrustations on dead corals, shells and sea-fans, and on these latter as they shrink or swell the millepore breaks into bead-like forms. The zoöids are armed with unusually powerful stinging cells which cause it to be called "Sea-ginger." Several distinct subspecies have been described from West Indian waters. In 1858 Louis Agassiz first established the hydroid nature of the zoöids of this millepore.

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ANTHOMEDUSAE.

Family: **OCEANIDAE** Vanhoffen, *s. s.*

Genus: **STOMOTICA** L. Agassiz.

Stomotica divisa Maas.

TYPE: Maas' type was taken by the *"Albatross"* at Station 3383, in the Bay of Panama; depository not given.

Distribution: A deep-sea species known from the tropical American Pacific.

Material examined: One specimen, dredged in 300 fms., 50 miles S. W. of Cape Mala, Panama, March 16, 1926, by the *"Ara."*

Color: This species, which is very closely related to the West Indian *Stomotica pterophylla* Haeckel, and possibly identical with it, is milky white, with the gonads rose-pink, the manubrium and tentacles canary yellow.

Life history: Unknown. The members of this genus are known to develop through Tubularian hydroids.

Technical description: Consult Maas (1897), p. 11, pl. I, figs. 1-7, color plate and Bigelow (1909), p. 203.

The single specimen taken by the *"Ara"* has an axial diameter of 12 mm. It is somewhat broken, but corresponds in all essentials with the above cited descriptions of this species.

References: *Stomotica divisa* Maas, Mem. Mus. Comp. Zoöl., vol. 23, p. 11, pl. 1, figs. 1-9, 1897.—Bigelow, H. B., Mem. Mus. Comp. Zoöl., vol. 37, p. 203, pl. 7, fig. 9, pl. 43, figs, 6, 7, 1909.—Mayer, Medusae of World, Publ. 109, Carnegie Inst. of Washington, vol. I, p. 114, fig. 61, 1910.

Order: LEPTOMEDUSAE.

Family: AEQUORIDAE.

Genus: **ZYGODACTYLA** Brandt, *s. s.* Agassiz.

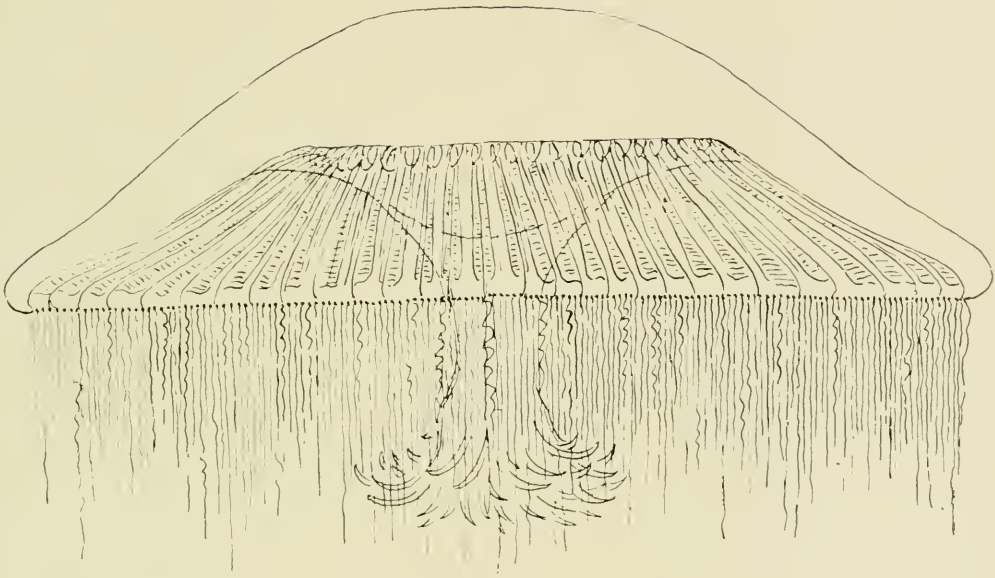
Zygodactyla groenlandica (Peron and Lesueur).

Plate 1.

Type: Peron and Lesueur recorded the species from "the seas of Greenland." Louis Agassiz in his "tabular classification of the hydroida" gives in addition to Greenland, the coasts of Maine, Bay of Fundy and Massachusetts Bay. Neither author cites a depository of his material.

Distribution: The northern form of this species is larger than the southern and ranges from the coast of Greenland to Cape Cod, Mass., while the southern form is found in abundant swarms pelagic from the southern shores of Long Island to Beaufort, N. C.

Material examined: One large specimen about 21 inches in diameter, collected at Eastport, Maine, by the *"Eagle."*



Zygodactyla groenlandica (Peron and Lesueur), about one-third natural size.

COLOR: Louis Agassiz records that this medusa is highly phosphorescent at night and that the phosphorescence takes place in the substance of the nervous cord. The northern form varies in color from nearly colorless specimens to some that are exquisite transparent violet fringed around the margin with fine tentacles of a darker violet. The southern form is decidedly pinkish.

LIFE HISTORY: The young of this species were first described by Agassiz (1865). Mayer (1910) also described the young.

TECHNICAL DESCRIPTION: Adult: Northern form. Disk, axial diameter 10 to 15 inches; aboral surface flat or slightly concave in the middle region; gelatinous substance hyaline, rigid, about three-quarters of an inch thick in the middle of umbrella, abruptly quite thin near the margin; velum rudimentary. Eighty to one hundred chymiferous tubes present, with three to four very long, retractile tentacles with hollow bulb-like ends between each two chymiferous tubes. The excretion papillæ are near the bases of the tentacles and some occur between them. There are eight to ten very minute lithocysts, each containing two spherical concretions, situated between each successive pair of tentacles. There is also a single row of six to fifteen solid, rounded papillæ on the subumbrella, between each successive pair of radial canals. The stomach is sac-like, broad proximally, tapering to an elongated, cylindrical throat-tube, margined by long oral tentacles which equal or slightly exceed in number the radial canals.

REFERENCES: *Medusa aequorea* FABRICIUS, Fauna Gronlandica, no. 357, 1780.

Medusa globularis MODEER, Nova Acta Phys. Med. Bd. 8, p. 33, 1791.

Aequorea gronlandica PERON and LESUEUR, Ann. Mus. Hist. Nat. Paris, tome 14, p. 339, 1809.—LESSON, Zoöph. Acal., p. 313, 1843.

Aequorea globularis MORCH, Beskriv. af Groenland., p. 96, 1857.

Rhacostoma atlanticum AGASSIZ, L., Proc. Boston Soc. Nat. Hist., vol. III, p. 342, 1850.

Polycanna groenlandica HAECKEL, Syst. der Medusen, p. 232, 1879.—WHITEAVES, Cat. Marine Invert. Eastern Canada, Publ. of Geol. Survey Canada, p. 22, 1901.

Zygodactyla groenlandica AGASSIZ, L., Contrib. Nat. Hist. U. S., vol. 4, p. 360, 1862.—AGASSIZ, A., N. American Acalephae, p. 103, figs. 153-155, 1865.—VERRILL, A. E., Rept. U. S. Comm. Fish and Fisheries, 1871-72, p. 729, pl. 37, fig. 275, 187 .—FEWKES, Bull. Mus.

Comp. Zoöl., vol. 8, p. 156, pl. 5, figs. 5, 6, 11, 12, 1881; Mem. Mus. Comp. Zoöl., vol. 9, pl. 5, figs. 7, 19, 1884.—Hargitt, Bull. U. S. Bur. Fish., vol. 24, p. 25, 1904.—Mayer, A. G., Medusae of The World, vol. II, p. 335, pl. 44, figs. 1-4, color plate, 1910; Publ. 109, Carnegie Inst. of Washington.

HYDROIDA.

Family: PLUMULARIIDAE.

Genus: CLADOCARPUS Allman.

Cladocarpus sigma (Allman).

Plate 2.

Type: Allman's type came from Florida and is deposited in the Museum of Comparative Zoölogy.

Distribution: Florida and the upper West Indian region. Bathymetric occurrence: 110 to 352 fms.

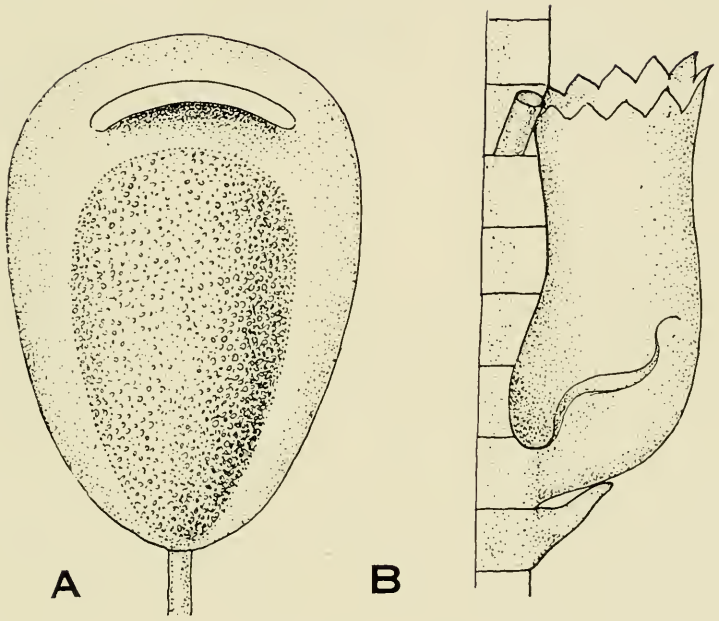
Material examined: Two small colonies taken in 150 fms., 7 miles S. W. off Alligator Reef, Florida, March 31, 1926.

Color: Crystalline, transparent.

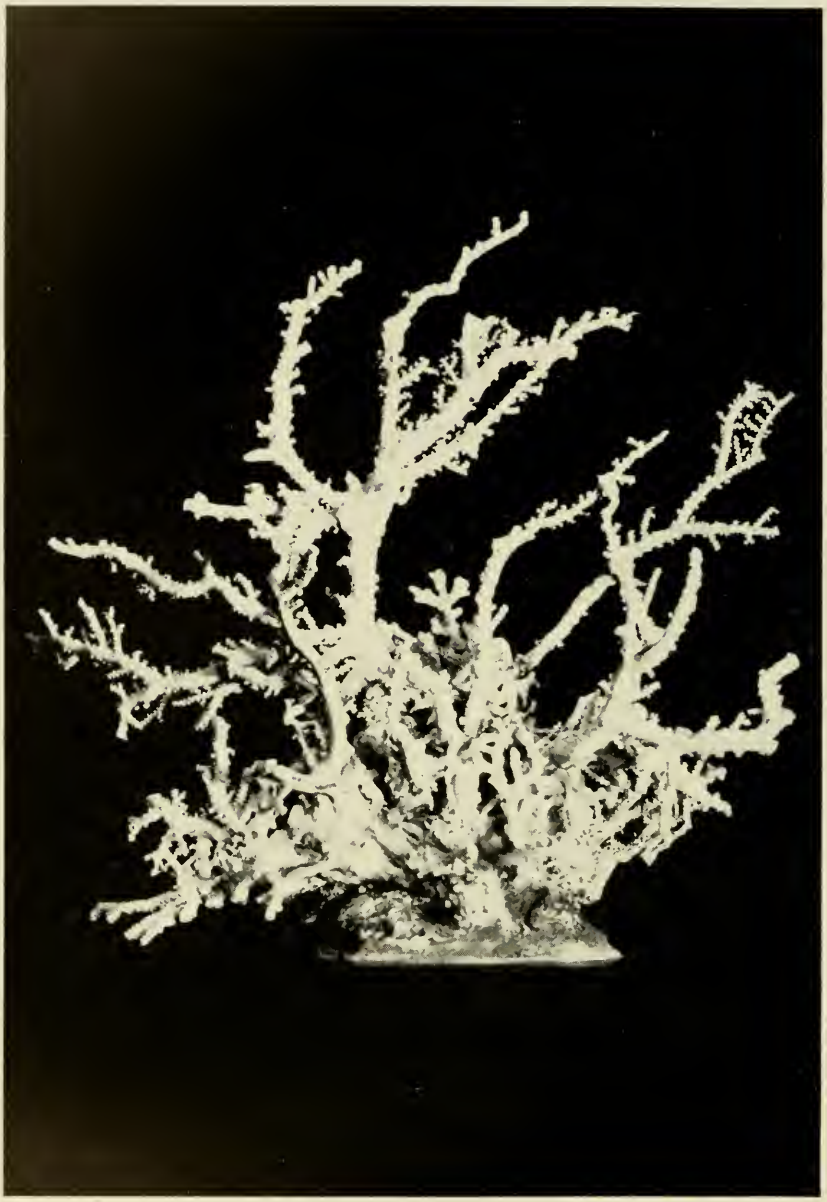
Technical description: According to Nutting this species attains a height of two to two and one-half feet, branching profusely and repeatedly. The *"Ara"* specimens are broken branches 80 mm. and 87 mm. high, respectively.

Trophosome: Colony pinnate, stem fascicled except at the extreme tips of the branches; hydrocladia alternate, closely set, originating from the front side of stem; internodes straight, each having its axial cavity divided by about ten very strong and conspicuous septal ridges, which appear to extend entirely around the internal surface of the internode. Hydrothecae rather closely approximated for this group, deep, cylindrical, with the margins cut into about ten shallow teeth, sharp pointed with shallow arcs between; margin slightly flaring; intrathecal ridge conspicuous with a sigmoid flexure in lateral view its course being curved forward then upward then forward, downward and forward again; the supracalycine nematophores are cylindrical, reaching the margin of the hydrotheca; the mesial nematophores are small, spur-like, adnate except at the distal end; the cauline nematophores afford no specific characters.

Gonosome: Gonangia are present on one of the specimens; they are borne on phylactogonia, springing from the proximal internode of



Cladocarpus sigma (Allman), A, Gonosome × 40. B, Hydrotheca × 80.



Stylaster roseus (Pallas), about one-third natural size.

the hydrocladia and are subovoid, much broader at the distal end than toward the proximal end, as shown in the figure; each has a lunate, laterotermínal aperture. Not all of the gonangia are identical in shape; some appear in profile somewhat like a bird's head, the convex distal end beyond the aperture being abruptly narrowed; these usually are the less fully developed gonangia, toward the tip of the phylactogonia. Each phylactogonium bears three to four gonangia and several protective nematophorous branchlets, one each arising at the base of each gonangium.

REFERENCES: *Aglaophenia sigma* ALLMAN, Mem. Mus. Comp. Zoöl., vol. V, no. 2, p. 45, pl. 26, 1877.

Cladocarpus sigma NUTTING, Smiths. Special Bull., part I, p. 111, pl. 26, figs. 1-2, 1900.

Order: **STYLASTERINA.**

Family: **STYLASTERIDAE.**

Genus: **STYLASTER** Gray.

Stylaster roseus (Pallas).

Plate 3.

TYPE: Pallas' type material came from the seas about St. Domingo, and was probably deposited in the Leyden or Belgium museum.

DISTRIBUTION: This is a deep water species, restricted to the West Indian region. Bathymetric occurrence: shallow water to 340 fms., but found mostly from 50 to 340 fms.

MATERIAL EXAMINED: Several very beautiful branches, some 7 to 10 inches high, dredged in 150 fms., 7 miles S. W. off Alligator Reef, Florida, March 30, 1926, by the *"Ara."*

COLOR: The branches vary from ivory in the older basal portions of the branches to deep rose toward the more fragile outer branches.

TECHNICAL DESCRIPTION: Corallum flabelliform, nonanastomosing, principal branches large, compressed cylindrical rapidly dividing and subdividing into smaller branches and branchlets, the distal branches very delicate, elegantly graceful. In cross section the proximal branches are broad, oval or subcircular, firm and hard. The cyclostems are on the lateral sides of the branches, a few are found on the surfaces also. The majority are turned towards one surface; they are slightly elevated; 0.7 to 1.2 mm. transverse diameter. The septa are delicate, usually 12, sometimes 10 to 14 distinct septa present; columella minute.

REFERENCES: *Madrepora rosea* PALLAS, Elench. Zoöph., etc., p. 312, 1766.

Stylaster roseus H. MILNE EDWARDS and HAIME, Hist. Nat. Corall. t. II, p. 130, 1857 (with early synonymy).—POURTALES, as footnote, Bull. Mus. Comp. Zoöl., vol. I, art. 7, p. 136, 1868.—VERRILL, *ibid,* vol. I, art. 3, p. 45.—HICKSON and ENGLAND, Stylasterina Siboga Exped., vol. VIII, p. 8, 1905.

Stylaster sanguineus VALENTIN, Mem. Mus. Comp. Zoöl., vol. II, p. 83, 1871.

Family: OLINDIAIDAE.

Genus: OLINDIAS F. Muller

Olindias tenuis (Fewkes).

Plate 4.

TYPE: Collected at Key West, Florida, 1878, by Alexander Agassiz; deposited in the Museum of Comparative Zoölogy, Cambridge, Mass.

DISTRIBUTION: Found abundantly on the muddy flats of the Florida coast, Bahamas and Bermudas. An abundant species in summer. Mayer (1910) suggests that *tenuis* may be only a small northern variety of *O. sambaquiensis,* which occurs abundantly along the Brazilian coast.

MATERIAL EXAMINED: One specimen, collected at Turtle Harbor, Florida, November 28, 1923, by the *"Ara."*

COLOR: Bell delicate translucent greenish yellow. Ectoderm of manubrium, gonads and tentacle bulbs is an opaque yellow green with the innermost parts purple-red. On the manubrium near the base of the origin of the four radial canals there are four interradial purple red spots. The nematocyst warts on the short exumbrella tentacles are either white or deep purple, while the half-rings on the long flexible marginal tentacles are red and yellow. (Mayer.)

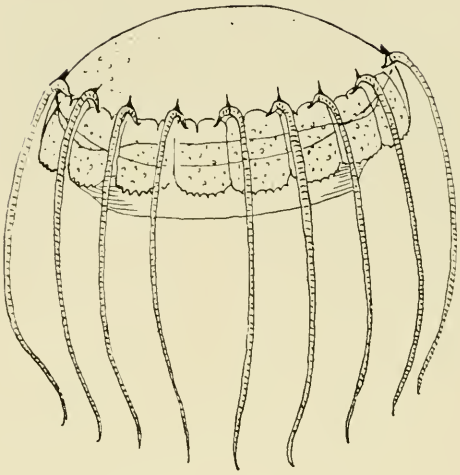
LIFE HISTORY: Mayer (1910) describes several growth stages of this species.

TECHNICAL DESCRIPTION: Consult Bigelow, Mem. Mus. Comp. Zoöl., vol. 37, p. 109, 1909, and Mayer, Medusae of the World, vol. II, p. 354, pl. 47, figs. 8-10, pl. 48, figs. 1-7, 1910.

The *"Ara"* specimen is 25 mm. diameter and has 34 primary tentacles; 52 secondary tentacles.

The bell is hemispherical, the gelatinous substance quite firm; the velar, short tentacles each arising from the bell in a line a little above

Olindias tenuis (Fewkes), × 2.



Solmissus albescens (Gegenbaur), ×1.5.

the margin. The tentacles of this series are furnished with wart-like clusters of nematocysts, and near the distal end, on the aboral side, there is an elongate, pad-like cluster of nematocyst cells, having a sucker-like appearance and serving as a strong adhesive organ, enabling the medusa to fasten itself to stones, etc. The exumbrella tentacles are 34 in number and arise from the bell margin; are about four times as long as the bell diameter, frequently retracted into cork-screw like curls and having a very powerful longitudinal muscle stripe on the inner side while the outer side is regularly banded by transverse half-rings of nematocysts. The tentacles terminate in a knob-like cluster of nematocysts and on their inner side there is a pad-like cluster of large cells which may serve as a weak adhesive organ. The exumbrella margin between the tentacles is in the form of small, rounded papillae. Above the ring-canal, on its inner side, are a series of lithocysts, a pair between the base of each velar tentacle; making a total of from 64 to 108 lithocysts. There is a spherical concretion in each lithocyst. There are four straight radial canals and twenty-eight to forty branches which extend inward from the ring canal and end blindly in the bell. The four gonads are papilliform, laterally reflected and develop on the outer halves of the radial canals. The manubrium is tubular, elongate reaching about three-fourths of the depth of the bell, and is cruciform in cross-section and has four out-curved lips.

References: *Halicalyx tenuis* Fewkes, Bull. Mus. Comp. Zoöl., vol. 9, p. 277, pl. 7, fig. 15, 1882.—Mayer, Bull. Mus. Comp. Zoöl., vol. 37, p. 63, pls. 5, 6, figs. 12, 13, 1900.—Goto, Mark Anniversary Volume, p. 15, 1903.

Olindias tenuis Browne, Fauna and Geol. Maldive Archipelagoes, vol. 2, p. 737, 1904.—Mayer, Mem. Nat. Sci. Brooklyn Inst. Mus., vol. 1, p. 23, pls. 5, 6, figs. 50-59, 1904; Medusae of the World, Publ. 109, Carnegie Inst. Wash., vol. II, p. 354, 1910.—Bigelow, H. B., Mem. Mus. Comp. Zoöl., vol. 37, p. 109, 1909.

Order: **NARCOMEDUSAE.**

Family: **AEGINIDAE** *sens. ampl.*

Genus: **SOLMISSUS** Haeckel.

Solmissus albescens (Gegenbaur).

Plate 5.

Type: Collected in the Mediterranean Sea; depository not stated.

Distribution: An abundant species in the Mediterranean Sea.

MATERIAL EXAMINED: One specimen, measuring 26 mm. bell diameter, collected 10 miles S. by E. of Monaco Harbor, Mediterranean Sea, April 19, 1923.

COLOR: The bell is transparent, colorless, except that the tentacles and gonads are milky; the concretions are garnet-red.

TECHNICAL DESCRIPTION: A small species, with bell diameter of 20 to 30 mm. The bell is flat, lenticular, with the central region a biconvex lens, thick in the center, while the bell collar is thin, flexible, contractile; over the collar region the exumbrella is beset with numerous prickle-like tubercles and flat, discoidal, wart-like nematocysts. There are 12 to 14 marginal lappets, with the same number of tentacles alternating the lappets. Each lappet is subrectangular, about one and one-half times as long as wide, the free margin a little rounded at the corners; there are five to eight sensory clubs on the margin of each lappet; each club is short, distally dilated, with a cup-like concavity within its outer end and filled with a vesicle containing a spherical concretion. There are sensory filaments on the outer half of the club. The velum is broad, with strong circular muscles. The tentacles are each nearly as long as the bell diameter, tapered distally and rather stiff, usually bending only near the base. The central stomach is large with a usually gaping circular aperture; the marginal stomach pouches are wide pentagonal, their outer angles extending under the base of the tentacles. There is no marginal canal system present. The gonads are situated over the subumbrella ectoderm of the stomach and its pouches and are somewhat milky in color.

REFERENCES: *Cunina albescens* GEGENBAUR, Zeit. fur. Wissen. Zoöl. Bd. 8, p. 260, taf. 10, figs. 3, 4, 1856.

Cunina moneta LEUCKART, Archiv. f. Naturgesch. Jahrg., vol. 22, p. 36, taf. 1, fig. 13; taf. 2, fig. 12, 1856.

Cunina solmaris HERTWIG, O. & R., Nerven. Syst. Sinnesorgane der Medusen, pp. 19, 34, taf. 1, figs. 7-10; taf. 10, fig. 6, 1879.

Solmissus albescens HAECKEL, Syst. der Medusen, p. 350, 1879.— BIGELOW, H. B., Mem. Mus. Comp. Zoöl., vol. 37, p. 63, 1909.— MAYER, Medusae of the World, Publ. 109, Carnegie Inst. Washington, vol. II, p. 482, figs. 326, 327, 1910.

Polyxenia albescens METSCHNIKOFF, Embryol. Studien an Medusen, Wien, pp. 23, 65, 1886.

Order: **CALYCOPHORAE.**

Family: **PRAYIDAE.**

Subfamily: **Prayinae.**

Genus: **NECTRODROMA** H. B. Bigelow.

Nectrodroma reticulata Bigelow.

TYPE: Collected by the *"Albatross,"* station 4681, 300 fms., down, two nectophores and three bracts; deposited in the U. S. National Museum or Museum of Comparative Zoölogy.

DISTRIBUTION: Known only from three small catches in the tropical American Pacific, in the vicinity of the Galapagos Islands, Cocos Island, and Cape Mala, Panama.

MATERIAL EXAMINED: One unusually fine colony and two not quite perfect nectophores of this rare animal were caught 300 fms., down, in the Pacific Ocean, 50 miles S. W. off Cape Mala, Panama, March 16, 1926, by the *"Ara."*

COLOR: Transparent, colorless, except for the yellow oil globule in the oleocyst.

LIFE HISTORY: Not known.

TECHNICAL DESCRIPTION: The *"Ara"* specimens conform in all essentials with Dr. Bigelow's excellent description and figures of the species.

REFERENCES: *Nectodroma reticulata* H. B. BIGELOW, Mem. Mus. Comp. Zoöl., vol. 38, p. 206, pl. 1, figs. 7, 8, pl. 3, figs. 1-7, 1911.

Family: **DIPHYIDAE.**

Subfamily: **Abilinae** L. Agassiz.

Genus: **ABYLOPSIS** Chun.

Abylopsis eschscholtzii (Huxley).

TYPE: Huxley's type material was collected in all the seas traversed by H. M. S. *"Rattlesnake,"* during the survey of the intricate passage within the Barrier Reef, which skirts the eastern shores of Australia and exploring the sea which lies between the northern end of this reef and New Guinea and the Louisade Archipelago. Depository, British Museum.

DISTRIBUTION: Widely distributed over the tropic Pacific and Malaysian regions. Deep-sea.

MATERIAL EXAMINED: Several bracts were taken in the dredge down 300 fms., Pacific Ocean, 50 miles S. W. of Cape Mala, Panama, March 16, 1926, by the *"Ara."*

COLOR: Transparent, colorless, with a touch of yellow due to oil in the oleocyst.

LIFE HISTORY: Imperfectly known.

TECHNICAL DESCRIPTION: Consult Huxley, T. H., (1859), and Bigelow, H. B. (1911).

REFERENCES: *Aglaismoides eschscholtzii* HUXLEY, T. H., The Oceanic Hydrozoa, p. 60, pl. 4, fig. 2, 1859, London.

Abylopsis eschscholtzii BIGELOW, H. B., Mem. Mus. Comp. Zoöl., vol. 38, p. 226, pl. 14, figs. 1-5, pl. 15, fig. 1, 1911.

Abylopsis tetragona (Otto).

TYPE: Otto's type came from the Mediterranean and is deposited in the Museum at Breslau.

DISTRIBUTION: Widely distributed in the Mediterranean, the tropical Atlantic, the West Indian region, the eastern and western tropical Pacific, the Malaysian region and the Indian Ocean. Bathypelagic.

MATERIAL EXAMINED: The Eudoxid stage of this species was taken in very good condition in the dredge down 400 fms., bottom depth 500 fms., off St. Raphael, bearing S. S. E., distance 9 miles S. of France, Mediterranean Sea, March 23, 1927, by the *"Ara."*

TECHNICAL DESCRIPTION: There are several excellent well illustrated descriptions of this species. It is more similar to *A. eschscholtzii* than any other members of the genus, but is readily distinguished therefrom by its very large size, its relatively much longer nectophore which is between four and five times as long as the anterior nectophore. The asymmetry of the nectophore in *tetragona* is very marked. The hydroecium is likewise diagnostic, the right wing being only slightly serrate on its transverse basal margin; the left wing being toothed throughout its length. The canals of the nectosarc are peculiarly arranged in *tetragona,* while in *eschscholtzii* they have the usual radial distribution.

The free Eudoxid stage of this species has likewise been well described. The outstanding diagnostic feature of this stage is that its dorsal facet is subrectangular in *tetragona,* but is regularly pentagonal in *eschscholtzii;* the ventral facet is straight in *tetragona,* deeply convex in *eschscholtzii;* the basolateral facets also differ in their proportions.

REFERENCES: *Pyramis tetragona* OTTO, p. 306, taf. 42, figs. 2a-2c, 1883.

Abylopsis tetragona H. B. BIGELOW, Mem. Mus. Comp. Zoöl., vol. 38, p. 224, pl. 14, figs. 6, 7, pl. 15, fig. 2, 1909-1911.

Family: **PHYSALIIDAE.**

Genus: **PHYSALIA** Bosc.

Physalia physalis (Linné) Schneider.

TYPE: Collected from the coasts of Santa Catharina, Brazil; depository not stated. Possibly St. Petersburg, Russia?

DISTRIBUTION: Pelagic in the West Indian region and Gulf Stream and the tropical Atlantic Ocean as far as the Azores and Canary Islands.

MATERIAL EXAMINED: Two specimens, pelagic at Sombrero Light, Florida, March 4, 1923 (coll. no. 140), collected by the *"Ara."*

COLOR: The float is pearly with a bright bluish tint, varying to rose color; the crest is margined with decided rose color and streaked below with rose. The appendages are opaque milky white with a bluish tinge.

DISCUSSION: *Physalia physalis* is the largest, best known, and most remarkable of the American siphonophora. The air-sac is pear-shaped with a conspicuous crenulated crest on the upper margin, which acts as a sort of sail. Pendant below the air-sac are three types of hydrae; the large, locomotive hydrae which arise from a hollow stem that communicates with the cavity between the inner and outer wall of the air-sac; outwardly the stem divides into three or four bunches of large hydrae which are placed on the windward side of the air-sac. Similar but definitely smaller clusters of hydrae occur on the lee-side. When the animal is storm driven, these larger tentacles can stretch forty to fifty feet in an effort to maintain the animal's safety. The feeding hydrae are scattered along the lee-side of the bag, and are of two kinds, large and small, clustered in bunches, each bunch arising from a common stem that communicates with the chymiferous cavity of the air-sac. The food is digested within these hydrae which have no tentacles. The third types of hydrae are very small, forming large clusters which are suspended among the feeding hydrae. The medusae buds, which arise singly either from the base of these hydrae or adjacent stems, are male or female, very similar to those of *Tubularia.*

REFERENCES: *Holothuria physalis* LINNÉ, Syst. Nat., p. 657, ed. X, 1758.

Physalia physalis SCHNEIDER, Zoöl. Anz., vol. 21, p. 190, 1898.—H. B. BIGELOW, Mem. Mus. Comp. Zoöl., vol. 38, p. 352, 1908-09 (with synonymy from Linné to date).

Family: VELELLIDAE.

Genus: **VELELLA** Lamarck.

Velella velella (Linné).

TYPE: Linné's type came from the Mediterranean Sea; present depository unknown.

DISTRIBUTION: In American waters known from the West Indian region and in the Gulf Stream as far north occasionally as Nantucket, Rhode Island; in the tropic Atlantic eastward to the Azores; also in the Mediterranean Sea.

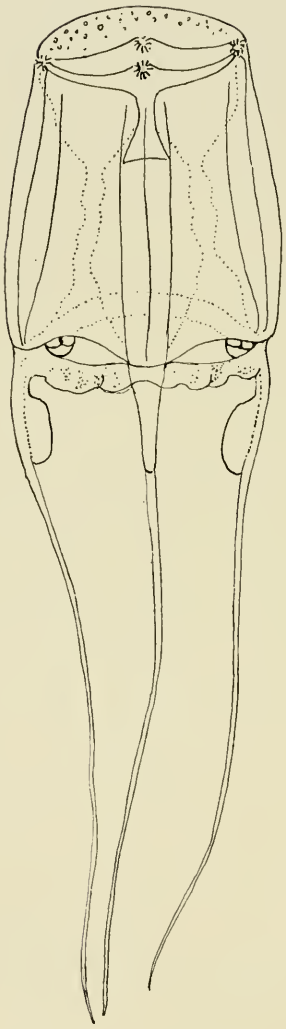
MATERIAL EXAMINED: Two specimens, 10 miles S. by E. of Monaco Harbor, April 19, 1927. One specimen, taken 4½ miles off Monaco, March 20, 1927.

COLOR: See Prof. Agassiz's color plate, made from Florida specimens, Mem. Mus. Comp. Zoöl., vol. VIII, pl. 1, 1881-83.

The mantle is a metallic bluish green with a deep cobalt blue margin surrounding the float and a similar band forming nearly an ellipse across the float. Between these bands of color the float passes from yellowish green to the dark blue marginal bands. The entire mantle is dotted with patches of brownish liver cells. The extreme outer margin of the mantle is fringed with a light cobalt blue band, through which the lower side of the tentacles of the float show. The mantle where it covers the central part of the float is light greenish blue with metallic lustre and with few liver cells, diminishing in abundance toward the base of the keel. The greenish color forms concentric lines parallel with the chambers of the float, crossed by triangular radiating rays extending from the fixed mantle margin towards the base of the keel, dividing the float into irregular alternating sections of light colored spaces. The keel is delicate steel color, with a thickened margin of the mantle extending around it; there are dark violet patches of liver cells in the mantle margin.

LIFE HISTORY: Extensive critical work has been done upon this species (see bibliography). In 1859 T. H. Huxley reported the larval forms.

TECHNICAL DESCRIPTION: Consult Agassiz, Mem. Mus. Comp. Zoöl., vol. 8, for description of the West Indian form, and Krohn, Archiv. f. Naturg., 1848, I, p. 30, for that of the Mediterranean form. Agassiz reviews the research done on the younger stages of *Velella velella* by Kolliker, Gegenbaur, Vogt, Huxley, Stuart and other workers.



Tamoya haplonema F. Muller, young specimen, × 1.5.

References: *Medusa velella* Linné, Syst. Nat. ed. X, p. 660, 1758.
Velella velella H. B. Bigelow, Mem. Mus. Comp. Zoöl., vol. 38, p. 353, 1909-1911, (with very complete synonymy).

SCYPHOMEDUSAE.

Order: CHARYBDEIDA.

Family: CHARYBDEIDAE Gegenbaur.

Genus: TAMOYA F. Muller.

Tamoya haplonema F. Muller.

Plate 6.

Type: Muller's type came from Desterro, Santa Catharina, coast of Brazil. The depository is not cited.

Distribution: This species is essentially of the West Indian region, having been recorded from the northern coasts of Brazil, at many places in the West Indies; the coasts of Florida; at Beaufort, N. C., and in the autumn from Long Island Sound, New York, at Branford Harbor and Great Peconic Bay. Mayer notes that none of the Long Island Sound specimens were obtained at the surface, all being taken in dredges in depths of a fathom or more. In southern waters the species is very frequently found at the surface.

Material examined: One young specimen, Bahamas, field tag 128. One young specimen, Matanzas, Cuba, February 28, 1928. One young specimen, Bimini, B. W. I., January 19, 1923, field tag 13. Nine young specimens, Hawk's Nest, Cat Island, Bahamas, with marine light and dipnet, January 15, 1928.

Color: The gelatinous substance of the bell is tough but transparent milky white; the wart-like nematocysts on the pedalia and velarium are also milky white. The long tentacles are milky amber, frequently with a delicate violaceous hue. The genital organs are milky amber; the ocelli dark wood brown.

Life history: Apparently not studied.

Technical description: Umbrella 85 to 110 mm. high, 50 to 60 mm. wide, shaped not unlike a four-sided tumbler, with the sides vertical, the top or aboral surface nearly flat; the aboral surface is thickly set with wart-like clusters of milky white nematocysts. There are four pedal lobes, each about 25 to 30 mm. long, flat, spatula shape, with thin edges. The four tentacles are each 85 to 95 mm. long, hollow, very flexible, and having regularly spaced rings of powerful nemato-

cysts. The rhopalia have two large median and four small lateral eyes, all placed on the inner side of the bulb. The large eyes have well developed, convex lenses. The velarium is thick, well developed, each quadrant having ten dendritic velar canals which terminate in many fine, non-anastomosing branches. The nerve extending from the base of each pedalium to the rhopalium is a well delineated white thread. The stomach is cruciform with four slightly recurved lips and extends approximately a third of the distance from the apex to the velarium. There are numerous short, gastric cirri. The genital organs are eight in number, attached to the four interradial septa, and extending like ribbon-like ruffles with frilled edges into the perradial gastrovascular pouches of the bell.

REFERENCES: *Tamoya haplonema* MULLER, Abhand. Naturf. Ges. Halle, Bd. 5, p. 1, taf. 1, 2, 1859.—AGASSIZ, L., Contrib. Nat. Hist. U. S., vol. IV, p. 174, 1862.—HAECKEL, Syst. der Medusen, p. 443, 1880.—BROOKS, Studies Johns Hopkins Univ. Labr., vol. II, p. 138, 1882.—VON LENDENFELD, Proc. Linn. Soc. New South Wales, vol. 9, p. 245, 1884.—MAYER, Mem. Nat. Sci. Museum Brooklyn Inst. Arts and Sci., vol. I, p. 28, pl. 7, figs. 60-64, 1904; Medusae of the World, Publ. 109, Carnegie Inst. Washington, vol. III, p. 513, pl. 57, figs. 2 to 2″′, color plate, 1910.—BOONE, L., Bull. Bingham Oceanog. Coll. vol. I, no. 5, p. 1, 1928.

Tamoya prismatica HAECKEL, *ibid,* p. 443.

Carybdea (Tamoya) haplonema FEWKES, Rept. U. S. Comm. Fish. for 1886, p. 526, issued 1889.

Order: **CORONATAE.**

Family: **PERIPHYLLIDAE.**

Genus: **PERIPHYLLA** Steenstrup.

Periphylla hyacinthina (Steenstrup).

TYPE: Steenstrup's type was taken in 300 fms., at Cape Farewell, Greenland, and is deposited in the Copenhagen Museum.

DISTRIBUTION: This exquisite medusa is widely distributed over the floor of the great oceans, and especially in the tropical parts of the Pacific, the west coast of Mexico, coast of Chile, the Hawaiian Islands, Philippines, Indian Ocean, Malaysia; Mediterranean Sea, and Guinea Stream in the Atlantic Ocean off West Africa.

MATERIAL EXAMINED: One specimen, dredged in 300 fms., bottom depth 1400 fms., 50 miles S. W. of Cape Mala, Panama, by the *"Ara,"* March 16, 1926.

COLOR: In life this jellyfish has the exoderm of the umbrella milky white, the endodermal part of the umbrella a rich red; the pedalia are reddish brown; the tentacles are an opaque milky blue.

REFERENCES: *Periphylla hyacinthina* STEENSTRUP, Acta et Catal. Musei Hafniensis, 1837, (not available for examination).—HAECKEL, System der Medus., p. 419, taf. 24, 1880.—VANHOFFEN, Deutsche Tiefsee Exped. Valdivia, 1898-99, Bd. 3, p. 29, pl. II, fig. 9, 1903, (excellent color plate).—BIGELOW, H. B., Mem. Mus. Comp. Zoöl., vol. 37, p. 26, pl. 1, fig. 3, pl. 9, fig. 2, (color plate) 1909. (With full synonymy, including that of the variety *dodecabostrycha.*)—MAYER, Medusae of World, vol. III, p. 544, figs. 342, 343, 1910, (synonymy).

Family: ATOLLIDAE.

Genus: ATOLLA Haeckel, *s. s.* Fewkes.

Atolla wyvillei Haeckel.

For color plate see Bigelow, 1909.

TYPE: Haeckel's type was obtained in the Antarctic Ocean; depository not stated.

DISTRIBUTION: A deep-sea species known first from stations in the Antarctic and sub-Antarctic, later taken by the *"Albatross"* at several stations in the eastern Pacific, including Hawaii and the coast of California.

MATERIAL EXAMINED: One small specimen, dredge down 300 fms., bottom depth 1400 fms., Pacific Ocean, 50 miles S. W. of Cape Mala, Panama; piece of a large specimen, from the same locality.

COLOR: See Dr. Bigelow's exquisite color plates of this species made from living specimens. (Mem. Mus. Comp. Zoöl., vol. 37, pl. 8, pl. 9, fig. 3, 1909.) The center of the bell is deep wine-red with more delicate markings of the same color toward the margin; the lappets and tentacles are delicate amber.

LIFE HISTORY: Unknown.

TECHNICAL DESCRIPTION: Consult Haeckel (1880) for the original description, and Bigelow (1909) for critical discussion of additional knowledge of this species.

The *"Ara"* specimen has an axial diameter of 46 mm., with broad radial furrows and smooth lappets.

REFERENCES: *Atolla wyvillei* HAECKEL, Syst. der Medusen, p. 488, 1880; Rept. Voy. H. M. S. *"Challenger,"* Zoöl., vol. IV, p. 113,

pl. 29, figs. 1-9, 1881.—Roule, Res. Sci. Campag. Caudan, t. I, Lyon, p. 302, 1896.—Maas, Mem. Mus. Comp. Zoöl., vol. 23, p. 79, 1897; Exped. Antarctique Francaise, vol. VII, p. 13, 1908.—Vanhoffen, Deutsche Tiefsee Exped. Valdivia, Bd. 3, Lfg. 1, p. 13, taf. 5, fig. 22, 1902; Deutsche Sudpolar Exped. Bd. 10, Zoöl., 2, p. 37, 1908.—Browne, Trans. Royal Soc. Edinburgh, vol. 46, p. 241, 1908.—Bigelow, H. B., Mem. Mus. Comp. Zoöl., vol. 37, p. 39, pls. 8-10, 1909.—Mayer, A. G., Medusae of the World, vol. III, p. 566, fig. 359, 1910; Publ. 109, Carnegie Inst. of Washington, (with full synonymy).

Atolla alexandri Maas, Mem. Mus. Comp. Zoöl., vol. 23, p. 81, taf. 11, fig. 2, taf. 14, figs. 4, 5, 1897.—Agassiz, A., and Mayer, A. G., Mem. Mus. Comp. Zoöl., vol. 26, p. 156, 1902.—Mayer, A. G., Bull. U. S. Fish Comm., vol. 23, p. 1138, pl. 2, fig. 7, pl. 3, figs. 10, 11, 1906.

Order: RHIZOSTOMAE.

Rhizostommata Pinnata Vanhoffen.

Genus: CASSIOPEA Peron and Lesueur.

Cassiopea xamachana H. B. Bigelow.

Plate 7.

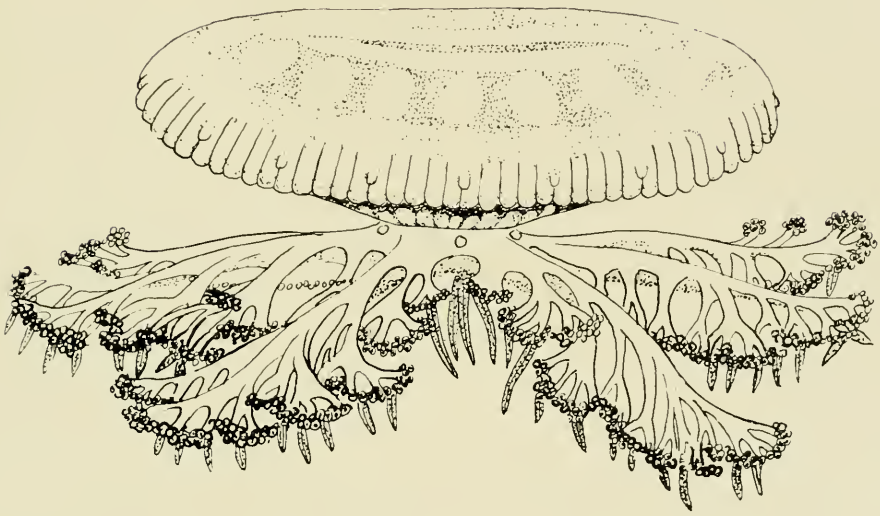
Name: This specific name is derived from the ancient Indian name for Jamaica.

Type: Dr. Bigelow discovered this species in great abundance in a salt water lagoon named Great Salt Pond, near Port Henderson, Kingston Harbor, Jamaica. The type is deposited in the Museum of Comparative Zoölogy.

Distribution: Known from the above type locality, Kingston Harbor, Jamaica, and also from the salt water lagoons along the Florida Reefs as far north as Miami.

Material examined: One specimen dredged in 6 fms., Dry Tortugas, Florida, November 26, 1923, field no. 315.

Color: In life the general color of this jellyfish is greenish gray-blue, the greenish color being due to the presence of clusters of commensal plant cells, algae, *Zoöthanellae,* within the gelatinous substance of the disk near the surface. Around the outer edge of the central concavity of the exumbrella is a wide, dull white circle, edged on its inner margin with delicate gray-brown. A somewhat Y-shaped radial white band extends outward from the broad ring in the radii of the



Cassiopea xamachana H. B. Bigelow, one-half of natural size.

sense organs. There is also a single radial stripe extending outward down the middle of the exumbrella side of each marginal lappet. Prominent spoke-like white stripes extend outward in the radii of the sense organs. The mouths, filaments and vesicles are olive or olive-brown; the vesicles and filaments more frequently being decidedly green. A number of color varieties of this species are known. An especially striking form is the rare one with dull white diamond-shaped markings.

Life history: The early stages of the development of the egg into scyphostoma are not yet studied. The formation of asexual buds by the scyphostoma has been critically studied by Bigelow and also observed by Perkins (1905). A careful résumé of this phase of the development of the species has been presented by Mayer (1910).

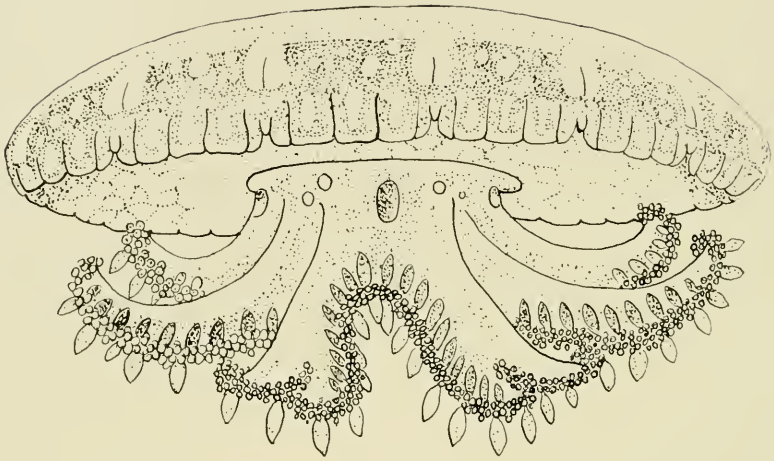
Regeneration in this species has been carefully studied by Stockard (1907) and Zeleny (1907). Histology of the muscles has been discussed by Dahlgren and Kepner (1908).

Studies of the rhythmical pulsation and its causes in the medusa have been reported by Mayer (1906, 1908).

Technical description: Mayer states that the disk diameter is usually 150 mm. Bigelow has recorded a specimen from Jamaica with a disk diameter of 240 mm. The disk is flat with rounded edges, the exumbrella with a median concavity the diameter of which is about equal to the disk radius, this concavity forming a sucking disk. The number of rhopalia is regularly 16, but often varies from 17 to 23. This variation is determined at the time of strobilization and is not related to the size of the medusa. The sense organs are short, blunt, clavate, and are set within niches protected above by a shelf-like membrane spanning the cleft between adjacent lappets. No exumbrella pit occurs above the club. Each sense organ contains an ectodermal ocellus with reddish brown pigment. There are five short, blunt, rounded lappets between each successive pair of sense organs; the two lappets adjacent to sense organs are only about half as wide as the others of the series. The mouth-arm disk which projects as a flattish plate from the center of the subumbrella is only about two-thirds as wide as the disk radius. Eight oral arms arise from this disk, each being rounded and slender with ten to fifteen alternate primary branches and numerous smaller ones. The arms project somewhat beyond the margin of the bell. There is a single flat ribbon-like filament in the axil of each primary branch of the oral arms. There are also five to thirteen ribbon-like filaments on the oral surface of

the mouth-arm disk. Besides these filaments there are many short, clavate, nematocyst-bearing vesicles scattered among the mouths. The mouths are located on the oral, principally on the primary and secondary branches of the arms and in less abundance on the oral sides of the eight basal trunks of the arms. In the adult medusa there are no mouths at the center of the mouth-arm disk. Very numerous fine waving tentacles fringe the mouths. There are four small, deep, oval, interradial, subgenital pits, and four separate invaginated genital sacs. The central stomach is cruciform; the four sac-like gonads somewhat encroaching upon it at the interradial sides. The axial ducts of the eight oral arms open into the central stomach at the four principal radii. Also arising from the central stomach are twice as many radial vessels as there are marginal sense organs; every other vessel extends to a sense organ, the remainder going to intermediate parts of the rim. All of these vessels communicate with one another by means of anastomosing branches, but this species lacks a well-defined circular vessel, such as is found in *Cassiopea ornata.*

References: *Cassiopea xamachana* H. B. Bigelow, Zoölog. Anz. Bd. 15, p. 212, 1892; Johns Hopkins Univ. Circ., vol. 11, p. 17, p. 84, 1892; Jrn. Inst. Jamaica, vol. I, p. 301, 1 pl., 1893; Mem. Boston Soc. Nat. Hist., vol. V, no. 6, p. 191, figs. A to L, pls. 31-38, 66 figs., 1900.—Perkins, Yearbook, Carnegie Inst. Washington, No. 4, p. 118, 1904; Publ. 102, Carnegie Inst. Wash., p. 150, pl. 4, 1908.—Mayer, A. G., Yrbk., Carnegie Inst. Wash., no. 4, p. 117, 1906; Publ., Carnegie Inst. Wash., no. 47, pp. 1-62, 1906 (discusses rhythmical pulsation); Yrbk., Carnegie Inst. Wash., no. 6, p. 121, 1907; *ibid,* no. 7, p. 123, 1908.—Maas, Scyphomedusen der Siboga Exped., Mon. 11, p. 40, 1903.—Stockard, Yrbk., Carnegie Inst. Wash., no. 6, p. 119, 1907 (discusses regeneration); *ibid,* no. 7, p. 130, 1908; Papers Tortugas Labr. Carnegie Inst. Wash., vol. 2, p. 61, figs. 1-29, 1909; Journ. Exper. Zoöl., vol. 6, p. 433, 8 figs., 1909.—Zeleny, C., Jrn. Exper. Zoöl., vol. 5, p. 265, 4 text figs., 1907 (discusses regeneration).—Dahlgren and Kepner, Text Book of Principles of Animal Histology, p. 88, fig. 85, 1908 (discusses histology of the muscles).—Mayer, A. G., Papers Tortugas Labr. Carnegie Inst. of Washington, Publ. 102, p. 113, 1908 (discusses cause of rhythmical pulsation); Popular Science Monthly, vol. 73, pp. 481-87, 4 figs., 1908; Rept. Seventh International Zoöl. Congress, 4 pp.—Harvey, Yrbk., Carnegie Inst. Wash., no. 8, p. 120, 1909.



Cassiopea frondosa (Pallas), about one-half of natural size.

Cassiopea frondosa FEWKES, Bull. Mus. Comp. Zoöl., vol. XI, p. 254, pl. 1, figs. 7-19, pl. 2, figs. 1-2, pl. 3, figs. 1-3, 9, 10, 1882; *ibid*, vol. 10, p. 80, pl. 1, fig. 16, 1883.

Cassiopea frondosa (Pallas).

Plate 8.

TYPE: Pallas described the species in 1774 from the Caribbean Archipelago. The depository of his type is not given, but probably was the Leyden Museum.

DISTRIBUTION: Found throughout the West Indian region and Florida Reefs. It lives on sandy bottom in sheltered places, in preference to weedy bottom, and prefers purer water than does *C. xamachana*. In Jamaica *frondosa* has been found on the muddy bottom of protected lagoons, especially those surrounded by mangroves near the entrance to Kingston Harbor, Jamaica.

MATERIAL EXAMINED: One specimen taken on the south coast of Cuba, February 19, 1923; field no. 97, lot E.

COLOR: In life this jellyfish is amber-yellow with a greenish tinge, with a series of white spots near the margin. There is a large, bean-shaped white spot above each marginal lappet and above this an irregular line of three to five small white spots between each pair of marginal sense organs. A more or less definite axial white line extends through the length of each mouth-arm. The arrangement and number of the white spots is quite variable. The frilled mouths are cinnamon color.

HABITS: *C. frondosa* lives in fairly pure water in sheltered places where it lies for long periods on the bottom with the oral surface and mouth-arms uppermost, slowly contracting its disk in sluggish rhythm. This serves not only to maintain the disk on the bottom but also to create a water current over the mouth-arms. The habits and physiology of this species have been reported by Dr. Bigelow (1893).

TECHNICAL DESCRIPTION: *C. frondosa* is easily distinguished from *C. xamachana* by the fact that *frondosa* has regularly twelve marginal sense organs, while *xamachana* has normally sixteen, but these vary from seventeen to twenty-three. *C. frondosa* has no ocelli on the rhopalia and no median concavity on the exumbrella. It is amber color with white spots. Disk diameter 110 to 260 mm., flattish with rounded edges; no median sucker concavity on the exumbrella. The

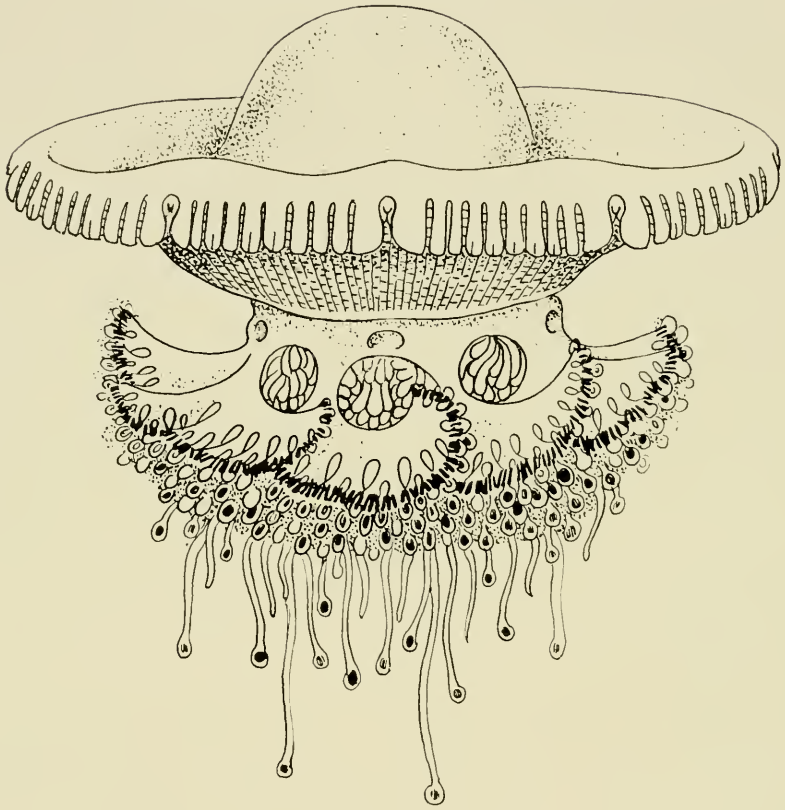
number of rhopalia is regularly twelve; four perradial and eight adradial. There are no ocelli. There are five subrectangular, nearly straight marginal lappets between each pair of sense organs; the two lappets adjacent to the rhopalia are only half as wide as the other lappets. The mouth-arm disk arises from the center of the umbrella and is usually about three-fourths as long as the umbrella radius, but sometimes a specimen is taken in which the arms are much longer, approximating those of *C. xamachana;* in *frondosa* the arms bifurcate distally, giving rise to numerous short, pinnate branches from the oral side. The many frilled mouths are found only on the lower or oral side of the arms, the upper sides of the arms being smooth. There is no central mouth-opening in the adult, but Louis Agassiz discovered that the ephyra stage of *frondosa* does have a central mouth aperture. There are 30 to 40 small, flat, leaf-like, expanded vesicles expanded between the mouths. There are four small, round, subgenital pits placed interradially. There are four separate, invaginated genital sacs which project into the stomach cavity. The axial ducts of the eight oral arms open into the central stomach and 24 radial canals extend from the stomach into the subumbrella, 12 passing to the rhopalia, and 12 are intermediate in position; all 24 communicate with one another by means of numerous anastomosing branches.

References: *Medusa frondosa* Pallas, Spicilegia Zoölog. fasc. 10, pp. 29, 30, pl. 2, figs. 1 to 3, 1774.—Gmelin, in Linné, Syst. Nat. t. I, pt. 6, p. 3157, 1788.—Bosc, Hist Nat. d. Vers, t. 2, p. 170, 1802.

Cassiopea frondosa Lamarck, Hist. Nat. Anim. sans Vert. tome II, p. 512, 1816.—Eschscholtz, Syst. der Acalephen, p. 43, 1829.—Tilesius, Acad. Caes. Leop. Nova Acta, tom. 15, pp. 263, 278, tab. 72, figs. 1-5, 1834.—Lesson, Zoöph. Acaleph., p. 405, 1843.—H. Milne Edwards, in Cuvier's Regne Anim. Zoöph., pl. 51, fig. 3, 1849.—Perkins, Yearbook, Carnegie Inst. Washington, no. 4, p. 115, 1906; Bull. 102, Carnegie Inst. Washington, p. 152, pl. 4, 1908.

Cassiopea pallasii Peron and Lesueur, Ann. Mus. Hist. Nat., Paris, tome 14, p. 357, no. 85, 1808.

Polyclonia frondosa L. Agassiz, Contrib. Nat. Hist. U. S., vol. III, pls. 13, 13a, 1860; *ibid,* vol. IV, p. 139, p. 152, pl. 4, 1862.—A. Agassiz, N. Amer. Acaleph., p. 41, 1865; Nature, vol. 24, p. 509,



Cotylorhiza tuberculata (Macri), about one-half of natural size.

1881.—Archer, H., *ibid,* p. 307.—Haeckel, Syst. der Medusen, p. 568, 1880; Report Voy. "*Challenger,*" Zoöl., vol. 4, p. 118, 1881. —Vanhoffen, Bibliotheca Zoölogica, Bd. I, Heft, 3, p. 40, 1888.— Bigelow, R. P., Johns Hopkins Univ. Circ., vol. 2, no. 106, p. 106, 1893.—Perkins, Yearbook, Carnegie Inst. Washington, no. 4, p. 15, 1906; Publ. 102, Carnegie Inst. Washington, p. 152, 1908.— Mayer, A. G., Medusae of the World, vol. III, p. 647, pl. 69, figs. 1-3, pl. 72, upper three figs., color plate, 1910.

Rhizostommata Dichtoma Vanhoffen.

Genus: **COTYLORHIZA** L. Agassiz.

Cotylorhiza tuberculata (Macri).

Plate 9.

Type: Collected in the Mediterranean Sea; depository not traced.

Distribution: This species is found chiefly in the Mediterranean Sea, but has also been found in the Atlantic Ocean near the Canary Islands. There is one valid record of its occurrence in the Red Sea, where it is believed to have been introduced via the Suez Canal. Pelagic. This species varies considerably in abundance, sometimes being very rare, especially so in midwinter. It is believed by Keller to be a deep water species which only comes to the surface occasionally when sexually mature and that the young remain at the bottom of the sea.

Material examined: One very large specimen, Monaco Harbor, 1927.

Color: The bell is rich olive tending to orange or brownish yellow, being darker brown on the dome-like apex of the exumbrella. Both the exumbrella and subumbrella show a rich yellow color due to the presence of multitudes of yellow and brown plant cells *(Zoöchlorellae)* which are present in the canal system and entoderm. The mouth-arms and disk are milky white tinged with creamy yellow; the free outer margins of the mouths are purple varying to violet or deep blue as are also the terminal parts of the milky white appendages. (See also Mayer's color plate.).

Life history: Much careful study has been made of the life history of this species by Busch, Frantzius, Gegenbaur, Kowalevsky, Claus, Goetle, du Plessis, Hein, Mayer and others.

Technical description: Consult Mayer, 1910, vol. III, p. 659, for an excellent modern description of this species.

The *"Ara"* specimen is an unusually fine one, measuring 190 mm. diameter.

REFERENCES: *Medusa tuberculata* MACRI, G., Osservazioni Int. Polmone Marino, p. 20, 1778.

Cotylorhiza tuberculata AGASSIZ, L., Contrib. Nat. Hist. U. S., vol. IV, p. 158, 1864.—MAYER, A. G., Medusae of the World, Publ. 109, Carnegie Inst. of Washington, vol. III, p. 659, pl. 73, fig. 2, color plate, and text figs., 1910, (with critical diagnosis and full synonymy).

Rhizostommata Scapulata

Genus: **STOMOLOPHUS** L. Agassiz.

Stomolophus meleagris L. Agassiz.

Plate 10.

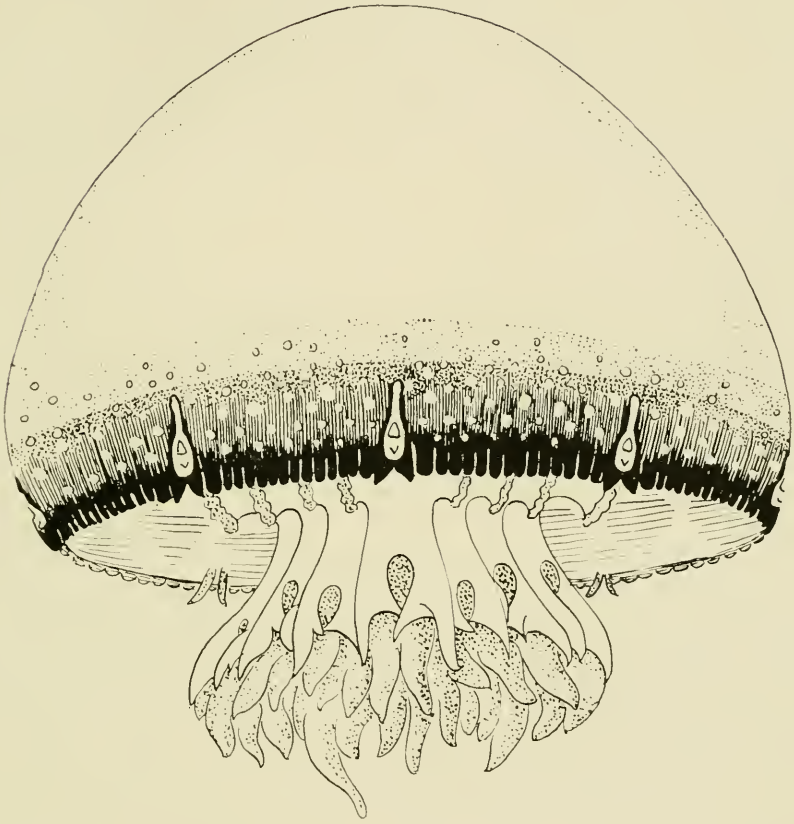
TYPE: Louis Agassiz states that he first observed myriads of this species in April, stranded upon the sand on the beach of Warsaw Island, below Savannah, Georgia; all of these were partially decomposed. Years later a specimen in similar condition was given him from the harbor, Charleston, S. C. Depository not stated.

DISTRIBUTION: Pelagic in pure ocean water off the coast of the southeastern United States, from the lower Chesapeake Bay southward to the Tortugas, Florida; it is abundant in the Gulf of Mexico, and also occurs along the northern coast of South America. Recorded as *S. chunii* Vanhoffen from the Bay of Panama.

MATERIAL EXAMINED: Eleven, collected off Miami Beach, Florida, by the *"Ara."*

COLOR: The bell is milky bluish or yellowish and the entodermal parts are yellow; the outer surface of the exumbrella is reticulated with brown which becomes a rather dense band near the margin, marked with many white or yellowish spots. The mouth frills are brownish pink.

TECHNICAL DESCRIPTION: Bell diameter 175 to 200 mm. axial diameter; hemiovoid, gelatinous substance thick and rigid, semi-opaque, marginal tentacles absent; eight rhopalia, four being radial and four interradial in position. Each rhopalium is deep-set in a niche between the ocular lappets and is also shielded above by a partial web between the lappets. The sense club is spindle-shaped, hollow, terminating in a knob-like end. Just above the base of each sense club there is a deep



Stomolophus meleagris L. Agassiz, about three-fourths of natural size.

three-sided, furrowed pit projecting inward from the surface of the exumbrella. There are about sixteen marginal lappets between each pair of rhopalia, the velar lappets having rounded margins, while the ocular lappets are longer and sharp pointed.

The manubrium is thick, rigid, extending 30 to 50 mm. below the bell, composed of the laterally coalesced eight radial arms, which are free only at the distal end, these free ends bifurcating and flaring outward at the lower end of the manubrium. Each of the eight arms has a deep groove on its lower side; this groove branches twice and extends over the free ends of the arms. The free edges of this branching groove are in turn much branched and folded and possess a row of many small, knobbed tentacles, constantly in motion to drive food particles into the mouth-groove. There are sixteen blade-shaped scapulets attached to the upper part of and occupying more than half the length of the manubrium. These bear many slit-like lateral mouths, the free edges of which are much crenulated and furnished with small tentacles of the same type found in the free margin of the central mouth. The eight principal mouth-grooves of the manubrium lead into a four-cornered central aesophagus, which opens into the wide, lenticular stomach, situated in the middle of the umbrella. There are sixteen branches, four from each side of the aesophagus, that extend outward to the slit-like mouths of the scapulets. From the stomach sixteen radial canals extend outward, the outer half of each canal branching many times and terminating in fine anastomosing branchlets which establish communication among all the radial canals. There is no ring canal present. The gonads are located in the four folded regions of the wall of the subumbrella at the base of the deep, cylindrical subgenital pits. Both the circular muscle areas and the radial muscle areas are well developed.

References: *Cephea rhizostoma* Gibbes, Fauna of South Carolina, p. xxiii, 1847. Published as an appendix to Rept. Geology of South Carolina, by M. Toumey, state geologist, Columbia, S. C.

Stomolophus meleagris Agassiz, L., Contrib. Nat. Hist. U. S., vol. III, pl. 14, figs. 1-8, 1860; *ibid,* vol. IV, pp. 138, 151, 1862.—Agassiz, A., N. American Acalephae, p. 40, 1865.—Mayer, A. G., Medusae of the World, vol. III, p. 710, pls. 75, 76, figs. 1-3, 1910; Publ. 109, Carnegie Inst. of Washington.